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Management and Finance in a "Flat World"

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Introduction

The second half of the twentieth century saw the emergence of many new conditions in the global economy, which have become so widespread that they are often referred to as "new development megatrends" [Herman, Szablewski: 14]. The following are most frequently highlighted ones: globalization, changes in the structure of industry, informational and technological revolutions, markets characterised by an excess supply or growing customer expectations.

The above changes in the environment are currently so dynamic and unpredictable that they are increasingly described not only as a "new competitive landscape" [Kaplan, Norton 2002: 22-23], but as a "new normality in the economy" [Kotler, Caslione 2009: 21], where competition takes place in the so-called "flat world" [Fung, Fung, Wind 2008]. The "new normality" is a state of growing expectations, changes bordering on chaos, and hence associated with permanent risk and increased uncertainty. The inability to predict business cycles, irregular and unpredictable declines and recessions, a careful and targeted way of investing, volatility in consumer attitudes, are just some of the features of this normality that determine how to create value at the macro and micro level.

One cannot overlook the effect of the third era of globalization of the "flat world", reflected in the triple convergence: critical mass of enabling technology, people and organizations that have the ability to use new platforms and develop people from "emerging economies" [Fung, Fung, Wind 2008: 24-25]. The world has become "flat" thanks to computers and the development of the Internet network, information flow in real time, software enabling cooperation in an open space and contributing to a collective product. It is a world in which more and more often people talk about human-human relations, but also man-machine and even machine-machine relations. What's more, the advanced process of digital transformation has a positive effect on the level of competitiveness of enterprises, institutions and the entire economies. Consequently, at the beginning of the 21st century, we witness a collision of two worlds, the real world and the virtual world,

which is gaining importance. This results in the need to conduct activities and implement multidimensional goals in an open space, whose participants, more and more often aware and educated, and therefore more demanding, can actively participate in the process of building value and creating (enforcing) the desirable behaviour of bidders. In this context, the issues of environmental pollution and impoverishment of societies should be addressed. As a result, the focus is on ecology and a fair distribution of created value. As a result, it is now necessary to create value based on global usability, which is evaluated in terms of the bidder's readiness and ability to create value for many stakeholders while preserving the value of natural resources for the future. Such a way of creating value affecting the reputation of the bidder determines the multiplication of capital both in the long and in the short term. Therefore, sustainable and sustainable development is now becoming the foundation of business models and operating strategies, not only in the business sphere. The main purpose of the volume is to identify the basic problems related to the impact of globalization, digital technologies and the concept of sustainable development on finance and the management process in public sector units, taking into account the challenges faced by the regulatory sphere. Striving to achieve the indicated goal, the articles in this volume focus on:

– costs of implementing ecological risk in the context of air pollution emissions,

– the need to include environmental aspects in the accounting system and business strategies and business models of enterprises,

– creating new insurance products aimed at reducing the risk of intangible assets,

– problems related to currencies and cryptocurrencies,

– changes in bank business models.

– ways and problems of financing R&D expenditures in selected EU countries,

– effectiveness of investments in shares of innovative companies and determinants of changes in market prices of shares,

– the role of statistics in the management of modern organizations,

– assessment of students' knowledge in the field of finance and the possibility of using,

– e-learning in creating knowledge resources of the organization,

– economic determinants of restructuring in healthcare entities,

Although the articles do not exhaust the topic, they can provide valuable input for a broad discussion and exchange of views between scientists, practitioners and teachers. One can hope that this discussion will create opportunities for the development of knowledge resources and trigger synergistic

effects resulting from their combination. The articles presented in this issue may be of interest not only to students of business majors, academics, but also to practitioners looking for new solutions and developing their competence resources.

dr hab. Wiesława Caputa

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Ecological Risk Implementation Costs in Mining Production in Poland in the Context of Emission of Air Pollution

Abstract. *The main goal of this article is to identify, analyze and assess the cost of ecological risk implementation in Polish mining industry in the years 2008-2015. To implement such a goal, the first part of the article analyses the sources of environmental risk originating in the activity of Polish coal mines. Next, in the second part, identified risk sources are assigned environmental costs associated with their implementation. The assessment of environmental costs was made with the use of statistical structures and dynamics indices, as well as historical trends. This assessment was presented in an unconditional perspective, referring to the total ecological costs and in conditional perspective, calculated per tonne of the extracted raw material. This assessment made it possible to verify the following working theories: T1: With the decrease of coal extraction in Poland, the ecological risk intensity decreases and T2: With the decrease of coal extraction in Poland, the ecological risk implementation costs decrease.*

Keywords: *ecological risk, ecological risk costs, mining production, environmental degradation by mining enterprises*

Introduction

Hard and brown coal mining is an industry that generates a range of major hazards for the natural environment, and – as a consequence – for the life and health of mining enterprises' employees and local communities living on the territory of mining operations [Zieliński 2015: 155-165]. These hazards change depending on the type and intensity, subject to the manner of exploitation (underground or opencast mining) and also depending on the mining plant cycle

phase [Mariet et al. 2017: 17-26; Pactwa, Woźniak 2017: 201-207; Árvay et al. 2017: 236-244].

It is also worth adding that unfavorable ecological risk influence linked with mining production persists and can be observed even after several dozens of years once the extraction has ended [Bijańska, Wodarski 2014: 53-65; Wodarski 2004: 305-314]. Taking the above into consideration, as well as the fact that hard and brown coal mining in Poland is one of the main branches of the economy, the main aim of this article is to identify, analyze and assess the cost of environmental risk implementation in Polish mining industry in the years 2008-2015 in the context of pollution emission to air. The implementation of the above goal included three stages. At the first stage, the types and intensity of air pollution emissions generated by Polish mines were identified and assessed and treated as basic sources of ecological risks. During the second stage, the costs associated with pollution emissions borne by the mining industry in Poland were defined and analyzed in an unconditional perspective referring to total costs [Caputa 2001: 9-15]. In the third stage, these costs were presented on a per-unit basis calculated per tonne thus obtaining relative analysis.

During the research, two working theories were proposed based on the assumption that the tightening emission restrictions in the European Union [Bluszcz, Kijewska 2017: 158-166] and increasing the expenditures on environmental protection in energy and heating industry resulting in greater efficiency of generating electric power and heat, have influence on the decrease of hard and brown coal extraction, which in turn reduces the ecological risk range and the cost of its implementation [Turek, Michalak 2013: 57-67; Michalak, Jonek-Kowalska 2012]. In detail, the theories are as follows:

T1: With the decrease of coal extraction in Poland, the ecological risk intensity decreases and

T2: With the decrease of coal extraction in Poland, the ecological risk implementation costs decrease.

1. Research method

When verifying the following theories, the Central Statistical Office as well as Energy Market Agency data from the years 2008-2015 concerning the volume of hard and brown coal extraction, the level of pollution emission to air by the mining industry as well as the amounts of ecological costs borne by mining industry due to the pollution of natural environment were used.

In the analysis and assessment of historical statistical data the following were used:

– dynamics indices:

$$i = \frac{y_t}{y_0} \times 100[\%] \tag{1}$$

where:

y_0 – feature value in base period,

$t = 1, 2, ..., n$,

y_t – feature value in research period being a reference point,

– structure indicators:

$$w = \frac{n_i}{N} \times 100[\%] \tag{2}$$

where:

n_i – class quantity of a class interval,

i – class sequence number of class intervals (i = 1, 2, …, n),

N – collectivity total,

– trend functions:

$$y_t = f(t, \varepsilon_t) \tag{3}$$

where:

f – analytical function,

$t = 1, 2, ..., n$,

– together with coefficient of determination that allows to assess the quality of trend functions adjustment:

$$R^2 = \frac{\sum_{t=1}^{n} (\hat{y}_t - \bar{y})^2}{\sum_{t=1}^{n} (y_t - \bar{y})^2} \tag{4}$$

where:

$\hat{y}_t$ – theoretical value of the variable explained,

y_t – real value of the variable explained in t time,

$\bar{y}$ – arithmetic mean of empirical values of the variable explained,

$$r = \frac{\mathrm{cov}(x, y)}{s_x \times s_y} \tag{5}$$

where:

$\mathrm{cov}(x, y)$ – the covariance of x and y variables,

s_x – standard variation of x variable,

s_y – standard variation of y variable,

$$r_s = 1 - \frac{6 \times \sum_{i=1}^{n} d_i^2}{n \times (n^2 - 1)} \tag{6}$$

where:

n – number of observations,

d_i – difference between x and y ranges.

