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OPTIMUM

STUDIA EKONOMICZNE

CONTENTS

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TRUST AS A COMPONENT OF SOCIAL CAPITAL OF ENTERPRISES

Summary

The social capital of an enterprise, understood as a network of relations among particular entities within a company, as well as those between the firm and its environment, can be best created by enhancing trust levels. Trust is indispensable for the development of every enterprise. Therefore, business entities have to undertake such steps that will reinforce it. The purpose of this paper is to discuss the nature of social capital on an enterprise level and to analyse the issue of trust as one of the pillars on which social capital is founded.

Key words: social capital, trust, human capital

1. Introduction

In order to be able to exist and develop, enterprises must possess capital, i.e. resources that help multiply economic value [http://mfiles.pl/]. Capital can take various forms. Most generally speaking, we can distinguish (i) physical and financial capital and (ii) human capital [*Ekonomia ogólna*…, 2007, p. 68]. While the former has long been the focus of interest of economists, theories of human capital are relatively new. This might be so because human capital has an intangible nature. Depending on the level of analysis, it is defined as the characteristics, abilities and skills of an entity, organisation or society.

This paper focuses on the perspective of an enterprise, so it must be assumed that the term human capital refers to certain personal characteristics of a company's employees which can be used by the company to increase its value. Although various authors propose different sets of human capital attributes, most of them mention the following: knowledge, experience, skills, abilities, attitudes, qualifications, intellectual attributes, motivation for action, health, values, and capabilities [See: Jamka, 2011, p.152]. However, there is yet another factor that makes it possible to utilise the above qualities for the benefit of a company, and namely: contacts with other people, bonds created among colleagues, between the employees and the ex-

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ternal environment, as well as between the firm itself and the particular elements of its environment. It is thanks to various networks of relations that enterprises can function and thrive. This leads us to the conclusion that taking full advantage of human capital is associated with an appropriate level of social capital.

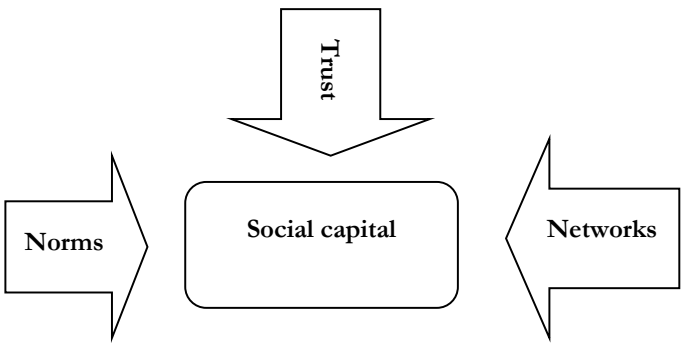
The present paper aims to discuss the nature of social capital on an enterprise level and to analyse the notion of trust as a foundation of social capital in terms of the possibilities of its creation and its significance for enterprises.

2. Social capital of an enterprise

The concept of social trust has been researched since the 1970s. Nevertheless, no uniform view of the phenomenon has been developed as yet, which results in a wide diversity of approaches and definitions. R. Putnam understands social capital as features of social organization, such as trust, norms, and networks, that can improve the efficiency of society by facilitating coordinated actions [Stypułkowski, 2008, p. 296.]. F. Fukuyama, on the other hand, interprets it as a capability that stems from the existence of trust within a society or its part [Fukuyama, 1997, p. 39]. For J. Coleman, social capital is a set of characteristics of social life: networks, norms and trust which enable co-operation among people and help coordinate their actions for the common good [Skawińska, 2012, p. 15].

FIGURE 1

Parts of social capital according to J. Coleman



Source: own work.

There are at least two conclusions that can be drawn from the above definitions. First, social capital *is inextricably* linked to trust. As W. Dyduch observes, some re-

searchers even equate social capital with trust, others see trust as a source of social capital, while still others believe the former is a constituent of the latter [Dyduch, 2004, p. 49]. It can be said, therefore, that social capital is based on trust, but also that it boosts the levels of trust: *the interdependence is mutual.*

Second, social capital concerns society as a whole, it is inherent in society and benefits its members. This does not mean, however, that the concept cannot be considered on other levels. Assuming that a given society consists of certain groups of people, including formal groups which comprise various organisations, social capital can be discussed from the point of view of an enterprise.

A number of definitions take this exact perspective. It is often emphasised that social capital is of crucial importance for enterprises. For instance, P. S. Adler and S. W. Kwon are convinced that the concept describes a company's good reputation originating from the existence of good social relations which are established to facilitate certain actions. P. Cooke, N. Clifton and M. Oleaga associate social capital with using the social norms of reciprocity, trust and exchange for achieving specific economic, and political, goals. W. Dyduch identifies social capital as the ties and relationships both among the employees of a company and between the company and its environment which help increase the firm's efficiency, mainly through facilitating co-operation [Grzanka, 2009, pp. 81-82].

It must be assumed that the social capital of a company is of intangible nature. Social capital can be treated as a part and an autonomous dimension of those values which make up the intangible assets of an organisation. It denotes the usefulness of the relations between social and individual characteristics for economic activity [Bartkowski, 2007, p. 59]. According to J. Bartkowski, the social capital of an enterprise stems from group relations, socially defined reputation, the functioning of a network of support and influence, and from the assistance that can be gained thanks to the social position. [Bartkowski, 2007, p. 80].

An appropriate level of social capital brings tangible benefits to a company. Social capital has an impact on efficiency because it: boosts innovation capacity, improves innovation performance, and is a 'catalyst' of knowledge management, providing favourable conditions for the creation of knowledge [Bugdol, 2006, p. 124]. "The social capital accumulated in the external environment helps to achieve greater certainty in the organization's position in its sector and in the market, as well as in society as a whole, as a result of having the necessary resources, obtaining information, and reducing the transaction costs linked to the creation and continuation of business dealings" [Titov, 2013, p. 48].

I. Grzanka noticed that by basing on people's ability to create social ties and relations, social capital results in better exploitation of human competence and knowledge. In view of the above, it seems reasonable to regard social capital as a special component of intellectual capital, which turns human resources into a capital in its own right, making them a value which adds to that of an enterprise. The relations and ties among the people within an organisation, and those across organisations, become a potential: a social resource which capitalises in a company as an increase

in its value, and as the benefits gained by its employees and customers. This value is achieved through a transformation of the company's assets, including particularly human competence, knowledge and shared values. It is because of this process of transforming resources (especially human ones) into increased value that social capital is considered to be a development factor of business companies [Grzanka, 2009, p. 89].

It can be assumed, therefore, that social capital [Bratnicki, Dyduch, 2003, p. 5]:

- is a resource which can be invested and expected to bring returns in the future,
- can be exchanged for other forms of capital, even though it is not as exchangeable as economic capital,
- can become a substitute for other resources,
- should be maintained and replenished.

J. Bartkowski claims that social capital raises the level of human capital by influencing the level of education of particular individuals and their readiness for business activity. Moreover, it improves the conditions for co-operation and exchange in society, reduces the costs of exchange, lowers risk, and ensures the necessary predictability of behaviour among partners [Bartkowski, 2007, p. 91].

If companies derive such substantial benefits from social capital, it seems worthwhile to attempt to determine how, through what kind of activity, an enterprise can increase this capital. The author will focus exclusively on one component of social capital: trust, since, as was stressed before, it is widely believed to be the central element of building social capital in a firm.

3. Trust as a company resource

Trust can be defined as the belief that a system of cultural and moral obligations, known to and acknowledged by a given community, will always, and under any circumstances (thus unselfishly), be respected by its members [*Elementy etyki*…, 2004, p. 276]. It is, therefore, connected with the predictability of behaviour and confidence in co-operating partners. "Trust refers to one party's belief that the other party will take actions generating positive outcomes for this party" [Su, 2014, p. 90].

In economic life, higher levels of trust can help reduce the number of top-down, formal regulations, and may restrict state interventionism. Trust streamlines the flow of information, diminishes risk and leads to better collaboration between individuals, enterprises and other business entities. This, in turn, boosts the competitive strength of companies. As J. Kay remarks, if an enterprises is to be competitive, it must strive to achieve a distinguishing ability or capacity to compete, which encompasses the following factors [Kay, 1996, pp. 99-138]:

- architecture: internal and external links of a company which determine the relations with employees, suppliers, customers and competitors;
- reputation: the way in which a company is perceived by its customers; competitive advantage from another source can be helpful in gaining it;

- innovation: the capacity of a company to create new products, technologies and management methods;
- resources, or strategic assets, obtained as a result of previously incurred costs, natural monopoly, or access to protected resources.

We should notice that at least two of these elements: architecture and reputation, are directly based on trust. Whereas, the other two: innovation and resources, are indirectly associated with the notion. It is thanks to trust that a company can acquire desired, unique or rare, resources, e.g. suitable employees, capable of innovative thinking.

Therefore, it must be concluded that trust is a strategic resource in business and can become a source of competitive advantage. Trust easily passes the tests of strategic value [Grudzewski, Hejduk, 2008, p. 10]:

1. the test of worth: thanks to trust, a company can promptly react to changes in a turbulent environment as it helps reduce formality of proceedings;
2. the test of rarity (shortage): high level of trust is a non-tangible asset possessed by few organisations;
3. the test of ownership: interpersonal trust is a kind of employee share ownership because it can be found in employees; it is then closely related to the company and cannot be simply transferred between enterprises;
4. the test of inimitability: trust is fairly resistant to imitation or automatic copying (it is difficult to imitate); this is because it takes a long time to build, while both its exact nature and the process of its creation remain unclear;
5. the test of durability: in a highly turbulent environment, trust can be a guarantee for a universal interpretation of reality;
6. the test of substitutability: trust cannot be replaced with any other utilitarian value since it is a stimulator of other cultural norms;
7. the test of competitive superiority: trust can be a basis for a highly competitive strategy;
8. the test of codification: trust cannot be gained by means of administrative measures or strictly-codified organisational routines;
9. the test of organisation: trust encompasses virtually all the areas of an enterprise's operation;
10. the test of embodiment: the presence of trust directly facilitates the management of a company;
11. the test of importance: trust is significant for efficient functioning and development of companies, at present and in subsequent years.

While analysing the problem of trust on an enterprise level, one must bear in mind that it is not only necessary within a company but should be transferred onto the company's relations with external entities.

How to build trust inside a company? According to M. Bugdol, trust building occurs when [Bugdol, 2006, p. 29]:

- there exist clear rules of action,
- structures and job descriptions are precisely defined,
- communication is based on feedback,

- direct relations between superiors and subordinates are maintained,
- employees co-operate, collaborate and have commitment to their tasks,
- those in charge manage by objectives and delegate power and responsibility,
- interpersonal relations are constantly improved,
- certain behaviour patterns are promoted,
- participatory management style and participatory remuneration systems are used,
- social contracts are in use.

'Internal' trust should be regarded as a precious, intangible resource located in organisational and interpersonal relations. It can also be seen as an element of organisational culture, having a positive influence on both the employees and the efficiency of a company.

Research shows that firms whose staff had more trust in their workplace relationships enjoyed better economic effects, higher profitability and greater flexibility [Juchnowicz, 2007, p. 28]. Employees who trust their superiors are more likely to follow them and pursue the established objectives. They are willing to invest their knowledge, skills and efforts for the sake of their company. Whereas the managers who have confidence in the workers, their skills and attitudes, are able to delegate some of their decision-making powers to the employees, thus allowing the latter to exhibit their competence and achieve greater professional development. According to ***a report by Watson*** Wyatt Worldwide, in companies whose employees had deep confidence in their superiors, the shareholder return within three years amounted to 108%, while in firms where the level of trust was low, it was just 66% [Bojańczyk, 2012, p. 30].

According to R. Sprenger, trust is indispensable for the process of transition from rigid hierarchy towards flexible business policies. He believes that if empowerment, flat hierarchies, team work, learning organisations are to be successful, they all require a solid foundation of trust. Enterprises undergo transformation only on the condition that their employees trust one another [Sprenger, 2011, pp. 33-34].

J. Paliszkiewicz claims that the positive impact of inter-organisational trust consists in [Paliszkiewicz, 2013, pp. 80-81]:

- motivating individuals to undertake open, spontaneous and creative action, activisation of people, and intensification of relationships;
- building honest communication, encouraging individuals to learn;
- better handling of unethical behaviour and suspiciousness;
- development of social capital and creation of conditions for better co-operation;
- sense of security and support felt by employees.

Meanwhile, trust towards the external environment makes it possible to reduce transactional costs by cutting down both the time and the resources necessary to conclude a transaction, as well as by reducing the amount of resources spent on monitoring and execution of contracts. The absence of trust generates about half of the costs incurred by enterprises in this field [Sankowska, 2011, p. 81]. "In one of the

commerce speeches Laurence Prusak (IMB CEO) said that any progress happens if you don't trust people (…). Prusak (…) argues that trust in an organization is a perfect lubricant for corporate efficiency which avoids tons of needles monitoring, bargains and negotiations" [Bakiev, 2013, p. 170].

When analysing the problem of building the trust of external entities, it is first and foremost necessary to focus on investors.

Here the question of trust is of utmost importance because it directly translates into the development capacities of companies. Obviously, investors try to limit their risk by choosing the shares of those companies which they trust most. The role of trust is, in fact, enormous: research conducted in the USA and some European countries has shown that firms which had been affected by a trust (reputation) crisis lost some of their market value (8% on average) [Ciaś, 2005, p. 9].

Building the trust of investors involves such activities as: implementation of good practices connected with the transparency of company policy, improvement of the quality of communication with investors, including appropriate communication in crisis situations, and the strengthening of the position of shareholders in stock-listed companies. Information policy plays a major role in this regard. M. Mikołajek-Gocejna suggests that the information policy of a company should be shaped in such a way that investors: (i) understand the strategy of the company and its overriding objectives, as well as the subsidiary systems used for creation of value, (ii) are regularly updated on any progress in implementation of agreed objectives and any other changes, (iii) have access to information about significant events related to the company, which, if withheld or distorted, would have an impact on investment decisions [Mikołajek-Gocejna, 2007, p.55].

Correctly prepared reports, taking into account aspects other than financial ones, can play a major role. Studies conducted by Prince's Accounting for Sustainability Project (A4S) and Global Reporting Initiative (GRI) have revealed that 80% of investors take non-financial data into consideration when making investment decisions [*Inwestorzy i analitycy*…].

A boost in the social capital of a company can also be achieved through increasing the levels of trust among its business partners. At the moment, the following factors are believed to have contributed to the rise in the importance of this type of trust [Grudzewski, Hejduk, 2009, p. 164]:

- increasing specialisation,
- growing interdependence among firms,
- rise in the number of established business relationships,
- greater promptness in establishing business co-operation.

Nevertheless, earning the trust of business partners must be based on four fundamental principles: 1) all the partners must believe that an activity is aimed at achieving common values; 2) common values must translate into specific common goals; 3) the expectations of partners must be compatible with their joint commitment as each of them is more than just a beneficiary; 4) the trust of a partner must be reasonable and should be verified by empirical information [Paliszkiewicz, 2013, p. 60].

K. Arrow, a Nobel laureate, claims that virtually every trading transaction involves an element of trust. Its lack means economic backwardness [See: Bojańczyk, 2012, p. 29]. The author believes that trust has a measurable, economic value since it results in increasing the effectiveness of a system and helps produce more goods. S. Covey, on the other hand, attempts to prove that in many institutions, trust has an impact on costs, speed and quality, which means that a low level of trust is a reason for slower pace, low quality and high costs, whereas, high levels of trust lead to higher speed and quality, and lower costs [*Zaufanie w biznesie*].

Building the social capital of a company can also rely on enhancing the trust of business partners, including suppliers. The relationship between a company and its suppliers must be mutually advantageous. Practically speaking, one should attempt to create non–zero-sum game situations. They are based on trust reinforced by clear and transparent information. Frequently, relationships are insured by means of detailed, long-term contracts. Studies to date indicate that successful co-operation must involve transfer of knowledge between an organisation and its suppliers [Bugdol, Jedynak, 2012, p. 68]. It should be noted that an organisation is able to achieve its goals only if it receives appropriate consumables, while suppliers are dependent on the acceptance of their products by the recipients. The dependence is thus bilateral, requiring consensus and a high level of mutual trust.

Trust has also become essential for the creation and development of distribution channels. It helps alleviate the conflicts which might occur in these channels. It is, therefore, crucial that a transparent agreement is always reached in the best interest of all concerned sides. In a healthy, trust-based culture, intermediaries can even become product ambassadors.

Not only is the trust of customers fundamental for the level of social capital, but also for the very existence of a company. Building the trust of customers must mean winning their confidence in a firm's products and services: by offering appropriate quality, price and shopping terms, as well as trust for the firm itself: its attitude to employees, its approach to the natural environment, its respect for the law and the principles of ethical competition. This is confirmed by a recent (2013) study by Edelman Trust Barometer, whose respondents believed that the most significant elements of trust in a company include: the quality of products (67%), good treatment of workers (66%), and responding to the feedback from customers and their needs. [*Edelman Trust Barometer*] A. Lewicka-Strzałecka claims that trust has a bearing on the choices of customers, because it allows for a reduction of purchase-related risk and helps overcome the cognitive complexity of technical, organisational and informational aspects of the process [Lewicka-Strzałecka, 2003, pp. 195-207].

Notably, trust is at the very core of customer loyalty. M. Bugdol associates trust with benevolence, claiming that it is the latter that helps organisations win the trust of their clients. Benevolence should be understood as readiness to make concessions to the customers, the ability to accommodate individual customer needs, and skilful use of procedures [Bugdol, 210, pp. 76-77]. B. Dobiegała-Korona believes that customer trust towards a firm should consist in mutual profitability. This trust can be developed in

such a way that the consumer attitudes are changed by targeting selected customers or by means of random information given to customers 'when the opportunity arises' and thoughtlessly, without cognitive effort. Such a strategy focuses on the emotional aspect. Trust earned in this way is regarded as easier to achieve, but when verified rationally, it can either be reinforced or lost [Dobiegała-Korona, 2007, pp. 23-24].

Operating in a specific region is, moreover, associated with the trust of the local community. This can be built through involvement in actions for that community, helping to solve the main social problems occurring in a given area, support for local initiatives, or contributions to raising the standard of living in the region. It is worth mentioning that a study conducted in the USA proved that two-thirds of the respondents had more confidence in companies engaging in some type of social activity. Another two-thirds claimed they would switch to a different brand if it was associated with a noble cause, provided the other conditions were identical [Low, Kalafut, 2004, p. 99].

Having analysed the methods of building trust, both inside a company and with external entities, one can observe that the used tools are identical with those proposed by the concept of corporate social responsibility. The concept assumes that, apart from pursuing their own goals, organisations should also take into account the demands and requirements of the so-called stakeholders, that is groups associated with the company. Socially responsible behaviour towards particular stakeholders involves exactly the same strategies as the above-mentioned ways of enhancing trust. This is not surprising as building trust is an important objective of social engagement.

4. Conclusion

The idea of social capital based on, or built around trust can therefore be used even by commercial entities. It can be a category that helps to analyse the behaviour of those entities, or even to study the differences between the results they achieve. The trust-based networks of relationships which a firm establishes with its environment determine the existence and development of every company.

J. Bartkowski says that business activity takes place in a particular social context. Business entities are inseparable from their social and institutional settings. Economic decisions are often based on assumptions which result from the social, not just economic, conditions. The behaviour of the market players is heavily influenced by social relations and non-market interactions. This is true about mutual trust, expected quality of co-operation and willingness to execute contracts in both the long and the short terms [Bartkowski, 2007, p. 56].

G.Colvin even goes as far as to say that in these days, an enterprise should not ask whom they can trust, but rather who is ready to trust them. [Low, Kalafut, 2004, p. 99]. That is why companies are obliged to constantly increase the quality of their social capital.

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RANK ORDERING CRITERIA WEIGHTING METHODS – A COMPARATIVE OVERVIEW[2]

Summary

Multicriteria decision making (MCDM) refers to screening, prioritizing, ranking or selecting the alternatives based on human judgment from among a finite set of ` alternatives in terms of the multiple usually conflicting criteria. A very significant role in MCDM models plays the weights of criteria which usually provide the information about the relative importance of the considered criteria. Several different methods are developed to take criteria priorities into account.

The aim of the paper is a comparative overview on several rank ordering weights methods which are considered to convert the ordinal ranking of a number of criteria into numerical weights. Using ranks to elicit weights by some formulas is more reliable than just directly assigning weights to criteria because usually decision makers are more confident about the ranks of some criteria than their weights, and they can agree on ranks more easily. The great advantage of those methods is the fact that they rely only on ordinal information about attribute importance. They can be used for instance in situations of time pressure, quality nature of criteria, lack of knowledge, imprecise, incomplete information or partial information, decision maker's limited attention and information processing capability. The equal weights, rank sum, rank exponent, rank reciprocal as well centroid weights technique are presented. These methods have been selected for their simplicity and effectiveness.

Key words: multi-criteria decision making, ranking weight methods, AHP, SAW

1. Introduction

Many real world decision making problems involve multiple criteria. Corporate decision making rarely involves a single criterion. Multicriteria decision making (MCDM) refers to screening, prioritizing, ranking or selecting the alternatives based on human judgment from among a finite set of decision alternatives in terms of multiple usually conflicting criteria [Hwang, Yoon, 1981]. Three separate steps are utilized in MCDM models to obtain the ranking of alternatives: determine the relevant criteria and alternatives, attach weights to the criteria and numerical measures to the impacts of the alternatives on these criteria and finally process the numerical values to determine a ranking score of each alternative [Hwang, Yoon, 1981]. In the multi-criteria models the weights of criteria play a very significant role and they have different interpretations depending

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on context decision making, on multi-criteria analysis methods [Choo et al., 1999]. However, they usually provide the information about the relative importance of the considered criteria.

Several different methods are developed to take criteria priorities into account. In this paper a limited selection of weight techniques, the ranking weight methods are presented. Judgments of the decision makers are frequently vague and their preferences as well weight cannot be exactly evaluated with numerical values in practice. The "true" weights of criteria remain unknown in practice. Even if the elicitation of precise weights is possible, it would probably be time-consuming and difficult and therefore impractical. The rank ordering weighting methods provide approximations of "true" weights of criteria when rank ordering information is known. Such assumption, complete rank ordering being provided by decision maker (DM), is also made in this study. Attaching ranks to elicit weights by some formulas is more reliable than just directly assigning weights to criteria. This is because usually even experts and decision makers are more confident about the ranks of some criteria than their weights, and they can agree on ranks more easily. Hence, it is concluded that usually ranking is easier than weighting for non expert or even experts. The great advantage of ranking weight methods is fact that they rely only on ordinal information about criteria importance. They can be used for instance in situations of time pressure, quality nature of criteria, lack of knowledge, imprecise, incomplete information or partial information, decision maker's limited attention and information processing capability. This follows that the decision maker may not be willing or able to provide exact estimations of decision parameters. Also the group of decision makers may not be able to reach agreement on a set of exact weights, so in such situation may be realistic to expect agreement only on a ranking of weights. Moreover, the ranking methods are easy to use and simply to understand for decision maker.

Generally, the ranking method weight determination involves two steps: ranking the criteria according to their importance and weighting the criteria from their ranks using one of the rank order weighting formula. In fact, two practical and important problems arise here. The first problem is criterion ranks: how to understand which criterion is more important than the other. The second problem is how to elicit weights from this information. This paper addresses only the second step decision problem: if only the criteria ranks are supplied by the decision maker how do we determine relative criteria weights?

The aim of the paper is a comparative overview on ranking method of weight determination. Rank ordering weighting methods take into account decision maker's information about rank ordering of criteria weights, from which approximations for criteria weights are calculated by using corresponding formula. The rank sum, rank order centroid and rank reciprocal as the most used rank ordering weighting methods are benchmarked in this study.

The paper is organized as follows. In Section 2, we formulate MCDM problem. In Section 3, literature overview on technique weight criteria is done. Conversion of ranks into weights is discussed in Section 4. In Section 5 we presented application the analytic hierarchy process (AHP) method for weight determination. Comparisons of presented rank ordering weight method as well AHP are provided in Section 6. Finally, conclusions and comments are given in Section 7-8.

2. The formulation of MCDM problem

In this paper, we consider a MCDM problem with m decision alternatives $A_1, A_2, ..., A_m$ and decision criteria $C_1, C_2, ..., C_n$. We assume that all alternatives score with respect to all criteria are known or has been estimated by the decision maker. The criteria may be grouped into two categories: benefit and cost. The benefit criteria are those attributes for maximization whose values are always the larger the better. The cost criteria are those for minimization whose values are the smaller the better. For criteria, we have weight vector $w = [w_1, w_2, ..., w_n]$ which satisfies

$$w_1 + w_2 + ... + w_n = 1$$

where w_j represents the weight of criterion C_j, $w_j \geq 0$ $(j = 1,2,...,n)$.

Let x_{ij} denote the performance value of alternative A_i in terms of criterion C_j. $(i = 1,2,..,m; j = 1,2,...,n)$. The decision matrix $D = \left(x_{ij}\right)_{m \times n}$ represents the performance rating or evaluation score x_{ij} of each alternative A_i with respect to each criterion C_j.

A general MCDM problem with set of m alternatives $A = \{A_1, A_2, ..., A_m\}$ and set of n criteria $C = \{C_1, C_2, ..., C_n\}$ can be expressed by decision matrix $D = \left(x_{ij}\right)_{m \times n}$ and the weight vector $w = [w_1, w_2, ..., w_n]$.

Finally, a choice from two or more alternatives requires a decision rule or ranking rule in which the DMs can obtain the information available to make a best choice. At the next stage, all criteria are normalized to have commensurable unit. For benefit criterion the normalized values can be calculated using the following formula[3]:

$$c_{ij} = \frac{x_{ij} - \min\limits_i x_{ij}}{\max\limits_i x_{ij} - \min\limits_i x_{ij}} \tag{2}$$

and for the cost criterion using the following formula

$$c_{ij} = \frac{x - \max\limits_i x_{ij}}{\min\limits_i x_{ij} - \max\limits_i x_{ij}} \tag{3}$$

where x_{ij} is the score of $i-\text{th}$ alternative with respect to $j-\text{th}$ criterion before normalization. After normalization all criteria are in benefit criteria where higher c_{ij} is preferred. Let $C = \left(c_{ij}\right)_{m \times n}$ be the normalized decision matrix.

The simple and most often used multi attribute decision technique is the *Simple Additive Weighting* (SAW) which is also known as weighted linear combination or scoring

[3] For normalization formulas see [Hwang, Yoon, 1981].

methods[4]. This method is based on the weighted average. The advantage of this method is that it is a proportional linear transformation of the raw data which means that the relative order of magnitude of the standardized scores remains equal. To use this method, we first must express values of decision making matrix as linear non-scaled values. The SAW technique consists of three basic steps: scale the scores to make them comparable, apply criteria weights, and sum the values along rows and select best (top ranked) alternative. In SAW technique, final score of each alternative is calculated as follow:

$$S_i = \sum_{j=1}^{n} c_{ij} w_j \tag{4}$$

where: S_i is score for $i-\text{th}$ alternative, and c_{ij} is the normalized score of $i-\text{th}$ alternative with respect to $j-\text{th}$ criterion and w_j is the weight of criteria j are as before. Next the final scores are ranked. It implies that the higher the value of S_i the higher is the rank.

3. The techniques of weights elicitation – the literature overview

Several approaches have been proposed to determine weights in multicriteria models. Some methods are more formal, and some have an axiomatic basis. For a comparison of weighting techniques, see Tzeng et al. [1998], Belton and Stewart [2002], Borcherding, Eppel and Winterfeldt [1991], Xu [2004].

Tzeng et al. [1998] classify weighting methods into objective or subjective. The subjective approaches select weights based on preference information of criteria, subjective intuitions or judgments based on their knowledge given by the decision maker, the objective methods determine the weights of criteria through mathematical calculation using objective information in a decision matrix. The subjective methods include ranking ordering method [Ahn, Park, 2008; Solymosi, Dombi, 1986; Stillwell et al., 1981], the tradeoff method and the pricing-out method [Keeney and Raiffa, 1976], the ratio method [Edwards, 1977], and the swing method [Kirkwood, 1997] and the analytic hierarchy process (AHP) [Saaty, 1980], the direct rating (DR) method [Bottomley, Doyle, 2001], point allocation (PA) method [Doyle et al, 1997)], Delphi method [Hwang, Yoon, 1981], eigenvector method [Takeda et al., 1987], LINPAC (LINear ProgrAmming of preference Comparisons) [Horsky, Rao, 1984], and others [Hwang, Yoon, 1981]. The objective methods determine the weights of criteria by the information in a decision matrix through mathematical models, but they neglect the subjective judgment information of the decision maker. They include entropy method [Hwang, Yoon, 1981], standard deviation (SD) method [Diakoulaki et al., 1995], CRITIC (Criteria Importance Through Intercriteria Correlation) method [Diakoulaki et al., 1995], maximizing deviation method

[4] In the paper we described only SAW procedure. For the other multi-criteria technique see [Hwang, Yoon, 1981].

[Wu, Chen, 2007] and ideal point method [Ma et al., 1999]. The integrated methods determine the weights of criteria using both decision maker's subjective information and objective decision matrix information. The subjective and objective integrated approach [Ma et al., 1999] is formulated as a two-objective mathematical programming model, integrated approach [Fan et al., 2002] integrates decision maker's fuzzy preference information on decision alternatives and objective decision matrix information into one model. The integrated approach [Wang, Parkan, 2006] integrates decision maker's fuzzy preference relation on decision alternatives decision maker's multiplicative preference relation on the weights of criteria, and objective decision matrix information into a general model framework.

Weber and Borcherding [1993] classify weight-determining procedures according to whether they are statistical or algebraic, holistic or decomposed, and direct or indirect. According to Weber and Borcherding [1993], the concept of weight can be defined only in reference to one of the specific theories of preference.

Belton and Stewart [2002] summarize two kinds of weights: tradeoff-based weights and non-tradeoff-based weights. Tradeoff-based weights emphasize the "compensation" of values across criteria, which permit preference data to be compared as they are aggregated into a single representative evaluation. Non-tradeoff-based weights do not permit direct tradeoffs across criteria; they are usually associated with outranking methods. Among the tradeoff-based weight methods, AHP and geometric ratio weighting are an integrated method, which means they proceed from preference data and weight assessments to aggregated preferences to final results.

4. Ranking methods of weights determinations

There are a variety of situations where it is reasonable to use ranked weights, and there have been various techniques developed to deal with ranked weights and arrive at a choice or rank alternatives under consideration. The relative criteria weights are based on the assumption that a universal weight–rank functional relationship exists between criteria ranks and average weight values. Such conversion is based on the different formulas. Rank ordering the importance of criteria may be easier than describing other imprecise weights such as bounded weights. This happens for instance in situations of time pressure, quality nature of criteria, lack of knowledge, imprecise, incomplete information or partial information, decision maker's limited attention and information processing capability. This follows that the decision maker may not be willing or able to provide exact estimations of decision parameters. There are also more specific reasons why the assumption of exact weights is unrealistic. For instance, Barron and Barrett (1996a, 1996b) state that various methods for eliciting exact weights from the decision maker may suffer on several counts, because the weights are highly dependent on the elicitation method and there is no agreement as to which method produces more accurate results since the "true" weights remain unknown. Also the group of decision makers not be able to reach agreement on a set of exact weights, so in such situation may be re-

alistic to expect agreement only on a ranking of weights. The rank order weight determination involved two steps:

ranking the criterion according to their importance weighting the criteria from their ranks using one of the rank order weighting formula.

More precisely, the rank order describes the importance of the criteria and next the information describing them (rank number) can be used for generating numerical weights. We assume here that that the decision maker (DM) is capable of providing preference information and rank ordering criteria. We have a list of n prioritized (ranked) criteria, where each criterion j has a rank r_j, $(j = 1,2,...,n)$. The decision maker selects and ranks a set of n criteria that he or she seems to be relevant, giving each criterion j a rank r_j, $(r_j = 1,2,...,n)$. The rank is inversely related to weight (rank $r_1 = 1$ denotes the highest weight, rank $r_n = n$ the lowest weight). In this paper we concentrate only on second step of ranking weight method. Our objective is to convert the list of ranks $(r_1,...,r_n)$ into numerical weights $(w_1...,w_n)$ for n criteria. Many authors suggested specific functions for assigning weights w_j to n criteria with ranks r_j.

Stillwell et al. [1981] propose three functions: rank reciprocal (inverse), rank sum (linear), and rank exponent weights. Solymosi and Dompi [1985] and Barron [1992] propose rank order centroid weights. Lootsma [1996] and Lootsma and Bots [1999] suggest two types of geometric weights. Here we presented equal weight, rank sum, rank exponent, rank reciprocal as well centroid weights technique. These methods have been selected for their simplicity and effectiveness.

4.1. Equal weight method

The equal weight method (*EW*) requires minimal knowledge about priorities of criteria and minimal input of decision maker. If the decision maker has no information about true weights than the true weights could be represented as a uniform distribution on the unit $n-$simplex of weights defined by conditions (1). The $n-$simplex of weight is a geometric object. For instance, with $n = 2$ criteria and no information $2-$simplex of weights is a set of points lying on the segment line between points on coordinates $(1,0)$ and $(0,1)$. If we have no knowledge about the weights then our knowledge can be represented by a uniform provability density function over this line. The expected value of this distribution is centroid (centre of mass) of the line (point with coordinates $\left(\frac{1}{2},\frac{1}{2}\right)$). So we have $w_1(EW) = w_2(EW) = \frac{1}{2}$. More generally, in case no information about weights distribution the expected value of the weight distribution determines the following weight formula:

$$w_j(EW) = \frac{1}{n}, \tag{5}$$

where $j = 1,2,..,n$.

4.2. Rank Sum weight method

In the rank sum (*RS*) procedure the weights, are the individual ranks normalized by dividing by the sum of the ranks. The formula producing the weights is the following [Stillwell et al., 1981]:

$$w_j(RS) = \frac{n - r_j + 1}{\sum_{k=1}^{n} n - r_k + 1} = \frac{2(n + 1 - r_j)}{n(n+1)} \tag{6}$$

where r_j is the rank of the $j-\text{th}$ criterion, $j = 1,2,...,n$.

4.3. Rank Exponent weight method

The rank exponent weigh method (*RE*) is a generalization of the rank sum method. We have the following formula

$$w_j(RE) = \frac{(n - r_j + 1)^p}{\sum_{k=1}^{n} (n - r_k + 1)^p}, \tag{7}$$

where r_j is the rank of the $j-\text{th}$ criterion, $p-$parameter describing the weights, $j = 1,2,...,n$.

The parameter p may be estimated by a decision maker using the weight of the most important criterion or through interactive scrolling (as in Table 1). The $p = 0$ results to equal weights, $p = 1$ rank sum weight. As p increases, the weights distribution becomes steeper. In Table 1 and Figure 1 the estimated weights for some values of p in case of $n = 5$ criteria has been shown.

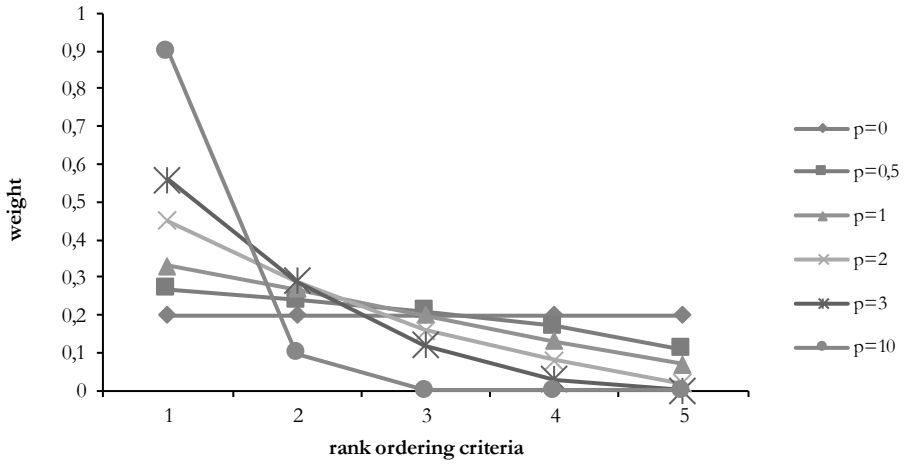
TABLE 1.

The behavior of the generated numerical weights depending on the parameter *p* of the rank component method.

Rank	**0**	**0.5**	**1**	**2**	**3**		**10**
1	0.20	0.27	0.33	0.45	0.56		0.90
2	0.20	0.24	0.27	0.29	0.29	.	0.10
3	0.20	0.21	0.20	0.16	0.12	.	0.00
4	0.20	0.17	0.13	0.08	0.03	.	0.00
5	0.20	0.11	0.07	0.02	0.00	.	0.00
Sum	**1**	**1**	**1**	**1**	**1**		**1**

Source: own study.

FIGURE 1.
Estimated rank exponent weight in case of $n = 5$ criteria for different parameters p



Source: own study.

4.4. Inverse or reciprocal weights

The inverse (or reciprocal) weights method (*RR*) uses the reciprocal of the ranks which are normalized by dividing each term by the sum of the reciprocals (Stillwell et al. 1981). The formula is the following:

$$w_j(RR) = \frac{1/r_j}{\sum_{k=1}^{n}(1/r_k)} \tag{8}$$

where r_j is the rank of the $j-\text{th}$ criterion, $j = 1,2,...,n$.

4.5. Rank-order centroid weight method

The rank-order centroid (*ROC*) weight approach produces an estimate of the weights that minimizes the maximum error of each weight by identifying the centroid of all possible weights maintaining the rank order of objective importance. Barron and Barrett [1996a] found that weights obtained in this manner were very stable. If we know the rank order of the true weight, but have no other quantitive information about them, then we may assume that the weights are uniformly distributed on the simplex of rank-order weight $w_{r_1} \geq w_{r_2} \geq ... \geq w_{r_n}$, where $w_{r_1} + w_{r_2} + ... + w_{r_n} = 1$ and r_i is a rank position of w_{r_i}.

For example if $n = 2$ then $w_{r_1} \geq w_{r_2}$ implies that $0{,}5 \leq w_{r_1} \leq 1$. If the decision maker knows nothing else about w_{r_1} he may assume that the probability distribution of w_{r_1} is uniform between 0.5 and 1. The expected value is $E(w_{r_1}) = 0{,}75$ which implies $E(w_{r_2}) = 0{,}25$. Barron and Barret [1996] generalized this argument for $n > 2$, showing that the expected value of the weights can be calculating using the following formula:

$$w_j(ROC) = \frac{1}{n}\sum_{k=j}^{n}\frac{1}{r_k} \tag{9}$$

This method is called rank-order centroid (*ROC*) weight because these weights reflect the centroid (centre of mass) of the simplex defined by the ranking of the criteria. With more criteria, the error for ranked criteria will be much less.

5. The AHP method

The well-known subjective method for determining weight is analytic hierarchy process method (AHP) proposed by Saaty [1980]. When applying the AHP, the preferences of the decision criteria are compared in a pairwise manner with regard to the criterion preceding them in the hierarchy. If two criteria are of equal importance, a value of 1 is given in the comparison, whereas a value of 9 indicates the absolute importance of one criterion over the other (see Table 2.).

TABLE 2.

The Saaty scale definition

Intensivity of importance	Definition
1	Equal importance
3	Moderate importance
5	Strong importance
7	Very strong importance
9	Extreme importance
2,4,6,8	can be used to express intermediate values

Source: Saaty 1980

The matrix of pairwise comparisons when there are n criteria at a given level can be formed as

$$A = \left[a_{ij}\right] \tag{10}$$

where $a_{ij} = \frac{w_i}{w_j}$, w_i , w_j are the relative importance of criteria *i* and *j*, respectively. We have also $a_{ji} = \frac{1}{a_{ij}}$ and $a_{ii} = 1$. Based on the matrix A, criteria weights can be

calculated in some methods, such as arithmetic mean method, characteristic root method, and least square method. Because individual judgments will never agree perfectly, the degree of consistency achieved in the pairwise comparison is measured by a consistency ratio indicating whether the comparison made is done. The Consistency Index (*CI*) of the square matrix A, was established by Saaty [1980]. This measure can be used to verify in what measure the judgments supplied are consistent.

$$CI = \frac{(\lambda_{\max} - n)}{n-1}, \tag{11}$$

where $\lambda_{\max}$ is the highest eigen value of the matrix A.

The calculated priorities are plausible only if the comparison matrices are consistent or near consistent. The approximate ratio of consistency can be obtained using the degree of inconsistency of the square matrix A can be measured by the ratio of *CI* to *RI*, which is called the Consistency Ratio (*CR*).

$$CR = \frac{CI}{RI}.100\%, \tag{12}$$

where *RI* is the Random Consistency Index, which is the average *CI* of a randomly generated reciprocal matrices with dimension *n* [see: Saaty, 1980].

We can conclude that the matrix is sufficiently consistent and we accept the matrix when $CR \leq 10\%$. In other cases it can be concluded that the inconsistency is too large and unacceptable, so that decision makers must revise their judgments. The AHP is especially designed to assess weights within a hierarchical structure of the criteria. However, due to the fast-growing number of pairwise comparisons it is not sensible to use the method for a large set of criteria. We show some relationships between AHP as well *ROC, RR* and *RS* technique in the case of 5 criteria. Let us denote by A_{ROC}, A_{RR}, A_{RS} matrices of pairwise criteria comparisons:

$$A_{ROC} = \begin{bmatrix} 1 & 2 & 3 & 9 & 9 \\ 1/2 & 1 & 2 & 3 & 7 \\ 1/3 & 1/2 & 1 & 2 & 4 \\ 1/9 & 1/3 & 1/2 & 1 & 2 \\ 1/9 & 1/7 & 1/4 & 1/2 & 1 \end{bmatrix}, \tag{13}$$

$$A_{RR} = \begin{bmatrix} 1 & 2 & 3 & 4 & 5 \\ 1/2 & 1 & 2 & 2 & 2 \\ 1/3 & 1/2 & 1 & 1 & 2 \\ 1/4 & 1/2 & 1 & 1 & 1 \\ 1/5 & 1/2 & 1/2 & 1 & 1 \end{bmatrix}, \tag{14}$$

$$A_{RS} = \begin{bmatrix} 1 & 1 & 2 & 3 & 5 \\ 1 & 1 & 1 & 2 & 4 \\ 1/2 & 1 & 1 & 2 & 3 \\ 1/3 & 1/2 & 1/2 & 1 & 2 \\ 1/5 & 1/4 & 1/3 & 1/2 & 1 \end{bmatrix} \tag{15}$$

In the Table 3 the results of estimation weight obtaining by AHP method based on matrices (13)-(15) and weight obtained by *ROC, RR* and *RS* methods in the case of n=5 criteria are presented.

TABLE 3.
The result of estimation weight by AHP, *ROC, RR* and *RS* technique in the case of n = 5 criteria – a comparison.

Methods/Weights	w_1	w_2	w_3	w_4	w_5	*CR* (%)
AHP (A_{ROC} matrix)	0.49	0.25	0.15	0.07	0.04	1.8
ROC	0.45	0.26	0.16	0.09	0.04	_
AHP (A_{RS} matrix)	0.33	0.27	0.20	0.13	0.07	0.9
RS	0.33	0.27	0.21	0.12	0.07	_
AHP (A_{RR} matrix)	0.44	0.22	0.14	0.11	0.09	1.0
RR	0.44	0.22	0.14	0.11	0.09	_

Source. Own study based on the matrices A_{ROC}, A_{RR}, A_{RS} and *ROC, RS, RR* rank order weights functions.

6. The comparison of the rank order weight functions

The decision about weight determination will strongly influence the final results of the decision making. The choice of weighting method depends mainly on knowledge of the underlying distributions of "true" weight. The first decision that needs to be made is equal and different weighting. Maggino and Ruviglioni [2011] suggest that:
"*equal weighting represents the preferred procedure, adopted in most of the applications. This happens mainly when:*

i) the theoretical structure attributes to each indicator the same adequacy in defining the variable to be measured,
ii) the theoretical structure does not allow hypotheses to be consistently derived on differential weightings,
iii) the statistical and empirical knowledge is not adequate for defining weights,
iv) the correct adoption and application of alternative procedures do not find any agreement". They also conclude that "differential weighting does not necessarily correspond to the identification of different weights but rather to the selection of the most appropriate approach in order to identify the weights among the identified ones.

Assigning differential weights can be just as doubtful, especially when the decision is not supported by

i) theoretical reflections that endow a meaning on each indicator or consider its impact on the synthesis,
ii) methodological concerns that helps to identify the proper techniques, consistently with the theoretical structure".

The *ROC* approach to rank order has clear statistical basis and interpretation whereas other methods have taken a more heuristic approach. A choice between rank sum weights (*RS*), reciprocal (*RR*) weights, centroid (*ROC*) weights depends in part on the

decision maker beliefs about the steepness of the true weights. The centroid *ROC* weights are "steeper" assigning relatively greater weight to the more important criterion, the rank sum (*RS*) weights are much "flatter" that centroind (*ROC*) weights. The rank sum weights *(RS)* are reduced linearly lower from the most important to the least important. The reciprocal (*RR*) weights descend aggressively after the most important, but in the least important end the centroid (*ROC*) weights are the lowest ones. Approximations for criteria weights given by used formulas (5)-(9), in case of criteria are presented in the Table 4. The differences of the weighting methods of criteria are also illustrated on the Figures 2-7.

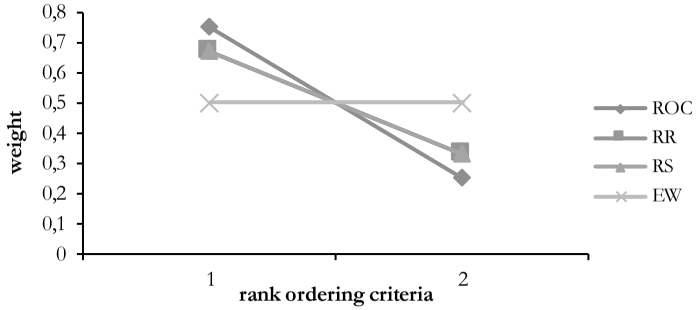
TABLE 4.

Approximations for criteria weights given by used different formulas, in case of n=2,…, 7 criteria

Number of criteria	Rank ordering methods			
	Centroid weight (*ROC*)	Reciprocal weight (*RR*)	Rank Sum weight (*RS*)	Equal weight (*EW*)
n=2	w_1=0.75	w_1=0.67	w_1=067	w_1=1/2
	w_2 =0.25	w_2 =0.33	w_2 =0.33	w_2 =1/2
n=3	w_1=0.62	w_1=0.55	w_1=0.50	w_1=1/3
	w_2=0.28	w_2=027	w_2=0.33	w_2=1/3
	w_3=0.12	w_3=0.18	w_3=0.17	w_3=1/3
n=4	w_1=0.52	w_1=0.48	w_1=0.40	w_1=1/4
	w_2=0.27	w_2=0.24	w_2=0.30	w_2=1/4
	w_3=0.15	w_3=0.16	w_3=0.20	w_3=1/4
	w_4=0.06	w_4=0.12	w_4=0.10	w_4=1/4
n=5	w_1=0.45	w_1=0.44	w_1=0.33	w_1=1/5
	w_2=0.26	w_2=0.22	w_2=0.27	w_2=1/5
	w_3=0.16	w_3=0.14	w_3=0.21	w_3=1/5
	w_4=0.09	w_4=0.11	w_4=0.12	w_4=1/5
	w_5=0.04	w_5=0.09	w_5=0.07	w_5=1/5
n=6	w_1=0.41	w_1=0.41	w_1=0.29	w_1=1/6
	w_2=0.24	w_2=0.21	w_2=0.24	w_2=1/6
	w_3=0.16	w_3=0.13	w_3=0.19	w_3=1/6
	w_4=0.10	w_4=0.10	w_4=0.14	w_4=1/6
	w_5=0.06	w_5=0.08	w_5=0.09	w_5=1/6
	w_6=0.03	w_6=0.07	w_6=0.05	w_6=1/6
n=7	w_1=0.37	w_1=0.39	w_1=0.25	w_1=1/7
	w_2=0.23	w_2=0.19	w_2=0.21	w_2=1/7
	w_3=0.16	w_3=0.13	w_3=0.18	w_3=1/7
	w_4=0.11	w_4=0.09	w_4=0.14	w_4=1/7
	w_5=0.07	w_5=0.08	w_5=0.11	w_5=1/7
	w_6=0.04	w_6=0.07	w_6=0.07	w_6=1/7
	w_7=0.02	w_7=0.05	w_7=0.04	w_7=1/7

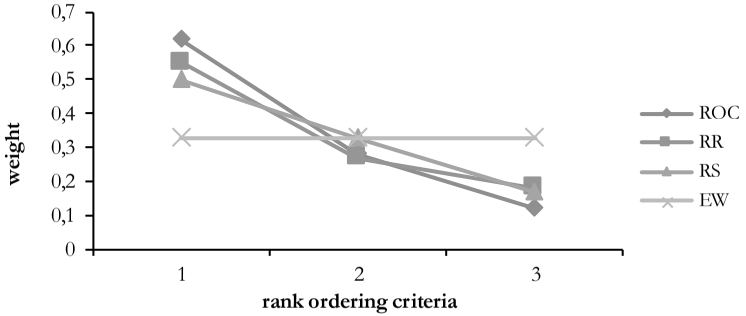
Source: own studies.

Figure 2.
Approximations for criteria weights given by used formulas in case of n=2 criteria



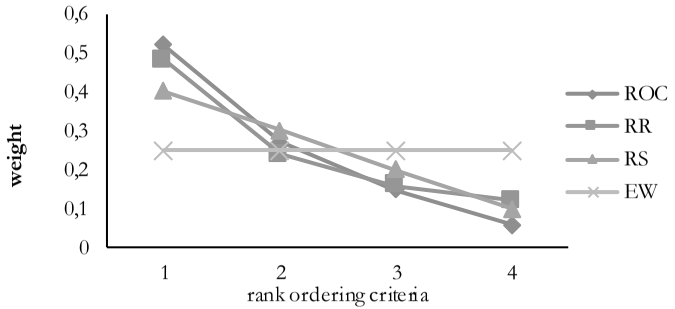
Source: own study.

Figure 3.
Approximations for criteria weights given by used formulas in case of n=3 criteria



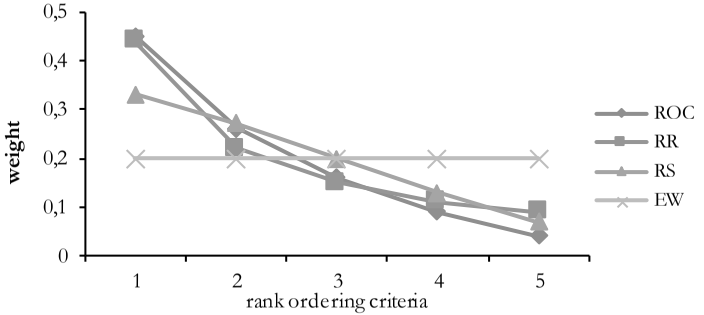
Source: own study.

Figure 4.
Approximations for criteria weights given by used formulas in case of n=4 criteria



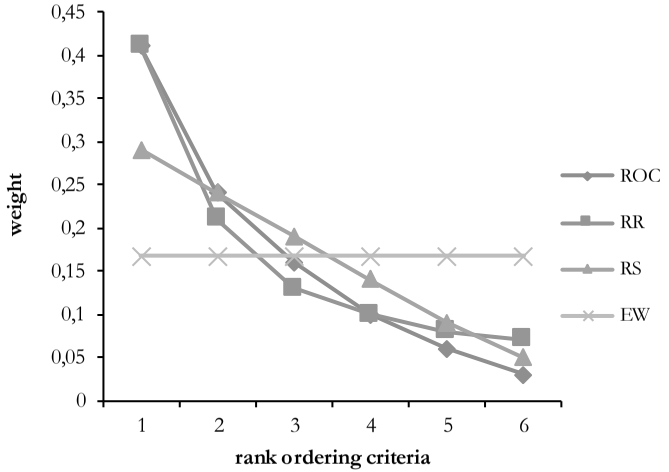
Source: own study.

Figure 5.
Approximations for criteria weights given by used formulas in case of n=5 criteria



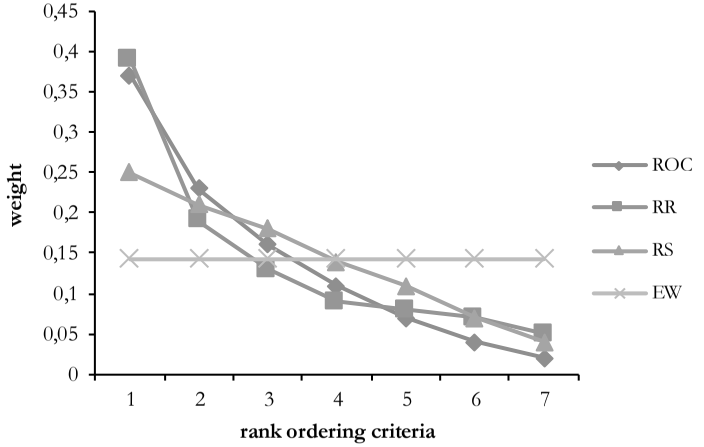
Source: own study.

Figure 6.
Approximations for criteria weights given by used formulas in case of n=6 criteria



Source: own study.

Figure 7.
Approximations for criteria weights given by used formulas in case of n=7 criteria



Source: own study.

There have been some studies on comparing the decision quality of weighting methods. Several studies have compared weight functions and found centroid weights to be superior in terms of accuracy and ease of use. Some of the studies are the following:

- Olson and Dorai [1992] compare centroid weights to AHP on a student job selection problem, concluding centroid weights provide almost the same accuracy while requiring much less input and mental effort from decision makers.
- Edwards and Barron [1994] using centroid weights extend SMART into SMARTER (SMART Exploiting Ranks).
- Barron and Barrett [1996a] analyse the effectiveness of centroid weights in SMARTER. Barron and Barrett [1996b] compare the four methods (*RS, RR, ROC,* and *EW*) using a simulation study and report that the *ROC* weights appear to perform better than the other approximate weights.
- Srivastava et al. [1995] on the basis of simulation experiments compare five weight elicitation methods, including rank sum and centroid weights, finding centroid weights to be superior to other methods.
- Barron and Barrett [1996b] find centroid weights superior to rank sum and reciprocal (inverse) weights.
- Jia et al. [1998] performed a detailed comparison of several weighting schemes and used simulation to compare centroid and rank sum weights with equal weighting and ratio weights, finding that equal weights do not always perform well, but rank-ordered centroid weights based on only an ordering of criteria lead to much the same choices as do actual weights.
- Bottomley and Doyle [2001] in empirical experiments conducted to compare different weight elicitation procedures.
- Noh and Lee [2003] compared centroid weights with AHP and fuzzy method and find that the simplicity and ease of use of centroid weights make it a practical method for determining criteria weights.

7. Example

In the multicriteria evaluation, different combinations of criteria weights have great influence on the final evaluation result. To illustrate the input of rank order weight methods in multi-criteria decision making a simple numerical example is considered. This example reviews several applications of SAW method using different weighting schemes and compares results of different sets of weights applied to this same set of multiple criteria data. We consider four different weight sources such as centroid weights, reciprocal weights, sum weight and equal weights. Let us assume that multicriteria decision problem consists of:

- the set of five alternatives: A_1,A_2, A_3, A_4,A_5
- the set of five criteria: C_1,C_2, C_3, C_4,C_5, where C_1,C_2, C_3, are benefit criteria and C_4, C_5 are cost criteria

– weighting vector $w = [w_1, w_2, w_3, w_4, w_5]$, representing the relative importance of the evaluation criteria with respect to the overall objective, where $w_1 \geq w_2 \geq w_3 \geq w_4 \geq w_5$ and $w_1 + w_2 + w_3 + w_4 + w_5 = 1$.
– the decision matrix (see: Table 5.).

TABLE 5.

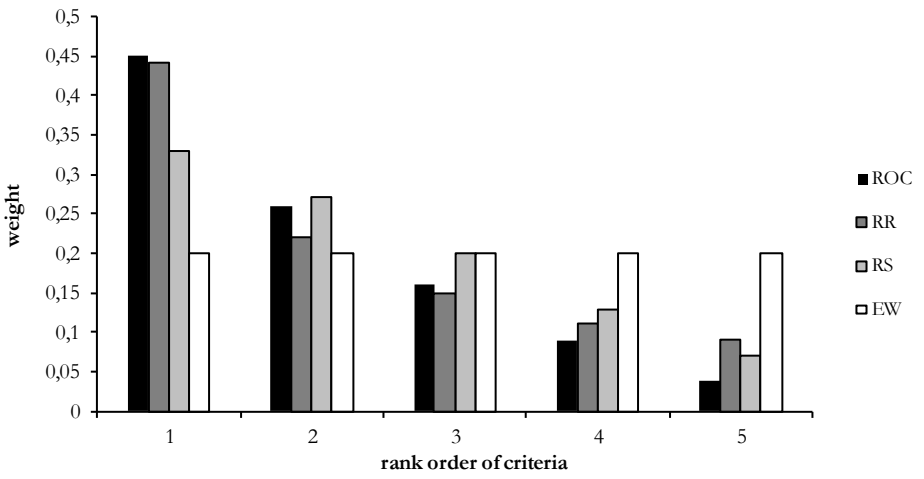
The decision matrix

	C_1	C_2	C_3	C_4	C_5
A_1	15	5	3	6	10
A_2	20	3	7	4	25
A_3	10	2	20	1	10
A_4	20	10	3	3	20
A_5	15	8	7	4	10

Source: own study.

Once a set of weights is determined according centroid methods, reciprocial method, rank sum method, equal, weight method (see: Table 4. for n=5). Let us observe that weights of *RS* are reduced linearly lower from the most important to the least important, *RR* weights descend aggressively after the most important, but in the least important end the *ROC* weights are the lowest ones. In the considered example differences of the weighting methods of five criteria are also illustrated on the Figure 8.

FIGURE 8.
Approximations for criteria weights given by used formulas, in case of n=5 criteria



Source: own study.

The SAW function is then used to rank the alternatives. The Table 6 provides the values computed by formulas (2)-(4) and ranking of the alternatives based on various criteria weights methods. We obtain different alternative rank ordering deepening on weights determination.

TABLE 6.
The value score and rank ordering of alternatives for different criteria weighting

Weight method	***ROC* method**		***RR* method**		***RS* method**		***EW* method**	
Alternative	**Value**	**Rank**	**Value**	**Rank**	**Value**	**Rank**	**Value**	**Rank**
A_1	0.362	4	0.392	4	0.336	5	0.375	4
A_2	0.556	2	0.547	3	0.463	3	0.352	5
A_3	0.290	5	0.350	5	0.400	4	0.600	1
A_4	0.777	1	0.756	1	0.701	1	0.587	2
A_5	0.534	3	0.554	2	0.537	2	0.577	3

Source: own study based on Table 5.

As the result from Table 6, the order of rating among those alternatives is the following:

$A_4 \succ A_2 \succ A_5 \succ A_1 \succ A_3$ (*ROC* weights)
$A_4 \succ A_5 \succ A \succ A_1 \succ A_3$ (*RR* weights)
$A_4 \succ A_5 \succ A_2 \succ A_3 \succ A_1$ (*RS* weights)
$A_3 \succ A_4 \succ A_5 \succ A_1 \succ A_2$ (*EW* weights)

8. Conclusion

The criteria weights are the key point in obtaining the total scores of alternatives and most importantly the conclusion of multicriteria analysis problems. In this paper the ranking methods to determine criteria weights in multicriteria analysis were presented. Ranking methods use the rank order on the considered criteria as inputs and converts them to weights for each of the items. Ranking is a necessary first step in most procedures for eliciting more precise weights There are a variety of situations where it is reasonable to use ranked weights, and there have been various techniques developed to deal with ranked weights and arrive at a choice or rank alternatives under consideration. Using ranks to elicit weights by some formulas is more reliable than just directly assigning weights to criteria because usually decision makers are more confident about the ranks of some criteria than their weights, and they can agree on ranks more easily. Rank ordering the importance of criteria may be easier than describing other imprecise weights such as bounded weights. In the situation where there is a group of decision makers, it may be realistic to expect agreement only on a ranking of weights. However, real application of this method is needed to detect real problems that the method may encounter.

Several methods for selecting approximate weights, including equal weights (*EW*) rank sum (*RS*), rank reciprocal *(RR*) and rank-order centroid (*ROC*) weights, have been proposed and evaluated. A common conclusion of these studies is that *ROC* weights have an appealing theoretical rationale and appear to perform better than the other rank-based schemes in terms of choice accuracy.

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STOCK MARKET REACTIONS TO THE ANNOUNCEMENTS AND EXECUTIONS OF STOCK-SPLITS AND REVERSE STOCK-SPLITS

Summary

The aim of this paper is to analyze the stock market investors reactions to the events of announcement and execution of stock-splits and reverse stock-splits carried out on Warsaw Stock Exchange (WSE) during the period 2004-2012. The study puts the emphasis on the differences between market reactions to standard stock-splits and reverse stock-splits. The results presented in this paper are based on the methodology of event study. The studied data sample consists of 45 instances of stock-splits and 6 instances of reverse stock-splits that took place on WSE in the specified period of time. Results obtained suggest no statistically significant reaction to the events of: split announcement, split execution and reverse split execution and a statistically significant (mostly negative) reaction to the event of reverse split announcement. Although some anomalies can be observed on close inspection of the data, in general the obtained results can be interpreted as evidence of investors' rationality with regards to events connected with stock-splits on the WSE.

Key words: stock-split, reverse stock-split, stock market, event study, Warsaw Stock Exchange, investors rationality

1. Introduction

Stock markets are flooded daily with torrents of information that may significantly influence the values of companies and related financial instruments. Because of that, the topic of measurement of market reactions to certain events is a widely discussed one among the economists. *Event study* is a method that allows to estimate the impact of a specific event on the market value of a joint-stock company. Most probably the procedure of event study was first carried out and published by Dolley in 1933 [Dolley, 1933, pp. 316-326]. A famous study on the impact of splits of shares on their price was also published by Fama, Fisher, Jensen and Roll (FFJR) in 1969 [Fama et. al., 1969, pp. 1-21]. It was one of the first articles in which the methodology of event studies (which remains commonly used at the present time) was applied. It seems logical from the perspective of economic and financial theory, that a stock split should have no effect on the valuation of the company. Because of the developments

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in computing and a wider availability of data, more and more possible applications of event study emerge.

The purpose of this article is to analyse the reaction of share prices listed on the Warsaw Stock Exchange (WSE) on the announcement and the execution of stock-splits and reverse stock-splits. Because the information on the planned stock split is made public well in advance of the event, the division itself should have no significant impact on the share price. Results obtained in this study confirm that hypothesis; however they may suggest some level of irrationality in the behavior of stock market investors. Due to their relative rarity there are not so many studies on reverse stock splits on Polish stock markets. Because reverse stock-splits became more popular in recent years this study is able to investigate the differences between market reactions to splits and reverse splits.

2. Methodology

According to Elton and Gruber [Elton, Gruber, 1998, p. 524] the biggest number of studies conducted in the field of finance utilizes the event study methodology. Event study is based on the assumption that releasing of new information should result in an immediate adjustment in the prices of assets. Apart from the quickness of the reaction the methodology measures the direction of price changes and their magnitude. Because of its versatility event study has a wide scope of applications. Event study methodology can be broken into four phases [Jamroz, 2011, pp. 107-108]:

1. Defining the event, Firstly the event in question needs to be defined and an appropriate event window should be chosen. Event window consists of the day in which the event occurs and usually includes the days after the event in order to capture the demand/supply adjustments after the market have been closed. Sometimes the event window can also include days before the event on the assumption that it can be known in advance for some investors. Criteria for choosing the companies can range from: data availability, size of the market-cap to industry and management specific factors.
2. Calculation of standard and abnormal returns. Standard rate of return can be defined as a rate of return that would occur has the event not taken place. Abnormal rate of return captures the impact of the event on the price of the share. Abnormal return of the i-th stock at time t can be defined as:

$$\varepsilon_{it} = R_{it} - E(R_{it} | X_{t-1}) \quad (1)$$

where: $\varepsilon_{i,t}$ is the abnormal rate of return, $R_{i,t}$ is the actual realized rate of return, and $E(R_{i,t} | X_{t-1})$ is the expected rate of return conditional on the set of information X_{t-1} that is available at time $t-1$ (standard rate of return). There are two basic approaches of estimating the standard rates of return:

a) By assuming that the standard rate of return is constant and equal to the average rate of return of the particular asset. This approach can be described by the Constant Mean Return Model [MacKinlay, 1997, p. 17];
b) By utilizing the market model[2] that relates the return of a given security to the return of a market portfolio $R_{m,t}$ (which consists of all assets in a given market, weighted by their respective market caps). Market model assumes that the relation is linear and constant:

$$R_{i,t} = \alpha_i + \beta_i R_{m,t} + \varepsilon_{i,t} \tag{2}$$

Hence, given the above model, the abnormal rate of return of the i-th asset can be described as:

$$\hat{\varepsilon}_{i,\tau} = R_{i,\tau} - \hat{\alpha}_i - \hat{\beta}_i R_{m,\tau} \tag{3}$$

3. Estimation and testing. After choosing the appropriate model its parameters need to be estimated in order to calculate the standard and abnormal returns. Most of the time a period ranging from just over a dozen to over 200 days is chosen for the estimation of the parameters of the model. This period is called the estimation window and should exclude the event window, so that the event would not affect the parameters of the estimated model. Subsequently, a test needs to be established for measuring the statistical significance of abnormal rates of return. Usually the null hypothesis, being verified, states that there is no significance of cumulated (summed) abnormal returns from the event window (from day τ_1 to day $\tau_2 : CAR_i(\tau_1, \tau_2) = \sum_{\tau=\tau_1}^{\tau_2} \hat{\varepsilon}_{i\tau}$), with the alternative hypothesis of cumulated abnormal returns significantly different from zero:

$$H_0 : CAR = 0 \quad H_A : CAR \neq 0 \tag{4}$$

4. Results and conclusions. The results are usually presented in an aggregated form, including reactions from all shares in the chosen group of companies. Ideally, the event study would explain the mechanism of the influence of a specific event on the prices of shares. However, results obtained should always be analyzed including other possible events that may have occurred during and before the studied period.

For more detailed descriptions see [Cambell et. al., 1997, chapter 4]. After clearly defining the event that is the topic of the study, an adequate period (event window) for which the influence of the event on the prices of shares will be analyzed, should be chosen. The event window can begin before the event date and may end after it. Only after that the estimation window for the model is chosen. It should not overlap with the event window. Abnormal rates of return (rates of return in excess of normal rates of return as determined by the model) are interpreted as the measure of the events influence on the company's market value. This methodology

[2] This form of a market model is a single factor model that does not require the assumption of lack of autocorrelation of the random component [See: Elton, Gruber, 1998, p. 178].

of event study assumes that the event is an external factor with regards to the change in the stocks prices. In other words, the event causes the change in the valuation of the company, what is considered to be a correct assumption for most cases [Cambell et. al., 1997, pp. 157-158].

A more complex model can also be adopted for event studies, for example models based on CAPM or APT. It is not entirely clear whether or not such approach is more advantageous, given among others studies on time variation of the beta factor [Fiszeder, Mstowska, 2011, p. 204]. A parametric test described by McKinley [MacKinlay, 1997, p. 24] can be used in order to verify the influence of announcement and execution of stock-split on the prices of shares. Given the null and alternative hypotheses specified in (4), the test will utilize the following statistic [Campbell, Lo, MacKinlay, 1997, p. 162]:

$$J_1 = \frac{\overline{CAR}(\tau_1, \tau_2)}{[\hat{\bar{\sigma}}^2(\tau_1, \tau_2)]^{\frac{1}{2}}} \sim N(0,1) \tag{5}$$

Where: $\overline{CAR}(\tau_1, \tau_2) = \frac{1}{n}\sum_{i=1}^{n} CAR_i(\tau_1, \tau_2)$ is the average of cumulative abnormal returns. This distributional result is asymptotic and requires a large sample of events and is not exact because of the estimator of the variance in the denominator. J_1 gives equal weight to all securities.

A second approach gives greater weight to the securities with lower abnormal return variance using the so called standardized cumulative abnormal returns (SCAR). $\overline{SCAR}(\tau_1, \tau_2)$ can be defined as the average CAR over n securities from event time τ_1 to τ_2:

$$\overline{SCAR}(\tau_1, \tau_2) = \frac{1}{n}\sum_{i=1}^{n} \frac{CAR_i(\tau_1, \tau_2)}{\hat{\sigma}_i(\tau_1, \tau_2)} \tag{6}$$

In this case the test statistic has the following form:

$$J_2 = \left(\frac{n(L_1 - 4)}{L_1 - 2}\right)^{\frac{1}{2}} \overline{SCAR}(\tau_1, \tau_2) \sim N(0,1) \tag{7}$$

where: L_1 is the size of the estimation window. Those tests assume normally distributed data, which is not always true for market returns. If the null hypothesis gets rejected, then the cumulated abnormal return is significantly different from zero, what indicates that the influence of the event on the prices of shares is statistically significant.

3. Legal regulations regarding stock-splits in Poland

The Code of Commercial Companies (CCC) [Dz. U. z 2000 Nr 94, poz.1037] states, in article 333 § 1, that shares are indivisible. It means that shares cannon be divided into parts neither by the shareholder nor by the company. This restriction renders

the division of a share as a security null and void, along with the division of rights incorporated in equity shares.

There is a distinction between dividing shares and decreasing their nominal value, what increases the number of shares in circulation. Such 'division' is possible as long as it does not result in the situation when the same set of stocks has different nominal values. Such procedure, when the nominal value of shares is decreased alongside an issue of new shares is called the stock-split. Splits are carried out in public companies. CCC does not explicitly regulate the procedures for carrying out a split. In order to determine the correct legal procedure for carrying out a split, one must consider regulations from: the CCC, law on public companies [Dz. U. z 2009 r. Nr 185, poz. 1439], and the provisions of the regulations of Central Securities Depository of Poland (CSD) and the Stock Market (in the case of this study the WSE).

Due to CCC regulations on changes in the nominal value of shares, a split requires a change in the companies' articles of association. "Split can be made only by changing the articles of association involving a change in the structure of joint-stock. This change should involve all shares issued by the company" [Opalski, 2010, p. 240]. This requirement is a consequence of articles 302 and 304 § 1 point 5 of the CCC. The former article states that the share capital of a joint-stock company is divided into shares with equal nominal value, the latter article states that the number of shares and their nominal value is determined by the articles of association. Hence each change in the nominal value of shares requires a change in the articles of association. According to the article 430 § 1 of the CCC, a change in the articles of association may only be made through a resolution of the shareholders general meeting (SGM). The proposed change in the articles of association should explicitly state the new amount of shares and their new nominal value.

According to the law on public companies, every public company is required to release information to: the Polish Financial Supervision Authority (PFSA), the company operating the regulated market (in this case the WSE), and the public. The scope of the information that needs to be released is set by the regulation of the Minister of Finance [Dz. U. z 2009 Nr 33, poz. 259]. The company is required to release information on every change made in the articles of association, in the form of current reports. Apart from the current report the company needs to submit relevant proposals to the WSE and the CSD. Since a change in the articles of association is necessary to carry out a split, the company is required to inform the public and its' shareholders about the split for the first time when the SGM resolution is passed. Hence for the purpose of this study the date of the SGM at which the split is announced is assumed to be the actual date of the announcement of the split.

The next step in caring out a split is to submit a request to the CSD to exchange shares due to their new nominal value. Management board of the CSD adopts a resolution in which it establishes the day of the split and the new share code. According to the regulations of the WSE, the company should inform the WSE about the change in the nominal value of shares immediately after registering the change in the articles of association. Later it should deliver the resolution of the CSD management board which sets the day of the split. Shares with old nominal value are listed at the stock market for

the last time at the last session before the split. It is however possible to suspend the trading of shares for a short period of time preceding the split day on a company's request.

4. Previous empirical research on stock-splits

According to the theory of finance, the nominal level of share prices should have no impact on investment decisions. Despite that, the topic of the impact of stock-splits on the prices of assets was researched extensively, even on mature markets. Stock-split means that the number of shares is increased with a corresponding proportional change in the nominal price, so that the overall market value remains unchanged. The opposite of a split is a reverse split, in this case the number of shares is decreased, for example a shareholder may receive one new share for each two previously owned shares. The aim of a reverse split is to increase the price of a single share, without a change in the market value of a company and is often carried out in order to conform with the quantitative requirements of the stock exchange [Martell, Webb, 2005]. It seems as though the stock--split should be a procedure that has no impact on investors attitudes. However some studies indicate otherwise.

An extensive study of 622 companies and 940 splits from a period ranging from January 1927 until December 1959 was carried out by Fama, Fisher, Jensen and Roll (FFJR). According to the authors, splits were carried out in periods when the price of the particular shares grew faster than the prices of other shares listed on the market. 71,5% of all splits were followed by a higher increase in dividends then in other companies. Hence a split could have been perceived as an indication of possible future increase in the dividends. The impact of a split is most apparent in the period preceding the division. Results obtained by the authors show that in the period from the announcement of the split (for example six months before the event) until the month in which the split is carried out (month '0') the cumulated abnormal rate of return averaged 12,96 percent. In their conclusions authors focused mostly on long-term behavior of prices, somewhat omitting this anomaly. In the cases when after the split was carried out there was a decrease in the dividend usually the prices would drop to the level from before the split, what can be considered as an argument for market effectiveness. The authors were criticized for the use of monthly instead of daily rates of returns, and for setting the month of the split as the event date instead of the day in which the split was announced or carried out [Haugen, 1999, p. 745].

Many studies on the topic of splits on the United States stock markets were carried out. Those include: Grinblatt, Masulis and Titman [Grinblatt, Masulis, Titman, 1984, pp. 461-490], McNichols and Dravid [McNichols, Dravid, 1990, pp. 857-879], Brennan and Hughes [Brennan, Hughes, 1991, pp. 1665-1691], Ikenberry, Rankine and Stice [Ikenberry, Rankine, Stice, 1996, pp. 357-375], Ikenberry and Ramnath [Ikenberry, Ramnath, 2002, pp. 489-526], and Byun and Rozeff [Byun, Rozeff, 2003, pp. 1063-1085]. Relatively little studies focus on markets outside of the US, for example for the Canadian market: Kryzanowski and Zhang [Kryzanowski, Zhang, 1993, pp. 57-81], for Swiss

market: Kunz i Rosa-Majhensek [Kunz, Rosa-Majhensek, 2007] and for the German market: Wulff [Wulff, 2002, pp. 270-297].

In the academic literature, the effects of splits are being explained in a couple of different ways. The most famous explanation is the information function of the split according to which, splits are announced in order to signal good perspectives of the company to the shareholders and to attract the attention of market analysts and potential investors. That function may be especially important for less known companies as indicated by Brennan and Hughes [Brennan, Hughes, 1991, pp. 1665-1691]. Conclusions of Brennan and Hughes partially explain motifs of caring out splits, however, as mentioned in Angel [Angel, 1997, pp. 655-681], it is unlikely that large companies would need to acquire investors attention in that manner. A similarly popular intention for carrying out splits is the desire to increase the liquidity of shares when their market price becomes too high for smaller investments. This explanation is put forward (among others) by: Copeland [Copeland, 1979, pp. 115-141] and Conroy and Harris [Conroy, Harris, 1999, pp. 28-40].

The liquidity motive is related to the optimal price range and tick size. According to some managers, stocks within the optimal price range sell better, hence splits can be utilized in order to decrease the price of shares when they rise above the higher bound of the optimal price range. When the price drops below the lower bond a company can carry out a reverse split. Tick is the lowest possible value by which a shares price can change as a result of transactions. Ticks can be expressed as percentages of current stock prices and as such are important for shares liquidity [Gurgul, 2012, pp. 136-137].

Studies of mature markets indicate conflicting findings on the behavior of transaction volumes in response to market splits. Some authors like Lakonishok and Lev [Lakonishok, Lev, 1987, pp. 913-932] indicate that the announcement of splits is an important factor that generate an increase in the amount of market transactions; others like Conroy, Harris and Benet [Conroy et. al., 1990, pp. 1285-1295] observe a decrease in the volume of transactions as a result of splits. According to a study on the Polish stock market, conducted by Bejger [Bejger, 2001, p. 314], more than 70% of managers that carried out a split, indicated that the optimum price range and liquidity were the most significant reasons for it. Only 14% of managers responded that the split was a means of conveying positive information about the company.

Bejger's is one of the first studies on the topic of splits on the Polish stock market. The results obtained by the author indicate that companies share price policies do affect investors decisions. The main reasons for carrying out splits in Poland are: the increase in liquidity and the existence of an optimal tick size relative to the price of the share.

A study on abnormal returns as a result of splits was carried out by S. Buczek, it was based on the prices of shares of five companies (Farmacol, Getin, Mieszko, Boryszew and Sanwil) in the period 2003-2005. Because of a relatively small amount of splits in the studied sample the author included in his analysis, the so cold quasi-splits. Quasi-splits occur when a company issues a large amount of shares with a price equall or very close to the current market price. Author did not conduct an aggregated analysis, instead of that he carried out the study on case-per-case basis. According to the study, it is possible to obtain abnormal returns by investing in shares

before the split day and in case of quasi-splits before the issue of rights. Buczek also points out an increase in the volume of transactions on the day following the split relative to the average price before the split. According to Buczek those findings are contradictory of the efficient market hypothesis and violate the semi-strong form of market efficiency [Buczek, 2005, pp. 128-138].

An extensive research on the topic of splits on Polish stock markets was done by H. Gurgul, for the period of 1995-2005. The author based the research on 11 cases of split announcement and on 17 cases of splits. The average abnormal return on the day of announcement was equal to 2.409%. A market reaction can also be observed 2 days before the announcement of the split, the abnormal return on that day is equal to 2.713% and is statistically significant at a 95% confidence level. The day of execution of the split and its neighboring days do not exhibit any statistically significant abnormal price patterns. In order to verify the results the author utilized a nonparametric test based on ranks (Corrado test) and additionally bootstrapping techniques. The results of those techniques correspond closely to the outcomes based on the analysis of student-t statistics.

Previous research of Jamróz [Jamróz, 2011, pp. 153-161] indicate that the announcement of split do not influence the shares' price significantly. Execution of splits on average results in negative rates of return, what may indicate an irrational reaction of the investors. The author noted the effect of split announcement noticeable two days before the split announcement (what corresponds to the findings of Gurgul) and an effect of split execution noticeable three and one day before the actual day of the split. In the analyzed period it was possible to obtain abnormal rates of return in the case of small and medium companies. However, taking into account the transaction costs of stock operations, obtaining extraordinary profits might not have been possible. Hence splits may not pay an important role in investors decisions.

Results obtained by Fiszeder and Mstowska indicate positive and negative abnormal return rates two days before and two days after the announcement of the stock-split respectively. The effect on the day of announcement was positive but very minor. In the case of the execution of the split, abnormal returns were not significantly different from zero but for the third day after the event when they were negative [Fiszeder, Mstowska, 2011, p. 209].

5. Empirical results

Research in this paper was carried out based on the announcements and executions of stock-splits and reverse stock-splits from the period: 1-January-2004 – 30-September-2012 by companies listed on Warsaw Stock Exchange. In the analyzed period there were 62 instances of stock splits (including reverse splits).The following 8 instances of splits needed to be excluded from this study, due to insufficient data in the estimation window before the announcement of the split: Krosno – July 2005, Estaroil – November 2006, Kruk – June 2007, Famur – August 2007, Pemug – September 2007, Herkules – February 2008, Zremb – October 2008, and Chemoservis – November 2009.

Three additional cases were also excluded due to irregular patterns in prices in the studied period that could not have been the results of stock-splits, those were: Mewa – November 2011 and September 2009, and Wikana – October 2011. The study covers 45 instances of splits and 6 cases of reverse splits (see table 1.). The study utilizes the methodology of event study. Data on splits was obtained from the BOSSA[3] brokerage of BOŚ S.A. Stock prices and other information were obtained from the following websites: www.stooq.pl, www.gpwinfostrefa.pl, and www.money.pl. The estimation window (L_1) was set at 250 days preceding the event window and it was repeated for different lengths of the event window ranging from two days to sixteen days. A relatively long estimation window was chosen because of the properties of test statistics, which are only asymptotically normal, hence a large window allows to utilize the central limit theorem. There are some analytical methods of choosing the length of the event window see [Gurgul 2012 p. 39]. In this study a number of event window lengths were chosen in order to capture possible differences in obtained results. In each case the study includes the event of a split and the event of split announcement. Standard rates of return were determined by the market model as described in (2). Returns on WIG index were used as a proxy for market portfolio returns ($R_{m,t}$). All returns were daily logarithmic returns. The software used was MS Excel and Mathworks Matlab.

TABLE 1.

Splits and reverse splits carried out on the WSE in the years 2004-2012 (62)

Company	Split size (1:)	Split announcement	Split execution	Market cap. on the day of the split (mln of PLN)	Business sector
Boryszew	10	20.08.2004	05.11.2004	2306.8	Metal industry
Sanwil	30	09.12.2004	17.01.2005	61.1	Textile industry
Duda	10	18.01.2005	31.03.2005	604.9	Food industry
Krosno	10	12.04.2005	01.07.2005	294.5	Glassware production
Enap	7	12.01.2005	15.07.2005	7.1	Construction industry
Stalprofil	10	29.03.2005	15.07.2005	159.3	Wholesale
Grajewo	8	24.05.2005	30.09.2005	1290.2	Wood industry
Cersanit	10	13.05.2005	17.11.2005	1848	Building materials
Lubawa	10	01.02.2006	10.03.2006	233.5	Light industry
Bioton	5	18.05.2006	26.06.2006	4686.7	Pharmaceutical industry
Kopex	10	20.06.2006	01.08.2006	437.6	Industrial machinery
Echo	4	08.05.2006	02.08.2006	308.7	Housing developer
GTC	10	26.04.2006	09.08.2006	6628.2	Housing developer
Apator	11	28.02.2006	21.08.2006	734.1	Industrial machinery
Wikana	30	25.05.2006	25.08.2006	45.4	Light industry
LZPS	6	30.05.2006	07.09.2006	48.2	Light industry
Mediatel	5	22.08.2006	30.10.2006	60.4	Telecommunications
Elstaroil	10	31.05.2006	03.11.2006	721.7	Food industry
Energomontaż Pld.	10	20.06.2006	28.12.2006	176.2	Construction industry
TVN	5	06.11.2006	29.12.2006	8553.4	Mass media
PC Guard	100	15.12.2006	25.01.2007	181.1	IT
IDM	10	07.11.2006	08.02.2007	916	Financial services

[3] http://bossa.pl

Bytom	10	12.03.2007	25.05.2007	35.7	Light industry
Fon	5	15.02.2007	04.06.2007	59.7	Other non-financial services
Kruk	11	20.03.2007	25.06.2007	641.3	Retail
Famur	107	29.05.2007	02.08.2007	2696.4	Industrial machinery
Pepees	100	18.05.2007	27.08.2007	230.5	Food industry
Impexmetal	25	22.05.2007	06.09.2007	2305.9	Metal industry
Vistula	10	30.05.2007	07.09.2007	1259.5	Retail
Polimex-Mostostal	25	04.06.2007	20.09.2007	4857.2	Construction industry
Pemug	10	29.05.2007	24.09.2007	74.1	Construction industry
Synthos	67	14.09.2007	15.11.2007	2117.2	Chemical industry
Mewa	20	23.10.2007	22.11.2007	64.6	Retail
Echo	10	26.09.2007	02.01.2008	3355.8	Housing developer
Fon	10	22.09.2008	09.01.2008	89.6	Other non-financial services
ATM	8	18.10.2007	10.01.2008	248.4	IT
Elkop	29	12.12.2007	01.02.2008	57.9	Construction industry
Herkules	5	08.11.2007	21.02.2008	203.9	Construction industry
Stomil Sanok	10	28.12.2007	22.02.2008	441.6	Automotive industry
Inwestcon	2	15.11.2007	22.02.2008	68.7	Other services
ATM Grupa	20	03.12.2007	14.03.2008	596.8	Mass media
Elzab	10	21.11.2007	30.04.2008	80.5	IT
Asseco Slovakia	10	11.01.2008	07.05.2008	697.6	IT
ZTSERG	5	08.04.2008	02.07.2008	23.2	Manufacture of synthetic materials
Tell	5	16.05.2008	08.08.2008	63.5	Retail
Zremb	100	25.06.2008	01.10.2008	26.7	Industrial machinery
Coliana	20	25.06.2008	14.11.2008	226.4	Food industry
FON†	01:50	27.03.2008	03.06.2009	22.3	Other non-financial services
Izolacja	30	25.06.2009	28.09.2009	14.7	Construction industry
PC Guard†	1:100	07.07.2009	12.11.2009	25.4	IT
Chemoservis	5	24.09.2009	24.11.2009	123	Machine industry
Elkop†	01:50	28.12.2009	16.04.2010	23.3	Construction industry
Sanwil†	01:20	02.09.2009	14.05.2010	38.1	Textile industry
Mewa†	1:106	15.02.2010	02.09.2010	19.1	Retail
Suwary	5	24.03.2011	26.04.2011	77.4	Manufacture of synthetic materials
Mennica	10	22.03.2011	30.05.2011	663.1	Metal industry
Wikana†	01:10	29.06.2011	31.10.2011	121	Housing developer
ING BSK	10	24.10.2011	18.11.2011	10121.8	Financial services
Lentex	5	25.05.2011	22.11.2011	251.5	Manufacture of synthetic materials
Unicredit†	01:10	15.12.2011	30.12.2011	57895.5	Financial services
Plastbox	5	31.03.2012	18.05.2012	102.2	Manufacture of synthetic materials
Herkules†	01:05	22.06.2012	19.09.2012	49.9	Construction industry

Cells in grey indicate splits that were excluded from the study as described above.
† indicates a reverse split.