Additionally, to define dependencies between variables, the Pearson correlation coefficient (5) (for variables of distribution similar to the normal one) or Spearman's rank correlation coefficient (6) (for variables the distribution of which is far from normal) were used.[1]

2. Sources of environmental risk in mining production – pollution emission to air

The identification of risk sources is the first stage of risk management. Its efficiency and complexity influence further stages of that process that covers risk assessment, activities dealing in protection against risk and risk control. In case of environmental risk associated with mining production, the sources of risk are harmful compounds emitted by the plants to the atmosphere. Their list covers the following substances and is a risk checklist characteristic for this type of hazards:

– nitrogen dioxide (NO_2) – a toxic gas causing irritations and respiratory system illnesses,

– nitrous oxide (N_2O) – suffocating gas harmful for respiratory system,

– methane (CH_4) – gas causing serious damage to the ozone layer and increase of the hazard of greenhouse effect,

– hydrofluorocarbons (HFC) – gases used in cooling devices, causing the greenhouse effect,

– nitrogen oxides (NO_x) – compounds absorbing light and together with other air pollutants forming the so-called photochemical smog, causing lung diseases and respiratory cancers,

– sulfur dioxide (SO_2) – a compound that oxidizes in the air and when combined with water forms sulphuric acid being the source of acid rains that damage the ecosystem,

– ammonia (NH_3) – gas causing throat, nose, lungs, skin and eyes irritation,

[1] The normality of the distribution was tested with the use of Shapiro – Wilk test at the level of relevance of $p = 0.05$.

– non-methane volatile organic compounds – organic solvents used for the purpose of maintenance and cleaning of machinery and industrial devices being secondary pollutants as a result of reactions occurring with other substances found in the air,

– carbon monoxide (CO) – a gas that in living organisms bounds with hemoglobin and blocks the inflow of oxygen causing a deadly threat for their existence,

– PM10 – inhalable dust of aerodynamic diameter smaller than 10 μm that reaches upper respiratory tract and causes irritations, illnesses and cancers,

– PM2.5 – respirable dust of aerodynamic diameter smaller than 2.5 μm that reaches lung alveoli and causes illnesses and lung cancers.

The volumes of the pollutants emitted to air as a result of mining operations in Poland in the years 2008-2015 were presented in Table 1.

Table 1. Share of emission of pollutants into the air by the mining industry as compared to emission in industry in general in the years 2008-2015 [%]

Specification	Years							
	2008	2009	2010	2011	2012	2013	2014	2015
Carbon dioxide	0.7889	0.6239	0.5094	0.5517	0.5029	0.5280	0.5555	0.8488
Nitrous oxide	0.0352	0.0289	0.0208	0.0244	0.0196	0.0186	0.0180	0.0224
Methane	41.8000	40.7000	40.2600	40.4600	40.8900	41.5200	41.9800	43.3200
Hydrofluorocarbons	0.1916	0.1660	0.0632	0.0588	0.0575	0.0530	0.0457	0.0412
Nitrogen oxide	0.4671	0.3612	0.3144	0.3669	0.3497	0.3233	0.3341	0.4603
Sulfur dioxide	0.9582	0.7691	0.2746	0.2836	0.2042	0.2047	0.2098	0.2573
Ammonia	0.0006	0.0005	0.0006	0.0008	0.0007	0.0006	0.0005	0.0005
Non-methane volatile organic compounds	3.0700	2.9700	2.8300	2.8500	2.9800	2.9400	2.8500	2.6800
Carbon monoxide	0.1514	0.1825	0.1833	0.2533	0.2727	0.2101	0.2069	0.2191
PM10	10.5600	12.2600	11.2800	12.0700	12.35	12.5400	12.4700	12.5300
PM2.5	2.5900	2.2500	1.8500	2.0000	2.0200	2.0300	1.9800	1.9800

□ – substances of share more than 0.5% in industrial pollution in general

Source: own study based on data of the Central Statistical Office.

From the statistical data contained in Table 1, it is evident that the greatest share of mining industry in pollution emission to air concerns methane, PM10 and PM2.5 as well as non-methane volatile organic compounds. What is more, the mining industry generates also significant amounts of carbon dioxide and

sulfur dioxide. The listed environmental hazards were treated as significant and were taken into account in further analysis. And so, in Table 2, the changes in emission of these pollutants in the years 2008-2015 were presented.

Table 2. Dynamics indices for pollutants emitted by mining industry of the greatest share in the emission of the industry in general in the years 2008-2015

Specification	Years						
	2009/2008	2010/2009	2011/2010	2012/2011	2013/2012	2014/2013	2015/2014
Methane	0.9483	0.9813	0.9878	1.0010	1.0237	1.0064	1.0468
PM10	1.0901	0.9490	1.0422	1.0256	0.9910	0.9618	0.9920
PM2.5	0.8262	0.8513	1.0422	1.0070	0.9665	0.9408	0.9889
Non-methane volatile organic compounds	0.9218	0.9728	1.0032	1.0317	0.9699	0.9639	0.9784
Carbon dioxide	0.7514	0.8559	1.1001	0.8872	1.0361	1.0216	1.5462
Fulfur dioxide	0.6641	0.3820	0.9979	0.6803	0.9522	0.9719	1.1796

Source: own study based on data of the Central Statistical Office.

Emission of methane having its source in the mining industry grows over time, which also causes the general increase of this compound share in the emission of the industry in general. Since 2012, pollution with particulate matter decreases by several percent every year, however, it results in the decrease of mining industry share in the emission of industry in general only for PM2.5. The share of PM10 emission remains at a fairly stable level with a slight upward trend. Since 2012, one can also observe the decrease of share of non-methane organic compounds emission. In turn, the emission of carbon dioxide and sulfur dioxide is characterized by variability and there is a lack of stable development tendency.

Having in mind the first of two research theories, the data concerning the volume of particular pollutants were compared with the data on hard and brown coal extraction in Poland in the analyzed period (Figure 1).

As a result, according to Figure 1, the first decline period in the coal production in Poland covers the years 2008-2010. Then, in the two subsequent years the extraction increases, but since 2013 its volume again decreases. Comparing these data to dynamics indices of pollutants presented in Table 2, we can state that in the first of the mentioned decline periods of mining production one can observe a significant reduction of all major air pollutants having their source in hard coal mining. Such unambiguous tendency does not concern the second of the indicated periods of extraction decrease, as in the years 2013-2015 only the emission of PM10 and PM2.5 as well as non-methane volatile organic compounds decreases by several

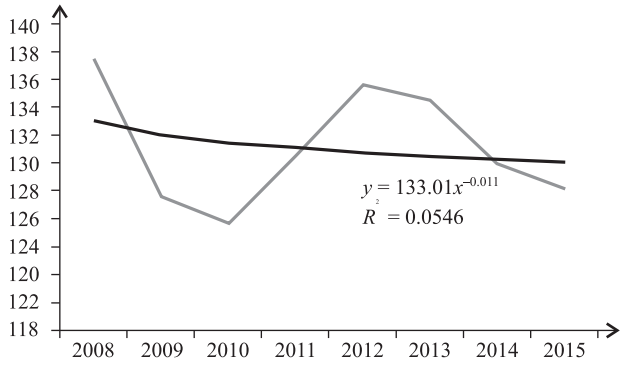

Figure 1. Hard and brown coal mining in Poland in the years 2008-2015 [million tonnes]

Source: own study based on data of the Central Statistical Office.

Table 3. Correlation coefficients between coal mining in Poland and the level of pollution generated by mining industry in the years 2008-2015

Specification	Methane	PM10	PM2.5	Non-methane volatile organic compounds	Carbon dioxide	Sulfur dioxide
Correlation coefficients	$r = 0.1813$	$r = 0.0131$	$r_s = 0.5000$	$r = 0.6598^*$	$r_s = -0.0476$	$r_s = -0.0952$

$p < 0.1$; r – Pearson correlation coefficient; r_s – Spearman's rank correlation coefficient

Source: own study based on data of the Central Statistical Office.

percent a year, while the emission of methane and carbon dioxide increases year by year, and in the period 2014-2015 we can also observe the increase of sulfur dioxide emission. Lack of clear link between the volume of extraction and the level of pollutants generated by mining industry is confirmed by correlation coefficients presented in Table 3. According to them, statistically significant correlation between the level of extraction and the level of pollution concerns only non-methane volatile organic compounds which is characterized by average strength of correlation. In other cases, the links are weak and statistically insignificant.

3. The costs of environmental risk implementation in mining production in an unconditional perspective

The emission caused by mining industry and other industries in Poland is associated with the necessity to pay taxes and environmental charges, which

include the following taxes and charges: (1) energy, (2) transport, (3) pollution and (4) natural resources consumption. The value of the charges mentioned above for the mining industry in the years 2008-2015 was presented in Table 4.

Table 4. Taxes and charges related to emission in mining industry in the years 2008-2015 [in million PLN]

Specification	Years							
	2008	2009	2010	2011	2012	2013	2014	2015
Energy taxes	295.86	278.74	367.64	416.72	413.23	324.44	408.05	380.92
Transport taxes	12.32	12.37	10.36	15.21	20.47	9.14	23.32	6.68
Pollution taxes	48.25	58.99	53.30	56.22	36.76	20.85	43.43	46.47
Natural resources consumption taxes	2.49	2.48	1.90	2.02	2.59	2.66	4.07	2.46
Total	358.92	352.58	433.19	490.16	473.05	357.09	478.86	436.53

Source: own study based on data of the Central Statistical Office.

Table 4 shows that the greatest environmental burden for the mining industry were the energy charges the value of which systematically increased in time, mainly due to stricter emission restrictions and associated increase of rates. The observed changes were also influenced by the increase of energy consumption of mining production due to the extraction deepening and worsening of extraction conditions. Pollution taxes were also a significant burden for the industry, the value of which decreased to 2013 but then in the subsequent two years it increased due to the raising rates and increase of extraction level. Transport taxes and natural resources consumption taxes had lesser share in total environmental pressures but were characterized by significant variability over time.

Table 5. Dynamics indices for taxes and charges due to emission in mining 2008-2015

Specification	Years						
	2009/2008	2010/2009	2011/2010	2012/2011	2013/2012	2014/2013	2015/2014
Energy taxes	0.9421	1.3189	1.1335	0.9916	0.7851	1.2577	0.9335
Transport taxes	1.0035	0.8375	1.4687	1.3460	0.4464	2.5511	0.2866
Pollution taxes	1.2227	0.9036	1.0548	0.6538	0.5673	2.0825	1.0700
Natural resources consumption taxes	0.9954	0.7648	1.0628	1.2851	1.0258	1.5310	0.6039
Total	0.9823	1.2286	1.1315	0.9651	0.7549	1.3410	0.9116

Source: own study based on data of the Central Statistical Office.

Dynamics indices presented in Table 5 confirm high variability of all environmental pressures concerning mining production. For none of the analyzed cases, the fixed and one-way changes over time could be identified. This proves a high unpredictability of environmental risk implementation costs, which – combined with significant variability of pollutants volumes – intensifies the risk associated with ecological hazards having their source in mining industry.

Table 6. Correlation coefficients between coal mining in Poland and the level of charges associated with environmental pollution in an unconditional perspective in the years 2008-2015

Specification	Energy taxes	Pollution taxes	Transport taxes	Natural resources consumption taxes
Correlation coefficients	$r = -0.1187$	$r = 0.2244$	$r = -0.5608$	$r_s = 0.5238$

$p < 0.1$; r – Pearson correlation coefficient; r_s – Spearman's rank correlation coefficient

Source: own study based on data of the Central Statistical Office.

Having in mind the second research theory, the dynamics indices were compared with the changes in the extraction levels in Poland in the years 2008--2015. In the first level of mining production decline in the years 2008-2010, only the natural resources consumption taxes clearly and steadily decreased which is directly linked with the volume of mining production. The total volume of remaining charges changed in various directions. Also, the second period of extraction decline in the years 2013-2015 was characterized by variability and multidimensionality. In this period, no fixed decline tendencies were present at the unconditional level of charges associated with the pollution caused by the mining industry. It is also confirmed by correlation coefficients presented in Table 6, according to which no statistically significant relations between extraction and the volume of taxes associated with emission were identified.

4. The costs of environmental risk implementation in mining production in a conditional perspective

In this section, the costs of environmental risk implementation in mining production were presented in a conditional perspective, compared with extraction levels in the analyzed period. Figures 3 and 4 present the value of taxes associated with environmental pollution calculated per 1 tonne of extraction in the years 2008-2015.

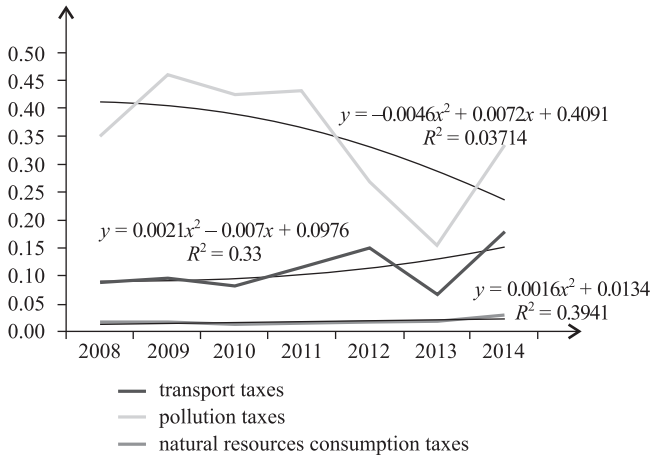

Figure 2. Taxes and charges on emission in mining industry calculated per 1 tonne of extraction in 2008-2015 [PLN/tonne]

Source: own study based on data of the Central Statistical Office.

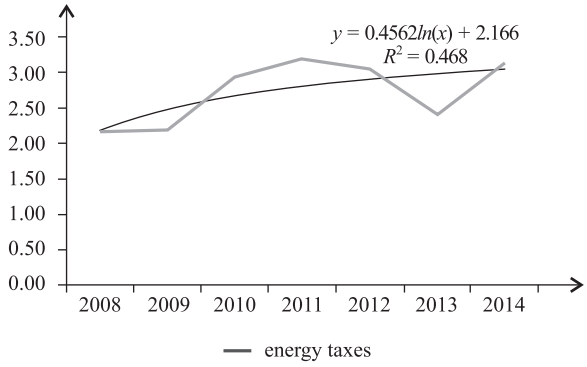

Figure 3. Energy taxes in mining industry calculated per 1 tonne of extraction in 2008-2015 [PLN/tonne]

Source: own study based on data of the Central Statistical Office.

In accordance with Figure 2, in the analyzed period natural resources consumption taxes were characterized by the lowest variability and the lowest value amounting to 2 to 3 groszes per 1 tonne. Till 2011, the value of transport taxes did not exceed 10 groszes per 1 tonne. Yet, after that period of stability, it became changeable in the period 2012-2015 and amounted from 7 to 15 groszes. Similarly, the pollution tax changed that reached its lowest value in 2015 (15 groszes per 1 tonne of extraction). The greatest environmental burden for the mining industry

were and are energy taxes the value of which in conditional perspective is presented in Figure 3 and the value of which in the studied period amounted from PLN 2.15 to PLN 3.19 per tonne. In case of this tax, it is difficult to define clear and fixed tendency in time, that could be an upward trend, if not for the year 2013 when a clear decrease of energy tax can be observed. It is worth adding, that in 2013 the Polish hard coal mining was in a very difficult financial position when a majority of mining plants lost their financial liquidity and part of tax liabilities was postponed in time. The decrease of all environmental pressures in that period was therefore a result of postponement of their payment.

Summary

The functioning of mining enterprises is a source of many environmental hazards, among which the most crucial one is the pollution emission to air. From the analysis carried out in the context of scope and volume of 11 pollutants, it is evident that a significant source of ecological risk in this group are methane, carbon dioxide, PM10 and PM2.5, non-methane volatile organic compounds and sulfur dioxide. In majority of cases, the emission of the above compounds to the atmosphere changes over time without any specific fixed tendencies. Yet, despite the periodical decrease of extraction, the volume of emission in that periods does not decrease. Therefore, one cannot confirm the first research theory according to which: T1: With the decrease of coal extraction in Poland, the ecological risk intensity decreases in mining industry.