Source: own elaboration based on: http://www.gpwinfostrefa.pl, http://www.money.pl, http://bossa.pl, http://www.stooq.pl, retrieved at: 04.05.2013.

Initial results are presented in graphs 1 – 4. Graph 1 shows the average abnormal returns and average cumulative abnormal returns for the event of split announcement for the data excluding the reverse splits. Graph starts at 5 days before the event and ends 10 days after the event. Graphs 2 – 4 are analogous to graph 1 and present: the event of execution of splits (without reverse splits), the event of reverse split announcement (only reverse splits), and the event of the execution of reverse splits, respectively.

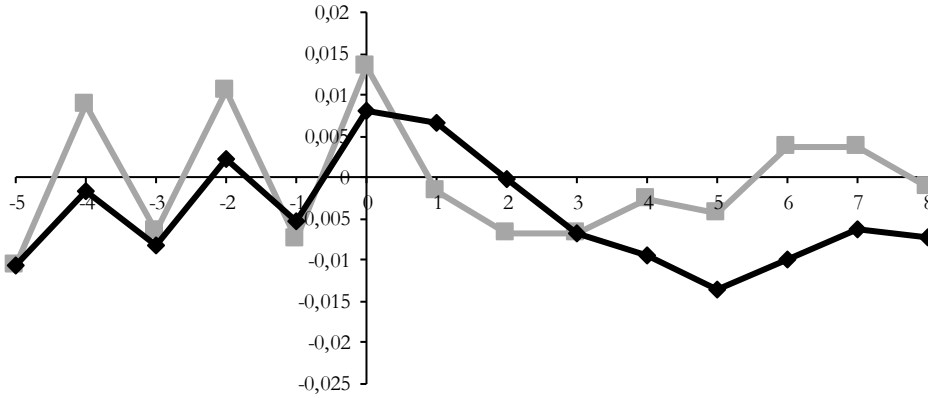
The average abnormal returns for the announcements and executions of standard (non-reverse) splits presented on graphs 1 and 2 seem to be of negligible size. What seems surprising is the fact that average abnormal returns exhibit a higher absolute value before the event of split announcement than immediately after (see graph 1). This may indicate that a significant number of traders posses the knowledge of the upcoming split announcement in advance other explanation might be that an increased number of transactions is taking place due to the upcoming SGM. Either way the alternating pattern of positive and negative abnormal returns suggests that obtaining abnormal profits before the stock-split announcement would be very hard if not impossible. After the event of split announcement, abnormal returns stay very close to zero suggesting that there was no impact on trading patterns of investors. The situation seems similar to the event of split execution, although abnormal returns exhibit similar sizes prior and after the event. There is, however, a no negligible average abnormal return, one day before the split of 2.46%. Because the date of split is publically known in advance it is not unlikely that all trading strategies that are suppose to exploit the event would be executed before it. However, given the efficient market hypothesis, all information should be incorporated into the stock prices without any delay, hence the 2.46% spike might be attributed to some irrational behavior pattern of investors. However the size of the apparent anomaly is small enough that it can be discounted as a random outcome in the sample. The relatively big negative average abnormal return at day 5 after the event is unlikely to be an outcome of the split.

The situation is significantly different with reverse splits. There seem to be a similar pattern in abnormal returns before the event of announcement (alternating positive and negative abnormal returns of modest size), but the reaction on day one after the announcement is very big with the average abnormal return of over 15%. It is important to remember that stock splits are often carried for the so called penny stocks (stocks which market value is very small, in this case below PLN 1), at which point the size of the tick becomes an important factor. In fact only one of the instances of reverse splits in the data was not a penny stock (Unicredit). Three companies Elkop, PCGuard and FON had their share prices at a crucial point of PLN 0.01 prior to the reverse split. Since stock prices cannot drop below the value of 0.01 one might expect a negative return after the reverse split is carried out.

Therefore, the positive reaction after the announcement of the split seems counterintuitive but in this case it was influenced by just one big daily return of 100% on FON shares (a jump in price from PLN 0.01 to 0.02). Still this may be considered irrational behavior by the investors to pay a premium price on a penny stock that is due to be the subject of a reverse split. The overall long term average CAR after the announcement event is negative.

GRAPH 1.

Average ARs and CARs, announcement of a split (without reverse splits)

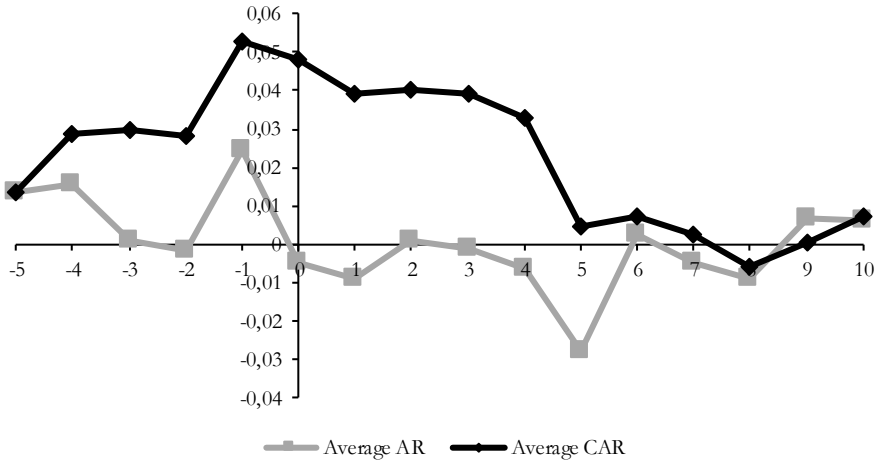


x-axis – number of days before/after the event, y-axis – average CAR/AR.

Source: own elaboration.

GRAPH 2.

Average ARs and CARs, execution of a split (without reverse splits)

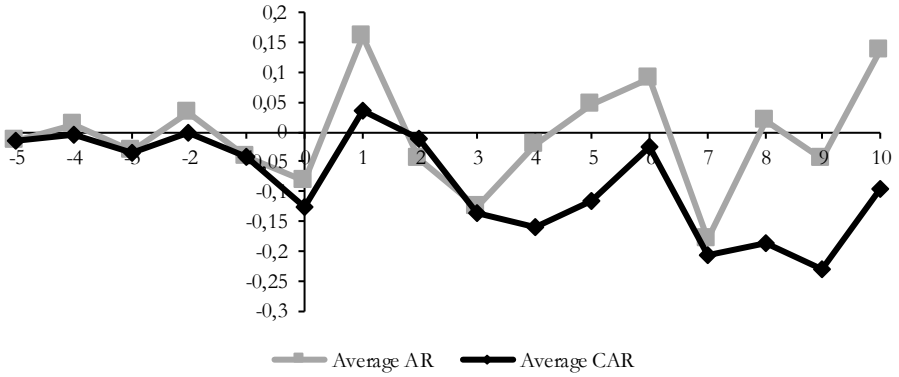


x-axis – number of days before/after the event, y-axis – average CAR/AR.

Source: own elaboration.

GRAPH 3.

Average ARs and CARs, announcement of a reverse split

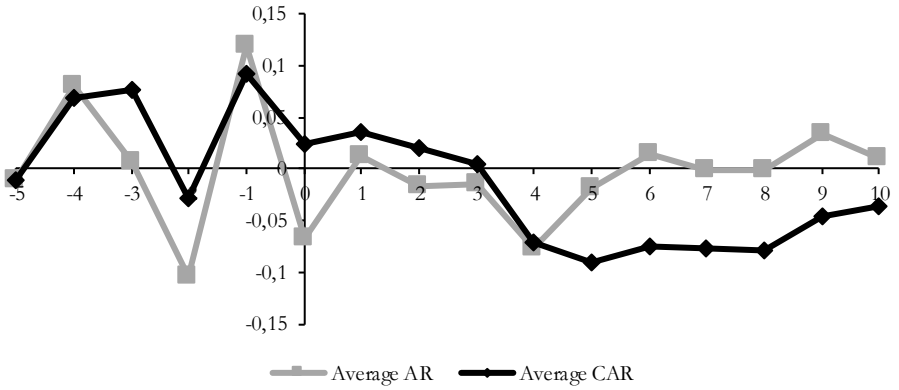


x-axis – number of days before/after the event, y-axis – average CAR/AR.

Source: own elaboration.

GRAPH 4.

Average ARs and CARs, execution of a reverse split



Graphs 1 – 4, x-axis – number of days before/after the event, y-axis – average CAR/AR.

Source: own elaboration.

Tables 2 – 4 summarize the outcomes of the statistical tests as specified in (5) and (7). Tests were carried out in each case (standard/reverse splits, announcement/execution) for ten different time ranges. In the case of standard splits tests show no statistically significant reaction to stock-splits or split announcements in the prices of shares. This suggests that investors do not make investment decisions

based on stock-splits what is consistent with the theory that a split is perceived as a purely technical procedure. The event of reverse split execution also seem to have no statistically significant impact on the prices of shares. The situation is different, however, in the case of reverse split announcement. On several occasions, both in short and long time ranges, the second test showed a significant reaction in the share prices as a result of reverse stock-split announcement. To a certain extent this may be accredited to larger nominal returns as a result of a larger ticker relative to the prices of shares, however, this cannot account for the entirety of the results, especially as there is no similar reaction to the split execution.

Hence it is safe to conclude that WSE investors do react to the event of a reverse stock-split announcement. In 4 out of 5 time ranges in which the test indicated significance. The reaction was negative. A reverse split event is different from a split event in that it allows the prices of some securities (those whose value is close to the ticker size) to drop below their current value, hence this negative reaction might be perceived as rational behavior. Because the date and size of the reverse split is known at announcement. The reaction at execution is not big.

TABLE 2.

Test results (excluding reverse splits)

	Announcement		Execution	
time range (τ_1,τ_2)	J_1 statistic	J_2 statistic	J_1 statistic	J_2 statistic
(0,1)	0.108	0.724	-0.146	-0.976
(0,2)	0.054	0.360	-0.160	-1.066
(0,3)	-0.013	-0.087	-0.138	-0.924
(-1,1)	0.035	0.236	0.074	0.500
(-1,2)	-0.023	-0.153	0.084	0.562
(-2,2)	0.078	0.526	0.061	0.414
(-3,3)	-0.039	-0.261	0.067	0.453
(-4,4)	0.008	0.058	0.120	0.804
(-5,5)	-0.105	-0.701	0.031	0.209
(-5,10)	-0.126	-0.843	0.035	0.237

Source: own elaboration.

TABLE 3.

Test results (reverse splits only)

	Announcement		Execution	
time range (τ_1,τ_2)	J_1 statistic	J_2 statistic	J_1 statistic	J_2 statistic
(0,1)	0.229	***1.679****	-0.198	-0.483
(0,2)	0.086	0.635	-0.263	-0.641
(0,3)	-0.635	***-4.649*****	-0.296	-0.723
(-1,1)	0.140	1.027	0.256	0.626
(-1,2)	0.012	0.094	0.160	0.390
(-2,2)	0.108	0.794	-0.195	-0.475
(-3,3)	-0.803	***-5.876*****	-0.214	-0.521
(-4,4)	-0.763	***-5.583*****	-0.152	-0.372
(-5,5)	-0.875	***-6.407*****	-0.229	-0.560
(-5,10)	-0.242	-1.770	-0.118	-0.289

statistically significant at level * 0.1; ** 0.05; *** 0.01.

Source: own elaboration.

TABLE 4.

Test results (all data)

	Announcement		Execution	
time range (τ_1, τ_2)	J_1 statistic	J_2 statistic	J_1 statistic	J_2 statistic
(0,1)	0.135	0.964	-0.149	-1.058
(0,2)	0.058	0.419	-0.171	-1.215
(0,3)	-0.101	-0.717	-0.168	-1.194
(-1,1)	0.051	0.366	0.107	0.767
(-1,2)	-0.021	-0.148	0.098	0.703
(-2,2)	0.070	0.498	0.010	0.076
(-3,3)	-0.144	-1.021	0.003	0.022
(-4,4)	-0.108	-0.768	0.047	0.335
(-5,5)	-0.195	***-1.384****	-0.033	-0.238
(-5,10)	0.009	0.069	0.009	0.069

statistically significant at level * 0.1; ** 0.05; *** 0.01.

Source: own elaboration.

6. Conclusion

Event study statistical tests show a general picture of rational approach of investors toward events related to stock-splits on WSE. On closer inspection of the data, one might find some patterns that might suggest a certain level of irrational behavior, however the scope and size of those anomalies is relatively small. In general, the study shows no statistically significant reactions in stock prices to the events of: split announcement. split execution and reverse split execution; and a statistically significant (mostly negative) reaction to the event of reverse stock-split announcement. Those outcomes can be considered as evidence of rational behavior of investors and are consistent with semi-strong form of market efficiency. It is important to consider the limitations of the approach. The biggest drawback is the assumption of normally distributed market returns which is not always true for the real-life market data. Because of that it might be reasonable to complement the outcomes of this study with non parametric tests.

Due to changing regulations on penny stocks at financial markets one might expect that there will be more events of reverse stock-splits in the future. This will mostly affect companies of medium and small sizes. Because reverse stock-split have some crucial differences from regular splits, this is a potentially interesting area for future research Authors plan to expand this study in the future with a wider scope of econometric and statistical tools.

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APPROACHES TO INTERNATIONAL TECHNOLOGY TRANSFER MEASUREMENT – AN OVERVIEW

Summary

The article addresses the issue of the international technology transfer (ITT) process. For most of the countries the ITT remains the main mechanism supporting the technological progress of the economy. Along with the growing importance of knowledge in every economy, technology diffusion taking place due to the ITT takes on a great and potentially even greater economic significance. However, there is no unified complex index of the process, which would indicate its scope and dimension in particular economies. In order to investigate the size of the process, a row of the following single measures are usually applied: the value of the FDI inflow into particular economy, the volume of imports, the value of the acquired intellectual property, the number of the patent application forms submitted by the foreign entities. Of the great importance is to analyse all aforementioned channels and estimate their value in different economies. To compare the process on the global scale, it is reasonable to evaluate the particular variables in relation to the GDP value in different countries individually. It would also allow to demonstrate the degree, to which the economy depends on the foreign technology.

Key words: international transfer of technology, international trade, foreign direct investment

1. Introduction

With the dynamic development of technology in the fields of telecommunications, information and transport, which allows fast and constant knowledge spread, international technology transfer is to be considered an important economic process. It plays a key role in technological progress of the developing countries as well as in the economic growth of the developed countries. The significance of ITT is extremely substantial in case of technologically advanced economic sectors [Xiaolan, Pietrobelli, Soete, 2011, p. 1206]. It is related to much higher costs of developing technical advanced knowledge rather than its transfer. Foreign technologies are estimated to generate 90% growth of productivity in most economies [Keller, 2004, p. 752]. The influence of ITT on domestic productivity is therefore greater than the effect of domestic technology on this variable. The ITT impact on the economy is also visible through its effect on domestic investment processes. It occurs due to actions

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undertaken according to economic policy pertaining development of the domestic innovation system [Xiaolan, Pietrobelli, Soete, 2011, pp.1204-1212] e.g.: through increasing expenditure on the R&D and investing in human capital development. Actions as such are indispensable in order to achieve proper ability of foreign technology absorption along with its functioning well in growing competition.

Available domestic and international literature analyses the ITT process considering it mainly only through single technology transfer channels, especially direct foreign investments and trade values. There is little attention paid to creating complex index which could be used in international comparisons. The following approach prevents from evaluating the ITT process as a whole and to define its real scale in economy. Due to lack of universal and complex ITT rate, its comparison on international scale and research concentrating on its determinants proves to be impossible. Taking it all into consideration, indication the most important and possible to measure, the ITT channels, are to be considered as study cases demanding thorough analysis.

This paper has a theoretical character and pretends to be the initiation to further, empirical research on the ITT measurement[2]. The first goals of this article is to select the ITT channels, which should be recognised as inevitable elements of the ITT process and at the same time are measurable using commonly available statistical data. The second goal is to propose a way to measure the scope of the process in a particular economy. In order to complete the aforementioned goal it is inevitable to clarify some issues related to defining the ITT process and technology diffusion. Furthermore, extensive knowledge being the core issue of the analysed proposes is to be discussed. As to achieve the set goal a hypothetic deductive method together with a descriptive and comparative analysis are to be applied.

2. Knowledge as an object of the transfer process

Knowledge should be considered a far broader term than technology. It does not only encompass a set of techniques available at a company, but also information related to organisation and management as well as combining technical processes [Gomułka 1998 p. 13]. Technology consists of all information required to implement the production. This information, however, may take various forms of knowledge. An effective technology transfer should include a vast scope of knowledge, especially technic-related, defined as technology. Stores of knowledge may be classified into: codified and unconfined as well as embodied and disembodied [Maskus 2004, p.9]. Furthermore, it can be distinguished between explicit knowledge and tacit knowledge. Explicit knowledge can be recorded and codified – taking a form of studies, analysis and products. Hidden knowledge pertains to a scope of skills of certain people gained through experience. Tacit knowledge does not only relate to information, but also to personal beliefs, judgements and intuition. This kind of knowledge is strictly connected with human

[2] In the future author will continue undertaken research and apply proposed measure ideas to estimate ITT in selected economies

capital, which remains its only carrier at the same time [Grudzewski, Hejduk 2004, p. 78]. Therefore, technology may refer to several aspects – material and embodied like machines and equipment, codified such as technical documentation and uncodified, which pertains mostly to human capital. A common denominator to all kinds of knowledge is the cost of its production or purchase [*Podręcznik*…, 2006, p. 218]. However, access to technology is also available via free of charge research publications or patent application forms. Nonetheless, stores of knowledge accessible in such forms are usually not sufficient to implement on a market scale.

Resulting from its level of codification, a diversified character of knowledge inclines to draw some conclusions. The level of knowledge codification determines the way it is spread on a global scale. Knowledge appearing to be less prone to be codified is based to greater extent on transfer through human capital migration. Higher level of codification allows to use sales channels, or licenses. Furthermore, effective transfer of technology solutions between business entities, especially coming from different countries, requires transferring of knowledge of various kinds and levels of codification simultaneously. Apart from the embodied knowledge transfer such as investment goods or the codified in form of intellectual property goods, a transfer of uncodified knowledge should occur concurrently – by providing technical support like training courses or temporary migration of the qualified staff [Misala, 2001, p. 198]. However, it should be noted that a chance to codify technology only partially equals the fact that its diffusion will never be complete and particular countries will always remain separated by technology gap.

3. Definition of ITT

Domestic literature treating about the analysis of technology transfer focuses mainly on transfer between national entities with indigenous knowledge remaining its main subject. The existing systematics distinguish between i.e.: vertical and horizontal transfer, active and passive transfer, commercial and non-commercial transfer [Matusiak, 2011, p. 301]. The division criterion used less often is the technology's source of origin, which pinpoints internal and external transfer. From the macroeconomic point of view, the internal transfer takes place inside the country between domestic entities [Poznańska, 2001, pp.72-73]. External transfer, however, where the subject of the process remains technology originating from a country different from the receiving one or a particular manufacturing company may be referred to as international transfer of technology. The ITT stands for a mechanism of information transfer beyond the country's borders and its effective diffusion in the receiving economy [Maskus, 2004, p. 7]. International transfer of technology takes place every time technical knowledge becomes available in a country by means different than domestic research or gathered experience [Misala, 2001, p. 198]. According to that, every way of obtaining access to foreign technology by indigenous entities, including commercial or not, should be considered a channel of its transfer. Equated with every single manner of its diffusion,

the ITT defined as above should be, due to its uncountable ways of knowledge transfer, regarded as a phenomenon impossible to measure.

A slightly differentiating view on the ITT process hold the international organisations creating instruments of legal protection and perceiving the transferred knowledge as an object of market transaction. In accordance with that approach, commercialisation becomes transfer's inextricably connected element. Enabling the technology recipient to put it into practice should be characteristic of the transfer [*Intellectual*…, 1996, p. 12.]. United Nations Conference on Trade and Development (UNCTAD) or World Trade Organisation both represent such approach. Within the authority of the WTO the international agreements are made, which further regulate the issues of investments abroad and protection of the intellectual property (The Agreement on Trade Related Investment Measures, The Agreement on Trade Related Aspects of Intellectual Property Rights). UNCTAD defines the process of technology transfer as a mechanism, which effects in spreading technology based on a proper agreement of the parties [*International*…, 2005, pp. 30-31]. Thus, transfer of technology indicates a process, which would make the results of research and development studies available by transferring intellectual property rights in different forms.

Having considered the above, ways of transfer onto the market need to be taken into consideration among many of the ITT channels. It would simultaneously enable to measure the process and distinguish it from a broader economic process, that is the technology diffusion. Analysing the possible ways of the ITT process, regarded as an element of the diffusion process, inclines to acknowledge the following notions as the main ITT characteristics: market-related character of the process connected with its contractual nature and a possibility to introduce the transferred knowledge to the market. Therefore, the ITT can be defined as a process consisting in transmitting technology, which is essential to be implemented, by means of market channels of transfer. The assumed definition allows to substantially narrow the channels of international transfer of technology and to set the borders between technology transfer, access to widely available sources and the external effects of the process. It also underlines the significance of the institution, especially of the legal system, in the dynamics of the ITT process. Such approach remains coherent with the contemporary research conducted on the transfer of technology, which classifies agreements as legal instruments of technology transfer and underlines the significance of protection of intellectual property rights during the process [Szewc, Ziołło, Grzeszczak 2006; *Negocjacje*…, 2004].

Technology transfer's vast and positive influence on the economy remains impossible without its diffusion, proceeding until all subjects interested in purchasing technology come into its possession. Due to non-market and informal character, diffusion appears to be of greater economic significance than the transfer itself, which is to be understood as a process involving only the parties of the transfer agreement. Following this way of deduction, actions taken on a global scale such as: trade in goods or trade in intellectual property, FDI or production cooperation – all seem substantial as they intensify the cooperation with rich in high-tech knowledge foreign entities and therefore become factors stimulating technology diffusion [Keller, 2004, pp. 756-759].

Apart from purchase of technology and cooperation in the field of innovation, open sources of information are regarded as main types of knowledge and technology transfer, which, however are not bound to market transaction. The aforementioned means of obtaining access to knowledge simultaneously reflect the elements of spreading technology globally [*Podręcznik Oslo*…, 2008, p. 82], which affects the economic growth in host countries. Thus, ITT constitutes only one of the elements of the process influencing the host economies. On account of the fact that it is possible to measure it and its high level of correlation with the diffusion process, the ITT measurement is of great economic importance.

4. International technology transfer and technology diffusion on a global scale

It is important to note that the terms: ITT and technology diffusion are often used interchangeably in literature and the ITT process is identified with the dissemination of innovation [Cichowski, 1998, pp. 10-11]. However, the process of transfer needs to be clearly distinguished from the diffusion process, which is to be understood as a supplementary benefit resulting from the transfer of technology [*International*…, 2005, p. 30-31]. The process of technology transfer itself should not be equated with its diffusion, which is a broader term.

Diffusion refers to transmitting innovation through market and non-market channels, starting from its primary application to its implementation in other countries and regions as well as other markets and companies. The process of diffusion often denotes something more than assimilating knowledge and technology, since business enterprises acquire new knowledge and technology and use it for further research studies and development. Owing to the process of diffusion, innovation may undergo changes and deliver feedback information to the primary innovators [*Podręcznik wskaźników*…, 2006, p. 82].

Since technology cannot be fully codified and information asymmetry prevails on the market, diffusion of technology on a global scale does not mainly perform via market transactions, but via so called external effects (*spillovers*.) [Keller, 2004, p. 758]. These effects consist in knowledge's leaking and penetrating into domestic companies, largely by cooperating with enterprises possessing advanced technologies. Investments performed by foreign entities are generally based on direct foreign investment. Technology's diffusion beyond subsidiary companies encompasses co-operators and national subcontractors particularly. It is believed that developing cooperation with local companies and establishing a network of subcontractors and suppliers result in the most effective diffusion [Umiński, 2000, p. 50]. Owing to that, local suppliers acquire a chance for training, counselling and sharing license. Knowledge spillovers occurring between subsidiaries and national companies due to technology multipliers result in reducing arrears in technology in the whole business, in which the FDI had taken place. The influence of foreign entities on the level of technological advancement of domestic companies arise mainly owing to two phenomena: the effect of competition and the effect of spillover, which occurs due to demonstration effect [Umiński, 2000, pp. 44-49].

The demonstration effect occurs every time an economic entity introduces a new product, which is based on innovative technological solutions and simultaneously makes certain significant information about it widely available. Possessing even some vague general information about the newest technological solutions stimulates competitors to obtain supplementary data inevitable to create an imitation. As a result, owing to learning by watching and reverse engineering domestic entities gain new knowledge. Additionally, the process remains stimulated by the effect of competition. National entities aiming at fighting the competition from the foreign companies are somewhat forced to enhance their level of innovation. Resulting from the so called external effects, among the channels of technology diffusion, different than the effect of demonstration or vertical linkages, one may appoint the labour turnover [Saggi, 2002, pp. 209-214; Hoekman, Maskus, Saggi, 2005]. Hence, the employees, who had acquired knowledge and experience by working for companies abroad, become vehicles of knowledge for domestic companies by changing their jobs or setting up their own businesses. Only a certain part of the technology transfer takes place as a result of market transactions occurring between the interested parties. Some knowledge remains commonly accessible, and its agreement does not involve any cost, or if so, the cost is rather minor. It transpires by obtaining knowledge from widely available sources. In accordance with some classification, these easily available, also called informal, ways of receiving access to knowledge to some extend coincide with the external effects and encompass such channels as: exchange of scientific and technological staff, research and technological conferences, show and trade fairs, education and training of foreigners, trade missions and industrial history [Nasierowicz, Nowakowski, 1994, p. 70]. The above may be classified as non-market channels of transfer among which one can additionally distinguish: copying, reverse engineering, staff turnover, widely available knowledge in form of scientific magazines or patent applications. The division into market and non-market ways of transferring technology, which has been adopted as the main criteria of distinguishing the process of transfer and diffusion, however, causes some problems. International movement of people is often enumerated among market-related channels of ITT [Maskus, 2004; Fosuri, Motta, Ronde, 2001]. Whenever the following movements come as the result of agreements between particular employers and oblige to introduce certain knowledge into the company, they may be characterised as market-related transfer. Migrations of scientists, students or interns, however, do not share this quality. Moreover, widely available statistic data allows precise and comparable measurement of the process on the global scale. Since human capital is not only the generator, but also the transmitter of knowledge, it can be considered, in a broader sense of the process, a channel of technology diffusion.

It remains impossible to directly measure the effects of the external market-related channels of the transfer. Occasionally, regression analysis is used in order compare the level of correlation of expenditure on the R&D of one of the examined companies with the growth of TFP of the other company cooperating with the first one. High level of correlation should stand for the occurrence of the technology diffusion [Keller, 2002, pp. 120-142]. Therefore, the changes in productivity of the companies as a result of their cooperation with innovative entities or their presence alone may be considered a measure of diffusion. However, the measure is far from

being perfect as it omits the endogenous efforts of the company, research studies among them, to increase the level of productivity. Owing to the fact that it is for the market channels of technology transfer that constitute a premise whether the external effects have taken place or not, their size and scale can be reflected in the intensity of the diffusion process. A strong dependence between market-related manners of technology diffusion and the external effects results in measuring the scope of ITT – the only key and possible to measure element of the technology transfer process – which simultaneously allows to partially evaluate the diffusion process as a whole.

5. Channels of International Transfer of Technology

Most available scholars literature does not define the process of technology transfer explicitly, but rather indicates the manners of its occurrence [Watson, Johnstone, Hascic, 2009]. These manners are referred to as the channels of technology transfer. Apart from the channels, the literature also mentions the phases of the technology transfer process. The following phases correspond with particular mechanisms of knowledge transfer, which take place according to its level of codification. The first phase encompasses export of innovative materials or products between the countries. The second following phase is referred to as design transfer, which covers various types of intellectual property rights. Finally, capacity transfer takes place, which is strictly related to the capacity to adapt new solutions to local conditions. The last phase consist in learning how to learn and is connected with production cooperation with more technologically advanced partners.

Traditionally, channels of technology transfer were interpreted in a very narrow manner, which would distinguish: turnover of patents, design patterns, licence agreements and know-how [Stoneman 1987; Malecki 1991]. The following division, however, does not reflect the business practice, in which transfer of technology and knowledge takes place through other transfer channels.

In order to group the ITT three manners of transfer are usually demonstrated [Haug, 1992, p. 5]. imports of machines and equipment as a vehicle of embodied technology, acquiring intellectual property rights such as technical know-how, patent and licence agreements, and classified in this article to diffusion channels, migrations of human capital as vehicles of uncodified knowledge. Analysing mechanisms of ITT the Polish literature refers to a vaster array of transfer channels [Firszt, 2007, pp.106-107]: licence operations, sales of patents, provision of know-how and other commercial agreements, which pertain to intellectual property rights; international trade, import of investment goods influencing production processes, import of consumption goods being objects of imitation, direct foreign investment, by which movement of capital is strictly related to spreading new technical and management solutions to subsidiaries located in the receiving country; joint-venture consisting in common business ventures of foreign and domestic entities, international industry cooperation in the field of research and development studies. It is often the

case that literature narrows the channels of the ITT to strictly two groups [Keller 2004 pp.752-783] the first one being investment channels and the second – trade channels (see Table no. 1).

TABLE 1.

The channels for transferring technology to enterprises

Trade Channel	Investment Channel
Direct exporting	Co-production
One-off transaction	Sub-contracting
Licensing	Contract joint venture
	Equity joint venture
	Wholly owned subsidiary

Source: own, based on: [Bennett, Vaidya, 2002].

Investment channels remain of great significance as they posses a strong ability to generate external effects. It is worth noticing that the transfer taking place within international joint-ventures also encompasses the transfer of disembodied knowledge [Sazali, Haslinda, Jeżak, Raduan, 2010]. The significance of international M&A is also underlined in the process of technology transfer. The mergers are referred to as fast ways of acquiring technology by companies backwarded in terms of technology and using it further to enhance the level of endogenous innovation and competitiveness [Xiuling, Li, Huiping 2012 pp.7-12]. Nonetheless, there is some research available, which points at low correlation of FDI with an increase in domestic companies' productivity. It has been proved that trade, similarly to FDI, remains an important channel of international diffusion of knowledge with its influence on the productivity increase remaining relatively low. Information technology has been therefore acknowledged as diffusion channel, which played an important role in productivity growth in the recent years [Lei, Bang Nam, 2007].

Analysing the literature in the field of transfer channels allows to formulate a conclusion that major number of various forms of technology transfer may be divided into two main groups, so called market channels of transfer. According to that, it can be assumed that the ITT is a process occurring through market channels including the purchase of technology by importing high-tech goods and acquiring rights to intellectual property as well as through investment channels encompassing the inflow of DFI and production cooperation.

6. Measuring ITT

The assumed definition of ITT defining it as one of the components of technology diffusion on a global scale allows to eliminate the external effects as well as non-market technology spillovers, also called informal channels of transfer, from the measuring process. Both, Polish and world literature does not dedicate a lot of attention to issues related to synthetic measurement of the ITT. As three main man-

ners of indirect technology measurement one may appoint: expenditures connected with its production (R&D), the results of its codification (patents) and the effect of its implementation in the production process (higher productivity.) International payments concerning patents and the level of their correlation with trade in goods between particular countries may be assumed as one of the ITT measurements examples in a certain trade [Watson, Johnstone, Hascic 2009 pp.1-4]. A different example of the ITT measurement attempt in a certain trade was measuring the amount of purchased investment goods, that is production equipment and the level of staff recruitment among foreign specialists. Necessary data was obtained from the surveys conducted among various companies. Annual payments and incomes from the licence and copyright fees are also regarded as measures of technology transfer in the United States.

Most research, both practical and theoretical, focuses on either one or two main channels of the transfer with FDI and trade attracting the most attention [Saggi, 2002, p. 193]. In research dedicated to measuring the transfer, Maskus analysed the following values: the value of incoming FDI, the value of technologically advanced imported goods, payments concerning intellectual property rights (technological balance of payments.) Among capital goods, which remain substantial technology vehicles, the following goods according to SITC methodology are appointed: capital intensive, skill-intensive, high-technology, which all originate from the OECD of high income. Statistic data used to measure the aforementioned values come from the UN Comtrade database, IMF balance of payments and UNCTAD World Investment Reports [Maskus, 2004]. The manners of foreign knowledge acquisition were analysed by Dahlman using two channels [Dahlman 2008, 2010]: the value of FDI and technology licensing. In the conducted analysis the mentioned values were compared with the value of GDP of chosen countries, which allowed to compare in a relatively objective way the scope and value of the knowledge acquired from abroad with the size of the whole economy. Research dedicated to acquisition of foreign technology by emerging economies such as: Brazil, China, India in terms of acquiring global knowledge the following values were analysed: imported goods as a percent of GDP, manufacturing imports as a percent of the whole import trade, average FDI value to GDP from certain years; remuneration for copyright, licence copyright fees compared to GDP; number of high school graduates taking education abroad compared to the number of students in the home country.

Technology balance of payment is regarded to be an indicative measure in terms of transfer measurement, which is considered as a partial measure of technology diffusion on a global scale. In the field of engineering the balance of payment is used in order do asses the position each country takes in the international arena concerning trade in intangible technology. It mainly refers to commercial transactions between the residents of different countries pertaining mainly to transfer of technology by means of: patents (purchase, sales, licence agreements), non-patented innovation; disclosures know-how, design and industry patterns, trademarks (sales, licensing, franchising), technical services, R&D works and services [Matusiak, 2001]. International technology payments are regarded as important, but not the only components of

ITT [Madeuf, 1984, pp. 125-140]. According to OECD Handbook on Economic Globalization Indicators [*Podręcznik wskaźników*…, 2006], the reference indicators of international technology diffusion are the following: trade in disembodied technology in form of patents, licences, know-how, technical support, research in the field of the R&D (all of the above comprise the elements of technology balance of payments) as well as trade in high tech products. In accordance with the recommendation of the TBP Manual [*TBM Manual*…, 1990] the technology balance of payments does not comprise the operations such as: business, financial, management or legal assistance, advertisement, insurance, transport, films and other copyright recordings, software etc. However, one of the disadvantages of the technology balance of payments as a measure of diffusion is the fact that over 66,6% of such transactions take place in the framework of KNT.

The literature indicates some attempts, which have been made to establish a special measure, or indicator, the so called Technology Transfer Index. Its aim would be to rate the percentage of imported technological components in the overall production costs of certain goods, each year in a given country. A proper adjustment of the set of goods in the suitable sectors of industry, which according to some scholars should not be more complex than the one applied by creating the consumer price index, would result in measuring the level of the ITT share in the economy of each country and thereby its independence on foreign technology. A quantitative measure constructed as such would, according to the authors, be a valuable source of information in the process of determining economic development strategy.

7. Conclusion

Based on the conducted analysis of literature and the assumed definition of the ITT, a way to measure the scope of the process in a particular economy may be achieved by adding the following values: the value of the imported investment goods, the value of the technologically advanced goods (all qualified according to SICT, CN), the value of the technology balance of payments (OECD, Technology balance of payments, IMF balance of payment), FDI inflow (World Bank Statistics Database, or UNCTAD). Considering the enterprise's sector responsible for the FDI and its significance for the indigenous economy, the most technologically advanced channels are to highlighted. According to that, an industrial structure of the undertaken FDI requires further analysis. However, the available date is not sufficient and there is are no standards concerning the FDI classification according to particular industries, which would lead to unreliable comparisons among different countries. The choice of the aforementioned variables is mostly based on the widely available access to the standardized databases. Moreover, the proposed measures reflect the key re-occurring channels of transfer. At the same time, it is worth noticing that the value of transfer, which is a total of the three assumed values, does not fully exhaust the whole size of the process. It omits the value of subcontracts concerning the production cooperation, consulting agreements and service. Moreover, the isolated value of the chosen channels without its reference to the whole

economy does not allow to evaluate the influence it has on the domestic economy. Comparing the size of particular channels of transfer with some of its counter indicators in the domestic economy enables to indicate the degree of the economy's dependence on the foreign technology. Thereby, it will be possible to determine the degree of the domestic technology development's dependence on foreign sources. In order to conduct such analysis, the following dependencies in a given periods of time may be applied:

1. the value of FDI / the value of domestic investment,
2. high-tech imports / domestic high-tech production,
3. number of domestic patent applications or/and granted / number of foreign patent applications or/and granted.

Comparing the above values allows to draw some conclusions concerning the influence of the process on the domestic technology advancement, however, it does not allow to compare it on a global scale. Thereby, it is impossible to determine the reference between the dimension of the ITT and the economic growth rate or defining the factors influencing the size and the efficiency of the process. Therefore, the comparative studies concerning the process are of great significance. In order to compare the ITT in particular domestic economies the chosen variables indicating the technology transfer should be juxtaposed with the corresponding values of a given economy. The following equations may be applied:

1. the value of FDI/GDP,
2. high-tech imports/GDP,
3. TBP/GDP,
4. foreign patents granted in selected country/overall number of patents granted in selected country in a given year.

Changes in the size of these measures in a given period of time would allow to determine their economic significance in particular economies as well as to identify the changes occurring in the structure of the conducted process. The comparative analysis would allow further research concerning the factors influencing the occurring changes and thereby indicating the efficient determinants of the ITT process.

Finally, it is worth highlighting once again, that the above described methods of measuring the size of the ITT in a given economy include a significant margin of error. First of all, they do not take in account other than indicated market transactions concerning the technology overturn. Moreover, in accordance with the assumed definition of transfer the role of the non-market ways of technology diffusion have been omitted. The diffusion, however, has even a greater economic significance than the technology transfer itself. Owing to the fact that diffusion largely takes place due to the market transactions, the conclusions concerning the scale of the process may be drawn only in reference to the ITT size. Therefore, the attempts to measure the process gain even more importance as it has been shown and attempted in this paper.

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Elżbieta Izabela MISIEWICZ[1]

THE INFLUENCE OF CHANGES IN PERSONAL INCOME TAX REGULATIONS ON DONATING NON-PROFIT ORGANIZATION

Summary

Each entity paying taxes would like to have real influence on the way of their allocation. Since 2004 in Poland payers of personal income tax were able to decide about donating 1 percent of personal income tax to a chosen public benefit organization for the first time. Since the introduction of the possibility of donating non-profit organization (NPO) tax regulations were repeatedly modified. Did tax-payers willingly use the ability to decide who they should donate their 1 percent of personal income tax to? In what way did changes of tax regulations influence taxpayers' decision? In order to answer those questions soft modelling was used, which allowed to examine the influence of changes in regulations relating to 1 percent of personal income tax on taxpayers' decision.

Key words: taxpayers' behaviuor, changes in tax regulations, 1 percent tax

1. Introduction

The initiative, which has been in force in Poland since 2004[2], allowing the taxpayers to decide on what purpose 1 percent of their personal income tax will be spent is not a novum. As early as in postwar years Spain and Italy permitted their citizens to donate a part of their taxes to Catholic Church. Since 1997 by virtue of the act on public benefit from 1996 Hungarian citizens were given the possibility to donate 1 percent of their personal income tax to chosen non-governmental organization, and since 1998 they can additionally donate 1 percent of their personal income tax to chosen church [Makowski, 2007]. Somewhat later than in Hungary in year 2000 in Slovakia there was passed an act on individual income tax, which predicted an ability to transfer 1 percent (currently 2 percent) of taxes in aid of non-governmental organizations.

Initially in Poland, in accordance with the act, only personal income taxpayers who individually filled in the tax form and also taxpayers paying lump sums on registered income could lower their income tax resulting from the tax return form by amount not

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[2] Regulations concerning subsidizing the NPO in Poland are set out in the Act of 24 April 2003 on Public Benefit and Volunteer Work (Journal of Laws of 2003 No. 96, item. 873).

exceeding 1 percent of personal income tax and donate it to a selected NPO. Since 2007 from a taxpayer's point of view, public benefit organization's support principles were simplified in a significant way, because having calculated 1 percent of personal income tax the taxpayer does not have to do a transfer on his own if he puts the counted amount, NPO name and KRS number while filling in PIT form, since it is the Tax Office that will take care of distribution of the tax..

The aim of the article is to examine taxpayers' reactions to changes of the 1 percent personal income tax regulations. In order to make such analysis there was used the soft model [*Wold*, 1980; Rogowski. 1990; Mierzyńska, 1999], which is the generalized econometric model allowing to examine relationships between unobservable variables. The model was estimated basing on the data from the period 2003-2011 coming from the Ministry of Finance.

2. Specification of the soft model

Each soft model consists of two submodels: internal and external. The first one determines the scheme of dependence between hidden variables, while the second one comprises definitions of hidden variables [Rogowski, 1990, p. 33]. The external model describes relations between unobservable variables and their indicators. Hidden variables can be defined in two ways: deductively and inductively. In the first case it is assumed that latent variable as a theoretical concept is a starting point to empirical data research, thus it is a prior indicator in relation to a given indicator. Ratios of such hidden variables are called reflective. They are supposed to be characterized by a high correlation between each other, because they react to changes of the same value. In the second inductive case, there occurs transfer from observable to hidden variables, while indicators are said to be emergent indicators [Perlo, 2004, p. 137-138]. While creating models with unobservable variables, one should define connections between indicators and theoretical variable in the first place. Making the decision concerning choosing the type of indicators, which are included in the model, should result from previously accepted theoretical description [Rogowski, 1990, p. 25].