We also cannot confirm the second theory being as follows: T2: With the decrease of coal extraction in Poland, the ecological risk implementation costs decrease. These costs also change in many directions, independently on the changes in the volume of extraction and the size of emission of particular compounds to the air. They are characterized by significant fluctuations in time and the impossibility to accurately match the trend functions which results from the changes in rates of particular charges and periodical postponement (the year 2013) of taxes due to difficult financial situation of hard coal mining which made it impossible to cover the ecological liabilities.

According to the above, both the level as well as costs of environmental risk implementation must be considered as difficult to foresee. It is worth adding, however, that the decrease of mining production volumes did not cause – in the studied period – expected effects being the decrease of environmental risk and the costs of its implementation, what indicates difficulties in managing this risk and in the possibility of its minimization.

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Koszty realizacji ryzyka ekologicznego w produkcji górniczej w Polsce w kontekście emisji zanieczyszczeń powietrza

Streszczenie. *Głównym celem artykułu jest identyfikacja, analiza i ocena kosztów realizacji ryzyka ekologicznego w polskim górnictwie w latach 2008-2015. By tak postawiony cel zrealizować, w pierwszej części artykułu analizie poddaje się źródła ryzyka środowiskowego generowane przez działalność kopalń węgla w Polsce. Następnie w drugiej części opracowania scharakteryzowanym źródłom ryzyka przypisuje się koszty środowiskowe związane z ich realizacją. Ocenę kosztów środowiskowych przeprowadzono przy wykorzystaniu statystycznych miar struktury i dynamiki oraz trendów historycznych. Ocena ta została zaprezentowana w ujęciu bezwzględnym odnoszącym się do całkowitych kosztów ekologicznych i w ujęciu względnym w przeliczeniu na tonę wydobywanego surowca. Jej przeprowadzenie pozwoliło na zweryfikowanie następujących hipotez badawczych:*

H1: Wraz ze zmniejszaniem poziomu wydobycia węgla w Polsce maleje natężenie ryzyka ekologicznego oraz H2: Wraz ze zmniejszaniem poziomu wydobycia węgla w Polsce maleją koszty realizacji ryzyka ekologicznego.

Słowa kluczowe: *ryzyko ekologiczne, koszty ryzyka ekologicznego, produkcja górnicza, degradacja środowiska przez przedsiębiorstwa górnicze*

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The Greening of Accounting for the Needs of Environmental Management

Abstract. *The aim of the article is to outline the options for increasing the efficiency of environmental management decision-making through improving information support from the accounting side. This means, in particular, monitoring adequate environmental information through managerial accounting. This information can be obtained through the gradual greening of accounting, i.e. through the gradual establishment of environmental accounting. The author proposes two versions of the greening of accounting: simple version – establishment of environmental accounting without the monitoring of material flows, a more complex version – establishment of environmental accounting with the monitoring of material flows. The proposals take into account the regulations on entrepreneurs' accounting in the Slovak Republic.*

Keywords: *greening of accounting, environmental accounting, environmental management, accounting analytical records, environmental code, material flows cost accounting (MFCA)*

Introduction

The effort of environmental management is to find ways of managing business activities while avoiding environmental degradation. By improving processes and activities, the enterprise can contribute to a better condition of environment, and reduce its business costs (by reducing the amount of waste, energy consumption, water and gas or discharged emissions), which has a positive effect on its profits [Sujová 2013].

The need for environmental management results from the Corporate Social Responsibility (CSR) principles. CSR covers three areas of enterprise activities:

economic, environmental and social activities. The CSR principles are contained in the standard ISO 26000 Guidance on Social Responsibility. CSR forms the basis of the objectives of the Europe 2020 strategy and significantly contributes to meeting objectives related to a sustainable development and highly competitive social market economy [European Commission 2011].

Cieślak and Kucharczyk [2016] note the growing importance of environmental management in enterprises with a high environmental impact and propose adding another perspective – an ecological perspective – to the existing 4 perspectives (financial, customer, internal processes, learning and development) within the tool of strategic management Balanced Scorecard.

Managers' decisions must take into account not only interests of the enterprise, but also general societal and economic problems associated with the protection of air, water, soil and population health. This requires quality environmental accounting information. Environmental accounting involves accounting of environmental costs, environmental liabilities and producing environmental reports [Chkhutiashvili 2014].

The need to capture the environmental and social aspects of entrepreneurial activity in accounting has been the subject of intensive discussions over the past three decades. Although some important publications were published in the 1960s and 70s, only in the 1990s did the concern about the relationship between business and the environment become a widely recognized problem of entrepreneurship in most countries, at least in the developed world [Bennett, Bouma, Wolters 2002].

Environmental accounting is primarily focused on environmental costs. The scope of how environmental costs are defined has changed along with changes in companies' environmental awareness. The most comprehensive view of environmental costs is the concept of target costs, which originated in Japan in the 1970s. According to this view, cost management should be carried out at the earliest stage – at the stage of product development and costs should be calculated for the entire life cycle of the product. This should be ensured by the pro-ecological orientation of cost accounting. An important element is accounting of target environmental costs. It helps companies in planning and management, but above all it enables them to introduce eco-innovation and obliges manufacturers to expand the scope of internalisation of external environmental costs, such as the manufacturer's obligation to collect the used equipment [Rosiek 2015].

Reporting of information about the environment is a new theme, which raises a lot of questions. There are still many problems that need to be addressed before reporting and accounting in the context of proper disclosure of environmental information [Balicka 2015].

The development of environmental accounting has led to the development of an understanding of the environment: from understanding of the environment as something completely separate from production to an integrated approach including material flows management. Environmental accounting is becoming increasingly important for product and process design, cost allocation and control, capital budgeting, purchasing, product pricing and performance evaluation [Jasch, Stasiškienė 2005].

Material flow management has become a new trend in actions aimed at increasing the enterprise's environmental performance. Since 2011 the issue has been regulated by the standard ISO 14051 – Environmental Management – Material Flow Cost Accounting – General Framework.

The Material Flow Cost Accounting (MFCA) represents an accounting method that provides the management and other stakeholders with absolutely new data, which can be used to support decision-making [Hyršlová, Vágner, Palásek 2011].

The development of an enterprise leads to a greater complexity in its relationship with the changing environment. This affects the extent of data collection, as well as the procedures for their processing, presenting and analyzing [Caputa 2014].

If the enterprise management does not apply the new managerial and accounting practices based on the rapidly changing enterprise environment and the analysis of eco-efficiency strategies and assessment of the impact of economic policy on the environment, the accounting system ceases to satisfy the needs of internal and external users of financial statements [Bahmareva 2015].

Japan provides an example of a flexible application of new managerial and accounting procedures in response to the growing demands of environmental performance and effective environmental protection. Katsuihiko Kokubu and Hirotsugu Kitada [2015] point out that the Japanese Ministry of Economy, Trade and Industry (METI) strongly supports the promotion of MFCA and is instrumental in the fact that a increasing number of enterprises are adopting this tool.

The results of a case study conducted by Rungchat Chompu-inwai, Benyaporn Jaimjit, Papawarin Premsuriyanunt [2015] provide evidence of the benefits that can be derived from implementing MFCA in enterprises that previously did not pay attention to material flows management and did not maintain a database with detailed environmental data. The authors performed a case study in northern Thailand, in a company which manufactures wood products. The analysis of the production process revealed that almost 70% of raw wood materials became waste in the form of chippings, sawdust, off-cuts and defects. By introducing a combination of MFCA and the design of experimental techniques (DOE), the company saw a reduction in wood material losses in the cutting process from approximately 69% to 54% (ratio to total wood material). The quality of the

products increased, the negative impact on environment was reduced, as were the costs, while the enterprise's competitiveness was gradually increasing.

Christine Maria Jasch, director of the Vienna Institute for Environmental Management and Economics (IÖW), following experience from several case studies in the areas of environmental management and MFCA, notes that the current accounting information systems do not offer opportunities required for an easier integration of the data requirements according to the standard ISO 14051 into financial and cost accounting, stock management and production planning [Jasch 2015]. They need to be thoroughly modified.

The aim of the article is to present ways of increasing the efficiency of environmental management decision-making by improving information support on the accounting side. It mostly consists in securing the provision of suitable environmental information, which can be obtained by progressive creation of environmental accounting. The article includes two versions of establishing environmental accounting: a simpler version – without the monitoring of material flows, and a more complicated version, which includes the monitoring of material flows. The proposals take into account the accounting regulations for entrepreneurs in the Slovak Republic (SR). They are intended for manufacturing enterprises.