Internal relations in soft models have linear characteristics. An internal model accepted in presented analysis has got the following form:

$$TPD_t = \alpha_0 + \alpha_1 CHTR_t + \varepsilon_t \tag{1}$$

where:

TPD_t – tax-payers' decision,

TRC_t – tax regulations changes,

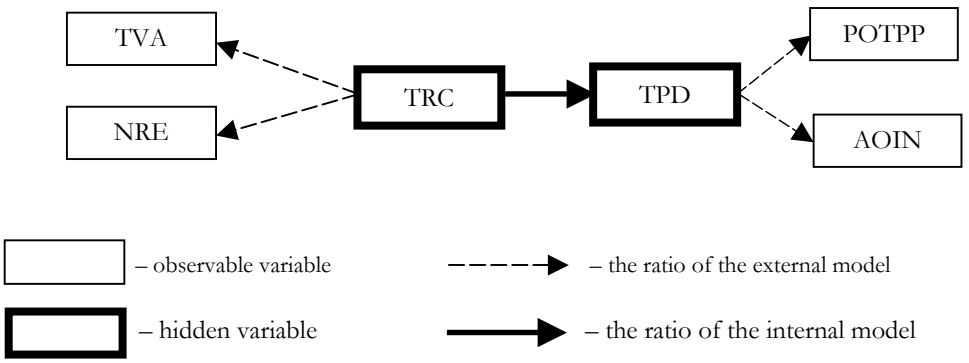
α_0, α_1 - model parameters,

ε_t - random factor.

Both, internal and external model was presented on the Diagram1.

DIAGRAM 1.

Soft model



Source: Author's own elaboration

There are two hidden variables described in the model: *changes in tax regulations* (TRC) as well as *taxpayers' decision* (TPD) (indicator description is included in the Table 1).

TABLE 1.

Indicators of hidden variables

Hidden variable	Symbol indicator	Meaning
Tax regulations changes **(TRC)**	**TVA**	time variable
	NRE	new principles of obligatory regulations of 1 percent personal income tax
Tax-payers' decision **(TPD)**	**POTP**	the percentage of taxpayers, who declare income by general rules and donate 1 percent of personal income tax
	AOIN	the amount of income on the accounts of public benefit organizations expressed as personal income tax percentage

Source: author's own elaboration.

Tax regulations changes (TRC) were defined by two indicators. The one determined as *new principles of obligatory regulations of 1 percent personal income tax donated to public benefit organizations* (NRE) reflects tax regulations changes included in the Public Benefit Activity and Volunteer Work, which took place in 2007. In order to grasp and picture those changes, NRE ratio was defined as dummy variable. During the period 2003-2006, while less advantageous for taxpayers regulations were still obligatory, the variable *new principles of obligatory regulations of 1 percent personal income tax* (NRE) takes value '0' and '1' in the remaining period. Another indicator, the *time variable* (TVA) was expressed in years. As a result of including this indicator in the model, apart from tax regulation changes,

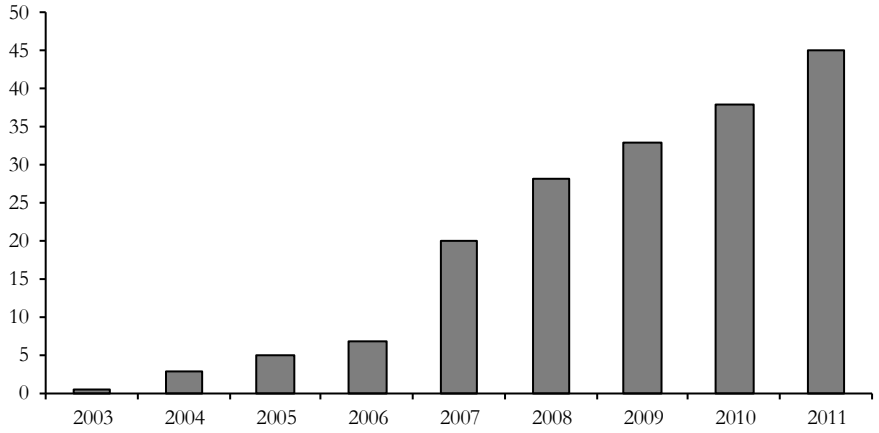
there were also caught changes occurring in economy during the examined period, e.g.: inflation. Because the model was based on the data from 2003-211, the *time variable* takes values: 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010 and 2011.

Similarly to *changes in tax regulations,* the second of unobservable variables, that is *taxpayers' decision* (TPD), was as well defined by two indicators: *the percentage of taxpayers who declare income by general rules and donate 1 percent of personal income tax NPO* (POTP) as well as *the amount of income on the accounts of public benefit organizations expressed as personal income tax percentage* (AOIN).

During the first year of existence of mandatory provisions of the public benefit activity and service act only insignificant amount of taxpayers, just 0.34 percent of entitled to do so, decided to donate 1 percent of personal income tax to a chosen public benefit organization. Year by year the situation improved and taxpayers were more likely to support NPO (Diagram 2).

DIAGRAM 2.

The share of tax-payers accounting according to general rules, who supported NPO with 1 percent of output (in %)



Source: [*Informacja dotycząca kwot 1% należnego podatku*…, 2011, s. 6].

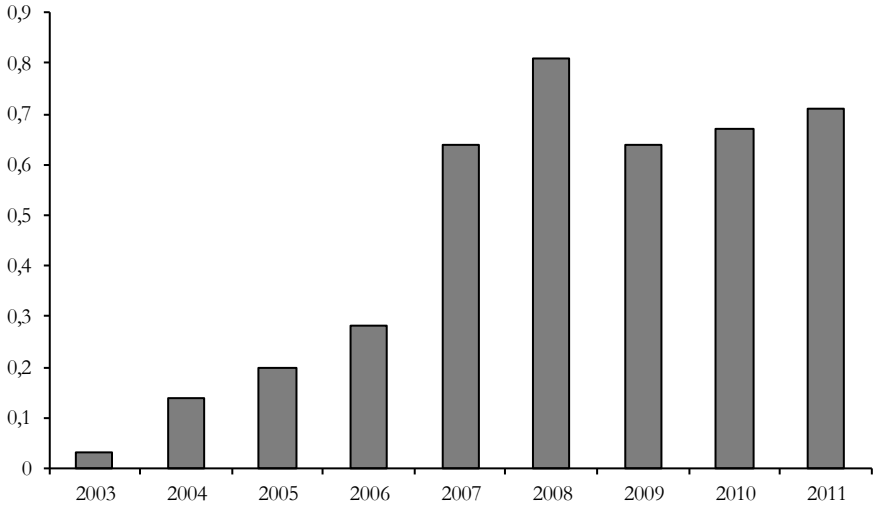
In 2006, the last year when the old rules were still valid, only about 7 percent of taxpayers, who could reduce their taxes to donate to NPO, did it. In the following year, i. e. the first year after the change of tax regulations there were nearly three times as many taxpayers who agreed to make a donation, that is approximately 20 percent, in 2008 almost 28 percent. Since 2008 the number of tax-payers donating 1 percent of personal income tax to NPO increases to about 5 percentage points per year. According to data from 2011 nearly 43 percent of tax-payers accounting to general principles donated 1 percent of personal income tax to NPO.

Similarly to the number of tax-payers accounting according to general rules, who supported NPO with 1 percent of personal income tax, in the initial period of the

existence of public benefit organization and service act, the share of amounts from 1 percent of personal income tax was on a really low level. In 2003 NPO taxpayers donated only 0.03 percent of personal income tax. The greatest increase of the amount constituting 1 percent of personal income tax took place right after the introduction of new regulations i.e. 2007 (in 2006: 0.28 percent while in 2007: 0.64 percent). In 2011 the amount which was donated to public benefit organizations by taxpayers made up 0.71 percent of personal income tax. Shaping the share level of amount donated to NPO by taxpayers expressed as personal income tax percentage in years 2003-2011 is pictured in Diagram 3.

DIAGRAM 3.

The share of amount donated by NPO tax-payers expressed as personal income tax percentage (in %)



Source: [*Informacja dotycząca kwot 1% należnego podatku*…, 2011, s. 6].

3. Estimation and verification of the model

The soft model was estimated by the partial method of the smallest squares, which allows concurrent obtaining of the parameters' assessment of the internal and external model. As a result of estimation the following assessment of parameters of internal relations was received (estimation errors were presented in the brackets).

$$\hat{TPD}_t = \underset{}{+} \underset{(0.0229)}{0.9942} TRC_t - \underset{(8.8244)}{398.881} \qquad R^2 = 0.9881$$

Estimations of model parameters meet the expectations. The number value at the parameter TRC is 0.9942 which means significant influence of tax regulations changes referring to one percent of personal income tax on taxpayers' behavior.

In the above model the parameters are considerably non-zero and the value of the coefficient of determination R^2 is 0.9881, which means a very good adjustment to estimated values of hidden variables.

As indicators occurring in the models are reflective indicators, the analysis of variables is done on the basis of factor loadings. These loadings are correlation coefficients among unobservable variable and its indicators, which were compiled in the Table 2, in Diagram 4. and in Diagram 5.

TABLE 2.

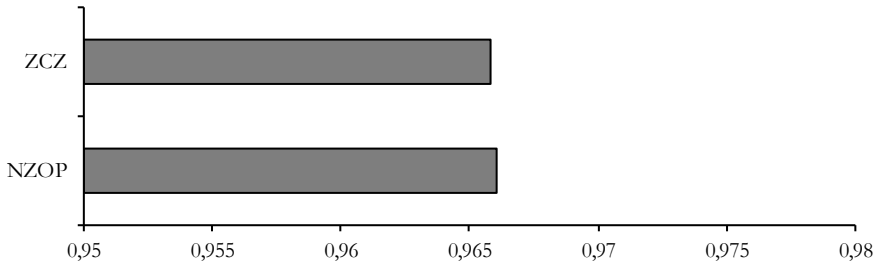
Estimating parameters of external relations in the soft model

Hidden variable	Symbol indicator	Factor loadings *(standard error)*
Tax regulations changes **(TRC)**	**TVA**	0.9658 *(0.0005)*
	NRE	0.9661 (0.0005)
Taxpayers' decision **(TPD)**	**POTP**	0.9769 *(0.0063)*
	AOIN	0.9756 *(0.0071)*

Source: Author's own elaboration based on the results of soft modeling.

DIAGRAM 4.

Value of factor loadings of latent variable indicators *changes in tax regulations*



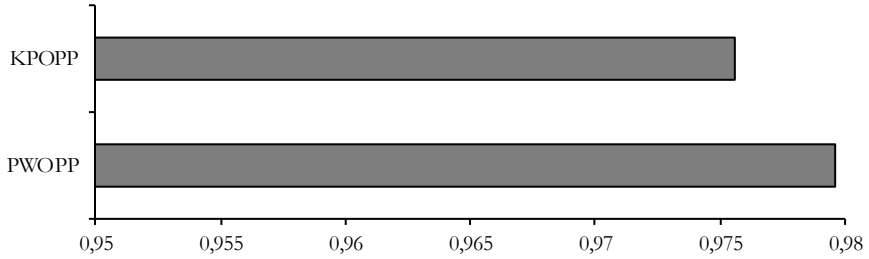
Source: Author's own elaboration based on the results of soft modeling

All ratios describing both hidden variables of this model are stimulants, so the increase of their values causes the growth of those variables. The variable of *tax regulations changes* is illustrated the best by *new obligatory principles of 1 percent personal income tax actsZ* ratio (0.9661) and slightly less by *time variable* ratio (0.9658). The variable taxpayers decision is strongly presented by the *percentage of taxpayers, who settle up according to general rules and donate 1 percent of personal income tax to NPO* (0.9769), a bit

weaker by the *amount of sum, which was transferred to public benefit organizations' accounts expressed as personal income tax percentage* (0.9756).

DIAGRAM 5.

Value of factor loadings of latent variable indicators *tax-payers' decision*



Source: Author's own elaboration based on the results of soft modeling.

Based on received soft model estimations referring to both external and internal relations the model was verified positively. Evaluations of models quality can also be done on the basis of Stone-Geisser's test, which verifies the model in terms of its usefulness in prediction.

TABLE 3

The value of the test Stone-Geisser general and for indicators

Symbol indicator	**The value of the test S-G**
POTP	0.7956
AOIN	0.7372
General value of S-G test	**0.7955**

Source: Author's own elaboration based on the results of soft modeling

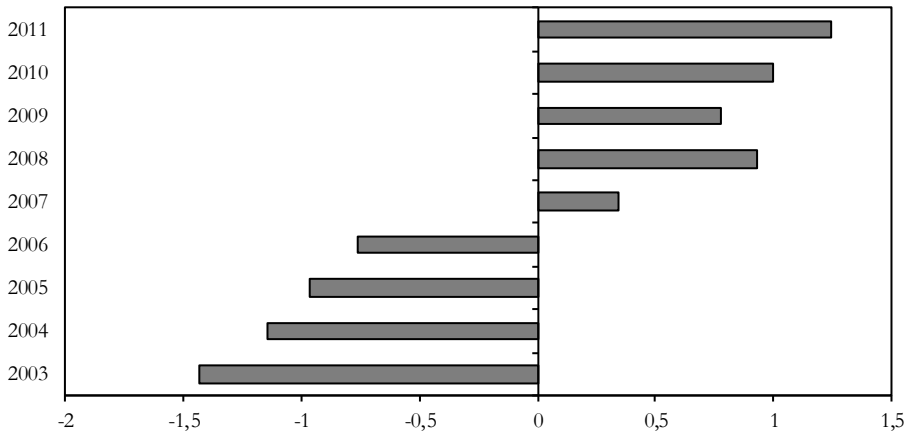
General value of S-G test as well as S-G values for particular hidden variable indicator are greater than zero, what gives evidence of good prognostic value of the model (table 3.).

4. Analyzed of the results

Using PLS method allows not only to estimate the relations between hidden variables, but also to estimate values of those variables. As a result we receive a synthetic variable whose values do not have substantial interpretation, but can be used in comparison analysis. Ratios of synthetic meter defining taxpayers decision were presented in Diagram 6.

DIAGRAM 6.

Values of synthetic meter



Source: Author's own elaboration based on the results of soft modeling.

It is necessary to remember, that the variable *taxpayers' decision* is mirrored by two ratios and that not only external model but the internal as well has impact on estimating its value.

In the first year of the existence of the act on public benefit activity and service there occurred the smallest over nine analysed years taxpayers' interest in such a form of donating NPO. It happened due to complication of the rules. Initially, principles relating to supporting NPO with 1 percent of personal income tax had a form of classic tax allowance. The taxpayer only after making a payment in favor of a chosen public benefit organization was able to count out not more than one percent of personal income tax. Such a construction surely did not have a beneficial effect on taxpayers' interest in this kind of donating NPO. It did not only require significantly higher activity, but also bearing additional costs and time, which had to be sacrificed in order to transfer specific amount to NPO in a proper way. One should also remember to archive a transfer confirmation, because such a document needs to be shown in case of inspection. What is more, the number of institutions having the status of a public benefit organization was really limited, because their registration started not until 1st January 2004.

Year by year the situation was improving. Not only did more and more people make a decision to donate 1 percent of personal income tax but there was also growth in values of donations transferred to NPO accounts. The biggest change in synthetic meter value took place in 2007, that is right after the modification of regulations. Those changes were mainly a result of simplifying the process of donating 1 percent of personal income tax to NPO, because since 2007 it has been The Revenue Office, not a tax-payer, which is responsible to transfer money specified in tax return to accounts of public benefit organizations. Apart from urgent reaction of taxpayers to changes of regulations regarding donating public benefit organizations with 1 percent of personal

income tax, which took place in 2007, the years 2004 and 2008 were periods, when the growth of synthetic meter value defining *taxpayers' decision* was the highest. It means that tax-payers reacted rationally to changes in tax regulations, but with a certain lag. In 2009 the value of synthetic meter was lower than in 2008, due to modifications of tax scale.

5. Conclusion

Soft modelling is one of methods used to examine relations occurring between unobservable variables. Received results show a very strong positive and statistically important dependence occurring between hidden variables. According to carried analysis, *tax regulation changes* variable was affected by modifications of tax regulations in 2007, which related to the way of changing the mechanism of allocation not directly from taxpayers but managers of The Revenue Office and with the extension of taxpayers' circle, who could use this form of supporting socially useful activity.

It is necessary to remember that when estimating the soft model using PLS method there are also received estimations of values of directly unobservable variables, which even though lack substantial interpretation are used in comparison analysis. Estimations of hidden variables allowed to capture those periods, when taxpayers reacted the hardest on modification of tax regulations and formulating a statement that tax-payers react to all changes rationally, but with a delay.

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Dorota KOBUS-OSTROWSKA[1]

ENTREPRENEURSHIP IN POLAND IN TIMES OF CRISIS AND ECONOMIC SLOWDOWN

Summary

Entrepreneurship is widely regarded as the key to economic development. In spite of the crisis is here, more and more companies are established. The aim of this article is the answer the question: does this difficult situation trigger an entrepreneurial spirit, effectively discourage us from taking on new challenges and make us more creative? An important factor creating entrepreneurship in Poland, in times of crisis and economic slowdown is the availability of funds for economic activity. Currently, people who want to start a business in Poland may apply for funds from many sources. The multitude of available resources and growing competition for their acquisition encourage creative people to create their own place in economic reality.

Key words: crisis, entrepreneurship, development, support

1. Introduction

The crisis is here, it is proved by the information provided to the public. Companies announce bankruptcy, others, even though they do not give up, report to labour offices that they are planning redundancies, and others who do not see chances of further development lay off employees. The falling Gross Domestic Product rate[2] (since 2009) followed by the decreased demand for many products and services[3] and rising unemployment[4] are the absolute measures demonstrating the scale of the risk. It is worth noting that only in a first quarter of 2011 the courts declared as many as 158 bankruptcies in Poland.[5] For comparison, a year earlier in the first quarter of 2010, 168 entities

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[2] GDP growth in Poland in constant prices (previous year = 100), correspondingly, 2007 – 6.8 percent, 2008 – 5.1 percent, 2009 – 1.6 percent and in 2010 – 3.9 percent, 2011 – 4.5 and in 2012 – 1.9 percent [See: gus.stat.gov.pl, access: 02.05.2013].

[3] Domestic demand in Poland, in constant prices (previous year = 100) respectively in 2007 – an increase of 8.7 percent, 2008 – an increase of 5.6 per cent, in 2009 – a decrease of 1.1 per cent. And in 2010 – an increase of 4.6 per cent , in 2011 – an increase of 3.6 but in 2012 decrease of 0.2; while respective total consumption in constant prices (previous year = 100) changed accordingly: in 2007 – an increase of 4.6 percent, 2008 – an increase of 6.1 percent, in 2009 – an increase of 2 percent, and in 2010 – an increase of 3.4 percent but in 2011 an increase of 1.6 in 2012 – an increase of 0.6 only.

[4] Total unemployment rate (as at end of year) was, respectively, in 2007 – 11.2 percent, 2008 – 9.5 percent, in 2009 – 12.1 percent and in 2010 – 12.2 percent in 2011 – 12.5 percent, 2012 – 13.4 percent.

[5] At the same time, new companies and new entrepreneurs register in KRS (National Business Register). For comparison, only in January 2011 and only in KRS, 1,653 new commercial companies were registered

declared bankruptcy, i.e., 33 per cent more than in the same period of 2009[6]. What is more, there is a noticeable lack of stability both in relation to share prices indices and national currency indices. Paradoxically, more and more companies are established. Why? Does this difficult situation trigger an entrepreneurial spirit and make us more creative? Or does it effectively discourage us from taking on new challenges and pursuing new investment? Or maybe the crisis affects only the unprepared? So how should we behave in times of crisis to use it for further development?

These and other questions will be discussed in this paper.

2. Entrepreneurship in theory and practice

Entrepreneurship is a concept differently understood and defined. It may be considered as:

- the set of characteristics/behaviours that enable the creation and implementation of projects designed to achieve the intended objective,
- the process of creating something new, valuable,
- the type of human activity consisting in using opportunities emerging in the vicinity [Janasz, 2004, p. 18-24].

According to J. Schumpeter entrepreneurship is expressed in constant search of new "combinations" of factors of production. J. Wiklund defines entrepreneurship as "taking advantage of opportunities by novel combinations of resources in ways that have impact on the market" [Wiklund, 1998, p. 13][7]. Entrepreneurship is manifested in:

- deciding on the resources used and methods of their involvement,
- taking risks in business,
- initiating and implementing new technologies.

Therefore, the entrepreneur is a person "sensitive" to new opportunities, who recognizes existing opportunities. It is a creative person and always willing to take risks, operative, able to quickly adapt to changing conditions [Malecka, 2000, p. 15].

The concept of entrepreneur emerged relatively late in the economic literature. The terms: merchant, craftsman, farmer (J. B. Say) were more frequently used. The lack of

(limited liability companies, joint stock, limited partnerships, limited by equity, partnerships, cooperatives, and branches of foreign companies). Apart from companies, every day, a lot of individual businessmen start their business activity registering in the National Business Register.

[6] The next months will confirm that the slow downward trend will be replaced by a strong upward trend. Industry that stands out negatively in comparison with other sectors is, unfortunately construction, where upward trend in bankruptcy has persisted since 2008 – reports Coface in a report on the bankruptcy of companies in Poland in the first quarter of 2011. The difficult situation in the construction industry has been caused by a payment gridlock, which intensifies in this sector. Many companies have troubles with the implementation of contracts concluded in unfavorable price conditions, some of these contracts are broken off, and some bring losses to general contractors. Delays in the execution of contracts and lack of profitability have a direct impact on paying obligations to subcontractors and distributors of building materials. For more see: [www.egospodarka.pl, access: 30.04.2012].

[7] "Entrepreneurship is defined as taking advantage of opportunity by novel combination of resources, in ways which have impact on the market".

uniformed definition of entrepreneur favoured assigning different functions to an entrepreneur. An entrepreneur was identified with a person who intends to create a product at their own risk and for their own profit. The activities of an entrepreneur were identified with a transfer of economic resources from areas of lower productivity and lower income to areas of higher productivity and higher income. Adam Smith on the other hand compared an entrepreneur to the owner or capitalist. For P.F. Drucker an entrepreneur is someone who "shifts economic resources out of lower and into higher productivity and greater yield" [Drucker, 1992, p. 30]. D. Ricardo saw an entrepreneur as an entity which gains competitive advantage by the introduction of technological progress [Blaug, 1994, p. 466].

And although in theory we find many times the statement that an entrepreneur is an integral part of each entity, what are therefore characteristics of an entrepreneur?

A. Gibb indicated the following attributes of an entrepreneur: "initiative, strong *persuasive* powers, (…) flexibility, creativity, problem solving ability, and need for achievement, imagination and leadership" [Gibb, in: Piasecki, 1998, p. 24]. These features may occur with varying intensity. To a large extent they depend on conditions in which the entrepreneur operates, but also on the reliability of suppliers, customers, and colleagues and on the aggressiveness of competition. An entrepreneur is also a person who not only believes that what he's doing is right, but is also able to affect the environment, and is the organizer and coordinator of economic resources and the arbitrator who chooses alternative applications [Blawat, 2001, p. 77]. As the economy was developing new features were attributed and new functions were entrusted to entrepreneurs including the ability to:

- acquire and motivate people,
- organize and run economic activity,
- introduce new innovative solutions,
- disrupt equilibrium and create market,
- notice opportunities not perceived by others,
- overcome difficulties which are insurmountable for others.

An entrepreneurial attitude is characterized by initiative, activity, independence and innovation both in personal and social life, and at work. Entrepreneurship is also independence, individual motivation, and ability to take risks. In many cases, it is an innate trait, but it can also be acquired or even learned. It turns out that self-employment is not only a way to make money. It is also developing of one's own interests and passions. If we are predisposed to run our own business, this will bring us more satisfaction than being a full-time employee. It is important to select an area which interests us. Then we will have a feeling that our work translates into financial results and it is not working full-time.

Entrepreneurship is widely regarded as "the key to economic development, but also as an impetus for new jobs" [Collins, Hanges, Locke, 2004, pp. 38-45]. Why do so many people decide to conduct business? They may be motivated by their personal characteristics such as resourcefulness, independence or the need for recognition and self-

realization. Following the Polish experience, we can distinguish the following reasons for conducting business:

- favourable situation in the market,
- unemployment and the need to find a job
- a desire for greater independence,
- an urge to increase their income,
- an urge to get rich,
- an urge to invest their own funds,
- a desire to continue family traditions,
- an inherited company.

Favourable situation in the market is one exterior motive, independent of man, for setting up a business. Unemployment is a counterweight, which in many cases is not a motivating factor, but a determining factor for the start-ups. Unemployment emerging in a local community has forced many young, creative and energetic people to find their "own place in the world," understood as the creation of independent work place. It is followed by the desire for greater independence, but also by greater responsibility for their decisions. Two objectives can be identified in this motivation: the first is the need to test oneself in an unassisted action, and the second ability to free oneself from the sometimes rigid organizational structures. This independence and the ability to decide their fate translates into financial independence. For many entrepreneurs the driving force is the desire to increase their income and the desire to get rich [Gibb, Davis, 1990, pp. 15-31]. The continuation of family tradition or inheritance of a company is rarely mentioned as determinants of activity in business life.

"Being the first" in the industry is an important success factor followed by finding a niche market in a local or regional market. The one, who first finds a chance for himself and combines it with skills and predisposition to connect people, increases the likelihood of success. Still, these are the innovative ideas, and not the copied patterns, that are in great demand. Well, with the exception of new habits we have brought from abroad. If only these comebacks were followed by the money earned there, and language skills, they would become a great opportunity to start and conduct business in the country. If in addition we could spot market niches, we would have a chance to lead the company to success. Thus, the entrepreneurship is a way of thinking and the process of designing and developing business thanks to the ability to take risks.

3. The crisis and entrepreneurship

Let us to look at the crisis through the prism of benefits. The time of crisis is a great moment to attract highly skilled employees. What's more, the growing unemployment in many regions helps employers attract workers with limited financial expectations[8]. This creates not only an opportunity to reduce costs, but gives the possibility of

[8] Assuming that the job seekers are not in the high-risk long-term unemployed group and are really, with particular qualifications and abilities, willing to work for a certain pay rate.

providing high quality service, assuming that the entrepreneur is a strategist and in the given circumstances, seeks to gain advantage in the market.

Another very important argument is that suppliers more willingly negotiate the prices of goods or services they offer themselves. For many, it is almost a struggle for existence which drives them to make concessions, deferred payments, etc. In this context it is worth looking at the existing situation from the perspective of an entity that in order to maintain a positive image in the market and continue to provide services, must use preferential payment conditions, and even strives for these conditions in various ways. Is there another reason why the entity "does this so fervently"? Yes, there is, the situation has been strengthened by the amendment to the act on sharing business information[9]. The new regulations open up for any entity the possibility of informing the Register of Debtors of the Economic Information Office. The access to the services provided by the Economic Information Office has also been granted to debt collectors. The new law makes it much easier to recover late payments. Entering the debtor's name to the Register increases the chances of an entrepreneur and even a consumer to recover late payments, since only when the obligation has been paid the debtor's data are removed from the database. This is confirmed by the fact that for the economy, especially in conditions of crisis, but not only, it is important to improve the process of recovering late payments. Unpaid on time debts and increased overdue receivables deteriorate liquidity of entities. In consequence, it may lead to bankruptcy of many small and micro enterprises[10].

Let us see how the number of self-employed changed in Poland between 2006 and 2012. The table 1. shows significant changes in the number of self-employed. The analysis of the data allows drawing the following conclusions: in 2010, the number of self-employed, both women and men, increased for the first time. In the context of the global crisis, the question arises: Why has this happened? The choice of the fourth quarter for the analysis is not accidental. During the analysed period, due to seasonality, the number of businesses commenced over the year is the lowest.

Among the entrepreneurs who decide to set up a company and run business on their own account, we can note a significant proportion of women, who in addition to the typical entrepreneurial traits have also excellent intuition. Perhaps thanks to the intuition the number of women who have been more and more active in business has been constantly increasing. The CSO data shows that most women worked on their own account in areas such as: financial activities, insurance, tourism, catering and trade, health, and education. Definitely less frequently they owned the newly created transport, industrial or construction companies. Table 2. presents the proportion of women among the employers and the self-employed in particular quarters between 2008 and 2012.

[9] The amended Act of 9 April 2010, on Disclosure of Business Information and Exchange of Economic Data [Journal of Laws No. 81, pos. 530] entered into force on 14 June 2010.

[10] The situation will improve with increased effectiveness of timely payments for the goods delivered and services rendered.

TABLE 1.

The number of self-employed according to the labour market status 4th quarter between 2006 and 2012.

Description	2006	2007	2008	2009	2010	2011	2012
Self-employed	2911	2942	2914	2906	3036	2969	2898
Men	1893	1928	1923	1914	1989	1964	1937
Women	1018	1014	991	992	1047	1004	961
	Dynamics of change (previous year = 100)						
Self-employed	X	101.1	99.1	99,7	104.5	97.8	97.6
Men	X	101.8	99.7	99.5	103.9	98.7	98.6
Women	X	99.6	99.7	100.0	105.5	95.9	95.7
	As a share of self- employed persons (%) (current year = 100)						
Men	65.0	65.5	66.0	65.8	65.5	66.2	66.8
Women	35.0	34.5	34.0	34.2	34.5	33.8	33.2

Source: [*Economic activity of Poland's population*…, 2006-2012].

TABLE 2.

The number of self-employed in particular quarters between 2008 and 2012

Quarters	Employers and self-employed (ths.)					
	Total			Including employers		
	Total (ths)	Including	Women (%)	Total (ths.)	Including	Women (%)
1Q 2008	2970	1042	35.08	639	200	31.30
2Q 2008	3032	1062	35.03	657	196	29.83
3Q 2008	2965	1024	34.54	632	186	29.43
4Q 2008	2914	991	34.01	638	193	30.25
1Q 2009	2994	1014	33.87	660	195	29.54
2Q 2009	3035	1056	34.79	680	191	28.08
3Q 2009	2982	1035	34.71	644	193	29.96
4Q 2009	2906	992	34.14	631	190	30.11
1Q 2010	2994	1017	33.94	683	194	28.40
2Q 2010	3005	1019	33.91	679	193	28.42
3Q 2010	2969	1026	34.56	647	185	28.59
4Q 2010	2970	1011	34.04	642	194	30.21
1Q 2011	2977	1000	33.59	662	195	29.45
2Q 2011	2996	1007	33.61	661	197	29.80
3Q 2011	2973	1019	34.27	651	200	30.72
4Q 2011	2969	1004	33.81	651	204	31.34
1Q 2012	2955	992	33.57	623	181	29.05
2Q 2012	2965	1003	33.82	640	189	29.53
3Q 2012	2950	989	33.52	679	216	31.81
4Q 2012	2898	961	33.16	659	207	31.41

Source: [*Aktywność ekonomiczna ludności Polski*…, 2012; *Aktywność ekonomiczna ludności Polski*…, 2009].

Based on the data in Table 2. the following changes can be demonstrated: firstly, the highest share of women in the whole period was recorded in the first quarter of 2008, 35.08 per cent, and the lowest in the fourth quarter of 2012 and amounted to 33.16 per cent. Secondly, the proportion of women among employers is usually high in the first

and fourth quarters of each year due to the seasonality of work of men who are employers, who in winter either suspend or close down their businesses.

Although the years 2010-2011 were characterized by a significant economic recovery which to a large extent translated into improvement of the conditions in which SMEs operated, but this "momentary relief" did not last long [*Raport*…, 2013, p. 8]. In 2012, and even in the second half of 2011, there was a significant slowdown, which in the context of assessing the profitability of conducting or even starting a business resulted in a significant reduction in self-employment. The weakening of economic activity in Poland aggravated macroeconomic determinants of business. This state of affairs was directly affected by: weak domestic demand, slowdown in exports, decline in investment and deterioration of liquidity of many companies. And thus, the weakening consumption growth was a result of a significantly worse situation in the labour market and the fear of losing jobs. What is more, at this time, the average employment in the economy fell and many households were in a much worse situation with a decrease in real income [*Raport*…, 2013, p. 9]. Strong restrictions on lending, also on mortgage loans and consumer loans made the situation even worse. Noticeable was also a decrease in the rate of investment loans for businesses, the growth was observed only in working capital loans. This situation indicates, however, that companies while desiring to overcome financial problems in terms of current liquidity raised working capital loans. The situation was exacerbated by the fact that in 2012 there was a significant decline in business investment by 1.7 per cent, which compared with 8.5 percent growth in 2011 [*Raport*…, 2012, pp. 41-42] meant that the investment decreased by as much as 10.2 percentage points. On the one hand, it was how businesses responded to the worsening outlook for sales in foreign markets; on the other hand it was the effect strong reduction of investment by local governments. Not without significance was the decline in the number of guarantees granted by funds which contributed to the slowdown in lending activity undertaken by banks and entrepreneurs themselves increasingly more carefully made decisions about taking out loans [*Ośrodki innowacji*…, 2012, p. 140].

4. Availability of funds for economic activity

An important factor creating entrepreneurship in times of crisis is the availability of funds for economic activity. Currently, people who want to start a business may apply for funds from one of the following sources:

- the Labour Fund
- the European Social Fund under the Human Capital Operational Programme[11]

[11] EU assistance for starting your own business can be obtained for almost any kind of economic activity. However, following business activities are not eligible for EU funding for formation of new business: fisheries and aquaculture, mining, agriculture, and also road transport of goods in the event of purchasing vehicles for this transport.

- the European Agricultural Fund for Rural Development under Operational Programme Rural Development,
- the European Regional Development Fund under the Operational Programme Innovative Economy (Measure 8.1)
- loan funds.

For example, a grant from the Labour Fund in the amount of PLN 19.000 is granted for:

- unemployed people who lost their jobs due to redundancies,
- unemployed people with disabilities,
- unemployed registered in Local Job Centres at least 3 months before the application,

and those who:

- have not conducted business in the past 12 months,
- have not refused, without a justified reason, to accept a proposal for training, apprenticeship, and vocational training in the workplace or to perform socially useful work, exercise intervention works and public works during the 12 months preceding the application[12].

TABLE 3

The number of self-employed and amount of grants from the Labour Fund in Poland between 2008 and 2012.

Description	2008	2009	2010	2011	2012
Amount of grants	698 961	1 093 888	1 389 123	419 864	686 037
Self – employed	52 155	63 964	77 017	21 108	39 410
	Dynamics of change (previous year = 100)				
In amount of grants	X	156.5	127.0	30.2	163.4
Self – employed	X	122.6	120.4	27.4	186.7
	As a share of self-employed in amount of grants from the Labour Fund (%) (current year = 100)				
Self – employed	7.5	5.8	5.5	5.0	5.7

Source: [*Annual Labour Funds Surveys*…].

The Human Capital Operational Programme (HC OP) 2007-2013 – Measure 6.2 – Support and promotion of employment provided the financial resources to start a business, assuming that the maximum value of the acquired funds is PLN 20, 000. Funding is available for people who want to start a business and who did not have a registered business over the 12 months prior to the project (does not apply to business outside Polish borders). In order to obtain funding for starting a business a participant in the project must pass a series of free trainings and make use advisory services. This is an excellent opportunity to gain knowledge and skills needed to set up and run a business,

[12] What's more people who want to start a social co-operative may also apply for funds from Labour Fund in the amount of PLN 14,960. It's much lower but very helpful especially when two or more people want to run their own business together.

covering such topics as bookkeeping, marketing, and law and consulting in the diagnosis of training needs, development of an individual program for each participant in the project.

Particularly advantageous is bridge support paid within 6 months from the date of commencement of a business, amounting to the equivalent of the gross minimum wage in force at the date of disbursement of the grant and the fact that the grants are non-returnable[13].

TABLE 4

The number of self-employed The Human Capital Operational Programme (HC OP) 2007-2013 – Measure 6.2 in Poland between 2008 and 2012.

Description	2008	2009	2010	2011	2012
Measure 6.2	21 660	54 882	96 892	124 503	148 603
Measure 6.2 people 15-24 years	3223	8058	13 674	21 314	26 455
	Dynamics of change (previous year = 100)				
Measure 6.2	X	253.4	176.5	128.5	119.4
Measure 6.2 people 15-24 years	X	250.0	170.0	155.9	124.1
	As a share of self-employed 15-24 years in amount of grants from Measure 6.2 (%) (current year = 100)				
Measure 6.2 people 15-24 years	14.9	14.7	14.1	17.1	17.8

Source: Developed by the author based on: [*Sprawozdanie roczne z wdrażania PO KL*…; *The Human Capital Operational Programme*…].

It is worth noting that the grant should be earmarked for capital expenditure, not for the costs of current activity, and therefore the funds may be used only for:

- purchase of fixed assets (including means of transport apart from entities operating in the transport of goods),
- purchase and acquisition of intangible assets,
- purchase of current assets,
- cost of repair and construction works.

In conclusion, the target groups, which can count on the support, include natural persons who:

- work (excluding people who had a registered business in the period of 12 months prior to the application),
- have remained unemployed for at least 12 months in the past two years,
- are entering the labour market for the first time or coming back after an absence caused by giving birth to or raising a child,
- are disabled with a determined degree of disability,

[13] Financial resources for development of entrepreneurship and monies as a bridge support are granted non-returnable, unless the conditions of the contract under which the funding was granted are violated. It should be noted, however, that the project participant who has received a grant for the development of entrepreneurship is required to repay received funds plus interest, if the business was conducted for less than 12 months.

– are residing in rural and rural/urban gminas (communes) and residents of cities with up to 25,000 residents.

Other interesting solutions include the funds that can be obtained for investment in agriculture and processing under the Operational Programme for Rural Areas Development – Measure 3.1.2[14]. The aim is to increase the economic competitiveness of rural areas, development of entrepreneurship and the labour market and, consequently, increase employment in rural areas. There are various forms of assistance which allow acquiring:

– PLN 100 000 – when the business plan provides 1 to 2 jobs (calculated as annual average full-time jobs),
– PLN 200 000 – if the business plan provides for more than 2 and less than 5 jobs (calculated as annual average full-time jobs),
– PLN 300 000 – if the business plan provides for at least 5 jobs (calculated as annual average full-time jobs).

The program assumes that the investment implemented by newly established or already operating companies will involve, e.g.: providing services for the population, craftsmanship, handicraft, utilities, energy production from biomass, etc. [See: *2007--2013 Rural Development Programme*…, 2010].

Measure 8.1 IE OP is an important support for people who are interested in establishing and development of business in electronics (digital services). However, the entrepreneur must[15]:

– run their business and have seat on the territory of Poland,
– apply for support before the end of the first year of running their business,
– apply for support before starting the project,
– maintain the sustainability of the project for at least 3 years following project completion.

It is also worth noting that the amount of support may represent up to 85 per cent of the project's expenditure eligible for the support and may not be less than PLN 20,000 and not more than PLN 1 million. The loan funds are an attractive form of support for entities that are in the early stages of development. The funds may be used for such projects as:

– creation of new jobs,
– purchase of machinery and equipment,
– expansion or modernization of commercial, service or manufacturing facilities.

[14] Assistance is granted to entities for investments in the creation and development of micro-enterprises operating in such areas as: services for agriculture and forestry, craftsmanship and handicraft, production of biomass energy products, tourist and sports services, recreation and leisure, processing of agricultural and edible forest products.

[15] The following entrepreneurs are not eligible for funding:

– those engaged in road transport of goods, who would like to raise funds for the purchase or transport equipment,
– those who wish to provide electronic mail services or register and maintain internet domains or trade products.

In this context it should be remembered, however, that the actions taken by loan funds contribute to the increase in competitiveness and innovativeness of the economy on the local and regional level. The funds offer the possibility to finance current and investment operations| including in particular in the initial stage of their development. The loan can be granted to entrepreneurs who cannot use traditional bank financing or have limited access to it [*Ośrodki innowacji*…, 2012, p.126]. During the economic downturn, under the impact of the global financial crisis and with reduced other forms of borrowing, including bank loans the loan funds are often the only source of financial support for companies seeking external funding.

Certainly, these actions helped by EU funds are an important element of "forward retreat" against the crisis.[16] The multitude of available resources, variety of investments, and growing competition for their acquisition encourage creative people to create their own place in economic reality. I am of the opinion that economic growth in Poland, in 2009 and in the following years, was in part a result of the effectively used funds. It has certainly generated more demand in many industries, especially in construction[17]. It is expected that in subsequent years, the impact of European funds on the Polish economy will be even greater, assuming that the funds are efficiently used.

5. Conclusion

To recapitulate, the crisis is a threat to unprepared entrepreneurs, driven in their decisions only by the current situation. For those who act in a thoughtful way and plan, the crisis may actually stimulate growth, giving impetus to seek new market opportunities and reduce costs. One issue remains to be considered. Namely, whether self-employment is an expression of entrepreneurship or the effect of coercion? While the stakeholders themselves often point to the need to become independent and find their place in economic reality, many however treat this form of action as a necessity because increasingly, entrepreneurs are forcing their employees to register a business and work as principals. The entrepreneurship is extremely important from an economic perspective. It is the safe- employment that is becoming an alternative from the viewpoint of a job-seeker and is the driving force of the economy in the macro-economic scale. Thus, economic activity brings economic and social benefits. Economic benefits due to new jobs, higher incomes and spending, and social benefits because economic activity allows finding a place in economic reality and encourages others to take creative initiatives. The question comes back: "Is the economic crisis, therefore, a good time to set up one's own business?" It is always worth considering starting one's own business. Especially in times of crisis, when companies announce layoffs and no one can guarantee permanent employment. In such situation setting up one's own business might be a better option than waiting for vacancies. Many treat this form of action as a necessity because

[16] In this context it is worth noting that the crisis and changes in the economy and require thus new initiatives, which should be favoured by a friendly legal, organizational, structural and political environment.

[17] Despite bankruptcies of some construction companies.

increasingly, entrepreneurs are forcing their employees to register a business and work as principals. Certainly, owning your own business involves greater risk and threat of failure. And although one has to be careful, above all, one should be an optimist. One cannot, at the outset, assume the failure of business. It is also worth remembering that running your own business, especially at the beginning, means above all, a major personal contribution. The success in business depends on the degree of determination, hard work and support of loved ones, meaning not only the financial support. The aid funds are certainly helpful; many people have started or expanded their businesses thanks to these funds. Finally, the success in business is not just a matter of idea and capital; it's also the continuous development.

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Agata KILON[1]

GOOGLE-MARKETING OF SELECTED ONLINE SERVICES OF POLISH BANKS

Summary

In this paper the results of the survey on the Google search engine marketing of selected phrases (keywords) for basic banking products for retail customers and small and medium-sized enterprises in Poland were discussed. The research was done in November 2012, concerning seven phrases covering deposit, savings and loan services. The recent statistics (from the 1st quarter of 2010 up to 2nd quarter of 2012) for online banking in Poland, as well as for Internet marketing market were also presented. In conclusion, the recommendations for the application of Google-marketing in retail banking were formulated.