1. Material and methods

The source material was obtained by studying the legislative, scientific and professional literary sources of Slovak and foreign authors and information from 28 selected enterprises. 18 enterprises come from agriculture and 10 from industry.

Top managers of 25 agricultural and 25 industrial enterprises were contacted by e-mail, which included a questionnaire containing 8 questions. The questions concerned the monitoring of environmental costs in accounting analytical records, the compilation of special reports with environmental cost data, the reporting of environmental data in annual reports and financial statements, the environmental management system, the use of environmental data in management, and the benefits of implementing the environmental management system and ISO 14 051 in the corporate accounting system. Completed questionnaires were returned by 18 agricultural and 10 industrial enterprises. Table 1 shows the structure of the interviewed enterprises.

Since there are no methodological guidelines in SR to implement environmental accounting, managers did not have sufficient knowledge of environmental accounting. Therefore, several filled-in questionnaires were further clarified by the author during a face-to-face exchange or over the phone.

Table 1. Structure of the surveyed enterprises

Legal form	Number of enterprises	Agriculture	Industry	Audit duty	Number of employees		
					11-50	51-250	over 250
Cooperative	9 (32.14 %)	9 (32.14 %)	–	all (32.14 %)	4 (14.29 %)	5 (17.86 %)	–
Stock company	10 (35.72 %)	6 (21.43 %)	4 (14.29 %)	all (35.72 %)	3 (10.71 %)	3 (10.71 %)	4 (14.29 %)
Limited Liability Company	9 (32.14 %)	3 (10.71 %)	6 (21.43 %)	all (32.14 %)	2 (7.14 %)	7 (25.20 %)	–
Total	28 (100 %)	18 (64.28 %)	10 (35.72 %)	all (100%)	9 (32.14 %)	15 (53.57 %)	4 (14.29 %)

Source: own materials.

In addition to the questionnaire, information from enterprises was acquired through interviews with managers responsible for accounting, controlling and environmental matters, as well as from selected internal corporate documents.

The source material was processed by applying **methods** of analysis, synthesis, selection, comparison, induction and deduction.

2. The present state of environmental information in accounting for entrepreneurs in the Slovak Republic

The first step towards the greening of accounting and the implementation of environmental accounting in Slovakia was made by the amendment of the Accounting Act (No. 431/2002 Coll.), in effect since 1.01.2005. The amendment obliged enterprises (which are required to conduct an audit) to declare in their annual report the data on the impact of business activities on the environment (§ 20(1)(a)). However, no methodological guidelines have been published so far on how to fulfill this obligation and there are also no accounting or tax authorities responsible for enforcing this regulation.

Since 1.01.2017, public interest entities with an average recalculated number of employees greater than 500 are also required to report in the annual report the following non-financial information about the impact of business activities on the environment, the social dimension and employment (§ 20(9) of Accounting Act):

– a description and results of the use of policies applied by businesses in these areas,

– a description of the main risks that could have adverse consequences,

– significant non-financial information,

– and, if appropriate, a reference to information about the amounts recognized in the financial statements and an explanation of the impact of these amounts on the environment, the social dimension and employment (§ 20 (9) (e)).

If an enterprise does not disclose this information, it must state in the annual report the reasons for non-disclosure of information (§ 20 (12) of Accounting Act).

The standard ISO 14051 was published in the Slovak language in 2012 as STN EN ISO 14051. At present, this standard is slowly becoming familiar to the management of enterprises and, if they are interested, they can perform the initial analyses needed to implement it. The standard ISO 14051 does not specify how and in what accounts material flow data should be accounted for. The accounting procedures in material flows cost accounting must be established by the enterprises themselves.

Under such conditions, the creation of environmental accounting and the application of MFCA depends on the excellence and the needs of managers. We were interested in the level of environmental accounting in selected Slovak enterprises.

Of the 28 enterprises surveyed, only two industrial enterprises had very detailed environmental information in their information system. Both are part of large multinational corporations. One is an enterprise of the electrotechnical industry with a parent company in Germany and the other one is a chemical enterprise with a parent company in the Czech Republic. Both enterprises have a separate environmental department and an established environmental management system. Environmental information is processed in both enterprises through the SAP software system. One enterprise has also created its own software for the selection of environmental information. Both enterprises consider the monitoring of environmental information to be sufficiently detailed. This information is stored in very large enterprise databases and managers do not see the usefulness of including the full information in the accounting system. Only selected aggregate information is monitored in the accounting.

The other enterprises surveyed have more or less detailed analytical records of environmental data.

In the agricultural enterprises, the relevant records concern mainly two accounts of costs: account 518 – Other services, and account 538 – Other taxes and fees. Five agricultural enterprises conducted detailed monitoring of environmental costs in previous years – during the implementation of projects funded from EU grants. The costs were monitored outside the accounting system and were registered on special forms provided by the EU. However, the detailed monitoring

of costs in these forms did not lead to a significant persistent modification of the sub-accounts of costs.

The industrial enterprises (except for the two mentioned), also monitored some environmental costs on sub-accounts of the main account s: 501 – Material consumption, 502 – energy consumption (external costs) and on MD of accounts: group 61 – Change in inventory (internal costs).

The following parts of the article contain two proposals of the greening of accounting:

– a simple version – establishment of environmental accounting without the monitoring of material flows,

– a more complex version – establishment of environmental accounting with the monitoring of material flows.

The proposals are based on the accounting regulations for entrepreneurs in the Slovak Republic.

3. Proposal for establishing environmental accounting without the monitoring of material flows

To create environmental accounting, one needs to determine a specific way to green accounting, especially how to green costs and revenues. Greening should be conducted in accordance with the requirements of the environmental management system, which was implemented in the enterprise. It would be ideal if it was possible to draw up some statements for purposes of environmental management, or at least some parts of them, directly from accounting records of costs and revenues.

One way of greening the cost structure is, in our opinion, to mark environmental characteristics of cost by assigning an environmental code to it. The environmental code can characterize the cost as environmentally positive, environmentally negative and, if necessary, environmentally neutral. We propose two ways to monitor environmental characteristics of costs in accounting:

1) to present environmental characteristics right in the numeric designation of sub-accounts for costs. In practice, this would require a modification of the existing chart of accounts – the numeric designation of the sub-account would have to be extended by at least one place

2) to maintain the existing chart of accounts and develop an environmental code list. The relevant code would be allocated to the existing sub-account of costs from the environmental code list.

The proposed options are shown in Table 2 using the example of creating analytical records for 5 selected main accounts of costs.

The study indicates that managers of enterprises do not like to include extensive analytical records directly in the numerical designation of sub-accounts. Therefore, we propose another more practical way.

Table 2. Proposal for the greening of costs through the creation of accounting analytical records without the monitoring of material flows

Numeric designation of main account (kind of cost)	1. option Environmental characteristic as part of numeric designation of sub-account	2. option Environmental characteristic as a code for sub-account	
		an sub--account	an environmental code
501 Consumption of material	501 xxx1 – Consumption of material with environmental certification	501 xxx	E1
	501 xxx0 – Consumption of material within production standards	501 xxx	E0
	501 xxx2 – Consumption of material over production standards	501 xxx	E2
502 Consumption of energy	502 xxx1 – Consumption of energy from alternative sources – Consumption of bioenergy	502 xxx	E1
	502 xxx2 – Consumption of energy from sources of polluting the environment	502 xxx	E2
518 Other services	518 xxx1 – Costs of wastewater treatment and air	518 xxx	E1
	518 xxx1 – Costs of waste disposal	518 xxx	E1
	518 xxx1 – The cost of rent for environmental equipment	518 xxx	E1
	518 xxx2 – Costs of elimination of environmental damage caused by enterprise	518 xxx	E2
	518 xxx1 – Costs of education about environmental protection	518 xxx	E1
	518 xxx1 – Costs of environmental audits	518 xxx	E1
538 Other taxes and fees	538 xxx0 – Fees for environmental protection according to law	538 xxx	E0
	538 xxx2 – Fines for excessive environment pollution	538 xxx	E2
549 Shortages and damages	549 xxx2 – Shortages and damages – all except natural attrition of inventory	549 xxx	E2
Other	5xx xxx0 (1, 2) – Name of cost	5xx xxx	E0 (E1, E2)

E – environmental characteristic of costs
E0 – environmentally neutral cost
E1 – environmentally positive cost
E2 – environmentally negative cost

Source: own materials.