Key words: modern marketing, Internet banking, Search Engine Optimization, Search Engine Marketing

1. Introduction

In the middle of 2012, 43 commercial banks and 573 cooperative banks operated in Poland. They were operating in more than 7.3 thousand branches and nearly 6.3 thousand customer service points [PFSA data, 09/2012]. Polish banks' assets exceeded the value of 1.3 bn zlotys, with more than 91.7% of this amount was accounted for commercial banks. The importance of traditional marketing and customer support for some specified groups of banks' customers, however, gradually decreases. The recently published results of *Gemius* survey indicate that online banking is used by the vast majority of people aged 18-34 [czasnafinanse.pl, access: 20.02.2013]. This is the so-called Generation Y, for which the use of the Internet and its advantages are quite natural. In the era of widespread use of the Internet in everyday activities, the primary communication channel between bank and such group of customers is to communicate electronically. In parallel, the role of proper presentation of the offer gradually increases – not only in order to allow complete and understandable presentation, but most of all – easy findable on the network. This raises the question of how do the Polish deal with that task? The main aim of this study is to show how search engine optimization and search engine marketing are used by Polish banks for promotion of the selected on-line services. The secondary aim of the paper is to confirm the hypothesis that the smaller banks, that

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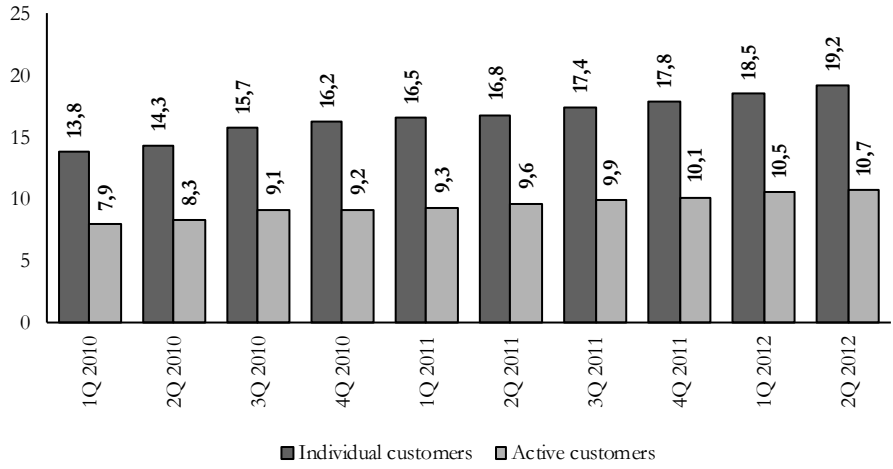
started the so-called 'technological race' with some delay, are often at the forefront of market innovators today.

2. Online banking sector in Poland – the size and growth prospects

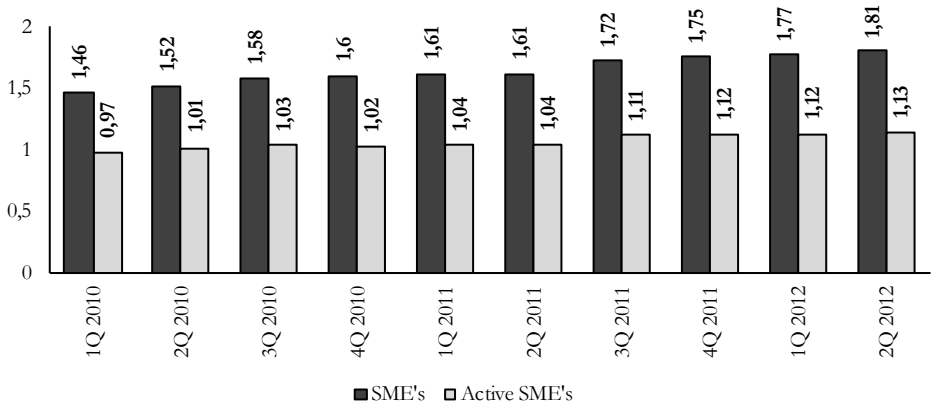
Individual customers increasingly appreciate the benefits of online banking services. Online banking primarily saves time and money and allows customers to access the services without having to visit a bank branch. Number of bank accounts with Internet access conducted by Polish commercial banks continues to increase (see Figures 1., 2.), and in the 2nd quarter of 2012 exceeded 21 million accounts. More than 90% of them (19.2 million) were owned by individual customers. Statistics show that new customers are active, and banks offering electronic transaction support agreements not only trying to improve their performance, but actually properly identify customers' needs and are able to encourage them to use services via Internet.

FIGURE 1.
Number of individuals active and having a signed contract for online banking services in Poland (1Q2010-2Q2012) (mln customers)



Source: own calculations based on: [*Raport NETB@NK…*, 2012a, p. 6; *Raport NETB@NK…*, 2012b, p. 6; *Raport NETB@NK…*, 2011a, p. 5].

FIGURE 2.
Number of small and medium-sized enterprises active and having a signed contract for online banking services Poland (1Q2010-2Q2012, in mln)



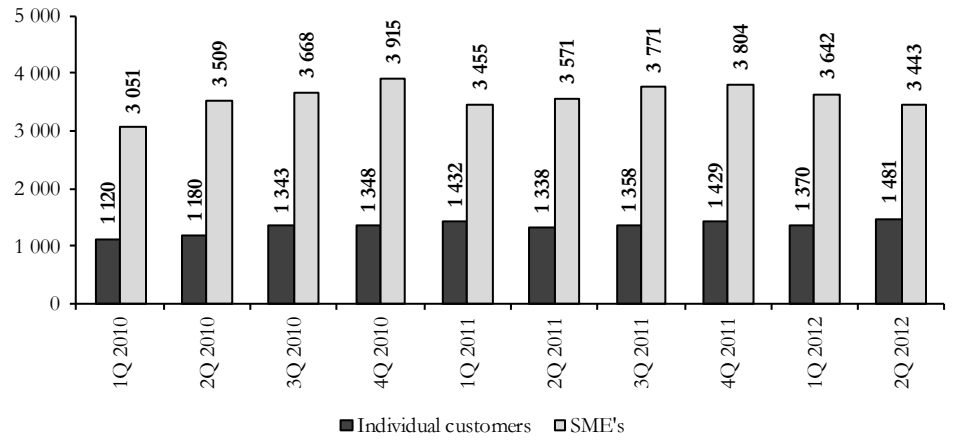
Source: own calculations based on: [*Raport NETB@NK…*, 2012a, p. 8; *Raport NETB@NK…*, 2011b, p. 8; *Raport NETB@NK…*, 2010, p. 8].

However, customers are still relatively not too active[2] when it comes to making transactions over the Internet. The activity of individual customers, which remains at about 55% during the analysed period remained relatively stable, despite the dynamic growth of the number of customers. The number of small and medium-sized enterprises (SME) that have access to online banking and the level of activity of these customers increase proportionally in a similar rate. The ratio of active SME's accounts remains constant at about 62% of the total number of accounts with online access.

The increase in the number of customers who have access to online banking and continuous increase of their activity results in growth of the average transfer's value made by single customer, and the average value of settlements (Figure 3., 4.). In the case of SMEs, these values are – when compared to generated by individual customers – many times higher. There are some seasonal effects clearly visible in the data. The steady increase in the number of customers also naturally impacts the volatility of these values. New users are less confident, at least initially. They need more time to get used to the constant use of Internet banking. In addition, apart from young people entering the market for retail banking services, there is a group of new users who for various reasons have not yet felt the need or had no knowledge how to access their account on-line. Therefore, the activity of these people is expressed naturally in lower amounts than the others.

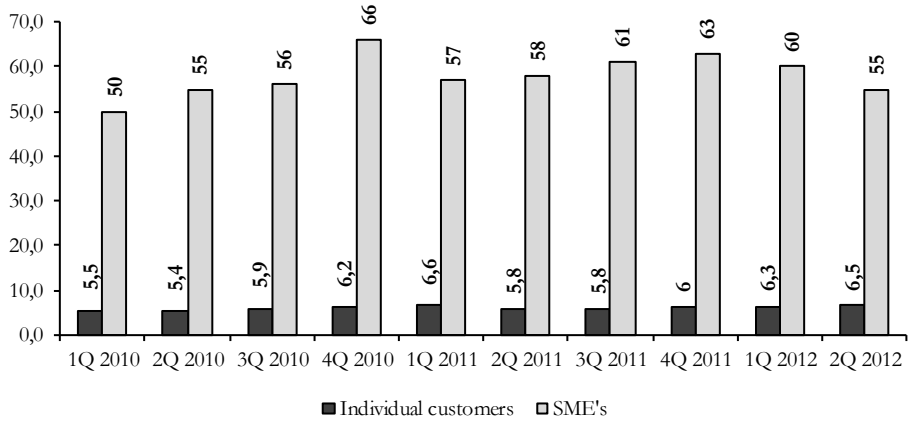
[2] Active customer logs in to the service at least once a month. A measure of its activity is the number of transfers carried out in the analysed period.

FIGURE 3.
The average value of transfers made by individuals and SMEs with Internet banking systems in Poland (1Q2010-2Q2012) (in PLN)



Source: own calculations based on: [*Raport NETB@NK…,* 2012a, p. 7; *Raport NETB@NK…, 2011a,* op. cit., p. 7.

FIGURE 4.
The average value of settlements made by the individual and SME customers using online banking systems in Poland (1Q2010-2Q2012) (in thousands PLN)

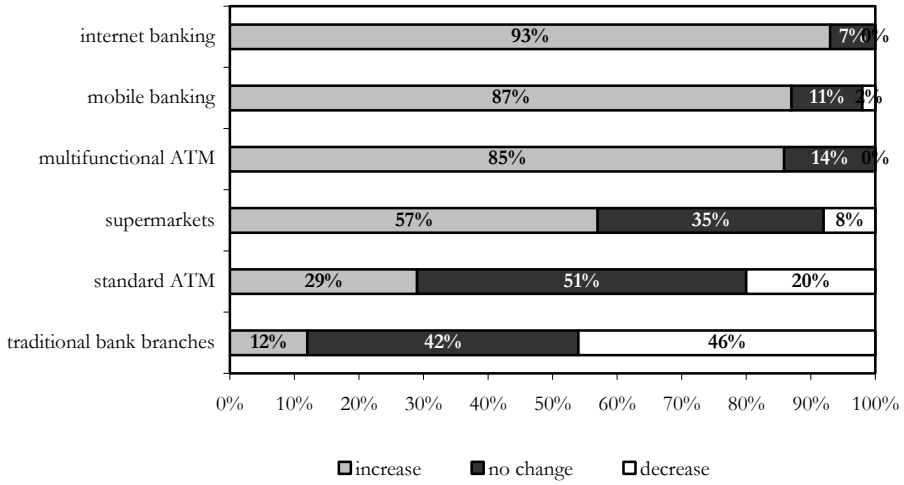


Source: own calculations based on: [*Raport NETB@NK…*, 2012a, p. 9; *Raport NETB@NK…*, 2011a, p. 9].

Despite the crisis in the international financial markets, confidence in both the SME sector and individual customers to the banks and banking sector still remains high. It is worth mentioning that the activity in the SME sector is often associated with a full, personal responsibility property. So naturally, there is the willingness to maintain control over finances by the SME's owner. An increasing number of SME customers recognize, however, that they have such a control thanks to the use of on-line banking services. Therefore, access to online banking a is natural component of the business, especially for small and medium-sized enterprises, where the owner is also often an active customer of these services.

Most experts assessing the prospects for banking sector shares the opinion that the importance of Internet banking, mobile and self-service banking will continue to grow in the next 5 years (Figure 5.). On the other hand, the role of traditional bank branches and single-function ATMs will, according to the experts, rather decrease. These statements seem to be fully justified, taking into account the broadening Internet access. According to the forecasts of the Ministry of Administration and Digitization, in 2012 there was about 2/3 of the population with Internet access in Poland, and more than 90% of the companies [*Społeczeństwo informacyjne*…, pp. 13-29]. The development of mobile devices and the development of infrastructure providing access to broadband Internet services can have a significant impact to the on-line banking sector. Undoubtedly, the work carried out by banks to improve IT systems and to build customer-friendly applications, easily understandable by individuals and SME's are also an important aspect.

FIGURE 5.
Possible changes in the use of different banking services distribution channels in the 5-year perspective



Source: own calculations based on: [*Monitor Banków Polskich*…, 2012, p. 6].

According to a comprehensive study on small and medium-sized companies habits connected with banking services, carried out by CBM INDICATOR and The Warsaw Banking Institute in early 2012 [*Małe firmy*…, 2012; *Średnie firmy*, 2012], the Internet was the basic channel of contact with the bank to nearly 90% of micro and small enterprises and 95% of medium-sized companies. What's more, entrepreneurs agree that, ahead of factors such as the amount of commissions and fees or range and speed of offered settlements, the possibility of on-line access to the services is the primary determining factor when choosing a bank.

What is more important, the Internet is a leading source of information on banking products and services for more than 40% of small business owners and for 44.4% of medium-sized companies. They are not only looking for information, when needed, but also regularly visit a banking websites in the network. According to that study, until the last year, a visit to a branch of the bank was the primary source of information about the offer. Today, this form of benefit is still important for medium-sized companies. However, in the case of small businesses, the owners of small enterprises prefer to visit a website, rather than going to bank branch or count on friend's opinions.

For the vast majority of Internet users, the Google search engine is a natural "gateway" to the world wide web resources [Fox, 2012, pp. 1-24][3]. Therefore, the efficient search engine optimization of Internet banks' offer should become an integral component of their marketing strategy.

3. Search Engine Marketing and Search Engine Optimization as tools of a modern marketing

The on-line advertising market in Poland is growing rapidly. The latest AdEx data (estimates of the *Interactive Agency Bureau* and *PwC Poland*), published in the second half of 2012, show that the first three months of 2012 years have brought the sector growth of just over 9 per cent on an annual basis (Figure 6). This gives the Polish advertising market 11th place among European economies (taking into account the value of advertising), while 6th in terms of growth of this market.

[3] According to the recent studies [Fox, 2012, pp. 1], about 92 percent of Americans use search engines and nearly 60 percent do it every day. In Poland, according to NetTrack survey, made continuously by MillwardBrown SMG/KRC, 61.2% of Internet users recognize Google as the most popular website, and about 90.4% of them regularly used Google [http://www.wirtualnemedia.pl/artykul/450-tys-polskich-internautow-wiecej-niz-przed-rokiem-58-proc-z-5-letnim-stazem, access: 2012.12.22].

FIGURE 6.

Online advertising expenses in Poland (2007-1Q2012)

Source: own calculations based on: [*Reklama w Internecie*…, 2012, p. 7].

Among the companies that spend most on on-line marketing of their businesses there are companies from the automotive sector (over 16% of total spending) and finance and banking (almost 1/8 of the market share, Table 1.).

TABLE 1.

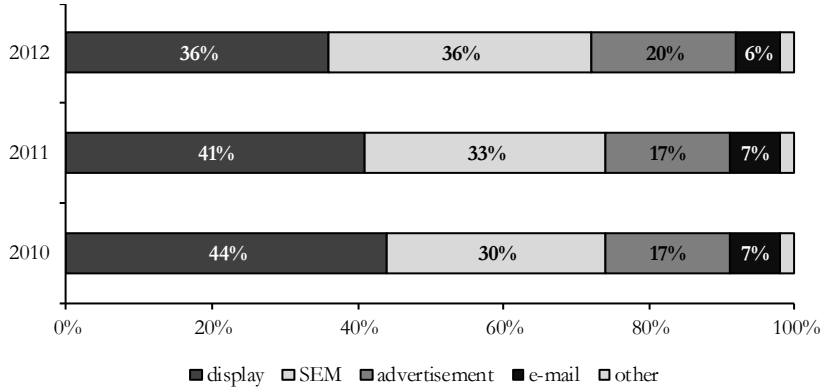
The structure of spending on oniline advertising in Poland (2012) by sectors of the economy

Sektor	Market share
Automotive	16.4%
Finance and banking	**12.4%**
Telecommunication	9.7%
Trade	9.3%
Real estate	9.3%
Media, books, CD, DVD	6.8%
Free time	6.1%
Health and care	5.2%
Food	4.9%
Tourism	3.5%
Other	16.4%

Source: own calculations based on: [*Reklama w Internecie*…, 2012, p. 7].

At the same time, some significant changes in the structure of expenditures should be noticed, when various forms (types) of on-line marketing are concerned. The previously unquestionable leader, which for several years was a display advertising (banners, billboards, etc..) begins to give way to Search Engine Marketing, ie. advertisements associated with the search results. This is in line with forecasts of advertising industry experts, who were predicting that more and more marketing budgets will be spent on SEM.

FIGURE 7.
The structure of Internet marketing expenses in Poland (2010-2012) by the type of advertising



Source: own calculations based on: [*Reklama w Internecie*…, 2012, p. 7].

The term SEM (Search Engine Marketing) is generally understood as promotional activities (sponsored links campaigns, and web optimization) that aim to achieve the best position in the search results for the selected word / keyword phrases typed by the user in the query to the search engine (eg. Google) [Lantz, 2009, pp. 146-148]. Search Engine Marketing is the wider discipline that incorporates Search Engine Optimization. SEM includes both paid search results (generated by tools like Google AdWords) and organic search results (SEO) [Ledford, 2009, pp. 18-23].

SEO is an important part of wider internet marketing. Search Engine Optimization (also known as positioning) are all the activities leading to the achievement the top position in the *organic* search engine results for specific key-words or phrases by the website (resulting from the construction of the website and its content payload). Search Engine Optimization is based on the well-known elements of the search algorithm, constantly exploring new algorithms and verifying the existing ones.

Search Engine Optimization is a long-term process, and sometimes the first results of SEO are visible after a few weeks or months. The largest disadvantage of SEO is the lack of clear standards on the Google search and indexing algorithm, which causes a number of ambiguities in the subject of permitted and effective practices.

The leading search engine, that is Google, use crawler (Googlebot) to find websites for its algorithmic search results. Googlebot processes each of the pages it crawls in order to compile a massive index of all the words it sees and their location on each page. In addition, Google process information included in key content tags and attributes, eg. title tags and ALT[4] attributes. When a user enters a query, Google searches the index for matching web-pages and returns the results that are the most relevant to the user.

[4] The alt attribute provides alternative information for an image if a user for some reason cannot view it (because of slow connection, an error in the source (src) attribute, etc.) [http://www.w3schools.com/tags/att_img_alt.asp, access: 21.03.2013].

Relevancy is determined by over 200 factors, one of which is the the measure of the importance of a page based on the incoming links from other pages (PageRank) [support.google.com; Access: 2012.11.10].

The Search Engine Optimization of the web-site can be divided into activities related to the modification of the content on the site (in terms of phrases, which intends to lead the campaign), and the code changes, which do not have direct impact on the appearance of the service [Bailyn, Bailyn, 2012, s. 31-52].

The optimization of content includes, among other things:

- matching the title-tag to the of the page,
- placement, arrangement or creation of the keywords in the existing text content (SEO copywriting),
- selection of adequate headlines,
- appropriate arrangement of menu content and the other elements comprising the internal linking of the service,
- setting alternative texts for graphics and other objects that can't be properly recognized by crawlers (eg. Flash).

There are also some actions that are largely invisible to the average website user, but are equally important. These are mainly efforts to clean up the code and structure of the website that have an impact on its classification and indexing in search engines. Among other things there should be mentioned:

- adaptation to the standards of the W3C[5],
- separation of the document logical structure layer from the presentation layer (eg. through the use of CSS[6]),
- improvement of page load time,
- use clean and search engine friendly URLs,
- provide an alternative version of the webpage for browsers not supporting for Flash technology (including the internet search engine crawlers).

Regardless of all the above methods, it is also possible to purchase paid search engine advertising campaigns, resulting in an indication of a hyperlink to the advertiser's web-site in the group of sponsored links located above the organic search results. Most Internet users aware of these indications, ignores them and goes to one of the web-sites appearing on the first or – less often – the following pages of the search. What's more, blocking annoying advertisements by the web browser (including sponsored links) is relatively easy using software such as AdBlock. However, this software does not affect the structure of the organic search results. That is why, website owners should pay particular attention to the quality of Search Engine Optimization of their websites. This statement particularly applies to bank websites, that, according to many researches, are one of the most important sources of information about banks' offer for more and more customers [Matuszewski, 2008, p. 15; *Finanse i plany finansowe*…, 2013].

[5] The World Wide Web Consortium (W3C) is an international community responsible for the development of WWW standards, [http://www.w3.org/standards/, access: 21.03.2013].

[6] CSS – Cascading Style Sheets Defie define how to display Web-site's HTML elements [http://www.w3schools.com/css/css_intro.asp, access: 21.03.2013].

4. Google-positioning of selected Polish banking products

In this paper we present the results of the survey on the Google search engine marketing of selected phrases (keywords) for basic banking products for retail customers and small and medium-sized enterprises in Poland. There were seven keywords (key phrases) selected to the comparison, ie.: transfer, bank deposit, bank account, savings account, bank loan, mortgage, cash loan. Such a keywords selection was made on the assumption that the positioning of these terms in the search results of Google search engine should naturally be in the interest of the specialists on the marketing of banks.

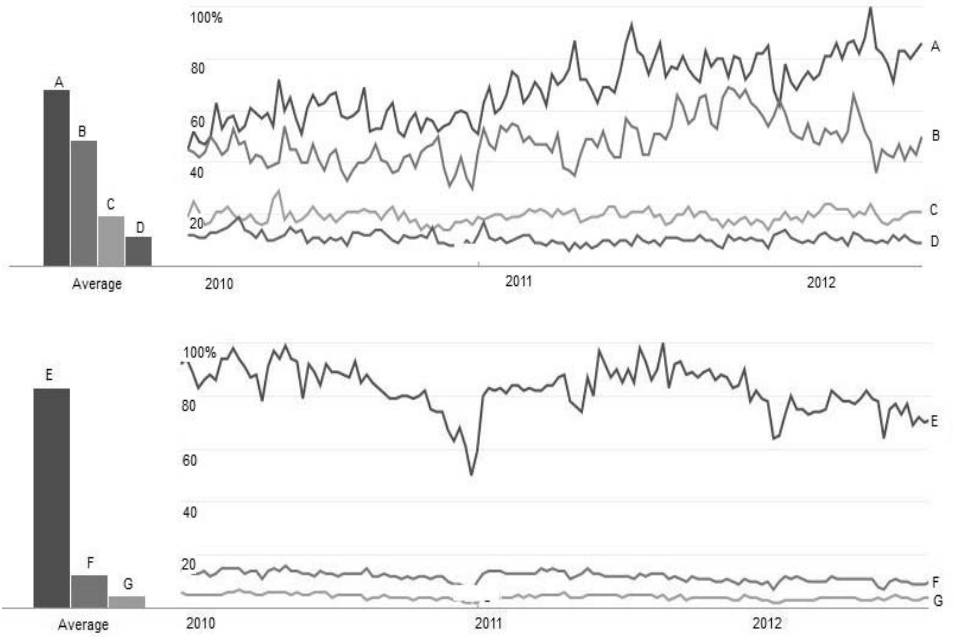
The Google Trends tool was used to assess the popularity of searches of the selected phrases in Google. The queries were territorially limited to Poland only. The analysis covered period from the beginning of 2010 to the end of June 2012.

According to the research mentioned above, in the first group, covering deposit and savings phrases, the biggest (and steadily increasing) popularity among the specified queries attracted keyword *transfer*. Google users were also frequently searching for information on deposits (although from the beginning of 2012 there can be seen a slow decline in interest in that phrase). Information about bank accounts and savings accounts was searched much less frequently. The most popular phrase among the loan products was *bank loan*. Mortgage and the cash loan were queried several times rarely. This is naturally due to the narrowing of the query. However, the decreasing number of queries can be observed for all terms from the second group of key phrases. The main reasons of such state are probably the general market conditions. There is an overall quality of positioning of the selected phrases in Google at the beginning of November 2012 shown in Table 2.

In accordance with the results of the study, it can be concluded that marketing strategies based on modern communication channels are much more often used by rather small banks, or banking sector start-ups. On the first page of organic search results, among all the banks with Internet offer, usually appear *BZ WBK* (5 phrases), *Bank Pocztowy* (3 phrases) and *Santander Consumer Bank* (2 phrases). What is interesting, the offer of a significantly lower institution, that is *Kasa Stefczyka*, is relatively well-positioned when compared to the others. Taking into account the first and the second page of search results (20 items), the most visible is the offer of *BZ WBK* (7 results), *Bank Pocztowy* (6 results), and *Bank Millennium* (4 results). In this ranking surprisingly weak positions are occuppied by banks that take the longest experience in the Internet: *mBank* (3 indications, including one on the first page of the search) and *Inteligo* (3 indications, including one on the first page of the search). Similar results are achieved by banks operating in the market much shorter, but at the same time much mor focused on the use of on-line services like Alior Bank or Credit Agricole.

When the number of personal accounts held in commercial banks in Poland is concerned, among the top 5 market players (running about 60% of all accounts [Boczoń, 2012]) the offer of *BZ WBK* was the most present in the organic search engine results by far. *PKO BP*, *mBank* and *ING* were much worse in that ranking. In addition, the offer of *PEKAO SA* – the second largest bank serving retail customers, was not present on the first either on the second page of search results.

FIGURE 8.
Popularity of the Google search of selected phrases in Poland (1Q2010-2Q2012)



A – przelew (transfer)
B – lokata (bank deposit)
C – konto bankowe (bank account)
D – konto oszczędnościowe (savings account)
E – kredyt (bank loan)
F – kredyt hipoteczny (mortgage)
G – kredyt gotówkowy (cash loan)

Source: own calculation based on: [http://www.google.com/trends/explore, access: 2012.11.01--2012.11.10].

The analysis of paid search results leads to a little different conclusions. The first position in this ranking is held by the unquestionable leader in the number of individual bank accounts in Poland – *PKO BP*. The offer is assigned to 4 out of 7 analysed phrases. All but two banks (Polbank and Ideabank) that belong to the group of advertisers were also present in the organic search results, but often on distant positions (such as the Internet only *BGŻ Optima*).

TABLE 2.

Google-positioning of the banks in Poland by the selected phrases

Key word (phrase)	Organic results				Paid results	
	1st page		2nd page			
	Bank	Position	Bank	Position	Bank	Position
przelew (transfer)	**BPH**	**9**	Alior Bank mBank Inteligo CitiBank	13 15 18 19	-	-
lokata (bank deposit)	**BZ WBK** **Kasa Stefczyka** **Noble Bank** **PKO BP** **Santander** **Consumer**	**3** **4** **6** **7** **8**	Deutsche Bank Getin Bank Meritum Bank Bank Pocztowy Reiffeisen Bank BGŻ Optima	11 12, 13 14 16 18 20	Ideabank Noble Bank	2 3
konto bankowe (bank account)	**Inteligo** **mBank** **Nordea** **BZ WBK**	**3** **4** **5** **9**	Bank Millennium Credit Agricole Bank Pocztowy	17 19 20	Credit Agricole PKO BP BZ WBK	1 2 3
konto oszczędnościowe (savings account)	**Bank Millennium** **BZ WBK** **Alior Bank** **Deutsche Bank** **Bank Pocztowy** **Meritum Bank**	**4** **5** **6** **7** **9** **10**	Reiffeisen Bank Toyota Bank Kredyt Bank PKO BP ING Inteligo mBank	13 14 15 16 17 18 20	PKO BP BGŻ Optima Ideabank	1 2 3
kredyt (bank loan)	**Kredyt Bank** **BZ WBK** **Kasa Stefczyka** **Getin Bank** **Eurobank** **Bank Pocztowy**	**2** **4** **5** **7** **8** **10**	Millennium Bank **Bank Pocztowy** Credit Agricole **BZ WBK** Alior Bank	11 13 14 17 20	PKO BP Alior Bank	2 3
kredyt hipoteczny (mortgage)	-	-	Nordea Bank Millennium BZ WBK	13 14 15, 16	Getin Bank	3
kredyt gotówkowy (cash loan)	**BZ WBK** **Credit Agricole** **Bank Pocztowy** **Santander** **Consumer**	**5** **8** **9** **10**	Bank Millennium Deutsche Bank	12 17	PKO BP Polbank Deutsche Bank	1 2 3

Source: own calculation, research period: 1-10.11.2012.

5. Conclusions

The results of desk research presented in that paper, concerning development trends of the online banking sector in Poland lead to the conclusion that the Internet is becoming one of the most important communication channel with customers. This applies both to issues related to the actual delivering of services (such as access to a bank

account, making transfers, etc..), but also – and above all – issues concerning the presentation of the bank's offer. The Internet, for the vast part of the customers, is a fundamental and natural source of information about banking products. Therefore, banks should take the utmost care of marketing communication in the network. Therefore, it seems that Search Engine Optimization of websites should be an integral part of the banks' marketing strategy. For the most of Internet users Google is an essential tool used for searching for information. Thus, the presence of the bank in the organic search results based on the selected keywords may decide to offer customers an effective presentation. As it was shown by the results of the study, the best in that task are relatively small banks, operating in the market for rather a short period of time. Much worse position is shared by the biggest, traditional banks, that are focused primarily on paid campaigns.

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Marta KUSTERKA-JEFMAŃSKA, Bartłomiej JEFMAŃSKI[1]

MEASUREMENT SCALE OF SUBJECTIVE QUALITY OF LIFE IN CROSS-BORDER REGIONS

Summary

The article presents the proposal of the measurement scale of subjective quality of life of the inhabitants living in cross-border regions. In the design of the measurement tool the exploratory and confirmatory factor analyses were used. The exploratory analysis was based on principal components analysis with VARIMAX rotation. In the evaluation of the model fitting the method that was used is the estimation one which combines the generalized least squares method with the maximum likelihood method. Three potential factor models differing in the number of subscales were analysed. The article includes the results of the survey conducted in 2012 within the Polish-German project: "*The quality of life in the border area – strengthening of cross-border flows for the common sustainable development and regional planning*".

Key words: subjective quality of life, measurement scale, cross-border regions

1. Introduction

Border areas, considering their location, are a specific domain of the study of quality of life, especially in the context of cross-border flows, which have their origin, among others, in the observed and perceived by residents living on both sides of the border the differences in the level and quality of life. In this type of research the category of quality of life, which is difficult to define, seems to be even more difficult to measure. Measuring the quality of life should in fact be made on the basis of objective indices (objective quality of life or living conditions), as well as of subjective ones, derived from population surveys. The first measurement, which is an objective dimension of quality of life, describes the factual circumstances, while the second one, as it is a subjective approach, gives the information on the perceived quality of life. As far as the choice of objective indices is often dictated by the quality, reliability and, above all, the availability of statistical and non-statistical data, in the case of the subjective quality of life studies the substantial content of this category remains an open and depending on the purpose and the scope of analyses question, as the studies being carried out in this field show.

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The article presents a tool for measuring the subjective quality of life used in the studies being carried out in the Saxon-Polish border area. The main objective of the paper was to characterize the development of an alternative proposal of subjective quality of life measuring scale in cross-border areas – in other words, to term "the capacity" of this concept in practical tests.

2. Measurement of subjective quality of life

The quality of life is a complex and multi-faceted category, and as such can cause problems concerning the adoption of an unequivocal and accepted "without reservation" definition. Initially, the considerations on the quality of life were the domain of philosophy, sociology and psychology. Over time, this category has become a subject of interest and studies also among representatives of other domains and scientific disciplines, including economists as well as management theorists and practitioners. The very concept of quality of life and attempts to quantify it are different depending on the research methods and measurement tools relevant to the discipline. The review of the definition of quality of life in the social sciences and medicine was performed by Baumann [2006], Trzebiatowski [2011], Wnuk et al. [2013].

The quality of life category appears in the theoretical debates, but is also an object of the interest in the individual scale – of every human, as well as in the collective one – local, regional, etc. A man formulates aims, strives for meeting their needs, fulfils dreams in the hope of a better life, a sense of happiness and satisfaction. High quality of life is, therefore, not only the superior purpose for the concept of sustainable development but also the essence of any activities taken by a human, both by individuals and population as well as social groups.

The quality of life, as a superior purpose of the sustainable development concept, according to T. Borys, is understood as the balanced appreciation and perception of the whole abundance of global quality and co-existence of, within human life, prosperity (quality characteristics of `to have`), well-being (quality characteristics of "to be") as well as bliss (quality characteristics of `to love`). In other words, the quality of human life means the balance of their physical, mental and spiritual (emotional) development [Borys, 2008].

There are some evaluating derivative concepts that are related to the category of quality of life, i.e. objective and subjective quality of life or, as T. Borys emphasises, objectification and subjectivisation of quality of life assessments [Borys, 2002]. In fact, this division expresses the degree of objectivity of measuring various aspects of quality of life. The quality of life in objective terms is a feature of the social environment, autonomous from its perceiving and evaluating by the humans [Rutkowski, 1988]. The objective quality of life is interchangeably defined as living conditions, which, apart from material realm, consist of social and natural environment, health or safety. Improving these conditions does not have to be directly translated to increasing the level of satisfaction. The level of satisfaction (gratification) with life is defined as the subjective quality of life and the relations of this category to the objective

quality are not clearly defined. The subjective sense of satisfaction with the objective conditions of life also depends on the complexity of the quality of life, the so-called relative sense of victimisation and value system [see more: Borys, 2002]. The quality of life in subjective terms is, therefore, determined by the satisfaction that people derive from their own life and its conditions [Rutkowski, 1988]. The subjective form of quality of life is, therefore, an individual matter, depending on the needs, aspirations and perception, that are unique to each person [Rutkowski, 1987; Skrzypek, 2001].

A subjective measurement of quality of life is done according to different systems. They can reflect a simplified approach including two spheres of the quality of life, it is well-being and welfare (also called the spheres of "having" and "being") or three spheres, where next to well-being and welfare, features of "loving" type are also assessed. An analytical approach assumed in this Project including a division into quality of life areas is also quite common.

There is a relatively big group of studies of expert character as well as the ones, which describe experiences of particular territorial government units, within research methodology of the quality of life, on a local level. This literature review was done among others in works edited by Borys and Rogala [2008], and also in a report from research, the so called "desk research" prepared within the Project under the title *The quality of life in the border area - strengthening of cross-border flows for the common sustainable development and regional planning* [Report, 2013]. This wide review of initiatives of the quality of life research, included in these works, constituted a starting point for working out a research questionnaire of the subjective quality of life in Polish-Saxon transborder area. Moreover, a choice of areas and aspects given to subjective assessments of respondents, in accordance with an assumption made by Project's performers, was supposed to be in a possibly highest rank compatible with distinguished areas, for the needs of objective measurement of the quality of life dimension. Objective quality, in a discussed Project, was assessed on the basis of objective indicators, for which data was taken from the sources of public statistics, and the accepted set of indicators included main areas of local governments activities. Because the main aim of conducted survey research was to get answer for a research question concerning subjective assessment of the quality of life and dependency between transborderness of researched area and the subjective quality of life. Questions included into a questionnaire were limited to the ones concerning the most important fields and aspects of the quality of life, which can be directly or indirectly influenced by local authorities through development policy run on a local level. The results of carried out research in accordance with Project's assumptions, would allow to define key problems for territorial government unit and constitute a significant source of information, which could be applied in a process of defining local and regional development priorities, on a level of shaping a general development strategy as well as on a level of policies and sector programs.

3. Stages of constructing the measurement scale of subjective quality of life in cross-border regions

3.1. Characteristics of the data set

In the construction of the scale, there are the data that were collected in the study on cross-border area consisting of two districts: on the Polish side – the district of Zgorzelec, and on the German (Saxon) one – Goerlitz. The study was a part of the Polish-German project: *The quality of life in the border area - strengthening of cross-border flows for the common sustainable development and regional planning.* The research was conducted by PAPI (Paper and Pencil Interview) in the period from November 2012 to February 2013. 873 interviews were carried out. The selection of respondents was purposeful, taking into account the structure of the population by gender, age and place of residence.

Proposed measurement scale, developed by the experts from the Department of Quality and Environmental Management in Wroclaw and Spatial Order Department of the Technical University of Dresden contained 43 items (criteria) relating to the six components of the construct of the subjective quality of life in border areas: healthcare, education, public and social safety, cultural and sporting offers, financial and employment status, place of residence, environment and transport accessibility. The respondents evaluated the individual criteria of the subjective quality of life using a 5-degree rating scale of measurement of the following scale points: "very dissatisfied", "dissatisfied", "rather dissatisfied", "rather satisfied", "satisfied". The components and criteria for the subjective quality of life offered by the team of experts are summarized in table 1.

To get the answer to the question whether the set of 43 criteria can be considered as homogeneous index of a latent variable, it was decided to use an exploratory factor analysis. In order to confirm the validity of the application of the factor model in this case, they assessed the correlation of variables and the significance of these compounds. They applied Bartlett`s correlation matrix sphericity test as well as calculated the KMO (Kaiser-Meyer-Olkin) statistics value for the whole set of data and the MSA (Measure of Sampling Adequacy) statistics for each variable [Bartlett 1950; Kaiser 1970]. The results are presented in table 2.

Bartlett's sphericity test relates to verifying the hypothesis of no significant correlations among the variables (the null hypothesis assumes that the matrix of correlation coefficients among the variables is the unit one). The rejection of the null hypothesis proves the validity of the analysis. The value of Bertlett's statistics was $\lambda^2 = 12682{,}951$ and is statistically significant at least at the level of $a = 0.000$. Therefore, the null hypothesis of no significant correlations among the variables was rejected, which confirms the validity of the assumed analytical approach.

TABLE 1.

Components of subjective quality of life

Components	No.	Items (criteria)
I. Healthcare	x_1	Access to general practitioners (number of outposts, office hours, waiting time, the quality of services).
	x_2	Access to specialized doctors (number of outposts, office hours, waiting time, the quality of services).
	x_3	Functioning of the medical emergency service.
	x_4	Access to pharmacies (number of outposts, opening hours and prices).
II. Education	x_5	Access to and the quality of the nurseries and kindergartens.
	x_6	Access to and the quality of primary schools.
	x_7	Access to and the quality of lower secondary schools
	x_8	Access to and the quality of secondary vocational schools
	x_9	Access to and the quality of general secondary schools.
	x_{10}	Access to and the quality of tertiary schools.
	x_{11}	Adapting schools for the disabled.
	x_{12}	Opportunities and the conditions of education improving or retraining for adults.
III. Public and social safety	x_{13}	Personal safety (at night and during the day).
	x_{14}	Traffic safety.
	x_{15}	Preparing the community for emergencies (floods, droughts, etc.).
	x_{16}	Security of property (flat, car).
	x_{17}	Care for those with special needs (elderly, chronically sick people).
	x_{18}	Help for individuals and dysfunctional families.
	x_{19}	The degree of solidarity with the people being in difficult situations (e.g. long-term unemployed, the homeless).
IV. Cultural and sports offer	x_{20}	Opportunities to participate in sporting events.
	x_{21}	Opportunities to participate in cultural events.
	x_{22}	Access to free sporting and cultural infrastructure.
V. Financial and work status	x_{23}	Personal financial situation (income, savings).
	x_{24}	Current work activity (its attractiveness, work conditions and atmosphere).
	x_{25}	Job security (temporality, the so-called `zero hours` or junk contracts).
	x_{26}	Chances of finding a new attractive job.
	x_{27}	Maintaining the proper balance between work time and leisure time.
	x_{28}	Housing conditions (size, location, condition and housing equipment).
VI. Place of residence, including access to services, assessment of the environment, transport accessibility	x_{29}	Access to the technical infrastructure (water supply and sewerage systems, gas).
	x_{30}	Access to commercial services such as restaurants, repairing services, postal services, etc. (number of outposts, opening hours, prices).
	x_{31}	Access to essential products such as food, clothing, etc. (number of outposts, opening hours, prices).
	x_{32}	Access to the Internet and mobile telephony.
	x_{33}	Access to and the state of green areas (e.g. parks, squares and forests).
	x_{34}	Image of the place of residence (cleanness and aesthetics of public places). Image of the domicile (the and the beauty of public places).
	x_{35}	Drinking water quality.
	x_{36}	Waste management (rubbish collection from households, access to waste containers in public places, possibilities of waste segregation).
	x_{37}	Air quality.
	x_{38}	Climate state level (low noise pollution).
	x_{39}	Possibility of travelling by bicycle, including cycling routes.
	x_{40}	Possibility of travelling by own car or motorcycle (traffic jams, road conditions, access to parking spaces).
	x_{41}	Possibility of travelling around by public transport (bus, train, etc.).
	x_{42}	Transport links to the nearest urban centre.
	x_{43}	Cross-border transport links.

Source: own elaboration.

TABLE 2.

The values of MSA statistics

Variable	MSA statistics	Variable	MSA statistics
x_1	0.802	x_{23}	0.925
x_2	0.731	x_{24}	0.867
x_3	0.760	x_{25}	0.855
x_4	0.809	x_{26}	0.892
x_5	0.851	x_{27}	0.905
x_6	0.807	x_{28}	0.853
x_7	0.850	x_{29}	0.812
x_8	0.893	x_{30}	0.789
x_9	0.872	x_{31}	0.811
x_{10}	0.856	x_{32}	0.856
x_{11}	0.892	x_{33}	0.852
x_{12}	0.901	x_{34}	0.875
x_{13}	0.830	x_{35}	0.816
x_{14}	0.791	x_{36}	0.850
x_{15}	0.817	x_{37}	0.796
x_{16}	0.796	x_{38}	0.803
x_{17}	0.764	x_{39}	0.794
x_{18}	0.786	x_{40}	0.792
x_{19}	0.823	x_{41}	0.762
x_{20}	0.816	x_{42}	0.723
x_{21}	0.817	x_{43}	0.831
x_{22}	0.844	–	–
KMO statistics: 0.835			

Source: own calculations using IBM SPSS Statistics 21.

The KMO and MSA indices allow to perform an initial elimination of variables, among which the correlations are small, and which may cause the extracted factors to be difficult to interpret. The limit values for the KMO and MSA indices were adequately set at the levels of 0.7 and 0.5. The KMO index value was high and amounted to 0.835 at the significance level $a = 0.000$. The result does not imply the reduction of the assumed set of variables. The MSA statistics provided similar recommendations for individual variables. Any case of variable, for which the MSA statistics value was lower than the limit value of 0.5, has not been identified. In the further stages of the measurement scale construction all the variables have been therefore included.

3.2. Results of the dimensionality of the scale

To extract the subscales the exploratory factor analysis was used, that had been conducted using principal components analysis with the VARIMAX rotation. It is the most popular approach in determining the dimensionality of composite measurement scales. Factor analysis results are presented below.

TABLE 3.

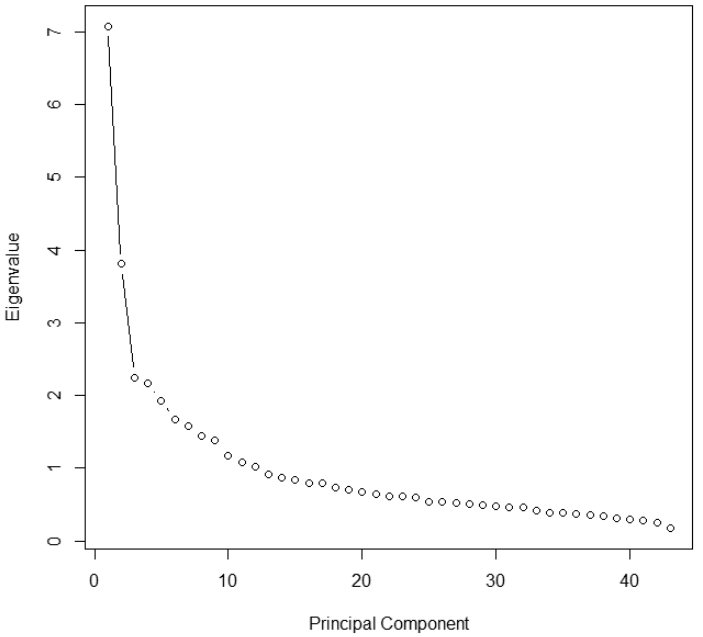
Factor analysis results

Component	Eigenvalue	% of variance	Cumulative %
1	7.077	16.457	16.457
2	3.806	8.851	25.308
3	2.245	5.221	30.529
4	2.164	5.033	35.562
5	1.934	4.498	40.060
6	1.678	3.903	43.962
7	1.578	3.669	47.631
8	1.449	3.370	51.001
9	1.382	3.215	54.216
10	1.173	2.727	56.943
11	1.078	2.507	59.450
12	1.029	2.392	61.843
13	0.917	2.132	63.975
14	0.866	2.013	65.988
15	0.836	1.944	67.932
16	0.796	1.851	69.783
17	0.789	1.835	71.618
18	0.732	1.701	73.319
19	0.702	1.632	74.951
20	0.679	1.580	76.531
21	0.650	1.511	78.042
22	0.614	1.428	79.470
23	0.608	1.413	80.883
24	0.596	1.387	82.270
25	0.545	1.268	83.538
26	0.540	1.257	84.795
27	0.523	1.216	86.011
28	0.506	1.176	87.187
29	0.498	1.158	88.345
30	0.485	1.129	89.474
31	0.467	1.087	90.561
32	0.462	1.073	91.634
33	0.419	0.975	92.609
34	0.396	0.920	93.529
35	0.386	0.898	94.428
36	0.378	0.880	95.308
37	0.359	0.835	96.142
38	0.340	0.791	96.934
39	0.315	0.732	97.665
40	0.301	0.700	98.365
41	0.283	0.657	99.023
42	0.247	0.574	99.596
43	0.174	0.404	100.000

Source: own calculations using IBM SPSS Statistics 21.

FIGURE 1.

Scree test



Source: own calculations using IBM SPSS Statistics 21.

In choosing the number of components the percentage of variance criterion and the scree test [Kim, Mueler 1978] were applied. The scree plot might suggest leaving the 3, 6 and possibly 10 factors (subscales). The 10-factor model was not considered further in the analysis because the analysis of the 10 subscales greatly complicates the measurement model and hinders its substantive interpretation. Furthermore, despite the large number of factors, the model would not meet the percentage of variance criterion, which is often set at a minimum of 60%. The fulfillment of this criterion would require the adoption of 11 factors which would complicate the model increasingly. Therefore, the models that were considered were the 3 and 6-factor ones bearing in mind that they do not meet the percentage of variance criterion. The alternative for them was the third model proposed by the experts (Table 1.). The values of factor loadings for the first two models are presented in tables 4. and 5.

TABLE 4.

Factor loadings before and after rotation for the first model

Variable	Component			Component		
	1	2	3	1	2	3
x_1	0.385	0.209	-0.144	0.384	0.044	0.252
x_2	0.285	0.189	-0.032	0.233	0.056	0.246
x_3	0.252	0.115	-0.180	0.311	-0.008	0.111
x_4	0.328	0.080	-0.218	0.389	0.036	0.093
x_5	0.481	-0.190	0.456	0.001	**0.660**	0.200
x_6	0.592	-0.371	0.370	0.130	**0.778**	0.052
x_7	0.589	-0.413	0.371	0.125	**0.799**	0.017
x_8	0.583	-0.404	0.287	0.181	**0.743**	-0.013
x_9	0.585	-0.404	0.302	0.172	**0.753**	-0.006
x_{10}	0.464	-0.220	0.373	0.046	**0.618**	0.135
x_{11}	0.459	-0.339	0.180	0.173	**0.571**	-0.047
x_{12}	0.460	-0.245	0.093	0.242	**0.471**	-0.003
x_{13}	0.285	0.295	-0.035	0.241	-0.003	0.334
x_{14}	0.289	0.319	0.108	0.143	0.067	0.414
x_{15}	0.304	0.115	0.134	0.123	0.202	0.260
x_{16}	0.349	0.221	-0.052	0.293	0.068	0.288
x_{17}	0.247	0.212	0.148	0.080	0.122	0.327
x_{18}	0.443	-0.154	-0.156	0.413	0.270	-0.036
x_{19}	0.476	-0.060	-0.061	0.373	0.293	0.093
x_{20}	0.459	0.075	-0.149	0.432	0.160	0.164
x_{21}	0.416	0.213	-0.119	0.388	0.075	0.277
x_{22}	0.386	0.010	-0.214	0.423	0.113	0.057
x_{23}	0.505	0.051	-0.217	**0.511**	0.162	0.132
x_{24}	0.517	-0.219	-0.286	**0.554**	0.278	-0.118
x_{25}	0.571	-0.201	-0.258	**0.572**	0.317	-0.073
x_{26}	0.526	-0.085	-0.203	**0.508**	0.258	0.032
x_{27}	0.526	-0.262	-0.278	**0.552**	0.311	-0.148
x_{28}	0.374	0.193	-0.214	0.425	0.006	0.206
x_{29}	0.323	0.299	-0.245	0.417	-0.101	0.264
x_{30}	0.435	0.152	-0.382	**0.585**	-0.028	0.124
x_{31}	0.461	0.072	-0.360	**0.583**	0.043	0.075
x_{32}	0.435	-0.004	-0.270	**0.497**	0.119	0.039
x_{33}	0.270	0.508	0.080	0.160	-0.063	**0.555**
x_{34}	0.292	0.529	0.164	0.117	-0.013	**0.615**
x_{35}	0.075	0.540	0.281	-0.118	-0.088	**0.595**
x_{36}	0.173	0.602	0.279	-0.044	-0.061	**0.682**
x_{37}	0.151	0.579	0.220	-0.019	-0.095	**0.630**
x_{38}	0.177	0.597	0.176	0.032	-0.115	**0.636**
x_{39}	0.321	0.221	0.248	0.061	0.220	0.402
x_{40}	0.304	0.284	0.187	0.096	0.140	0.424
x_{41}	0.323	0.180	0.057	0.195	0.135	0.289
x_{42}	0.318	0.259	0.059	0.195	0.090	0.354
x_{43}	0.381	0.072	-0.024	0.287	0.184	0.185

Source: own calculations using IBM SPSS Statistics 21.

TABLE 5.

Factor loadings before and after rotation for the second model

Variable	Component						Component					
	1	2	3	4	5	6	1	2	3	4	5	6
x_1	0.385	0.209	-0.144	0.287	0.351	-0.175	0.074	0.104	0.098	-0.060	**0.595**	0.256
x_2	0.285	0.189	-0.032	0.318	0.364	-0.042	0.056	0.098	0.063	-0.064	**0.574**	0.057
x_3	0.252	0.115	-0.180	0.116	0.476	-0.119	0.010	-0.087	-0.058	0.030	**0.549**	0.223
x_4	0.328	0.080	-0.218	0.271	0.208	-0.331	0.101	0.032	0.134	-0.184	0.419	0.386
x_5	0.481	-0.190	0.456	0.168	-0.031	-0.069	**0.659**	0.174	0.128	-0.020	0.130	-0.109
x_6	0.592	-0.371	0.370	-0.039	-0.009	-0.181	**0.795**	-0.003	0.094	0.091	0.051	0.088
x_7	0.589	-0.413	0.371	-0.093	0.032	-0.210	**0.822**	-0.055	0.043	0.108	0.044	0.116
x_8	0.583	-0.404	0.287	-0.088	0.051	-0.159	**0.752**	-0.097	0.084	0.138	0.072	0.121
x_9	0.585	-0.404	0.302	-0.110	-0.010	-0.205	**0.774**	-0.064	0.084	0.124	0.013	0.155
x_{10}	0.464	-0.220	0.373	0.037	-0.127	-0.086	**0.622**	0.134	0.140	0.050	-0.009	-0.020
x_{11}	0.459	-0.339	0.180	0.073	0.133	-0.023	**0.546**	-0.142	0.143	0.068	0.195	0.001
x_{12}	0.460	-0.245	0.093	0.003	-0.041	0.002	0.445	-0.051	0.230	0.141	0.067	0.068
x_{13}	0.285	0.295	-0.035	0.124	0.297	0.091	-0.027	0.164	0.036	0.157	**0.477**	0.031
x_{14}	0.289	0.319	0.108	0.183	0.121	0.199	0.020	0.302	0.129	0.154	0.368	-0.127
x_{15}	0.304	0.115	0.134	0.223	0.293	0.159	0.154	0.102	0.073	0.088	**0.463**	-0.150
x_{16}	0.349	0.221	-0.052	0.091	0.400	0.142	0.025	0.061	0.032	0.231	**0.550**	0.020
x_{17}	0.247	0.212	0.148	0.243	0.287	0.175	0.076	0.176	0.045	0.074	**0.472**	-0.181
x_{18}	0.443	-0.154	-0.156	-0.070	0.306	0.123	0.212	-0.241	0.141	0.310	0.351	0.125
x_{19}	0.476	-0.060	-0.061	-0.041	0.248	0.205	0.220	-0.107	0.173	0.351	0.353	0.030
x_{20}	0.459	0.075	-0.149	-0.298	0.065	0.224	0.092	-0.007	0.161	**0.552**	0.142	0.153
x_{21}	0.416	0.213	-0.119	-0.332	-0.018	0.152	0.036	0.142	0.108	**0.534**	0.077	0.204
x_{22}	0.386	0.010	-0.214	-0.283	-0.022	0.217	0.046	-0.063	0.213	**0.492**	0.043	0.162
x_{23}	0.505	0.051	-0.217	0.135	-0.002	-0.010	0.141	0.065	0.371	0.136	0.279	0.256
x_{24}	0.517	-0.219	-0.286	0.331	-0.372	0.192	0.188	-0.035	**0.798**	0.038	0.031	0.084
x_{25}	0.571	-0.201	-0.258	0.349	-0.359	0.209	0.222	-0.004	**0.815**	0.060	0.072	0.070
x_{26}	0.526	-0.085	-0.203	0.268	-0.272	0.278	0.155	0.050	**0.695**	0.158	0.118	0.008
x_{27}	0.526	-0.262	-0.278	0.268	-0.329	0.165	0.227	-0.084	**0.744**	0.068	0.026	0.112
x_{28}	0.374	0.193	-0.214	0.269	-0.174	-0.031	0.000	0.237	0.433	-0.015	0.192	0.215
x_{29}	0.323	0.299	-0.245	-0.018	-0.098	-0.396	-0.002	0.278	0.107	-0.001	0.115	**0.564**
x_{30}	0.435	0.152	-0.382	-0.304	-0.097	-0.356	0.052	0.085	0.116	0.255	0.009	**0.706**
x_{31}	0.461	0.072	-0.360	-0.304	-0.051	-0.395	0.128	0.025	0.094	0.233	0.029	**0.719**
x_{32}	0.435	-0.004	-0.270	-0.289	-0.052	-0.250	0.166	-0.018	0.114	0.269	0.005	**0.545**
x_{33}	0.270	0.508	0.080	-0.005	-0.194	-0.204	0.006	**0.581**	0.037	0.076	0.065	0.259
x_{34}	0.292	0.529	0.164	-0.045	-0.185	-0.128	0.040	**0.619**	0.011	0.152	0.065	0.179
x_{35}	0.075	0.540	0.281	0.184	-0.187	-0.021	-0.055	**0.651**	0.008	-0.051	0.081	-0.092
x_{36}	0.173	0.602	0.279	0.079	-0.166	-0.104	-0.006	**0.707**	-0.045	0.034	0.100	0.036
x_{37}	0.151	0.579	0.220	0.068	-0.122	-0.056	-0.054	**0.636**	-0.038	0.061	0.123	0.024
x_{38}	0.177	0.597	0.176	0.079	-0.166	-0.094	-0.065	**0.660**	0.004	0.046	0.110	0.085
x_{39}	0.321	0.221	0.248	-0.161	-0.101	0.291	0.155	0.319	0.083	0.417	0.028	-0.166
x_{40}	0.304	0.284	0.187	-0.122	-0.243	0.240	0.090	0.404	0.164	0.359	-0.051	-0.098
x_{41}	0.323	0.180	0.057	-0.416	0.150	0.151	0.103	0.097	-0.127	**0.549**	0.109	0.091
x_{42}	0.318	0.259	0.059	-0.434	0.049	0.230	0.043	0.185	-0.072	**0.607**	0.049	0.050
x_{43}	0.381	0.072	-0.024	-0.434	0.049	0.277	0.111	0.010	0.036	**0.633**	0.032	0.059

Source: own calculations using IBM SPSS Statistics 21.

Analyzing the matrix of rotated components for the 3-factor model it can be noticed that for nearly half of the criteria (21 of 43) factor loadings are not statistically significant (they are below the acceptable level of 0.5). This means that 21 criteria are not specific to any of the separated subscales and poorly correlate with them. Therefore, these variables ought to be removed from the measurement scale. It should also be noted that the interpretation of the first subscale is not clear. This is because it com-

bines the assessment of the financial and employment situation with the one of the access to commercial services, indispensable products as well as to the Internet and mobile networks. The second and third subscale can be defined respectively as "education" and "the environment".

In the 6-factor model for the eight criteria statistically significant factor loadings were not observed. The first three subscales are unequivocal to interpret and can be defined as: "education", "environment" and "employment status". The interpretation of the other subscales is less unequivocal. The fourth subscale integrates the assessment of the aspects of culture and sporting offer and the one of the access to public transport. The fifth subscale includes the criteria for health care and public and social safety. The last one contains the evaluation criteria for access to services. The interpretation of the subscales is therefore similar to the third model adopted by experts.

The next step of the analysis was to assess the reliability of the separate subscales within the three factor models. The coefficient that was used is Cronbach's alpha, which is based on the coefficients of the correlation of all scale items with the overall result of the scale. The results are summarized in table 6.

TABLE 6.

Reliability of measurement

	Reliability		
	Model 1 (α=0.835)	Model 2 (α=0.845)	Model 3 (α=0.874)
Subscale 1	0.787	0.857	0.656
Subscale 2	0.856	0.784	0.856
Subscale 3	0.784	0.838	0.667
Subscale 4	-	0.698	0.724
Subscale 5	-	0.639	0.804
Subscale 6	-	0.714	0.762

Source: own calculations using IBM SPSS Statistics 21.

In the assessment of scale reliability using Cronbach's alpha it is essential that the number of the survey samples and the number of the items scale affect its value. The larger the number of the scale items is, the higher the value of coefficient position may be. In the present case the accuracy of full scale for the three models is high (the highest for model 3, but recall that it contained the largest number of items which could have an impact on the high value of the coefficient). In addition, in the case of the first two models there are the subscales for which the value of the coefficient is higher than for the whole scale despite a much smaller number of items comprising these subscales (subscale 2 for model 1 and subscale 1 for model 2). In the other cases, the reliability of the subscales can be considered as satisfactory, bearing in mind that they are composed of a much smaller number of items than the complex ones.

3.3. Results of the assessment of measurement models fit

In the final stage the degree of fit of three models to empirical data were compared. Theoretical accuracy of the models was tested by means of confirmatory factor analysis. The method that was applied is the estimation one, which combines generalized least squares method with the method of maximum likelihood. In order to choose the model that most closely matches the data, values of several common goodness of fit indices were calculated. The results of confirmatory factor analysis for the three models are listed in table 7.

TABLE 7.

Goodness of fit indexes

Indexes*	Model 1	Model 2	Model 3
χ^2 statistics	1808.84	2877.36	**5344.35**
$\frac{\chi^2}{df}$ ratio	8.655	**5.460**	6.214
GFI (Goodness-of-Fit Index)	**0.831**	0.823	0.731
AGFI (Adjusted Goodness-of-Fit Index)	0.796	**0.800**	0.704
RMSEA (Root Mean Square Error of Approximation)	0.098	**0.076**	0.09
Akaike information criterion	**2.131**	3.386	6.198
Gamma Index	0.846	**0.847**	0.756
Bayes information criterion	**2.368**	3.752	6.661
NFI (Normed Fit Index)	**0.754**	0.716	0.586
NNFI (Non-Normed Fit Index)	**0.751**	0.738	0.608
CFI (Comparative Fit Index)	**0.775**	0.754	0.626

* The most advantageous values of each index are shown in bold.

Source: own calculations using IBM SPSS Statistics 21.

The recommendations that were used in the analysis of fit indices are included in the following studies: Akaike [1974], Bentler and Bonnet [1980], Jöreskog and Sörbom [1981], McDonald [1988], Steiger [1990], Rigdon [1996], Hu and Bentler [1999], Sztemberg-Lewandowska [2008]. Fit indices did not give a clear indication as to the choice of model. Only one of the indices (χ^2 statistics) pointed to the choice of the model proposed by the experts. However, considering the sensitivity of this index to the size of the sample, the alternative indices, listed in table 7, were also analysed.

The values of these indices suggested the choice of the first or second model. For both models the values of AGFI and Gamma indices were basically identical. In the case of GFI, NFI, NNFI and CFI indices the differences were also small. Considering the above results, it was decided that the scale of quality of life measuring in cross-border areas should be composed of six subscales represented by the second model. Such a choice was a compromise between the stock of information being explained by the model and its complexity. It should be noticeable that the first model is responsible

for explaining only 31% of the total variance. The second one explains 44% of the variance while the number of sub-scales is acceptable. The interpretation of the sub-scales also appears to be coherent and substantively justified. The subscales along with the criteria are listed in table 8.

TABLE 8.

Measurement scale of subjective quality of life in cross-border regions

Sub-scales	Items (criteria)
Education	Access to and the quality of the nurseries and kindergartens. Access to and the quality of primary schools. Access to and the quality of lower secondary schools Access to and the quality of secondary vocational schools Access to and the quality of general secondary schools. Access to and the quality of tertiary schools. Adapting schools for the disabled.
Environment	Access to and the state of green areas (e.g. parks, squares and forests). Image of the place of residence (cleanness and aesthetics of public places). Drinking water quality. Waste management (rubbish collection from households, access to waste containers in public places, possibilities of waste segregation). Air quality. Climate state level (low noise pollution).
Work status	Current work activity (its attractiveness, work conditions and atmosphere). Job security (temporality, the so-called `zero hours` or junk contracts). Chances of finding a new attractive job. Maintaining the proper balance between work time and leisure time.
Cultural and sports offer and transport accessibility	Opportunities to participate in sporting events. Opportunities to participate in cultural events. Access to free sporting and cultural infrastructure. Possibility of travelling around by public transport (bus, train, etc.). Transport links to the nearest urban centre. Cross-border transport links.
Healthcare, public and social safety	Access to general practitioners (number of outposts, office hours, waiting time, the quality of services). Access to specialized doctors (number of outposts, office hours, waiting time, the quality of services). Functioning of the medical emergency service. Personal safety (at night and during the day). Preparing the community for emergencies (floods, droughts, etc.). Security of property (flat, car). Care for those with special needs (elderly, chronically sick people).
Access to services	Access to the technical infrastructure (water supply and sewerage systems, gas). Access to commercial services such as restaurants, repairing services, postal services, etc. (number of outposts, opening hours, prices). Access to essential products such as food, clothing, etc. (number of outposts, opening hours, prices). Access to the Internet and mobile telephony.

Source: own elaboration.

4. Conclusion

The article presents a proposal for measurement scale which enables to measure the subjective quality of life of the inhabitants of cross-border regions. The results of the researches using factor analysis show that within the category of subjective quality of life six components (subscales) can be extracted: "education", "environment", "work status", "cultural and sports offer and transport accessibility", "healthcare, public and social safety", "access to services". The subscales are characterized by satisfactory reliability of measurement. The initial set of items was possible to reduce by 9 items which allowed to simplify the measurement model. It is very significant in terms of cost reduction of the research being conducted through direct interviews. It also allows to reduce the risk of the respondent's resignation from the participation in the study.

The authors are aware that the proposed measurement model is not a universal tool. Diversified social and economic structure of other cross-border regions can cause that the application of the scale will require its modification. Therefore, the authors of the article are hoping that the proposed solution will be an inspiration for further studies on the impact of the cross-border regions on the quality of life of their inhabitants and the measure of this quality. The researches that will be taken in this area may still further enhance the fit of the measurement model to empirical data.

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Urszula WIDELSKA[1]

MARKETING BARRIERS TO E-HEALTH IN THE PODLASKIE PROVINCE

Summary

The article undertakes the problem of a marketing scope of e-health, combined with the use of ICT in the health care system. The study focuses on the needs of patients - the main consumers of medical services. The purpose of the article is to identify marketing barriers to e-health services from the perspective of patients and the medical community. To analyze the problem an example of the Podlaskie Province was used.

Key words: e-health, marketing, Podlaskie Province

1. Introduction

E-health is a relatively recent phenomenon. It is more often analyzed in terms of implementing broadly defined innovation of ICT into the health care system and the various medical facilities. In a broader sense, e-health means activities aimed at improving the quality of health services, improving the quality of patient services and improving access to health services. Taking into account the wider context of e-health, building the right relationships between health care facilities and patients, recipients of medical services, seems to be a particularly important aspect. The aim of the study is to identify marketing barriers to e-health from the perspective of the patient and the medical community based on the example of the Podlaskie Province. To achieve the objective, the example of Podlaskie Province was used. The conclusions were supported by the research results included in the final report on the area of e-health in the Podlasie Province within the project "E-Poland - development trends of the information society" [Widelska at al., 2011][2], which was co-created by the author of this paper.

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[2] The object of the research was the area of application of Information and Communication Technology in healthcare – e-health. The following research areas were distinguished: the analysis of e-health in the Podlaskie Province, in comparison with other regions of the country and Europe; identification of development factors of e-health in the Podlaskie Province including barriers and determinants influencing this development; assessment of the prospects for the development of e-health in the Podlaskie Province. The main objective of the study was to determine the current state of information society development in the area of health care in the Podlaskie Province, with particular em-

2. The essence of e-health – european and national context

E-health is the use of ICT in the health care system. By assumption, it is based on the cooperation of two fields – broadly defined health care and modern information systems. The modern health care system requires continuous improvement of processes affecting the availability, efficiency and quality of health services. It is particularly important to increase access to preventive tests, make changes in traditional systems of patient service and support all activities and processes, whose aim is to take into account often unfavorable demographic trends and the trends towards an overall improvement in the living standard of citizens.

E-health has become a subject of interest to the European Commission. In the discussion of the analyzed issues in May 2003, the definition of e-health was presented as the use of modern information and communication technologies to satisfy the needs of citizens, patients, professionals in the field of health care, health care providers and policy makers [Widelska at al., 2011]. As the most important arrangements of the diagnosis of the development of e-health in Europe, influencing the need for urgent action, the EC acknowledged: [Widelska at al., 2011]:

- the increase in demands to health care and social welfare services resulting from the "aging" of society;
- the increase in income and level of education;
- increasing expectations of citizens who in the current EU social model demand the best health care and reducing disparities in access to high quality medical care;
- increasing mobility of patients and physicians within better functioning internal market in the EU;
- the need to reduce a burden of diseases and the prevention of risks of emerging diseases (e.g. SARS);
- early detection of diseases and quicker response and minimization of the risk of these diseases;
- difficulties of public authorities to connect investments in technologies with investments in complex organizational changes needed to use the potential of the implemented technologies;
- the need to reduce accidents at work and the risk of occupational diseases;
- the management of all the resources of health data that must be available in a safe, friendly, and fast way and in a place where they are needed, and processed in an efficient manner for administrative purposes;
- the need to provide the best possible health care under limited budgetary resources.

In April 2004, the European Commission published "The EU Action Plan" (European Union Action Plan) for a European e-Health Area. The document specifically refers to the following activities [*Communication From* …., 2004]:

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phasis on IT technologies, which are the subject of research of the EU institutions and to identify the main development barriers.

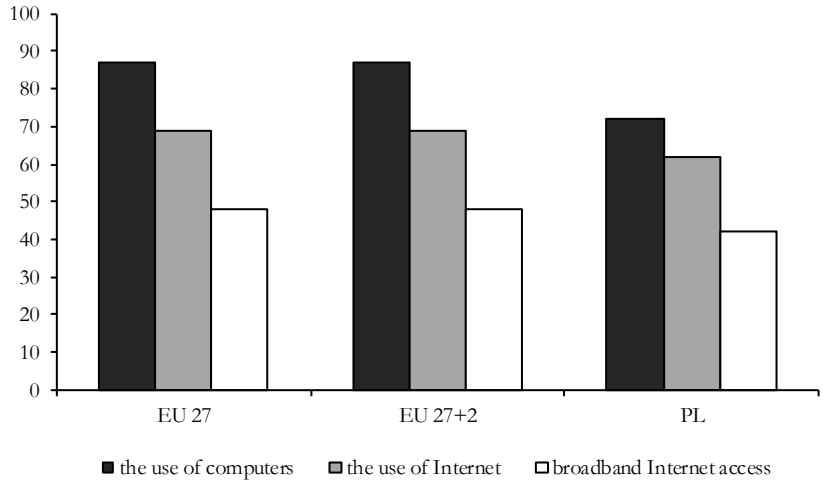
1. Gaining independence of health care consumers (patients and healthy citizens) to enable them to manage their well-being through access to qualified sources of health information, as well as through active participation in the prevention of diseases, allowing patients to participate (with better knowledge and responsibility) in the process of care and rehabilitation through intelligent monitoring systems, as well as by the appropriate and personalized medical information.
2. Supporting professionals by providing them with access to relevant and current information at the time of such need, to new tools for better risk management and systems to acquire current biomedical knowledge.
3. Supporting departments and managers of health care by assisting in the appropriate management of the ongoing reorganization of health care systems.

The process of development of e-health in Poland has been slow. Using published in June 2006 results of the sixth edition of measurements of the development of health care services on-line conducted by Capgemini, Poland was the last on the list out of eighteen countries covered by the survey [Widelska at al., 2011].

The development of e-health in Poland is suppoted by a large, compared to other countries of the European Union, proportion of Internet users looking for information on health services (63.2%). However, many other disparities in the development of this sphere of heatlh care in comparison with other European are noticed. Using the results of the research carried out at the request of the European Commission in 2008, the following conclusions can be drawn (see Figure 1) [*Benchmarking ICT…., 2007*; *Europe's Digital Competitiveness Report,* 2010]:

1. Poland was considered a "straggler" within the implementation of e-health, due to the results below the EU-27 average for most indicators included in the study. It concerned both the availability of ICT infrastructure (computer, the Internet) and the use of ICT in various areas related to e-health.
2. Approximately 50% of the Polish GP practices were using administrative data of a patient in an electronic form, whereas the patient's medical records (in whatever form) in an electronic form were in about 40% of practices.
3. In Poland, the computers were used during medical consultations only to a very limited extent (11% of practices). This percentage has remained far behind the EU-27 average at 66%. The use of decision support systems was the exception rather than the rule. 19% of Polish physicians used decision support systems, applied both in the diagnosis and to issue recommendations, which was one of the lowest rates in the EU-27.

FIGURE 1.
The use of ICT infrastructure in a group of family doctors in Poland and in the EU countries



Source: [*Benchmarking ICT*…, 2007].

It should be noted that Poland is one of the few countries that does not have a National Strategy for the Development of e-health, although some of its elements (except for telemedicine) began to be implemented. Also the lack of regulation on a cross-border exchange of medical data of patients, the lack of a system of certification for websites of online pharmacies, the lack of training system for mid level medical personnel can be seen. The development of Polish telemedicine is also limited by the lack of appropriate legal regulations and the high cost of implementation, but also the lack of demand from service providers. Regarding the use of e-learning in the field of health sciences, the lack of an offer concerning nursing, public health and dentistry is particularly noticeable [Widelska at al., 2011].

3. Marketing context of e-health

It should be emphasized that modern medical services market is subject to many changes. In the market, more and more non-public medical facilities are established, thereby competition is increasing. The process can be described as progressive and increasingly important. Providing health services on market basis results in the fight for the customer - the recipient of medical services. Health care is a system whose main goal is to meet the health care needs of the population, which, due to social and demographic transformations, are subject to constant changes [Stanisz-Bush, 2010, p. 2]. Speaking of the needs of citizens within e-health, it should be emphasized that in spite

of the fact that people are healthier and live longer, the demand for health care services continues to increase. Also the circumstances of these transformations change, which is associated with [*Good Practice Guide E-Health…,* 2007]:

- the development of medical technologies (increased possibilities),
- the aging of the population (a growth of the needs),
- increased mobility of people (which changes the needs for the provision of health care services).

The idea of e-health is conducive to building proper relationships with customers – recipients of medical services. E-health, due to the strong involvement of new information and communication technologies into a process of patient care services, can in particular contribute to a stronger exposure and strengthening the role of information, which often determines the quality of the relationships between the patient and the medical facility. Informational context of e-health can directly translate into:

- the image of the medical facility in the patient's awareness,
- more effective promotion of the medical facility,
- building the knowledge potential of medical personnel (e-health implementation requires the development of specific competencies).

In addition to the informational aspect, the aspect of quality is particularly important. Concerning the quality, it is referred to the quality of medical services, but also the quality of patient care. Research on e-health strongly emphasize the marketing context of the analyzed project. In the period between December 2008 and May 2009, Gartner on behalf of the Minister of Health and Social Affairs of Sweden conducted in six European countries (the Czech Republic, France, the Netherlands, Sweden, Spain and the United Kingdom) a detailed study on the potential benefits from the use of e -health. The research results were published in the document entitled "eHealth for a Healthier Europe!". The authors of the report singled out thirty-seven potential benefits of the use of innovative solutions in health care. The most important include [*E-health for Europe!…*, 2009]:

- significant reduction of duplicate laboratory tests;
- reduction in the number of visits to primary care physicians;
- reduction of misadministration of medication;
- shorter stay in hospital;
- reduction of cases of wrong prescriptions or dosage of medications;
- reduction of the risk of adverse effects during treatment;
- reducing the cost of each prescription;
- shortening the time for administration to fill forms;
- reduction of the waiting time for an appointment or treatment.

It should be noted that e-health should be considered on two levels. The first level is building relationships with patients in the context of the needs of the society. The second level is the use of e-health in a medical facility. Referring to the first of the levels, it should be emphasized that the benefits to the society are connected with high costs borne by the system. In 2009, at the request of the European Commission, a report on the socio – economic benefits from the use of a electronic

health record (EHR) and electronic transfer of prescriptions was prepared. The authors of the document, entitled "The socio-economic impact of interoperable electronic health record (EHR) and ePrescribing systems in Europe and beyond – Final study report" [*The socio-economic impact…,* 2009], calculated that the use of these solutions has begun to bring measurable benefits that exceed the costs of implementing the changes from the sixth year, and benefits grow rapidly in subsequent years of the use of the systems. Referring to the social aspect of the needs, the following facts should be considered [Widelska at al., 2011]:

- a rapid growth of broadband access;
- there is availability for training projects funded from the EU's resources on learning how to use computers and the Internet for groups who do not have knowledge of IT technologies;
- an increasing interest of the Polish society associated with using the Internet to search for information on health;
- a growing number of computer hardware, which is in the possession of private users and companies in Poland;
- an increase in the role of information societies;
- a visible increase in public awareness of the benefits of modern technologies in the field of health care.

Referring to the e-health as a factor in strengthening the process of marketing management of a medical facility, it is important to take into account the following aspects of development:

- there is an increase in the awareness of managers of health care facilities of long-term benefits resulting from the implementation of new solutions;
- an increase in awareness of the benefits associated with the use of IT systems in health care;
- visible readiness of medical personnel to improve qualifications within the use of IT technologies.

E-health is not only a response to the changing social needs. The marketing aspect of e-health is very broad. First of all, it enables to build a new quality of relationships with patients. It is an undertaking that can support the creation of a positive image of medical facilities in the minds of health care service recipients. In addition, e-health is a tool that improves the system of marketing management in a medical facility.

4. Barriers to e-health in the opinion of medical communities[3]

Referring to marketing barriers to e-health in the Podlasie Province, those aspects of e-health have been analyzed which have a direct impact on building the relationships between the medical facility and the patient. As the study showed, representatives of se-

[3] On the basis of in-depth interviews of managers of health care facilities, particularly hospitals, and the results of focus group interviews (FGI) among managers of health care, representatives of the medical services, representatives of the private health care institutions in the Podlasie region [Widelska at al., 2011].

lected medical communities in the Podlasie Region clearly indicate the need for implementation of e-health to the health system. In their opinion, e-health is the main condition for the development of the health system as well as individual medical facilities. As barriers to the quality of the relationships between health care facilities and patients were indicated:

- financial barriers,
- mental barriers,
- infrastructural barriers,
- the lack of knowledge about e-health,
- the generation gap.

It was emphasized that the changes in the health care system are combined with high costs. Owners of private medical practices are concerned that most of the costs associated with the implementation of e-health will have to be paid from their own resources. In the opinion of the respondents, investments in e-health require big expenses, and return on investment is not always followed in the short term. In addition, in the opinion of health care managers, computerization and the use of IT is reflected in savings as a rule.

Mental barriers were recognized as essential limitations of e-health development. Health care employees, but often also managers of medical facilities are not fully able to identify specific and long-term benefits connected with the use of e-health. Knowledge potential of the medical communities about e-health has been assessed at an even lower level, because it is often limited to the internal processes involving advanced information technology in individual health care facilities.

An opinion was expressed that e-health directly affects the quality of patient care, but it is limited by the need to implement the security system. It is an important premise in the respondents' opinion to have specific systemic solutions when implementing e-health.

The generation gap was recognized as particularly important. According to representatives of health care, this type of limitation concerns both patients and medical personnel, including doctors. Successful implementation of e-health is connected not only with the awareness of changes, but also with specific skills. It was emphasized that in an aging society it can be a major challenge.

Among the barriers limiting the benefits for patients resulting from e-health also organizational barriers were identified, since the implementation of e-health requires:

- an increase in the level of competence of medical personnel within e-health,
- clear division of duties,
- modernization of the infrastructure,
- creation of a uniform system of administrative supervision within e-health,
- the need to improve the information system about e-health.

Representatives of medical communities recognize the need for changes in the health care system based on the implementation of the e-health process. It should be emphasized that mental and awareness factors have been identified as the main barriers to the implementation process in the first place, rather than financial determinants.

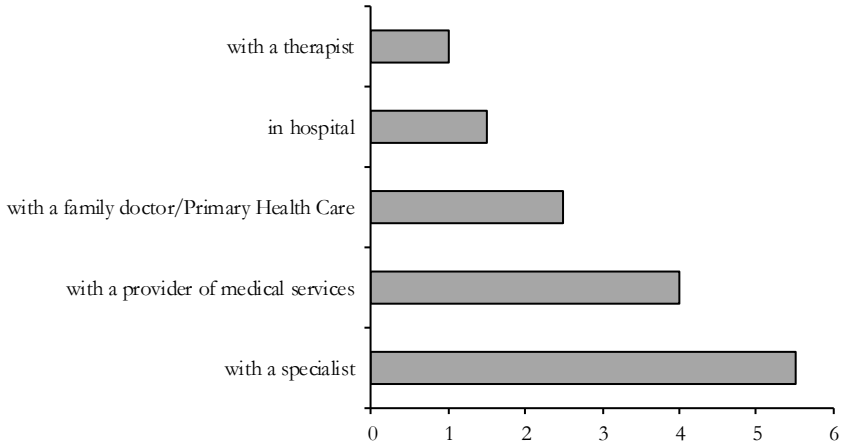
5. Barriers to e-health in the opinion of personnel and patients[4]

Patients as customers of the health care system have clear expectations as to the service level, but also to the organization of the service system in the health care facility. Civilization conditions make the information storage devices become more common. Secondly, people manage their time consciously. A characteristic feature of the quality of patient care is not only a competent service, but quick access to medical services.

Studies of patients in the Podlasie Province indicate very strong interest in the Internet – us much as 82% with Internet access use it every day. This high rate is generated mainly by young people. Most patients search information online about diseases and their symptoms (74%). Almost half of them check surgery hours of the doctors using the Internet (48%). Studies show that the Internet or e-mail is almost not used to communicate (to consult) with a doctor or other specialists in health matters (only 2% of respondents admit to it) (see Figure 2.).

FIGURE 2.
The use of the Internet by patients and e-mail in order to arrange a medical appointment

Do you use the Internet or e-mail in order to arrange a medical appointment:



Source: [Widelska at al., p. 74].

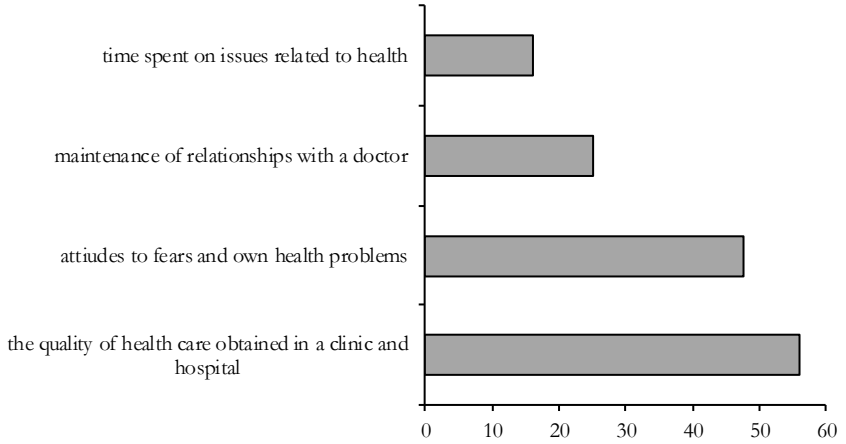
Also the doctor (in a clinic or hospital) rarely uses a computer to transfer health information to the patient, for example relating to the description of the treatment or explanation of symptoms of the disease. Only 5% of respondents reported that such a fact occurred.

[4] Based on the survey (PAPI) conducted among 200 patients of the Podlasie Province [Widelska at al., 2011].

The vast majority of respondents believe that universal access to computers and the Internet helps in maintaining health (74.5% of respondents think that), helps to improve the health care system (78.5% of respondents) and facilitates contact with health service and other providers of health care services. In this area, it is clear that patients with higher education are much more enthusiastic about e-health than those with primary education (see Figure 3.).

FIGURE 3.
The areas where the use of a computer and the Internet by a patient causes changes

Where does the use of a computer and the Internet cause changes?



Source: [Widelska at al., p. 76].

Patients in connection with the intensive use of a computer and the Internet see many benefits of e-health to the quality of health care, including the impact on the attitudes to their own health problems and even relationships with their doctor.

The presented results of the research show that marketing barriers to e-health have a twofold source. The first one are the gaps in the healthcare system. Patients express their opinion on the current state of e-health and its possible impact on the extent of their needs from the perspective of the current situation in the whole system. The second source is the level of their knowledge of e-health. Patients do not have an organized system of information on this sphere of the health care system. The knowledge of e-health seems to be superficial and general.

6. Conclusions

As the example of the Podlaskie Province shows, solutions in e-health are consequently to serve patients. It is a basic premise for analyzing examined field of health

care in terms of a marketing undertaking. This results from taking into account the social needs in health care and the factors that cause major changes in their area. The implemented scope of innovation is also significant. Also the need for changes in the health care system with the use of broadly defined processes of e-health is declared.

E-health is not only high costs and the expectation of long-term benefits. It is primarily an undertaking, the development of which is dependent on overcoming mental and information barriers. This concerns both the representatives of the medical communities, as well as patients. The second group of these stakeholder declare their readiness to changes, however, a limited information system about e-health does not allow a full assessment.

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Elwira SKIBICKA-SOKOŁOWSKA[1]

ANALYSIS OF RESEARCH AND DEVELOPMENT SECTOR IN PODLASKIE PROVINCE AND ITS POTENTIAL OF DEVELOPMENT

Summary

The Research and Development sector is created by the institutions involved in activities of increasing the knowledge and exploring new applications. Products created in the sector are innovations which are a factor of rapid economic development. The problem of R&D sector is still a low level of funding, especially in the private sector. The number of patents and commercialization of solutions is small compared to other European countries. Enterprises do not use opportunities to cooperate with universities and other research institutions, and opportunities for the development of R&D sector, taking into account the potential of the existing academic and research institutes, are still huge. This is why the aim of this study is the analyze of the R&D sector structure and a short description of research and development activities in the Podlaskie Province. The level and method of financing the R&D sector in Poland is characterized by a relatively low share of expenditure on R&D activities, the domination of the public sector financed and a low spending on applied research and development work. Poland is among the group of countries with the highest share of basic research in the overall structure of research.

Key words: research and development, innovation, academic institutions, knowledge, sustainable development

1. Introduction

The aim of this study is the analyze of the R&D sector structure, the types of organizations which cooperate in this area, the comparing of the organizations structure operating in Poland and the European Union, indicators definition which determinate the level of R&D sector development, an indication of the role of research and development organizations in the process of economic innovation and a short description of research and development activities in the Podlaskie Province. The presented statistics generally relate to the period 2005-2010, in some cases the data for this period were not available and therefore was present the most current information which was possible.

The system of innovations is created by the structure and quality of educational system, forms of financing, as well as the type of R&D institutions and their ability to adapt technologies. An analysis of the business entities in the area of R&D and innovation activity against the background of the European Union countries, points to the weakness

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of our country in this regard. In today's world the sphere of research and development should be one of the main sources of knowledge and innovation, and awareness of this condition should lead to the concentration of activities in the area of R&D.

2. Analysis of the R&D potential structure

The changing the development paradigm adopted the Europe 2020 Strategy provides Europe on the path of smart and sustainable development. At the basis of the Europe 2020 Strategy are to achieve three priorities [*Komunikat Komisji Europa 2020*…, s. 11]:

1. smart development (economy development based on the knowledge and innovation);
2. sustainable development (support the effective economy which using the resources, environment friendly and more competitive economy);
3. development foster to social inclusion (economy supporting which is a high-employment economy and which provides social, economic and territorial cohesion).