When assigning environmental characteristics to costs, more attention should be paid to accounts where the enterprise has so far incurred mixed costs – environmentally positive and, at the same time, environmentally negative. It is necessary to divide such sub-accounts in order to ensure an unambiguous identification of environmental characteristics of costs.

4. Proposal for establishing environmental accounting with the monitoring of material flows

Environmental accounting, which tracks material flows, should be organized to meet the requirements of ISO 14051. The standard establishes framework principles for the management and accounting of material flow costs. However, it does not specify how to organize this accounting.

According to ISO 14051, the basic requirement in the accounting of material flows is to distinguish between:

– material flows related to the creation of added value – the procurement of materials, the various stages of processing, distribution of products to customers. These are flows towards the products. Products delivered to customers are classified as positive products,

– flows of material losses – poor quality and damaged products, non-product outputs – scrap, waste products, etc. These products are not desirable from an economic and environmental viewpoint. Basically, these are streams of solid, liquid and gaseous waste (flows towards waste). Losses of material are classified as negative products.

In the process of implementing the management and accounting of material flow costs, the main emphasis must be on the transparency of material flows and associated costs. The costs associated with waste flows should be estimated as accurately as possible and should be allocated to the loss of material, not to the products sold. In classical management and accounting systems, they are allocated directly to products. Their separation from product will enable in-depth analysis and minimization of waste flows.

ISO 14051 distinguishes between 4 basic kinds of costs: material costs, energy costs, system costs and waste management costs. The allocation of energy and system costs to positive and negative products has to be carried out within each cost center, according to the ratio in which the material is represented in positive and negative products. In Figure 1, this ratio is 80%: 20%. Let us assume the following situation: the price of 1 kg of material is 10 EUR and the costs of processing in the center are: energy consumption – 60 EUR, system

costs – 850 EUR, costs of waste control and disposal – 90 EUR. Energy costs and system costs will be divided according to the 80-20 ratio: 80% to positive product and 20% to negative product. The cost of waste control and disposal will be allocated in the full amount to the cost of a negative product.

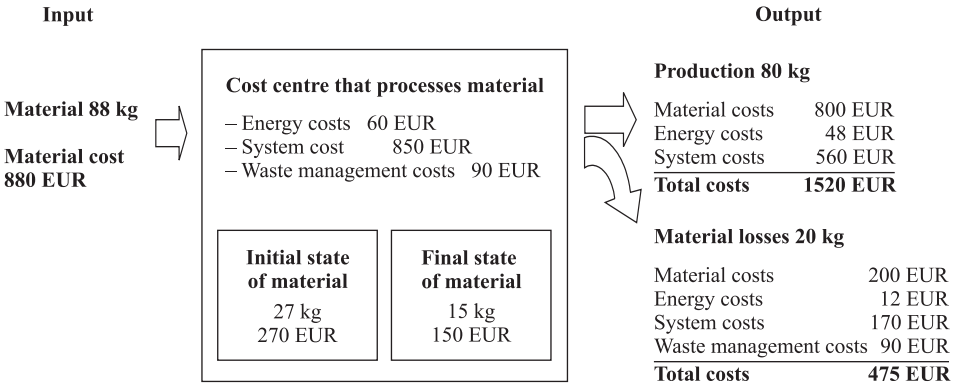

Figure 1. Distribution of costs in management and accounting of material flows costs

Source: standard ISO 14051 and own data.

Individual cost centers in the production process are linked to each other and the values of positive and negative products for the whole process are cumulated. The model thus provides an overview of the whole process and identifies where material losses can occur.

In the following text, we will use the manufacturing process of product A to illustrate our proposals. We will designate the positive product as AP and the negative product as AN. AP product valuation will consist of production costs without losses and waste. The valuation of AN product will consist of two components:

1) value of material losses and waste,

2) waste disposal costs.

When applying ISO 14051 under the conditions of an already established environmental management system, we also recommend monitoring the degree of environmental impact of the load on the environment (level of environmental negativity) according to the following scale:

1) negligible environmental impact – no/insignificant impact on the environment,

2) marginal environmental impact – little impact on the environment,

3) "medium" significant environmental impact – significant environmental impact that needs to be minimized,

4) significant environmental impact – to be addressed as a matter of priority, the measures must be taken.

Such a scale is often used in environmental management systems of enterprises. Using this scale in the MFCA system would ensure the interconnection of the MFCA with the environmental management system. We recommend beginning the implementation of MFCA as a pilot project for materials classified as level 4 on the scale.

A proposal to create accounting analytical records for cost main accounts for the purpose of environmental accounting with material flow tracking is shown in Table 3. Main accounts are the same as in Table 2.

Conclusion

Quality information support including accounting information is an important factor in increasing the efficiency of environmental management. It is required to innovate the content of the enterprise accounting system through the greening of accounting – i.e. by extending the traditional accounting information on environmental information. This primarily means cost information. The following steps are required:

– to reconsider the sub-accounts of costs in an enterprise, and create analytical records for them so that they can record important kinds of environmental costs,

– to identify kinds of property and sources of funding that may lead to undesirable environmental costs. It is necessary to record these kinds in accounting on special sub-accounts and to monitor them separately in the environmental statement,

– if a company is interested in implementing ISO 14051, it needs to insert detailed information on the input material to the enterprise information system. The information in current material cards is not sufficient for the purpose of MFCA. The revised cards need to include environmental characteristics of the material – its detailed composition and the degree of its environmental impact on the environment (environmental negativity).

To establish environmental accounting and implement MFCA, the company must have a software environment for detailed recording and analysis of environmental information. Given detailed accounting records and the possibility of processing them using different mathematical-statistical methods, it is possible to perform a multi-criterion and multidimensional analyses, which can be used not only to determine the current status but also to identify its causes [Látečková 2014].

Table 3. Proposal for the greening of cost through the creation of accounting analytical records with material flows monitoring

Main account	Determining the cost of the positive and negative product	Degree of environmental negativity
501 Consumption of material	indication of the product, for which the cost was expended, in our case product A, indication of material consumption for the production of AP, indication of material consumption for the production of AN, calculating the ratio of the expended material AP : AN.	degree 1-4
502 Energy consumption	indication of the product, for which the cost was expended, in our case product A, allocation to AP and AN is performed on base of the calculated ratio of material consumption for AP and AN.	degree 1-4
518 Other services	For the main account it is required to create sub-account for waste disposal. Several enterprises do not have it created. The cost in sub-account will be marked as the cost of the negative product – AN.	degree 1-4
538 Other taxes and fees	For the main-account it is required to create the sub-account for environmental taxes and fees. If it was a fee or penalty relating to a particular product – A, it is necessary to create new analytical record within the sub-account for environmental taxes and fees. The full value of fee or penalty will be allocated to the negative product – AN.	degree 1-4
549 Shortages and damages	Shortages and damages of products are part of the costs of negative products. From analytical records should be evident: – which cost is belonging to a particular product – AN, – which shortages and damages are relating to the enterprise as a whole.	degree 1-4
Other	Minimum: 1. indication of the product, for which the cost was expended, in our case, product A 2. allocation to AP and AN is performed on base of the calculated ratio of material consumption for AP and AN.	degree 1-4

Source: own processing.

Specialists around the world have been developing special software to facilitate the introduction of environmental accounting and MFCA. Such software can be obtained, for example, in Germany. It is not yet available in the Czech or Slovak language [Hájek 2016]. It is a new opportunity for Czech and Slovak software companies.

On January 2016, a new waste law became effective in the Slovak Republic, which requires much more detailed waste information than before. The new law has introduced the so-called "Expanded producer's responsibility", which makes producers responsible for taking care of their products throughout their life cycle, i.e. also when they become waste.

In our opinion, it will be necessary to create more sub-accounts and analytical records for waste management for the main account 518 – Other services, for the purpose of monitoring in particular:

– individual kinds of separated and other waste (e.g. used batteries and accumulators, waste oils, worn tires, multilayer combined materials, electrical equipment, plastics, paper, glass, vehicles, metal packaging waste, etc.),

– individual kinds of products that become waste after the end of the production cycle due to their very low quality or which have been collected by the manufacturer after the end of their life cycle.

To encourage Slovak companies to establish environmental accounting and MFCAwe consider it necessary:

– to develop educational and methodological materials within the Slovak Association of Accountants, the Slovak Chamber of Certified Accountants, the Slovak Chamber of Auditors and

– to take motivational measures at the level of the ministry of finance, ministry of environment and relevant sectorial ministries.