Actions which should to be taken by EU countries are: increase the investment spending on R&D sector. Currently, the expenses on the research and development sector in Europe are below 2%, while in the U.S. it is 2.6% and in Japan 3.4%. The difference formed from the lower level of private sector investment. It is important the amounts spent on R&D, but also the impact and structure of expenditures on research and improving the conditions for private R&D activity in the EU [*Komunikat Komisji Europa 2020*…, s. 13]:

According to the Lisbon Strategy, which main aim, in the area of regional policy was creating in Europe, up to 2010 the most competitive and dynamic economy in the world, based on knowledge, capable of sustainable development; Member States were obliged to perform the actions within the four major areas: innovativeness (economy based on knowledge), markets' liberalisation (of telecommunication, energy, transport and financial markets), entrepreneurship and social cohesion. The records of strategy document pointed out better use of the existing potential of the EC regions namely: work, knowledge, fund, as well as creating new forms of regional competitive advantage through the increase of investment in pro-growth activity, that is research and development, education, infrastructure of information society [*Strategia zwiększania nakładów*…, 2004, p. 3].

In 2008 the Cabinet accepted the document prepared by Ministry of Economy*: the National Reform Programme for the period 2008-2011 for the implementation of the Lisbon Strategy*. One of the key actions highlighted in this document is Action 3: *Implementation of solutions supporting pro innovating as well as research and development (R&D) activity, including improving the knowledge transfer and innovation diffusion* [*Krajowy Program Reform*…, 2008]. It follows that development activities are the basis for socioeconomic development based on knowledge.

Pro innovative activities include creative work undertaken systematically to increase the stock of knowledge (about human, culture and society) and finding new possibilities of using this knowledge. A vital feature that distinguishes the activity in the research and

development area from other activities is the newness and technical or scientific uncertainty, as well as some economic risk. Research and development are the basis of knowledge, which is the source of innovative processes, continuous pursuit of improving the products, organizational structures, production and business processes, and human resources. Innovativeness considered, among the others, as improvement and development of existing production or developing technologies, the introduction of new solutions in organization and management, involves the continuous exploration and exploitation in practice, the results of research and development, new concepts, ideas and inventions [Goliński, 2002, p. 145]

In Poland, research and development activities are carried out by the following entities [*Sektor badawczo-rozwojowy*…, 2010 p. 2]:

1. research institutions of Polish Academy of Sciences (institutions carrying out basic research financed mainly from the state budget);
2. research and development units (units with the task of conducting research and development, the results of which should be applied in specific areas of the national economy and social life, which are subject to various ministries, including research institutes, central laboratories and research and development centres);
3. development units (economic entities, mainly industrial companies, possessing own R&D backup; laboratories, research and development facilities and centres, research and technological departments, design and design-technological offices , technology development facilities, offices of studies and projects, as well as agricultural and zoo technical farms and experimental stations);
4. institutions of higher education (public and private institutions operating in the field of R&D)[2].

R&D unit is a business entity running a business, that, at the same time, represents a type of academic institution, specializing in the implementation of new technologies and their improvement. Units have been established by the Act of 25 July 1985 on Research and Development [*Ustawa o jednostkach*…, 1985; *Ustawa o zmianie ustawy o jednostkach*…, 2007]. Since 1 October 2010 the R& D units acting on the basis of the Act of 25 July 1985 on Research and Development units which received a category 1, 2, 3, 4 or 5 under the provisions of the Act of 8 October 2004 on the principles of science funding, have become the research institutes within the meaning of the Act of 30 April 2010 on the research institutes [*Ustawa o instytutach badawczych*…, 2010]. R&D units within the meaning of the Act, are state entities distinguished in terms of legal, organizational, economic and financial sense, created in order to conduct the research and development work [*Ustawa Przepisy wprowadzające ustawy reformujące*…, 2010].

Institutional division of the R&D sector in the European Union is slightly different. The structure of employment consists of following sectors: government, higher ed-

[2] The data published by the GUS in the universities research and development works include only the expenditures and employment information associated with this activity, just after the turning off university teaching function.

ucation and the business one. The government sector corresponds to academic entities of Polish Academy of Sciences and includes a part of the R&D units. The quantity of research within the university colleges and the number of employment can be compared with the Polish data. Unfortunately, the biggest differences are in the group of Research and Development units in the sector of enterprises [*Statistics on Science*…, 2004, p. 40].

Three types of research are distinguished in the structure of the R&D activity [Gaczek, 2004, p. 11]:

1. *Basic research* as theoretical and experimental works, implemented in order to gain or enrich the knowledge concerning certain causes of phenomena and facts. The works are not aimed at direct use in practical activities, however. The basic research can be divided into the so-called *pure and targeted* (oriented) basic research.

   Pure research is conducted with a view of knowledge advancement, without directing to achieve long-term economic or social benefits, without making efforts to apply the results of the research to solve the problems of a practical nature, or to give the results to the entities that may be concerned with their application.

   Targeted research is conducted in order to create a vast knowledge base as the basis for solving of known or anticipated future problems [Baruk, 2006, p. 56-57].
2. *Applied research* concerns the research work undertaken to acquire new knowledge, to subsequently enter specific practical applications. They rely on searching for new possible practical applications for the basic research's results or searching for new solutions allowing to gain preconceived practical goals. The results of applied research are test models of products, processes or methods.
3. *Development work* is the work of a structural, technological and design character as well as the experimental one, involving the implementation of existing knowledge gained through the research work or as a result of practical experience, to work out new, or improve the existing materials, devices, products, processes, systems, methods or services[3]. It is not related to deployment development works, going beyond the scope of the R&D activity, connected with the implementation of technical documentation, instrumentation, trial installations, trial series of new product, carrying out amendments after testing, etc. The development works use the existing knowledge.

In Poland the basic research is mainly conducted in the academic institutions of Polish Academy of Sciences, applied research and development activities dominate in the R&D and development units. Scientific research and development activities are conducted by universities, the academic institutions of Polish Academy of Sciences, R&D units and enterprises. The biggest differences, as far as the forms of performance are concerned, can be seen in the institutions of Polish Academy of Sciences, dominated by basic research and deployment activities. It is difficult to point out a uniform type

[3] Including preparation of the experimental prototypes and pilot fittings.

of activities conducted at higher colleges, because the basic research, as well as particular applied activities, surveys used in practice are conducted there Development activities of university employees also includes deployment works. The participation of non-public university colleges conducting R&D activities is still minor. From year to year the number of units operating on the basis of the act on research and development is decreasing. On the other hand, the number of enterprises conducting R&D activities is increasing. However, the scope of enterprises' activity in the area of R&D is a minor one, both in terms of the amount of expenditure on R&D, as well as staff employed [*Strategia Rozwoju Kraju*…, 2007 p. 7].

The activity of the R&D and development units plays a major role in improving the innovativeness of economy. The R&D units are a part of institutional innovation system next to the manufacturing and service companies, university colleges, independent R&D units cooperating with enterprises, institutions of supporting and transferring the knowledge and innovativeness. Entities conducting R&D activities have a major influence on the type of research conducted in a region. Diversified sources of financing may be the state budget, business entities, international organizations and foreign institutions as well as the budget of the European Union. From the point of view of funding for research and development by the minister responsible for science. Three types of entities involved in this activity and financed by the state budget can be distinguished, namely: colleges, institutes of Polish Academy of Sciences and the R&D units. In the case of colleges own research and associated statutory activity are financed. The institutes of Polish Academy of Sciences receive resources within statutory activity connected with the conducted research. The R&D units have the possibility of receiving grants from the representatives of ministries, which they are directly subjected to [Czerniejewski, 2002, p. 1].

An analysis of characteristics and evaluation of the R&D sector structure is determined by examination of the employment structure within the units conducting R&D activities. The Evaluation of the structure of employment by individuals, from the point of view of implementation the results into economy, should be compared with the assessment of expenditure direction in R&D sector, with the division of expenses into basic activities, applied and developmental ones.

Generic structure of financing development activities conducted at colleges is a varied one. Academic institutions of Polish Academy of Sciences concentrate on basic research, in the regions with the average R&D potential. As far as the transfer of scientific solutions and implementation of innovations into economy are concerned, it is vital that the expenditures were incurred within the units of development. In Poland participation of these units in the usage of expenditures in R&D sector is slightly higher than that of academic institutions of Polish Academy of Sciences.

3. Formation of research and development potential

The connections between R&D potential and innovativeness of economy require diagnosing of sources financing the R&D activity and analysis of their regional diversity. Sources of financing expenditures on the R&D activity may be [*Mały Rocznik Statystyczny*…, 2009, p. 34]:

1. funds from the state budget;
2. own funds of business entities;
3. funds of academic institutions of Polish Academy of Sciences and the R&D units;
4. funds of international organizations and foreign institutions.

Development of education sector in Poland lays within the competence of government administration, where the division into departments is visible. Funds for the bailout of statutory activity are granted to three types of entities: colleges (only within the statutory activity connected with the conducted research and own research, didactic activity is financed by the Minister of Education), institutes of Polish Academy of Sciences (within the statutory activity connected with the conducted research), and the R&D units (subsidised by other representatives of resorts they are subjected to). Research units of private schools may apply for grants by way of competition. Research at the position of lower-level schools is financed by local authorities.

Significance of expenditures in the field of research and development economically depends on the structure of their financing and spending. It is vital, in what range creation of technological and scientific progress is financed by enterprises, especially the private ones, and the state budget on the other hand [Ptaszyńska, 2009 p. 182].

In addition to the budgetary and non-budgetary expenditures, supporting the innovative activity may be carried out through the use of systemic and organizational solutions, aimed at strengthening links between the R&D and economy [*Strategia zwiększania nakładów*…, 2004, p. 13-26]. In connection to this, investments in the development of institutional and academic environment of business are made and more regulations to allow the development or creation of direct financing and operation of the units of the environment are created. Examples of this type of entities are technological centres or centres of excellence. Among systemic and organizational, supporting innovativeness solutions, it should be remembered that there is a possibility of systemic and ownership transformations of the R&D units, often relevant to the development needs of the knowledge based economy.

Features characterizing the level and method of financing the R&D activity in Poland are [Koźlak, 2009, p. 1]:

1. rather low level of the R&D expenditures to GDP;
2. domination of budgetary financing and minor participation of business entities in total expenditure on the R&D;
3. relatively low expenditure on applied research and development activities, compared to expenditure on basic research.

The situation of science in Poland is illustrated by ineffective structure of budgetary expenses, because majority of resources is assigned ,within statutory activity, for protecting the basic needs of scientific units, other expenses on research and intentional projects, as well as on investments and scientific and technical cooperation with foreign countries. This kind of structure indicates that budgetary financing is in a small extend related to the usefulness of economic research, carried out by the subsidized research units. With this kind of structure Poland is among the countries with the highest participation in basic research (it is characteristic for underdeveloped countries). The main

performers of basic research are academic institutions of Polish Academy of Sciences and colleges [Łobesko, 2008, p. 23]. Units of particular sections rarely cooperate with one another, which is often the cause of ineffective use of staff potential, financial means and research equipment. Apart from development units, alternatively private colleges claim subsidies within the statutory activity.

Poland should restructure the economic strategy within the R&D. Stimulating this kind of activity may be the base of strengthening the position of Polish enterprises. It is connected with the need of substantial financing of this sphere, especially by enterprises. It is necessary to introduce new legal and financial solutions, which will urge on private entrepreneurs to invest in R&D [Barej, 2009, p. 10].

Implementation of the R&D activities is connected with involving the staff potential, which is characterised in Polish conditions by lower than average in the EU participation of researchers in the working population. Moreover, there is minor participation of the R&D workers employed in the sector of enterprises in the total number of researchers working in the country. Features characterising the staff potential of science and technology include [*Program Operacyjny Innowacyjna*…, 2011, p. 36]:

1. lower than average in the EU participation of researchers in the working population,
2. minor participation of R&D workers employed in the sector of enterprises in the total number of researchers working in the country,
3. relatively advanced age of gaining the degree of assistant professor and the title of professor,
4. increasing number of doctorates gained (still lower than the average in EU),
5. multi employment of science workers caused by low payments and boost of educational duties (almost fivefold increase of the number of students since 1990).

4. Measures describing research and development sector [4]

Selection of indicators being an important source of the R&D sector description is limited to indicators, for which comparative statistic information is regularly gathered in cross-section of countries and regions of the Community. The same kind of data is also helpful in the analysis of the situation in the EU regions within the realization of Lisbon Strategy's aims. List of indicators chosen by the European Commission to research the level of expenditures on the R&D includes both cost and performance indices, which are grouped in the following categories: financial, human resources, innovative potential, innovativeness of enterprises and competiveness [*Investing in Research: an Action Plan*…, 2003] and two synthetic indices.

The group of indicators in the financial category include [Gaczek, 2004, p. 6]:

1. participation of gross domestic expenditure on the R&D (GERD) in GDP,

[4] Pointed the indicators which are relevant to the implementation of the Lisbon Strategy.

2. gross domestic expenditure on the R&D (GERD) as % of GDP according to sources of financing (governmental ones, business entities, other domestic sources, foreign sources),
3. business entities' share in expenditure on the R&D (GERD) in total expenditures on the R&D (GERD),
4. participation of the R&D activities executed in favour of enterprises financed by the government,
5. participation of small and medium enterprises (SMEs) in the R&D activities in favour of enterprises' sector and financed by the government.
6. intensity of expenditures on the R&D in particular branches of industry, counted as % of expenditures made to value added.

Indicators in the category of human resources include [Ibid, p. 6-11]:

1. participation of expenditures on higher education in GDP,
2. participation of the R&D and engineering-technical employees to the number of population,
3. working in the R&D sector according to institutional sectors (of enterprises, governmental, higher education) in relation to economically active population,
4. expenditures on the R&D in terms of the R&D employee taking into account institutional sectors,
5. the number of newly promoted Ph.Ds. in relation to the population aged 25--34 per year,
6. the structure of employed in the R&D sector by country of origin (the analysis of the domestic system only).

The group of indicators in the category of innovative potential include [Ibid, p. 12]:

1. patents granted by the European Patent Office (EPO) and the United States Patent and Trademark Office (USPTO),
2. patents granted in the field of high-tech by EPO and USPTO,

Indicators of the enterprises' innovativeness category include:

1. participation in GDP of venture capital funds intended for so called seed and initial capitals necessary for starting new companies,
2. whole economy's participation in seed and initial capitals, those that are dedicated to the development of high-tech sectors,
3. expenditures on innovations in relation to sales in industrial sector,
4. participation of SMEs introducing innovations at home (in % of the total processing industry),
5. participation of SMEs cooperating in the implementation of innovation (in others),
6. balance of payments in the field of technology per person,
7. import and export of hi-tech products per person.

The synthetic indicators include [Gaczek, 2004, p. 7]:

1. synthetic indicator of investing into economy based on knowledge (standardized weighted index based on the following partial indicators: GERD/per capita, the number of researchers per 1,000 economically active, newly promoted Ph.Ds. per 1000 inhabitants, expenditures on education per inhabitant,

participation of population in non-school age taking part in lifelong learning, on line public services' participation, investments in durable property except the construction);

2. synthetic indicator showing the effects of the transition to a knowledge-based economy (standardized weighted index based on the following partial indicators: GDP per working hour, the number of gained patents in EPO and USPTO per 1000 inhabitants, the percentage of companies using the internet to promote their products and services.

According to A.H. Jasiński measures describing the level of innovativeness of the R&D sector may be divided into two basic groups: signs of innovation and innovation basics. The former include: participation of new and modernized as well as technologically advanced products in the industrial production, participation of high-tech products in export, the number of particular country's inventions patented abroad, the number of licences sold abroad. The group of innovation basics include: the number of patent applications in a particular country, the number of granted patents, the number of foreign inventions patented in a particular country, participation of high-tech products in import, the number of licences bought abroad [Jasiński, 2006, pp. 180-183].

5. Human resources in the R&D sector

Human resources is the basic indicator of development, together with the level of education and qualifications, in every field of economy. Within the R&D activity the significance of this factor seems to be superior to other fields of economy. To emphasize the role of the R&D innovation in improving the economy may be, in addition to the educational level of employees, the structure of employment within the sector in the system of work and the types of organizational units.

Intensity of work resources in the R&D sector reflects the indicator of the employed in that sector (with specification of the number of researchers) in relation to the number of economically active. The most important element of human resources deciding about the R&D potential of a region is the level of education of people employed in the R&D sector, as well as the level of education of inhabitants. [5]Employed in the R&D sector work within the three main categories of positions: R&D employees, technicians, equivalent and support staff [Gaczek, 2004, p. 23].

The major significance for the work effects is that of: R&D employees, technicians and equivalent staff. The rate of growth of the number of employees in the whole sector should be bigger due to assumed in the country's development policy transition to a knowledge-based economy. Changes of inner structure in employees category in the R&D sector may be estimated positively, when they show a constant, gradual increase of researchers with the decrease of technicians, equivalent staff and other staff. How-

[5] A higher level of education of the population is a factor of the adaptation new solutions, ideas and innovation. It promotes not only the creation of new solutions, but also the transfer, adoption and implementation of the solutions by new customers, facilitates the learning process companies and institutions, it becomes a condition to the transfer of hidden knowledge.

ever, the decrease in the number of support staff may have disadvantageous effects on work's results [Ibid, p. 24].

Technical equipment of the R&D work, more specifically the level and quality of technical background, of units conducting the R&D activities depend on investment expenditures. It probably has a minor significance for the R&D effectiveness than the quality of work resources, but at the present stage of science development, especially in some fields of technical and natural science, the quality of equipment in machines and devices may have a major significance to scientific development and implementations. The R&D equipment is classified as fixed assets and their value is shown in current prices. While conducting the analysis at the regional level we should take a look at the concentration of research equipment in each region as a percentage of the amount attributable to the country. It often happens that the extent of employment concentration in the R&D activity is lower than the expenditures on this activity.

It should not be concluded that the higher R&D potential of a region, the lower degree of research equipment's attrition in the R&D sector. There is no simple relation between technological equipment of work and a region's R&D potential. Advantage can be gained only by metropolitan regions over regions with very slight R&D potential. Regional differentiation of research equipment's value per worker in connection to the level of its usage allows to conclude about technical equipment of work in the R&D sector [Ibid, p. 29].

6. Description of the R&D sector in the Podlaskie Province

The Podlaskie Province is not characterised by significant research potential, the region does not possess highly developed cooperation with other R&D units in the country or abroad. The R&D potential of the region is characterised by the following structure:

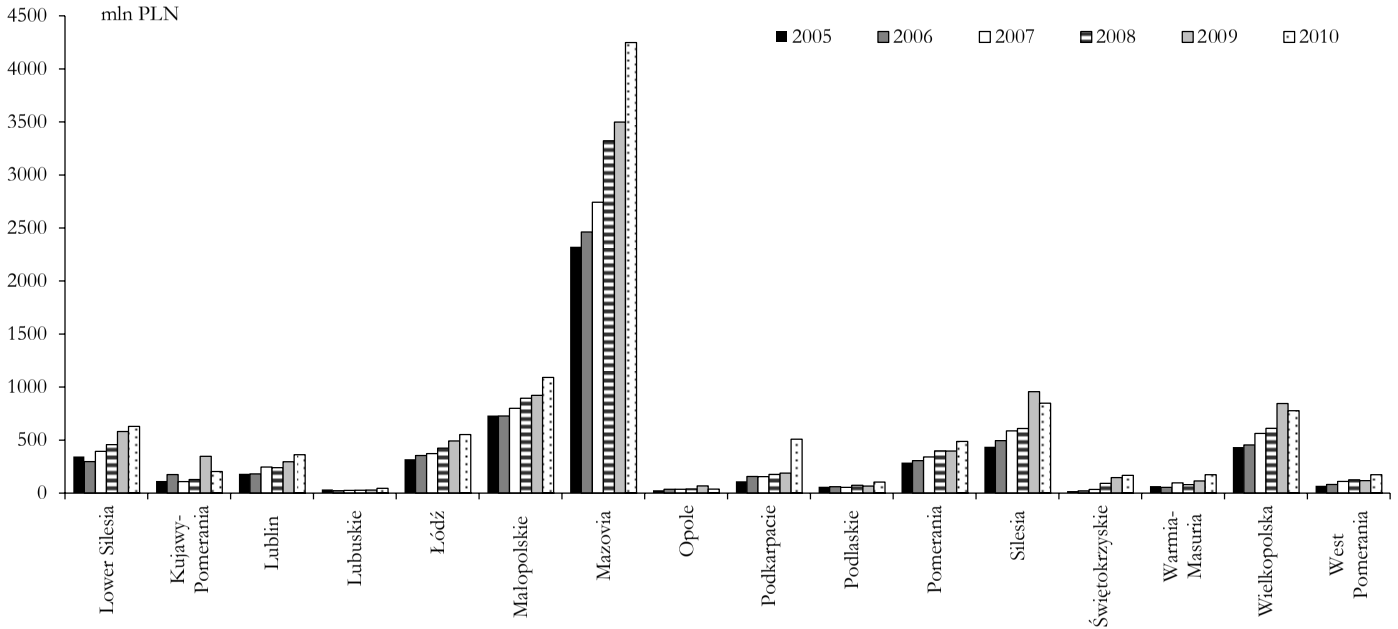
1. number of units conducting R&D activity in the province;
2. number of researchers;
3. amount of expenditure on R&D;
4. number of submitted inventions and obtained patents.

Despite the fact that the region of Podlasie does not belong to the leading ones in terms of innovative potential, statistical data show that the situation has improved in the recent years. Location of the region in the middle position in the country, in terms of the number of expenditures on R&D and the functioning of the R&D units may favour to development of the basis for the system of innovations in the future.

Total expenditure on the R&D activities expressed in current prices in 2010 for the Podlaskie Region reached the level of 103.9 million of PLN. Two regions in the country made lower expenses on that purpose: Opole and Lubuskie. The highest level of expenditures was noted in Mazowiecki Region-4248.7 million of PLN being over 40% of the value on the country level. Analysing the data of the years 2005-2010 these values in the country show an increasing tendency. The Podlasie Province, in spite of 70% increase of expenditure on R&D in the analysed period took the fifth in 2006, to the second in 2009 positions from the end, in the ranking [*Benchmarking regionalny czynników*…, 2012, p. 408] (Fig. 1.).

FIGURE 1.

Total expenditure on the R&D activity (current prices) for provinces during the period 2005-2010



Source: Own study based on: [*Rocznik Statystyczny*…, 2011, s. 56; *Rocznik Statystyczny*…, 2010, s. 52; *Rocznik Statystyczny*…, 2009, s. 51; *Rocznik Statystyczny*…, 2008, s. 51; *Rocznik Statystyczny*…, 2007, s. 107; *Rocznik Statystyczny*…, 2006, s. 105].

TABLE 1.

Expenditures on R&D activities per 1 inhabitant in PLN (current prices) during the period 2005-2010

Province	2005	2006	2007	2008	2009	2010
Polska	**178**	**155**	**175**	**202**	**238**	**273**
Dolnośląskie	145	103	137	159	202	219
Kujawsko-pomorskie	69	85	53	63	168	99
Lubelskie	96	83	114	111	137	168
Lubuskie	40	24	26	28	29	45
Łódzkie	131	138	146	166	194	218
Małopolskie	279	222	244	273	280	330
Mazowieckie	561	476	529	639	670	812
Opolskie	36	35	35	39	66	37
Podkarpackie	67	75	75	85	90	242
Podlaskie	**69**	**51**	**46**	**63**	**56**	**87**
Pomorskie	181	139	154	180	178	219
Śląskie	111	106	126	131	206	183
Świętokrzyskie	17	17	28	72	115	132
Warmińsko-mazurskie	57	39	68	56	81	122
Wielkopolskie	161	135	166	180	248	228
Zachodniopomorskie	53	48	66	74	70	103

Source: own study based on: [*Rocznik Statystyczny*…, 2011, p. 56; *Rocznik Statystyczny*…, 2010, p. 52; *Rocznik Statystyczny*…, 2009, p. 51; *Rocznik Statystyczny*…, 2008, p. 51; *Rocznik Statystyczny*…, 2007, p. 107; *Rocznik Statystyczny*…, 2006, p. 105].

TABLE 2

Expenditures on R&D activities to GDP in % (current prices) during the period 2005-2009

Province	2005	2006	2007	2008	2009
Poland	**0.57**	**0.56**	**0.57**	**0.60**	**0.68**
Dolnośląskie	0.45	0.35	0.41	0.44	0.53
Kujawsko-pomorskie	0.25	0.35	0.20	0.22	0.56
Lubelskie	0.48	0.44	0.54	0.48	0.58
Lubuskie	0.15	0.10	0.09	0.10	0.10
Łódzkie	0.52	0.54	0.51	0.54	0.60
Małopolskie	1.02	0.92	0.92	0.95	0.93
Mazowieckie	1.10	1.07	1.07	1.21	1.19
Opolskie	0.12	0.16	0.14	0.14	0.23
Podkarpackie	0.30	0.39	0.36	0.37	0.37
Podlaskie	**0.27**	**0.25**	**0.20**	**0.26**	**0.21**
Pomorskie	0.52	0.51	0.51	0.57	0.52
Śląskie	0.34	0.36	0.38	0.36	0.55
Świętokrzyskie	0.08	0.08	0.12	0.27	0.42
Warmińsko-mazurskie	0.24	0.18	0.29	0.23	0.31
Wielkopolskie	0.47	0.46	0.52	0.52	0.66
Zachodniopomorskie	0.17	0.19	0.24	0.24	0.22

Source: own study based on: [*Rocznik Statystyczny*…, 2011, p. 56; *Rocznik Statystyczny*…, 2010, p. 52; *Rocznik Statystyczny*…, 2009, p. 51; *Rocznik Statystyczny*…, 2008, p. 51; *Rocznik Statystyczny*…, 2007, p. 107].

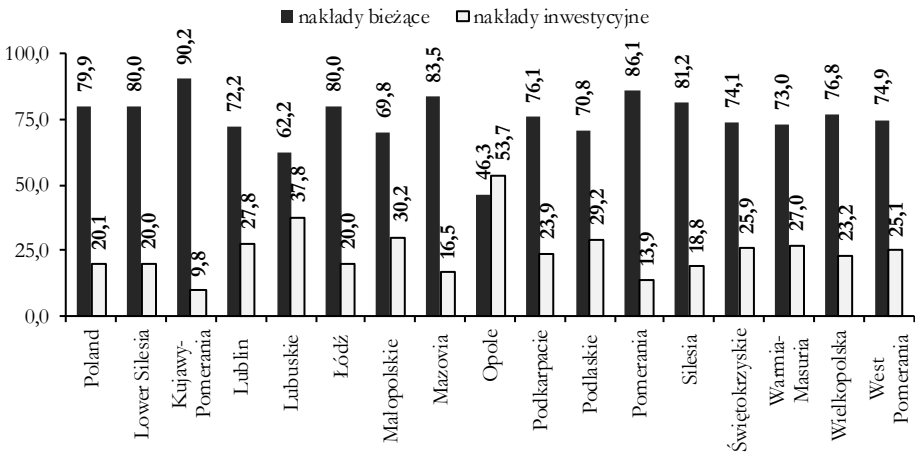
R&D potential characterised, among the others by the amount of expenditures on R&D per an inhabitant (69 PLN in 2005) classifies the region in the last positions in the country. The leading position was taken by Mazowieckie Province and Małopolskie Province. It should be emphasised that expenditures on the R&D per an inhabitant during the period 2005-2010 increased by over 26% in 2010, compared to 2005. Podlaskie Province in 2010 was placed in the third position from the end before Lubuskie Province and Opolskie Province. The biggest increase in the value of expenditure on the R&D activity per an inhabitant in the years 2005-2010 in Podlasie Region was noted between 2009 and 2010 [*Benchmarking regionalny czynników*…, 2012, p. 409] (Table 1).

In 2005, the relation between expenditures on the R&D activities in Podlaskie Province to GDP amounted to 0.27 %, in Poland it was 0.57%. Taking into consideration this indicator Podlasie was placed on the tenth place, the leading position was taken by Mazowieckie Province and Małopolskie Province. In the following periods the indicator showed a decreasing tendency. However, in 2008 compared to the previous year the indicator increased by 0.06 of percentage point. In the same period, the indicator of expenditures on the R&D to GDP in the country amounted to 0.60%. Podlaskie Province took the eleventh place in the country proceeded by the following provinces: Pomorze Zachodnie, Warmia-Mazury, Kujawy-Pomorze, Opolskie and Lubuskie. In the following year the region took the second place from the end, being ahead of Lubuskie Province (Table 2).

While analysing the structure of expenditures on the R&D, it should be noted that in the country, most of them are dedicated to current expenses in comparison to the investments. In 2009, the relation was 80% to 20 % for the country. The biggest participation of investment expenditures in the analysed year took place in the Opole Region, where they exceeded the values of current expenditures. The lowest percentage was noted in the Kujawsko-Pomorski Region [*Benchmarking regionalny czynników*…, 2012 p. 410] (Figure 2.).

Current expenditures on the R&D activity are dedicated for basic and applied research as well as for developmental works. In this respect, the biggest participation in the country's scale is that on developmental works. Applied research is done half as much and basic research participation is lower than developmental works by about 2 percentage points. In territorial division, the biggest percentage of developmental works and applied research (with the lowest of basic research) characterises the following regions: Lower Silesia, Lubuskie and Pomorskie. The reverse situation applies to Podlaskie, Świętokrzyskie and Podkarpackie Provinces. It should be noted that the domination of basic research is characteristic of underdeveloped economies, while in developed countries development and applied research play a leading role. That is this kind of works and research which have the biggest influence on increasing innovativeness of economy. Moreover, the participation of expenditures directed at development works funding, accounts for the proximity of the R&D activity and the market. The desired relationship of three types of studies is the ratio of 1:2:3, starting from basic research, and ending with the development work. In Poland, there is still far too high proportion of basic research and too little development and applied research [*Benchmarking regionalny czynników*…, 2012 p. 411] (Fig. 3.).

FIGURE 2.
The structure of expenditures on the R&D according to main categories in provinces in 2009 (in %)



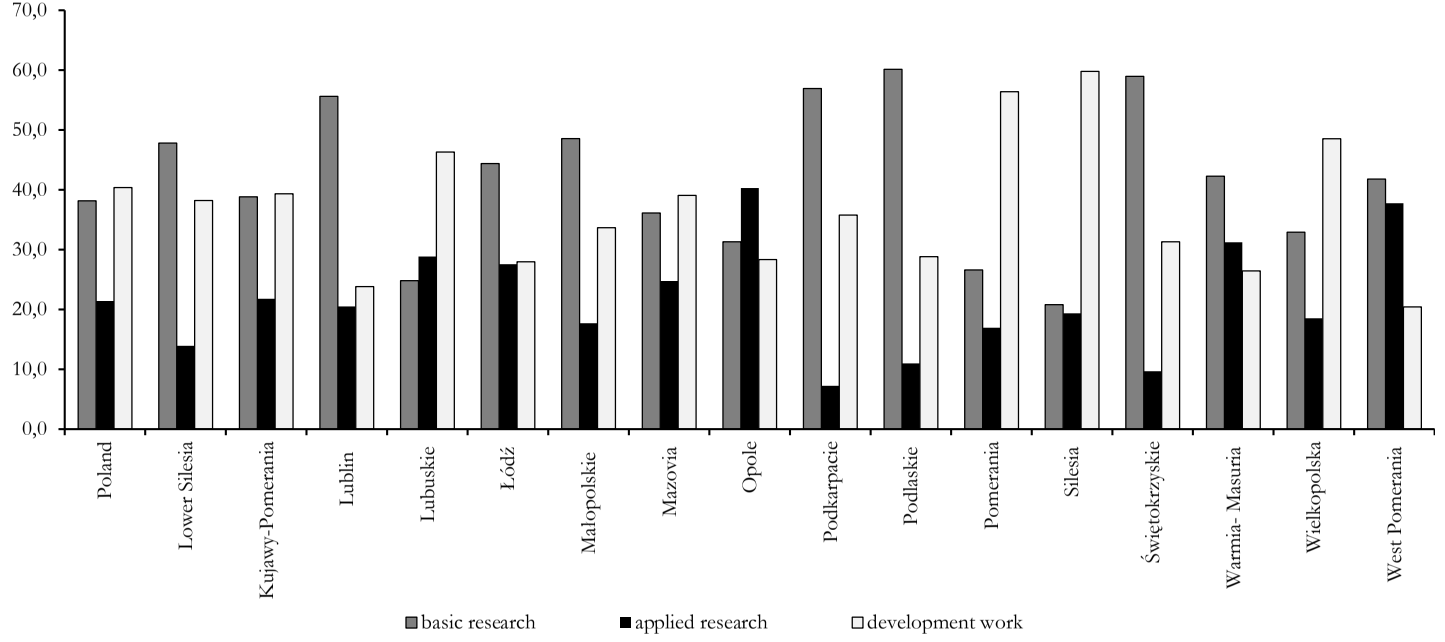
Source: own study based on: [*Nauka i technika*…, 2011, p. 192].

The indicator of researchers per 1000 economically active people, in 2005 amounted to 2.6, in connection to that the region took the eleventh place in the country (about 4.5% of employed in Poland). In the following year the number of the employed in this activity increased, then a slight decrease in the next year was noted and in 2009 the region was on the eighth position in the country with the indicator of 2.9 (Poland had the indicator of 4.3) of the employed researchers. In 2010 there was a slight drop of the indicator to the level of 2.8, with the increase for the country to 4.6 [*Benchmarking regionalny czynników*…, 2012, p. 412-413] (Table 3.).

Development of the R&D activity, apart from the level of funding and human resources also depends on the level of equipment. The rate of equipment classified as fixed assets expressed in current prices as at the last day of the year, and the meter indicating the level of consumption given in % is used to determinate this factor. The value of equipment in Poland during the period 2007-2009 was systematically growing from the level of 5 878 million PLN to 6 956 million PLN (18% increase). The degree of its usage was at the level of 74-78%. The highest value of R&D units equipment was noted in Mazowieckie and Małopolskie Provinces (from PLN 2 496 m in 2007 to PLN 2 807 m in 2009 in Mazowieckie Province and from PLN 745 m in 2007 to PLN 758 m in 2009 in the Małopolskie Province. The lowest value of equipment was characteristic for Lubuskie and Swiętokrzyskie Provinces (PLN 6.6-13 m for the Lubuskie Province and PLN 9.2 – 23.9 m for the Świętokrzyskie Province). In 2009 the most tattered equipment was in the Podlaskie Province (in 95.5%), and the least tattered in Lubelskie Province (53.5%). During the period 2008-2009 the Region of Podlasie was placed in the third position from the end, and in 2008 together with Kujawsko-Pomorskie, being ahead of Lubuskie and Opolskie (Fig. 4 and 5).

FIGURE 3.

The structure of the current expenditure on the R&D by type of activity in the provinces – the average during the period 2007-2009 (in millions PLN)



Source: own study based on: [*Nauka i technika*…, 2011, s. 193-194; *Nauka i technika*…, 2010, s. 122-123; *Rocznik Statystyczny*…, 2010, http://www.stat.gov.pl/bialystok/69_797_PLK_HTML. htm; *Nauka i technika*…, 2009, s. 111].

TABLE 3.

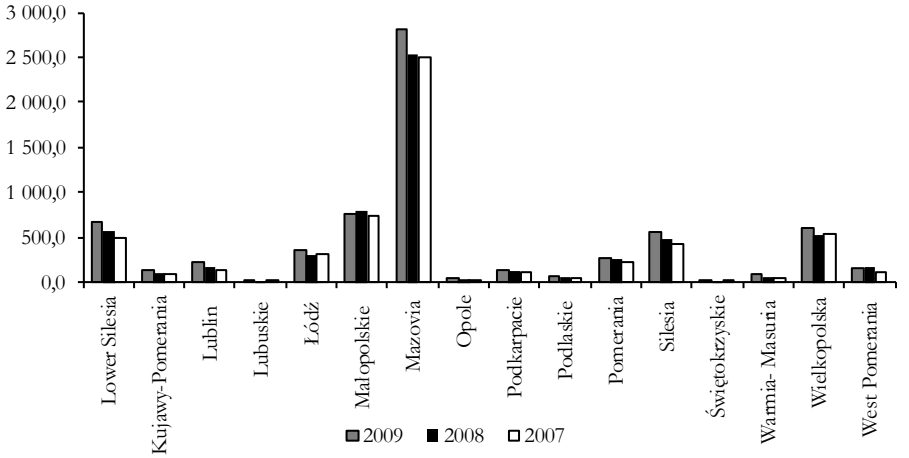
The employment in the R&D per 1000 economically active people during the period 2005-2010

Province	2005	2006	2007	2008	2009	2010
Poland	4.5	4.3	4.4	4.3	4.3	4.6
Dolnośląskie	4.0	3.8	4.6	4.7	4.7	4.2
Kujawsko-pomorskie	3.1	3.4	3.7	3.6	2.9	3.0
Lubelskie	3.2	3.3	3.1	3.1	2.8	3.0
Lubuskie	1.9	1.6	1.7	1.8	1.5	—
Łódzkie	3.2	3.4	3.2	2.9	3.2	3.2
Małopolskie	6.9	5.4	5.8	5.3	5.1	6.2
Mazowieckie	10.7	9.8	9.6	9.2	9.3	10.4
Opolskie	2.3	2.4	2.4	2.1	2.2	2.3
Podkarpackie	1.6	1.7	1.6	1.6	1.6	4.2
Podlaskie	**2.6**	**2.8**	**2.4**	**2.8**	**2.9**	**2.8**
Pomorskie	5.5	5.4	5.0	4.2	5.0	4.8
Śląskie	3.4	3.5	3.3	3.7	3.5	3.5
Świętokrzyskie	1.3	1.2	1.2	1.3	1.7	1.7
Warmińsko-mazurskie	2.0	2.0	2.0	2.1	2.0	2.2
Wielkopolskie	3.6	3.5	4.6	4.7	4.1	4.3
Zachodniopomorskie	2.8	3.4	3.2	3.1	2.5	—

Source: Own study based on: [*Rocznik Statystyczny*…, 2010, p. 53; *Rocznik Statystyczny*…, 2009, p. 52; *Rocznik Statystyczny*…, 2008, p. 52; *Rocznik Statystyczny*…, 2007, p. 108; *Rocznik Statystyczny*…, 2006, p. 106].

FIGURE 4.

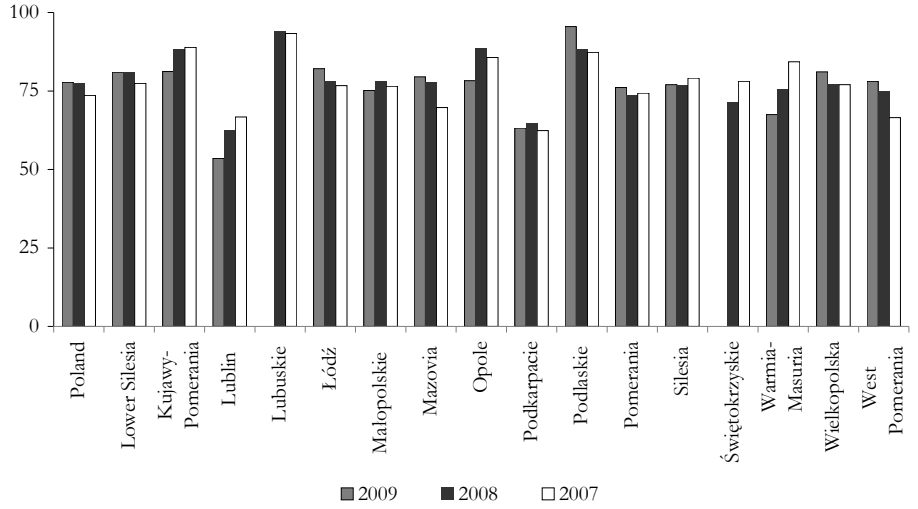
The value of the R&D equipment classified as fixed assets in Poland, in the provinces during the period 2007-2009 (current prices in millions of PLN)



Source: own study based on: [*Nauka i technika*…, 2011, p. 199-200; *Nauka i technika*…, 2010, p. 124; *Nauka i technika*…, 2009, p. 112].

FIGURE 5.

Degree of the R&D equipment attrition in Poland in the provinces (current prices in millions PLN) during the period 2007-2009



Source: Own study based on: [*Nauka i technika*…, 2011, p. 199-200; *Nauka i technika*…, 2010, p. 124; *Nauka i technika*…, 2009, p. 112].

TABLE 4.

Submitted inventions during the period 2007-2010

Province	2007	2008	2009	2010
Poland	**2392**	**2488**	**2899**	**3203**
Dolnośląskie	323	280	287	320
Kujawsko-pomorskie	94	82	115	124
Lubelskie	104	127	137	124
Lubuskie	14	28	23	28
Łódzkie	153	157	177	212
Małopolskie	186	204	258	310
Mazowieckie	474	499	644	701
Opolskie	45	65	75	70
Podkarpackie	55	85	70	82
Podlaskie	**34**	**48**	**50**	**56**
Pomorskie	130	140	216	201
Śląskie	406	383	374	436
Świętokrzyskie	53	48	47	49
Warmińsko-mazurskie	46	30	35	60
Wielkopolskie	189	218	282	314
Zachodniopomorskie	86	94	109	116

Source: Own study based on: [*Rocznik Statystyczny*…, 2010, p. 51; *Rocznik Statystyczny*…, 2009, p. 51; *Rocznik Statystyczny*…, 2008, p. 51].

In terms of the number of inventions submitted, the Podlaskie Region does not fall quite well in comparison with other Polish regions. There has been a reported increase

in the number of inventions, but in 2009 Podlaskie came in the thirteenth place among the 16 provinces. Compared to 2007, this is unmistakable advancement as the region was in the fifteenth place, and a year later – in the thirteenth. In 2009, a smaller number of inventions was submitted only from the provinces: Świętokrzyskie, Warmińsko-mazurskie and Lubuskie, which are the regions with one of the lowest GDP and lower growth potential in the country. The frequency of patent applications in the Podlaskie Region in 2009 compared to 2008 (104.2) was smaller than the national average (116.5%). This was the case also in the year 2010. The increase in the number of submitted inventions by 12% compared to 2009, did not lead to a change in the ranking position of the region as the region still took third from the end [*Benchmarking regionalny czynników*…, 2012, p. 416] (Table 4.).

TABLE 5.