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Ekologizácia účtovníctva potrieb environmentálneho manažmentu

Abstraktné. *Cieľom práce je načrtnúť možnosti zvýšenia efektívnosti rozhodovania v oblasti environmentálneho manažmentu prostredníctvom zlepšenia informačnej podpory z účtovnej strany. Ide najmä o monitorovanie primeraných informácií o životnom prostredí prostredníctvom manažérskeho účtovníctva. Informácie je možné získať postupnou ekologizáciou účtovníctva prostredníctvom postupného vytvárania environmentálneho účtovníctva. V príspevku sú prezentované návrhy dvoch variantov ekologizácie účtovníctva: jednoduchá možnosť – budovanie environmentálneho účtovníctva bez sledovania materiálových tokov, komplexnejšia možnosť – budovanie environmentálneho účtovníctva s monitorovaním materiálových tokov. V návrhoch sa zohľadňujú legislatívne predpisy o účtovníctve podnikateľov v Slovenskej republike.*

Kľúčové slová: *ekologického účtovníctva, environmentálneho manažérstva, účtovných analytických záznamov, environmentálneho kódu, nákladového účtovníctva materiálových tokov (MFCA)*

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Green Marketing as Part of Corporate Social Responsibility: IT Companies in the Slovak Republic

Abstract. *The paper gives the overview of the green marketing and Corporate Social Responsibility in the spectre of the standards in companies in Slovak Republic. Author of the paper states why it is important to build and maintain social responsibility as one of the social marketing tools. The paper highlights significance of green marketing in the modern business and economy and its importance in the future as well. Study included in the paper consists of qualitative research of selected business subjects in Slovak Republic, focused on green marketing and CSR. Data retrieved from the research are compared with international analyses and researches. Critical analysis is being used to identify specific tools of green marketing used within selected subjects. The paper brings empirical evidences how locally based companies have been approaching to CSR and green marketing in recent years, compared with companies abroad in the region. It explains that more stress is being given on social responsibility in average in Slovak Republic than in the past, but the prognoses see stagnation in the CSR in the region, as well as shallow application of the green marketing principles in the local businesses. This paper includes list of recommendations for local firms based on best practices abroad, with aim to increase the CSR effect. It gives selected subjects specific suggestions how to improve their green marketing effects within their consumers. The paper brings new point of view for selected businesses, as well as the whole sector, compared with international studies, suggesting specific steps and tasks with aim to improve the green marketing in general.*

Keywords: *green marketing, corporate social responsibility, environment, determinants*

Introduction

We live in the world where the global production and population have had significant impact on the environment from the past until today. Modern

technologies, processes and lifestyle in the recent years has influenced our lives in fast positive way. Unfortunately, every coin has two sides. The tax for our modern lifestyle is weakened environment we do live in. In the recent years, modern, ecologically oriented subjects are focusing on environment improvement, with aim to develop modern present and preserve the environment at the same time. New strategies and policies are being adopted in more and more modern companies, with goal to provide green and sustainable products to their customers. These strategies, also known as Corporate Social Responsibility, has various forms. One of them is green marketing, which we will look at in this paper. The theoretical principles will be supplemented by empirical study, detailed analysis of selected companies within Slovak Republic, focused on the green marketing implementation in their business processes. We will compare these results with general CSR local and global statistics, based on selected markers.

1. Corporate social responsibility and green marketing

Businesses in the current competitive environment are determined by numerous and often turbulent market changes, imbalances of supply and demand, increasing competition between business entities, frequent legislative changes and government intervention [Mura 2016]. Companies are increasingly dealing with sustainability issues as part of their core business strategy. Because of this, companies review and improve their sustainability management processes (CSR Europe). There are multiple approaches to terms Corporate social responsibility and green marketing. Corporate social responsibility can be defined as pack of interests in social and environmental field and the relationship between different groups of interest within the business [Szwajca 2013]. Based on this definition, the strength of the approach is in the optimization of needs for all parts of interests, i.e. shareholders, stakeholders, employees, public authorities, etc. "Whole industries have recently experienced 'responsibility waves', times of swift shift toward more sustainable, responsible, and ethicalpractices" [Laasch, Conaway 2015: 8]. Social entrepreneurship is a response to the ongoing social and economic changes, incentives and challenges of social development [Mura 2016]. As Caputa [2015] mentioned, the foundation of the relationship, in which the customer becomes an active participant of exchange, is customer's emotional engagement, which finds its reflection in, among others, launching a one-way of two-way information transfer, what could be the way to CSR. This means, practically, to set a sum of actions, that influence positively the environment, even under circumstances of

temporary or permanent profit decrease. This steps, however, lead to change of business approach from solely profit oriented to "people, planet, profit" [Průša 2007]. This triple bottom line, defined by Segal-Horn and Faulkner [2010], is the three-pillar structure to define the basic principles and aims of the modern CSR. Modern CSR principles respecting companies do not focus only on profit increase, but take also people, as consumer as wider communities, and planet as the environment where all subjects create one synergic unit. The other approach say, that CSR is solely voluntary tool to provide integration of the principles into the daily enterprises' operations [The Green Book 2001]. It means that no enterprise is forced to adapt the principles of CSR into their internal business process, however ignoring these principles can affect negative growth of the company in the future, since CSR and environment preservation is being sensed sensitively in the present among consumers as well as public institutions. Implementation of socially responsible activities results in reduction of negative impacts on the environment through more efficient use of resources, reduced water consumption, lower waste disposal costs, savings from lower material and energy consumption of the enterprises'activities [Klimek 2014: 282]. Corporate social responsibility can also be understood as a benefit for the local community and region, as well as represents a new dimension of regional development. It is externally manifested in creation of higher quality social relations with individuals, social groups, local governments which can contribute to accumulation of social capital of local communities [Ubrežiová, Mura 2017].

Green marketing, as a significant part of the CSR, is tool to utilize the activities of the enterprises in terms of environmental friendly behaviour. Nowadays especially, stress on environmental production process is vital for consumers on one side, and local authorities on the other side. Current customer is widely ranged in green products, natural products and environment-friendly products. Green marketing as a tool of CSR is being known since 1970s, introduced on seminar held by American Marketing Association. Green marketing respects and supplements basic principles of social responsibility and business activities [Supeková 2014]. There are several factors that green marketing takes into consideration. According to Castenow [1993], the stress is pressed on increased care about clean air, water and soil, nature devastation ceasing, optimized natural resources usage and recycling, and promoting the ecological and healthy lifestyle among the population.

We can understand the green marketing as a narrow term and a broad term. According to narrow green marketing theory, we understand the focus of the company onto more organic products [Zhang, Zhang 1999], while broad theory works with approach that green marketing is a sum of ideas, steps and actions in the production process, that are aimed to satisfy population needs and do not

impact significantly on the natural environment [Dubey 2008]. As Kunz and Hronová [2016] mentioned, the actual implementation of the CSR principles brings the need to include them into the corporate values, business strategies and processes at all levels of the company. One of the key prerequisites for effective implementation of CSR into corporate practice is to provide comprehensive communication about socially responsible activities to all key corporate stakeholders. The success of any company and also the country of origin in the global concurrency depend on speed and complexicity of reaction on the changes [Krchová 2017].

2. The green marketing mix

Today's keywords include environmental protection, CSR (corporate social responsibility), ethics, sustainability, and the concept of responsible employer. We can say that environmental awareness, responsibility is a matter for everyone, and not just for a group [Happ 2012]. Even when talking about green marketing, we have to take into consideration the marketing mix. However, the approach to green marketing mix definition is slightly different from the classic model.

Product. Green marketing requires significant product changes to be more green and ecological. Maximization of positive and minimization of negative impact on permanent sustainability are one of the goals for the product and system changes that provide sustainable solutions in terms of greener and ecological products. Essential part of the green marketing is to understand the ecological thinking from the very start of the product cycle, implemented into the product design as well as marketing strategy design.

Key factors of the products, that determine their green sustainability, are those one, that effect the waste production and recycling possibilities of such products and those, that are connected to the production process and environmental load in the process [Baker 2003].

Communication. One of the trickiest parts of the green marketing is the marketing communication. Even in the time of information boom, where lots of information are available through internet and other sources, there are still companies proclaiming green marketing approach in their manufacturing process, that are convicted of the opposite behaviour. For instance, Nestlé, one of the worlds' largest food producing companies, claims the production process to be as much sustainable as possible and holds the strict CSR policy on one hand, but gains the primary resources from suppliers, who use child or forced labour [Green America 2011].