Granted patents in the years 2007-2010

Province	2007	2008	2009	2010
Poland	1575	1451	1536	1385
Dolnosląskie	219	153	170	146
Kujawsko-pomorskie	42	49	53	35
Lubelskie	79	73	60	55
Lubuskie	12	10	18	7
Łódzkie	107	99	115	94
Małopolskie	154	140	141	164
Mazowieckie	391	377	339	326
Opolskie	42	43	34	28
Podkarpackie	44	48	45	32
Podlaskie	**14**	**11**	**15**	**11**
Pomorskie	62	49	78	81
Ślaskie	236	240	274	233
Świętokrzyskie	22	27	37	25
Warmińsko-mazurskie	22	13	9	18
Wielkopolskie	92	87	105	95
Zachodniopomorskie	37	32	43	35

Source: Own study based on: [*Rocznik Statystyczny*…, 2011, p. 55; *Rocznik Statystyczny*…, 2010, p. 51; *Rocznik Statystyczny*…, 2009, p. 51; *Rocznik Statystyczny*…, 2008, p. 51].

In terms of patents granted during the period 2007-2010, the Region of Podlasie was on the penultimate place in Poland. Lubuskie and Warmińsko-mazurskie Provinces gained weaker results. The Region of Podlasie in 2007 was awarded with 14 patents, in 2008 and 2010 with 11, and in 2009 with 15. Comparing the data to national data, patents granted to the Region of Podlasie are 0.98% of all patents in Poland, which is evidence of the low level of innovation in the region and on a number of shortcomings in this area [*Benchmarking regionalny czynników*…, 2012, p. 417] (Table 5.).

7. Conclusions

The level and method of financing the R&D sector in Poland is characterized by a relatively low share of expenditure on the R&D activities, the domination of the public sector financed and a low spending on applied research and development work. Poland is among the group of countries with the highest share of basic research in the overall structure of research.

The Podlaskie Province is characterized by a slight potential of research and insufficiently well-developed scientific cooperation with other units in the R&D area in the country and abroad. The structure of the R&D potential of the region consists of a number of units engaged in researches in the R&D sector and the number of researchers, the amount of investment in the R&D activities, the number of inventions and patents.

The amount of expenditure on the R&D activities in spite of their growth in the region, during the period 2006-2010 did not contribute to occupy the leading position by Podlaskedie, a similar case was concerning the investment in the R&D activities per 1 inhabitant. In Poland, the most part of these expenditures is spent on current expenditure compared to investments. This still outweighs the percentage of basic research and too small applied research and development work.

The Podlaskie Province with a number of research employees takes the center position in the country, but in terms of abundance of equipment found takes the ending position in the country. According to the number of registered inventions, Podlaskie Province region is also not good in comparison with other Polish regions, the number of patents granted ranked the region in the next to last place in Poland.

It is possible to improve the situation that could contribute the cooperation between the R&D sector and local government institutions or cooperation in the innovation area between universities and companies. The low activity of the entities in the technology transfer would need to support of the companies through their involvement in the sale of a new technical solutions.

Poland should be the one of the most attractive place for the localization of the R&D centers, due to the large supply of highly qualified staff, or economic and technical fields. The investments in a of the R&D sector, in the innovation area it is the ability of creating more jobs. Furthermore, it is an opportunity for knowledge-based economy developing. Perhaps if there would not be the increasing the spending on the R&D centers, Poland will stay in the last places in the European Union. Therefore, it may lose the opportunity to develop the of R&D sector, which determines the whole economy development.

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ЧЕЛОВЕЧЕСКИЙ ПОТЕНЦИАЛ РАЗВИТИЯ АГРОТУРИСТИЧЕСКОЙ ДЕЯТЕЛЬНОСТИ НА ТЕРРИТОРИИ МИНСКОЙ ОБЛАСТИ

Аннотация

В статье проанализирована общая характеристика социально-экономической ситуации Минской области и выявлены возможности дальнейшего развития агротуристической деятельности среди сельских жителей области.

Ключевые слова: агротуризм, Минская область, домашние хозяйства, экономически неактивное население, экономически активное население, агротуристические усадьбы, плотность населения

POTENTIAL DEVELOPMENT OF RURAL TOURISM IN MINSK REGION

Summary

The article analyzes the general characteristics of the socio-economic situation in the Minsk Region and identify opportunities for further development of rural tourism in activities among rural residents.

Keywords: agro-tourism, the Minsk region, households, population inactive economically, population active economically, farm tourism, population density

1. Введение. Постановка проблемы.

Агротуризм в Минской области с каждым годом набирает популярность. По информации управления физической культуры, спорта и туризма Миноблисполкома, в 2011 году агроусадьбы района посетило около 45,4 тыс. человек, что на 5 тыс. больше, чем в 2010-м [Лучшие агроусадьбы... 2012]. В 2012 году количество объектов агроэкотуризма в Минской области увеличилось на 19,8% и составило 406 усадеб. Наибольшее количество агроусадеб функционирует в Минском, Мядельском, Логойском, Воложинском районах Минской области.

Сельские территории обладают богатым природным, демографическим, экономическим и историко-культурным потенциалом. В области реализуются различные проекты и программы по укреплению производственного и инфраструктурного потенциала районов, развития их экономики, повышения занято-

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сти и доходов сельского населения, улучшения жилищных условий и социальной среды. Вместе с тем принятых мер недостаточно для полного и эффективного использования потенциала сельских территорий. Современная социально-экономическая и демографическая ситуация на селе указывает на ряд проблем сельских территорий. Характерными чертами появления проблем являются уровень безработицы, неактивное трудоспособное население, низкий уровень трудоспособного сельского населения и низкий образовательный уровень населения.

Цели исследования. Главной целью данного исследования является характеристика социально-экономической ситуации районов Минской области и обоснование целесообразности использования агротуризма для активизации сельского населения Минской области.

2. Анализ последних исследований и публикаций

Проблематика развития агротуризма приобрела в последнее время значительный интерес среди научных исследователей. В Беларуси наработки в изучении различных аспектов агротуризма имеют А. Г. Авдей, В. Н. Высотенко, Л. М. Гайдукевич, И. С. Гапонюк, А. Н. Грицовец, А. П. Дурович, Н. Н. Зуева, В.Н. Зуев, О. В. Коробкина, Е. Н. Мешечко, Т.Т. Бизюкова, С.А. Лученок [Кацубо, 2005, с. 112-115; Лученок, 2008, 198с.]. Вместе с тем исследования по данной проблематике являются фрагментарными, не имеют системного характера и требуют дальнейшего углубления.

3. Методы научного исследования.

Для проведения научного исследования важным будет определение главных элементов проблемы и их анализ. В результате теоретических исследований литературы были определены следующие главные элементы: агротуристические усадьбы и сельские жители (трудовые ресурсы). Взаимосвязь между двумя элементами заключается в получении дохода от реализации агротуристической деятельности сельскими жителями в сельской местности. В работе будет рассмотрена центральная часть Республики Беларусь – Минская область, включающая 22 района, а также дана характеристика основных элементов проблемы. В результате сопоставления элементов были выявлены взаимосвязи, которые привели к обоснованию целесообразности использования агротуризма для активизации и развития сельского населения Минской области.

4. Изложение основного материала.

«Агротуризм – это вид деятельности, организуемый в сельской местности, при котором формируются и предоставляются для приезжих гостей комплексные

услуги по проживанию, отдыху, питанию, экскурсионному обслуживанию, организации досуга и спортивных мероприятий, занятиям активными видами туризма, организации рыбалки, охоты, приобретению знаний и навыков. Агротуризм ориентирован на использование сельскохозяйственных, природных, культурно-исторических и иных ресурсов сельской местности и ее специфики для создания комплексного туристского продукта» [*Ассоциации содействия*…, 2013].

Исходя из данного определения основным ресурсом развития агротуризма в сельской местности является трудовой ресурс. Трудовые ресурсы – это население, обладающее физическими и интеллектуальными способностями, необходимыми для участия в трудовой деятельности (агротуристической деятельности).

Данное определение свидетельствует о том, что в сельском туризме может участвовать каждый сельский житель, который будет иметь знания и возможности по предоставлению дополнительных услуг туристам.

Большая часть трудовых ресурсов – это население в трудоспособном возрасте (женщины от 16 до 55 лет, мужчины от 16 до 60 лет), но также и работающие лица пенсионного возраста, и работающие подростки в возрасте до 16 лет.

Качественные характеристики трудовых ресурсов неразрывно связаны с такими понятиями как человеческий потенциал и трудовой потенциал.

Человеческий потенциал – это совокупность качеств конкретного индивида, сформировавшаяся под воздействием социальных сил и взаимодействия общества и личности.

Трудовой потенциал, как подсистема социально-экономического потенциала региона, представляет собой «форму, в которой происходит становление и функционирование личного фактора производства на разных уровнях организации общественного производства» [Татаркина, 2000, 504 с]. То есть, по форме трудовой потенциал выступает многогранным социально-экономическим показателем, характеризующим численность трудового населения, его структуру, образовательный уровень.

Трудовой потенциал любой страны (региона) характеризуется совокупной способностью её трудовых ресурсов к производству максимально возможного в данных экономических и социальных условиях объема продуктов и услуг, необходимых для удовлетворения потребностей и обеспечения поступательного развития экономики [*Развитие понятия*…, 2013].

Факторами, определяющими трудовой потенциал страны в современных условиях, являются: рост численности и качества трудовых ресурсов; рационализация их распределения по профессиям, видам деятельности, территориям, секторам экономики; повышение эффективности использования трудовых ресурсов, повышение удельного веса экономически активного населения в численности трудовых ресурсов, а также доли занятых в численности экономически активного населения и другие факторы.

"Под экономической активностью можно понимать сознательную деятельность человека по управлению принадлежащими ему экономическими ресурсами с получения дохода. В этом смысле к видам экономической активности человека

можно отнести трудовую как физическую, так и интеллектуальную деятельность по найму, предпринимательскую деятельность, деятельность в личном подсобном хозяйстве, поскольку она приносит доход в натуральной форме" (А.Е. Курило).

Экономически неактивное население – это население, которое не входит в состав рабочей силы. Сюда включаются: учащиеся и студенты; пенсионеры; лица, получающие пенсии по инвалидности; лица, занятые ведением домашнего хозяйства; лица, которые прекратили поиски работы, исчерпав все возможности ее получения, но которые могут и готовы работать; другие лица, которым нет необходимости работать независимо от источника дохода.

Учитывая вышеизложенное, считаем целесообразным внести в понятие трудового потенциала ряд уточнений, что позволит, с нашей точки зрения, осуществлять его реальную оценку, а именно:

- с количественной стороны – численность населения, численность населения в трудоспособном возрасте, численность экономически активного населения, численность трудовых ресурсов (в том числе по годам);
- с качественной стороны – продолжительность трудоспособного возраста, уровень жизни населения, соотношение групп населения трудоспособного возраста, моложе трудоспособного возраста и старше трудоспособного возраста, миграция населения.

Трудовой потенциал региона определим как взаимосвязанную совокупность количественных и качественных характеристик населения региона, способного заниматься трудовой деятельностью, обеспечивающее достижения производственных целей в конкретных социально-экономических условиях с учетом научно-технического прогресса [*Развитие понятия*…, 2013].

Из выше изложенного следует, что эффективное использование трудовых ресурсов возможно путем включения их в трудовую деятельность, в процессе которой непосредственно реализуется способность людей к труду.

Для обеспечения эффективности управления трудовыми ресурсами могут применяться такие методы как:

- профессиональная ориентация;
- планирование профессионального пути;
- методы социально-трудовой адаптации;
- мониторинг в социально-трудовой сфере;
- целенаправленное воздействие государства на спрос и предложение на рынке труда;
- трудоустройство с помощью органов трудоустройства населения [*Трудовые ресурсы*…, 2013].

Следовательно, развитие агротуризма будет зависеть от качественной и количественной стороны трудовых ресурсов, которые входят в данный момент в категорию экономически активного (безработные) и неактивного населения, но которые в будущем могут способствовать социально-экономическому развитию сельской местности, в результате участия в агротуристической деятельности.

Развитию агротуризма также могут способствовать низкие доходы экономически активного населения и высокий уровень безработицы в сельской местности.

Анализ статистических данных позволяет проанализировать общую социально-экономическую ситуацию Минской области и выявить трудовые ресурсы, способные реализовывать агротуристическую деятельность в районах Минской области.

В сфере агротуризма в Минской области на 01.01.2011 года было зарегистрировано 271 агротуристическое хозяйство.

ТАБЛИЦА 1.

Количество агротуристических усадеб по районам Минской области на 01.01.2011

№	Районы	Агротуристические усадьбы	Население (тыс.) 2009	Площадь (тыс.км 2)
1.	Березенский	8	25,0	1,9
2.	Борисовский	11	188,1	3
3.	Вилейский	8	52,1	2,5
4.	Воложинский	25	37,5	1,9
5.	Дзержинский	11	61,3	1,2
6.	Клецкий	1	32,3	0,974
7.	Копыльский	3	32,8	1,6
8.	Крупский	4	26,5	2,1
9.	Логойский	17	36,0	2,4
10.	Любанский	1	35,4	1,9
11.	Минский	68	159,6	2
12.	Молодечненский	13	138,4	1,4
13.	Мядельский	38	29,6	1,967
14.	Несвижский	3	41,6	0,863
15.	Пуховичский	13	69,4	2,4
16.	Слуцкий	6	95,1	1,8
17.	Смолевичский	11	104,6	1,4
18.	Солигорский	7	136,1	2,5
19.	Стародорожский	2	21,9	1,4
20.	Столбцовский	10	42,0	1,9
21.	Узденский	6	23,7	1,2
22.	Червенский	5	33,4	1,6
	Итого	271	1422,4	39,904

Источник: [*Трудовые ресурсы*…, 2013; *Районы Минской области*…, 2013].

Согласно представленной таблице 1 в Минской области наиболее заселенными районами являются: Борисовский, Минский, Молодечненский, Смолевичский. Наибольшую площадь 2,4-3,0 тыс. кв.м в Минской области занимают районы: Борисовский, Солигорский, Вилейский, Логойский, Пуховичский. Следова-

тельно, в районах Солигорский, Вилейский, Логойский и Пуховичский необходимо проводить политику по улучшению демографической ситуации. Данные представленные выше свидетельствуют, что плотность населения в районах с наибольшей численностью агротуристических усадеб составляют: Минский район – 83 человека на 1 кв.м., Воложинский район – 21 человек на 1 кв.м., Мядельский район – 15 человек на 1 кв.м.

ТАБЛИЦА 2.

Количество жителей Минской области и г. Минска (с 2009 по 2012 год, тыс. жителей)

Область	2009	2010	2011	2012[2)]	Площадь тыс.км^2
Беларусь	9513,6	9500,0	9481,2	9465,2	207,6
Область и город:					
Брестская	1404,5	1399,2	1394,8	1391,5	32,7
Витебская	1237,5	1229,4	1221,8	1214,0	40,0
Гомельская	1443,2	1439,2	1435,0	1429,7	40,4
Гродненская	1076,7	1071,3	1065,9	1061,3	25,1
Город Минск	1814,3	1843,7	1864,1	1885,1	0,35
Минская	1431,1	1419,9	1411,5	1403,5	39,9
Могилевская	1106,3	1097,3	1088,1	1080,1	29,1

Источник: [*Статистическая информация*…, 2013].

Средняя плотность населения в Минской области составляет 35 человек на 1 кв.м. Средняя плотность населения в Республике Беларусь составляет 45,6 человек на 1 кв.м (табл.2). Следовательно, наиболее перенаселенным районом Минской области является Минский район (83 человека на 1 кв.м.), что существенно влияет на экономическую ситуацию района (эмиграция в город, рост уровня безработицы, уменьшение уровня заработной платы и др.).

ТАБЛИЦА 3.

Демографическая ситуация Минской области

Показатели	2008	2009	2010
Количество населения (на начало года) тыс.	1440,7	1431,1	1419,9
Городское	787,0	789,0	787,5
Сельское	653,7	642,1	632,4
Общий показатель рождаемости (на 1000 человек населения)	11,2	11,6	11,8
Общий показатель смертности (на 100 человек населения)	16,0	16,2	16,4
Уровень зарегистрированной безработицы (на конец года), в процентах к экономически активному населению	0,8	0,8	0,7

Источник: [*Статистическая информация*…, 2013].

Анализируя данные таблицы 3 можно сделать вывод, что 44,5% (в 2010 г.) населения Минской области составляло сельское население. Количество сельского населения с каждым годом уменьшается 0,67% (в 2009 г.), и 1,44% (в 2010 г.), что свидетельствует о необходимости проведения новых программ по улучшению социально-экономической ситуации в сельской местности. Одним из направлений улучшения социально-экономической ситуации может быть создание условий для развития агротуризма (проведение обучающих семинаров, создание информационных центров, улучшение туристической инфраструктуры и т.д.). Уровень регистрируемой безработицы в области является небольшим и составляет 0,7-0,8%, что может указывать на сезонный (регистрируемый) или скрытый (не регистрируемый) вид безработицы. Показатель рождаемости и смертности в Минской области увеличивается каждый год на 0,2 – 0,4%.

В сравнении с другими областями Республики Беларусь демографическая ситуация выглядит таким образом: Брестская область – количество сельских жителей составляло 34% (2010 г.), миграция -0,7% (2010 г.); Витебская область – количество сельских жителей составляло 27% (2010 г.), миграция -1,4% (2010 г.); Гомельская область – количество сельских жителей составляло 27% (2010 г.), миграция 1,35% (2010 г.); Могилевская область – количество сельских жителей составляло 24% (2010 г.), миграция -1,54% (2010 г.).

Анализируя выше представленные данные, можно сделать вывод, что Минская область находится на первом месте по количеству сельского населения и имеет небольшой процент миграции населения в сравнении с другими областями Республики Беларусь. Эти данные указывают на высокий трудовой ресурс сельской местности Минской области. Чтобы количество трудового ресурса в Минской области не уменьшалось с каждым годом в результате миграции, необходимо на наш взгляд создание социально-экономических условий для развития и реализации агротуризма.

Согласно последним официальным статистическим данным агротуристические хозяйства образовались в 95% случаях в результате семейного интереса. Следовательно один агротуристический объект включает в себя целую семью, которая участвует в его деятельности. Данный показатель свидетельствует о необходимости проведения количественного анализа состава семей проживающих в сельской местности [*Агротуризм в Беларуси*…, 2011], с целью определения среднего количества участников в функционировании одного агротуристического объекта.

Данные о количестве домашних хозяйств в зависимости от численности лиц в семье в областях Республики Беларусь и г. Минске, согласно статистической переписи населения в 2009 году, представлены в таблице:

ТАБЛИЦА 4.

Количество хозяйств согласно численности лиц в семье

Область	Общее количество домашних хозяйств	В том количестве домашние хозяйства, состоящие из				
		1 человека	2 человек	3 человек	4 человек	5 и более человек
Беларусь	3 873 139	1 148 527	1 081 984	854 187	538 395	250 046
Область и город:						
Брестская	558 642	160 592	155 509	117 019	82 646	42 876
Витебская	523 637	162 162	157 074	117 028	61 721	25 652
Гомельская	598 374	182 828	169 144	130 713	80 633	35 056
Гродненская	442 915	136 610	123 977	93 110	61 925	27 293
Город Минск	734 191	215 566	183 489	174 096	110 743	50 297
Минская	575 406	170 446	164 015	120 263	79 719	40 963
Могилевская	439 974	120 323	128 776	101 958	61 008	27 909

Источник: [*Статистическая информация*…, 2013].

Анализируя данные таблицы 4 можно сделать вывод, что Минская область по количеству семей находится на втором месте после Гомельской области. Наибольшее количество домашних хозяйств в Минской области состоит из одного человека, на втором месте находится семья из двух, на третьем из трех, на четвертом из четырех, на пятом из пяти и более лиц. По-другому обстоит дело в Могилевской области, где на первом месте находятся семьи, состоящие из двух человек.

Подобная тенденция наблюдается в сельской местности, домашнее хозяйство состоит из одного человека в 34,4% случаях, из двух – 30,1%, из трех – 16,5%, из четырех – 11,7%, из пятерых и более – 7,3%.

В городах и городских поселках зарегистрировано 2 832 тыс. домашних хозяйств, что составляет 73%, в сельской местности – 1 041 тыс. домашних хозяйств, что составляет 27% домашних хозяйств.

Средний состав домашнего хозяйства в Беларуси составил 2,4 человека, в местности городского типа – 2,5 человека, в сельской местности – 2,3 человека. В соответствии с данными переписи населения Беларуси за 1999 год, средний состав домашнего хозяйства составлял – 2,6 человека, в местности городского типа – 2,7 человека, в сельской местности – 2,4 человека.

Уменьшение среднего состава домашних хозяйств в Беларуси с 2,6 до 2,4 человека согласно статистическим данным, наступило в результате роста домашних хозяйств, состоящих из одного или двух человек (от 52% в 1999 до 58% в 2009 г.) и уменьшении домашних хозяйств, состоящих из четырех и более человек (соответственно от 25% до 20%). Эти данные свидетельствуют об уменьшении натурального прироста, так как с каждым годом растет количество семей состоящих из двух человек, и уменьшается количество многодетных семей.

Данные представленные выше свидетельствуют, что среднее количество участников (трудовые ресурсы) в функционировании одного агротуристического объекта составляет 2,3 человека.

Для вычисления среднего количества участников в функционировании агротуристических объектов Минской области, необходимо найти произведение между количеством агротуристических хозяйств в Минской области (271) и средним составом домашних хозяйств в сельской местности (2,3). В результате вычисления – среднее количество трудовых ресурсов в агротуристических объектах Минской области составило 623,3 человека. В результате таких же вычислений определим среднее количество трудовых ресурсов в районах с наибольшим количеством агроусадеб: Минском районе (156,4), Мядельском районе (87,4), Воложинском районе (57,5). Согласно официальным статистическим данным за 2010 год доход от осуществления агротуристической деятельности в Минской области составил около 4 млрд. рублей.

Ситуацию в агротуризме Беларуси можно представить следующим образом, с 2006 до 2011 года количество агротуристических хозяйств выросло с 34 до 1576. Для вычисления среднего количества участников в функционировании агротуристических объектов Беларуси в 2010 году используем произведение между количеством агротуристических хозяйств в Беларуси (1247) и средним составом домашних хозяйств в Беларуси (2,4). В результате вычисления – среднее количество трудовых ресурсов в агротуристических объектах Беларуси составило 2993 человека, общее количество дохода от агротуристической деятельности в Беларуси в 2010 году составило 10 млрд. рублей. Показатели дохода от агротуристической деятельности и среднее количество трудовых ресурсов, вовлеченных в функционирование агротуристических объектов, свидетельствуют о высоком уровне доходности от реализации этой деятельности, и являются стимулирующим показателем для других трудовых ресурсов домашних хозяйств, которые являются безработным или экономически неактивным населением [*Агротуризм в Беларуси*…, 2011].

Анализируя данные таблицы 5 можно сделать следующий вывод, что наибольшее количество сельских жителей проживает в следующих районах области: Минском, Борисовском, Пуховичском, Молодечненском, Слуцком; наименьшее количество в районах: Стародорожском, Березинском, Узденском. Наибольшая регистрируемая безработица в районах: Березинском (3,3%), Борисовском (3,3%), Крупском (3,3%), Молодечненском (3,1%), Минском (3,0%). Средний уровень безработицы в области составляет 2,5%. Наибольшее количество экономически неактивного населения находится в районах: Воложинском (46,5%), Березинском (46%), Вилейском (46%), Копыльском (44,9%), Солигорском (44,6%), Мядельском (44,3%). Средняя численность экономически неактивного населения в области составляет 36,4%. К экономически неактивному населению сельской местности относятся следующие группы людей [*Развитию агропредпринимательства*…, 2013]:

– учащиеся: 24 920;
– лица, ожидающие начала сезонной работы: 3 355;

- лица, переходящие на пенсию: 163 853;
- лица, ведущие домашнее хозяйство, являются опекунами детей или других членов семьи: 12 711;
- лица, не работающие в соответствии с состоянием здоровья: 16 145;
- лица, без возможности нахождения работы: 984;
- лица, без потребности в работе или желания работать: 6 393.

ТАБЛИЦА 5.
Экономически активное и неактивное сельское население в районах Минской области 2009 года

№	Районы	Количество сельских жителей	Экономически неактивное население	Экономически активное население	
				Работающие	Безработные
1.	Березинский	13 011	5 991	4 637	426
2.	Борисовский	40 761	15 089	18 762	1 335
3.	Вилейский	25 217	11 612	9 416	696
4.	Воложинский	22 665	10 546	8 953	280
5.	Дзержинский	22 388	7 824	10 482	460
6.	Клецкий	21 541	8 632	9 456	444
7.	Копыльский	22 880	10 266	8 856	356
8.	Крупский	15 234	6 617	5 841	504
9.	Логойский	19 210	8 153	7 852	488
10.	Любанский	21 020	8 869	8 256	487
11.	Минский	137 989	32 608	70 000	4 199
12.	Молодечненский	38 575	13 389	17 816	1 211
13.	Мядельский	17 250	7 648	6 837	384
14.	Несвижский	23 486	8 590	10 739	342
15.	Пуховичский	38 847	13 572	17 677	1 005
16.	Слуцкий	33 662	14 366	13 744	771
17.	Смолевичский	26 683	8 696	12 950	662
18.	Солигорский	23 976	10 696	8 804	675
19.	Стародорожский	10 901	4 479	4 480	228
20.	Столбцовский	26 640	11 148	11 312	524
21.	Узденский	13 973	5 634	6 158	294
22.	Червенский	18 579	6 838	8 037	338
	Итого	634 480	231 263	281 065	16 109

Источник: собственная разработка на основании данных из статистического источника [Статистическая информация…2013]

Чтобы лучше понять экономически неактивную часть населения и уровень безработицы в области, на наш взгляд, необходимо также проанализировать состояние образовательного уровня жителей сельской местности.

В сельской местности Минской области состояние образования представлено таким образом: без образования – 7 285 лиц, с образованием – 562 984 лица. Для

лиц с образованием, уточним их уровень образования: начальное общее 99 550, базовое общее 77 208, среднее общее 142 811, профессиональное 64 120, среднее специальное 116 162, высшее 63 133. Следовательно, жителей сельской местности со средним общим образованием составляет 25%, с высшим образованием – 11%.

Как уже отмечалось ранее, наибольшее количество агроусадеб функционирует в Минском, Мядельском, Логойском, Воложинском районах Минской области. В Минском районе существует проблема безработицы и большое перенаселение района. В Мядельском районе существует проблема экономически неактивного населения. В Логойском районе существует проблема с заселением района. В Воложинском районе существует проблема экономически неактивного населения.

5. Выводы

Представленный в статье анализ элементов проблемы позволил:

- выявить трудовые ресурсы по районам Минской области, которые состоят на данный момент из количества безработных и количества экономически неактивного населения (учащиеся; лица, ожидающие начала сезонной работы; лица, переходящие на пенсию; лица, ведущие домашнее хозяйство, являются опекунами детей или других членов семьи; лица, не работающие в соответствии с состоянием здоровья; лица, без возможности нахождения работы; лица, без потребности в работе или желания работать);
- определить перенаселенные и не достаточно заселенные районы Минской области. Перенаселение районов благоприятствует увеличению безработицы, недостаточное заселение районов свидетельствует о неблагоприятной социально-экономической ситуации в районе;
- исследовать тенденцию уменьшения сельского населения Минской области. Уменьшение сельского населения свидетельствует о миграции населения из сельской местности. В сравнении с другими областями Беларуси, Минская область по количеству сельского населения находиться на первом месте, что может свидетельствовать о лучших социально-экономических условиях в Минской области (например, заработной платы), чем в других областях Беларуси;
- проанализировать средний состав домашних хозяйств в сельской местности и местности городского типа, который в 2010 году составил соответственно 2,3 и 2,5 человек. Уменьшение среднего состава домашних хозяйств происходит в результате роста домашних хозяйств, состоящих из одного или двух человек и уменьшение домашних хозяйств, состоящих из четырех и более человек;
- проанализировать образовательный уровень сельских жителей районов Минской области. Данные позволили выявить людей без образования и с образованием. Низкий уровень образования, свидетельствует о необ-

ходимости проведения программ по повышению уровня квалификации сельского населения.

Анализ проблемы свидетельствует о необходимости вовлечения свободных трудовых ресурсов (безработных или экономически неактивного населения) в агротуристическую деятельность (оказание дополнительных услуг туристам) в целях получения ими дополнительного дохода.

Создание агротуристических хозяйств способствует улучшению не только материального положения жителей сельской местности Беларуси, но и создает возможность для развития экономической и социальной сферы сельской местности.

Агротуризм может способствовать уменьшению социальной напряженности в сельской местности путем создания новых альтернативных рабочих мест, позволив сельским жителям обеспечить себе достойную жизнь. В районах, где уже функционируют агротуристические объекты, необходимо совершенствовать агротуристическую инфраструктуру, с целью привлечения свободных трудовых ресурсов. Агротуризм это эффективный вид туристической деятельности с отчетливо выраженным социально-экономическим и культурным эффектом, отвечающим запросам клиента со средним достатком и учитывающий особенности его образа жизни, психологические, культурные, духовные потребности и ценности.

Для включения сельских жителей в агротуристическую деятельность необходимо решить следующие задачи:

- в области организационного обеспечения – создание объединений субъектов агротуристического бизнеса и туристического бизнеса (сотрудничество между субъектами агротуристического и туристического бизнеса), консультационные пункты в каждом районе для владельцев агроусадеб (по вопросам: правовым, экономическим, рекламным, инвестиционным, организационным, налоговым, образовательным, международным);
- в области информационного обеспечения – формирование на базе объединений интерактивных баз данных для туристов (создание рынка предложений агротуристических услуг);
- в области инфраструктурного обеспечения – финансирование в развитие инфраструктуры сельской местности (в сферах – транспортной, коммунальной, культурной, образовательной, здравоохранительной, спортивной и т.д.);
- в области финансового обеспечения – создание конкурсных программ для получения дополнительных ресурсов на развитие агротуристической деятельности;
- в области образовательного обеспечения – организация курсов повышение квалификации в области агротуристической деятельности, проведение семинаров, интеграционных мероприятий, международных выездов;

Реализация большого трудового потенциала (трудовых ресурсов) сельских регионов на основе развития агротуристического сектора должна помочь в улучше-

нии экономической, социальной и духовной ситуации жителей сельской местности. Важнейшим результатом развития агротуризма должен стать социокультурный и духовный эффект в результате активизации местных творческих ресурсов, сохранение и развитие национального природного, историко-культурного наследия, повышение самооценки местных сообществ, появление позитивной социальной перспективы. В данной социально-экономической ситуации для неактивного и безработного населения сельской местности – это один из эффективных способов вовлечения в трудовую деятельность и реализации своего трудового потенциала.

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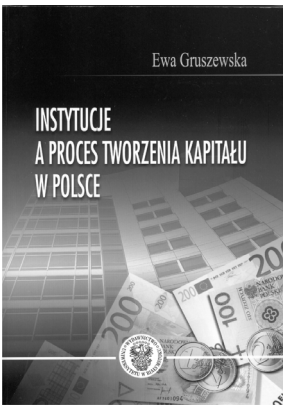

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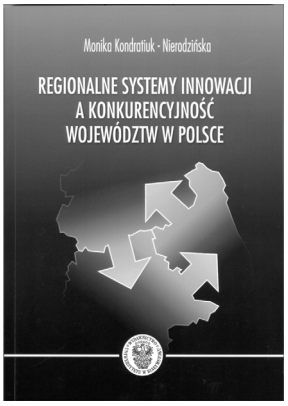

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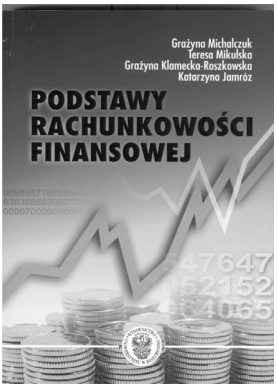

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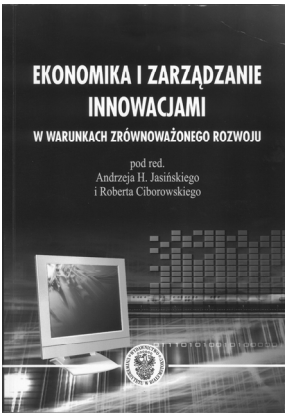

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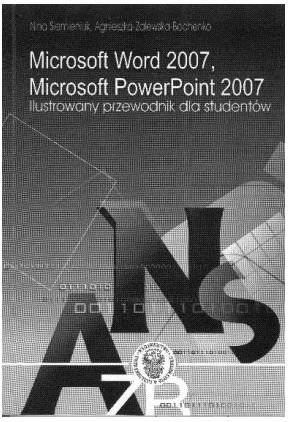

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Kierownik: dr hab. Ryta I. Dziemianowicz, prof. UwB
Sekretariat: Grażyna Majewska

CEL STUDIÓW

- zdobycie i pogłębienie wiedzy z zakresu organizacji i funkcjonowania sektora finansów publicznych,
- pogłębienie wiedzy w zakresie prawa finansów publicznych i administracji publicznej,
- przekazanie słuchaczom wiedzy na temat szczególnych zasad i metod prowadzenia rachunkowości w jednostkach sektora finansów,
- poznanie nowych regulacji dotyczących organizacji i zasad przeprowadzania wewnętrznej kontroli finansowej w jednostkach sektora finansów publicznych,
- zdobycie praktycznych umiejętności w zakresie tworzenia oraz analizy funkcjonowania i oceny komórek kontroli finansowej i audytu wewnętrznego.

STUDIA ADRESOWANE SĄ DO:

- głównych księgowych i kadry kierowniczej w jednostkach sektora finansów publicznych
- pracowników odpowiedzialnych za prowadzenie nowoczesnego systemu audytu wewnętrznego i kontroli finansowej w jednostkach sektora publicznego.

Zasady naboru:

- decyduje kolejność zgłoszeń.

Warunki rekrutacji:

- odpis dyplomu,
- wygenerowane z systemu IRK podanie kandydata,
- kserokopia dowodu osobistego
- potwierdzenie opłaty manipulacyjnej.

PODYPLOMOWE STUDIA FINANSÓW I RACHUNKOWOŚCI PRZEDSIĘBIORSTW

15-062 Białystok
ul. Warszawska 63
pok. 208

tel. (085) 7457702,
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Kierownik: dr hab. Ryta I. Dziemianowicz, prof. UwB
Sekretariat: Grażyna Majewska

Podyplomowe Studia Finansów i Rachunkowości Przedsiębiorstw istnieją od roku akademickiego 1992/1993. Przeznaczone są dla absolwentów szkół wyższych różnej specjalności.

Celem studiów jest przygotowanie kadr dla przedsiębiorstw i instytucji w zakresie finansów i rachunkowości oraz przygotowanie słuchaczy do działalności usługowej w zakresie prowadzenia ksiąg rachunkowych.

Studia trwają dwa semestry, kończą się zaliczeniami lub egzaminami z poszczególnych przedmiotów. Zajęcia odbywają się w formie 7 dwudniowych zjazdów w weekendy w każdym semestrze i obejmują ponad 300 godz. zajęć dydaktycznych. Studia kończą się wydaniem świadectwa ukończenia studiów podyplomowych.

Wykładane są następujące przedmioty:
- rachunkowość finansowa,
- sprawozdawczość finansowa,
- rachunek kosztów,
- system podatkowy,
- papiery wartościowe,
- prawo cywilne, gospodarcze i administracyjne,
- system informatyczny i podstawy informatyki,
- wykłady okolicznościowe.

Zasady naboru:
- decyduje kolejność zgłoszeń.

Warunki rekrutacji:
- odpis dyplomu,
- wygenerowane z systemu IRK podanie kandydata,
- kserokopia dowodu osobistego
- potwierdzenie opłaty manipulacyjnej.

PODYPLOMOWE STUDIA MENEDŻERSKIE

✉ 15-062 Białystok
ul. Warszawska 63
pok. 229

☎ tel. (0~85) 745 77 25
fax (0~85) 741 46 85

Kierownik: **dr hab. Tadeusz Truskolaski, prof. UwB**
Sekretariat: **Anna Kitlasz**

Podyplomowe Studia Menedżerskie istnieją od roku 1992. Przeznaczone jest dla absolwentów szkół wyższych, różnych specjalności.

Wykładowcami są pracownicy naukowi oraz praktycy, dyrektorzy banków i specjaliści z poszczególnych dziedzin. Program i treści nauczania dostosowane są do potrzeb i wymagań rynku. Studium daje szansę nawiązania ciekawych kontaktów oraz konsultacji z wieloma specjalistami z różnych branż.

Zasady naboru: decyduje kolejność zgłoszeń.

Warunki rekrutacji:

- odpis dyplomu,
- wygenerowane z systemu IRK podanie kandydata,
- kserokopia dowodu osobistego
- potwierdzenie opłaty manipulacyjnej.

Studia trwają dwa semestry. Zajęcia odbywają się w formie 2-dniowych zjazdów (w soboty i niedziele) i obejmują 256 godzin zajęć dydaktycznych. Studia kończą się egzaminem i wydaniem świadectwa ukończenia studiów podyplomowych.

Wykładane są następujące przedmioty:

- Organizacja i zarządzanie
- Zarządzanie finansami i rynek kapitałowy
- Marketing
- Zarządzanie zasobami pracy
- Zarządzanie strategiczne
- Biznes plan
- System podatkowy
- Funkcjonowanie gospodarki rynkowej
- Rachunkowość zarządcza
- Negocjacje w biznesie
- Public relations
- Prawo pracy
- Zamówienia publiczne
- Rynek i wycena nieruchomości
- Zajęcia komputerowe
- Seminaria - wykłady okolicznościowe

PODYPLOMOWE STUDIA ZARZĄDZANIA PROJEKTAMI UNII EUROPEJSKIEJ

15-062 Białystok, ul. Warszawska 63, pok. 234,
tel. (085) 7457721, fax (085) 7414685

e-mail: kpeirg@uwb.edu.pl
http://www.weiz.uwb.edu.pl/

Kierownik: **dr Elżbieta Sulima**
Sekretariat: **mgr Jolanta Wiszniewska**

Cele studiów
Przekazanie praktycznych umiejętności opracowania projektu i jego zarządzania (w tym finansowego) oraz wypełniania wniosków, gwarantujących pozyskanie środków finansowych z Unii Europejskiej.

Adresaci
Wszystkie osoby, które są zobowiązane lub pragną z tytułu potrzeb lub planów zawodowych otrzymać wiedzę dotyczącą pozyskiwania środków finansowych z Unii Europejskiej.
W szczególności program kierowany jest do:
- przedsiębiorców,
- pracowników administracji samorządowej, organizacji pozarządowych,
- nauczycieli
- absolwentów szkół wyższych
- i innych osób zamierzających uzyskać kwalifikacje niezbędne do pozyskiwania środków finansowych z UE

Korzyści
Przygotowanie specjalistów w dziedzinie zarządzania projektami Unii Europejskiej. Studia dają możliwość nawiązania kontaktów z osobami bezpośrednio zaangażowanymi w realizację projektów finansowanych z funduszy strukturalnych

Zasady naboru: decyduje kolejność zgłoszeń.
Należy złożyć następujące dokumenty:
- odpis dyplomu,
- wygenerowane z systemu IRK podanie kandydata,
- kserokopia dowodu osobistego
- potwierdzenie opłaty manipulacyjnej.

PODYPLOMOWE STUDIA
WYCENY I GOSPODARKI NIRUCHOMOŚCI

Specjalności:
WYCENA NIERUCHOMOŚCI
ZARZĄDZANIE NIERUCHOMOŚCIAMI
POŚREDNICTWO W OBROCIE NIERUCHOMOŚCIAMI

Kierownik Studiów:
dr Dorota Wyszkowska
e-mail: d.wyszkowska@uwb.edu.pl

Sekretariat:
mgr Jolanta Wiszniewska
tel. 085 745 77 21
fax 085 741 46 85
e-mail: kpeirg@uwb.edu.pl

CEL STUDIÓW:
Celem Studiów jest przygotowanie słuchaczy, w zależności od wybranej specjalności, do ubiegania się, po spełnieniu dodatkowych wymogów (praktyki zawodowe) o uzyskanie uprawnień zawodowych:

- **RZECZOZNAWCY MAJĄTKOWEGO**
- **POŚREDNIKIA W OBROCIE NIERUCHOMOSCIAMI**
- **LUB ZARZĄDCY NIERUCHOMOŚCI.**

Uczestnikami Studiów mogą być absolwenci szkół wyższych.

Studia trwają 2 semestry od października do czerwca w wymiarze godzin określonym w ramowych programach studiów.

Programy zgodne są z „minimum programowym" zalecanym przez Ministerstwo Infrastruktury, zawartym w Rozporządzeniu Ministra Infrastruktury z dnia 7 czerwca 2010 r. w sprawie ustalenia minimalnych wymogów programowych dla studiów podyplomowych w zakresie wyceny nieruchomości (Dz. Urz. Min. Bud. Nr 3, poz. 16).

Zajęcia odbywają się w 2-dniowych zjazdach (soboty i niedziele) co 2 tygodnie i kończą się przygotowaniem pracy dyplomowej oraz egzaminem

Zasady naboru:
o przyjęciu decyduje kolejność zgłoszeń

WYMAGANE DOKUMENTY:
- odpis dyplomu,
- wygenerowane z systemu IRK podanie kandydata,
- kserokopia dowodu osobistego
- potwierdzenie opłaty manipulacyjnej.

PODYPLOMOWE STUDIA ZARZĄDZANIA ZASOBAMI LUDZKIMI

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e-mail: agrzes@ uwb.edu.pl
http://www.weiz.uwb.edu.pl

Kierownik: dr Anna Grześ

CEL STUDIÓW:
Przekazanie specjalistycznej wiedzy teoretycznej i praktycznych umiejętności z zakresu zarządzania zasobami ludzkimi niezbędnych do skutecznego funkcjonowania organizacji.
Zakres ten obejmuje m.in.:

- zasady i metody rekrutacji i selekcji,
- system ocen pracowniczych,
- systemy wynagradzania,
- prawo pracy i zbiorowe stosunki pracy,
- negocjacje zbiorowe,
- zarządzanie karierami i rozwojem pracowników, itp.

ORGANIZACJA STUDIÓW:
Studia trwają 2 semestry. Obejmują 188 godzin dydaktycznych. Zajęcia odbywają się w 2-dniowych zjazdach (w soboty i niedziele) co 2 tygodnie i kończą się obroną pracy dyplomowej oraz wydaniem świadectwa ukończenia studiów podyplomowych.

STUDIA ADRESOWANE SĄ DO:

- kadry kierowniczej przedsiębiorstw,
- pracowników działu kadr,
- osób zainteresowanych zdobyciem oraz pogłębieniem wiedzy z zakresu problematyki zarządzania zasobami ludzkimi w nowoczesnych organizacjach.

WYMAGANE DOKUMENTY:
- odpis dyplomu,
- wygenerowane z systemu IRK podanie kandydata,
- kserokopia dowodu osobistego
- potwierdzenie opłaty manipulacyjnej.

Zasady naboru:

- decyduje kolejność zgłoszeń.