There are several requirements for fulfil to communicate green product correctly. Producers must claim that products have real positive impact on the environment, must provide actual and clear information and data, understandable for customers and related strictly to green marketing, or to give clear explanation of the benefits of the products, that can stimulate consumer' needs [Baker 2003].

Price. Green marketing principles increase company costs. New technologies implementation, renewable materials usage and other variables affect company costs. On the other hand, reducing material consumption, lower waste production and energy saving processes can optimize cost increase. Nowadays, there are plenty of options for cost optimization in terms of environmental sustainability.

Distribution. There are various ways to optimize the distribution process to be in accordance with marketing principles. More ecological distribution methods are being used for the distribution itself. The improvement in the fuel consumption of the vehicles is more economic than in the past. Modern green products focus on product labelling and packaging. Products are being packaged in reusable or recyclable packages, using green labelling methods consumers are encouraged to reuse or recycle packages for further usage. Glass bottles or jars can be used repeatedly for the same purposes, while plastic and paper packages can be transformed into usable products. Even products, that do not need to be in physical form, e.g. software, can be distributed virtually, which conserves environment by not making another packages and hardware medium [Dvořáková, Lišková 2014].

3. Methodology

The paper is focused on the evaluation of the green marketing usage among selected subjects – global companies manufacturing product in Slovak Republic. The aim of the paper is to assess the green marketing activities of these companies in terms of the global market, focused on advanced activities on the local market of the Slovak Republic. The partial aim is to compare CSR and green marketing activities of the region of Central Europe with Slovak Republic.

For the purpose of this paper, we used scientific literature, special publications and scientific papers as secondary resources to define the area of green marketing among the Corporate Social Responsibility. De have defined the main objectives of green marketing, marketing mix of the green marketing with stress on specifics compared to traditional marketing mix model. These findings have helped us to assess the green marketing activities level on selected studies in our research.

As primary sources, we have used the CSR and green marketing promotional materials of selected subjects. We have chosen three of the largest IT and electronics companies that operate in Slovak Republic – Panasonic, DELL and Samsung. The reasons of not choosing local companies are that we can assess activities of these companies in local terms compared to global behaviour on one hand, and the fact, that local companies do not state their activities or have no activities in green marketing. Additional data we used has been obtained from secondary sources, related to the problem, like scientific articles and monographs.

The findings are presented in schema and graphs. There was very important to use also logico-cognitive methods. Based on uses analyses we try to identify current statutes of the green-marketing in the segment of the IT companies and define to formulate recommendation to improve its quality and development. We used scale from 1-12 for determinants affecting the application of CSR in the companies strategy. In the survey for companies (V4 countries) we asked for the most important determinants affecting the using CSR, such a size of company, the profit of company, legislation related to environmental and social issues, history of application of the CSR at the company, innovation and technology, customer opinion, demand, value of brand, internationalisation, country of production.

We have used critical analysis of the primary sources to point on the green marketing tools used in selected subjects, focused on strong and weak parts of the green marketing strategy. Synthesis of these fact has been used to build unified conclusions of the research. These conclusions have been compared to statistics obtained by two surveys – CSR Managers Survey 2015 in Central Europe by Deloitte and Currents of change survey by KPMG.

Finally, specific recommendations and suggestion has been designed to support green marketing development in the economy of Slovak Republic.

4. Research and results

Results during the solution of research project Marketing Communications in the Conditions of V4 Countries (University Grants of Visegradfund) we also defined the determinants assessing to the CSR and green marketing activities of companies general. Those analysis included the following variables:

1) The size of company,
2) The profit of company,
3) Legislation related to environmental and social issues,
4) History of application of the CSR at the company,
5) Innovation and technology,

6) Customer opinion,
7) Demand,
8) Value of brand,
9) Internationalisation,
10) Country of production.

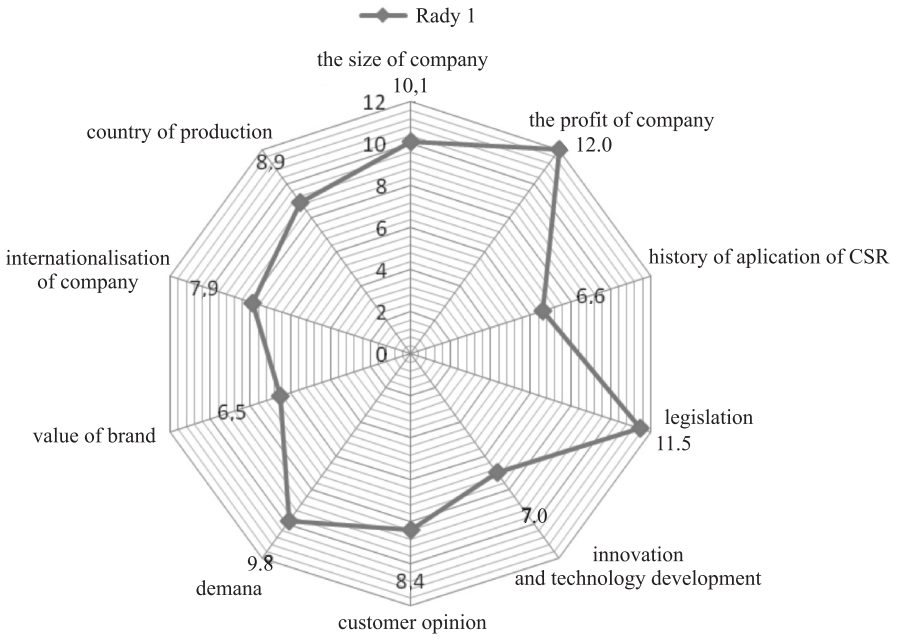

Figure 1. Determinants affecting the application of CSR

Source: own.

Regarding to the research, the most significant determinant affecting the application CSR in case of green marketing is the profit of company and legislation (see Figure 1). This determinant appers in the international survey (University Grants – Visegrad Fund) as well. In the research on a scale of 1-12, the profit of company reached a score of 12 and the legislation reached a score of 11,5. The third of the most important determinant affecting the application of CSR in the company activities is the size of company and followed next by country of production (score 8,9). The determinant demand reached very close score of 8,8. The sixth most important determinant is customer opinion (score 8,4), followed by the internationalisation of company, what reached score of 7,9. We could say, that close to the middle of scale of our survey is determinant the innovation and technology development. It is very interesting fact, that for producers determinant the history of application of the CSR in the company is the second last of the

survey results (score 6,6) and determinant the value of brand is the last one in the survey of producers with score 6,5. We could say, that there are not differences among companies from V4 countries. The profit of company and legislation determinate the decision for company in case of CSR and green marketing application.

Regarding the list of The World's Most Sustainable Companies 2017, the first place reached. Siemens AG (Germany, Industrials), the second place reached Storebrand ASA (Norway, Financials) and the third place Cisco Systems Inc (United States, Information Technology). The list consist from 100 most sustainable brands from different industries [Forbes 2018]. No one from three analyzed companies from IT sector acting in Slovakia too has not place in this list. On the other side the list of Green Brands [www.rankingthebrands.com] lists the Panasonic on 52nd place, Samsung and DELL, however global brands are not listed among TOP 100 Green Brands Ranking. We would like to show in our analysis, that all three analyzed brands are very active in the field of application CSR and green marketing activities.

Panasonic Slovakia. Panasonic plant in Trstená and Stará Ľubovňa are one of the largest electronics concerns in Slovakia. Nowadays, two factories have invested or plan to invest into production automation processes, mainly in the manufacturing of loudspeakers. The aim of the investing is to increase the ENERGY STAR brand level among their products, as well as the components used in other divisions. With more than 300 ENERGY STAR products Panasonic proves that eco-friendly electronics can be manufactured massively with minimal loss on process performances. Also, Panasonic improves its manufacturing process in waste recycling. In 2013, factory waste recycling achieved rate of 99,3 per cent. Company uses recycled plastic waste in its products manufacturing process. Panasonic has established its own power and water saving function – ECONAVI, in 2009. Home products using this technology are power and water consumption friendly, using intelligent technologies to save the consumption and be more ecologically effective. Today, many consumer and business products use ECONAVI technology, which is widely accepted by consumers.

Although the principles of green marketing are widely implemented in the production process (see Figure 2), and investment to change the appliances to be eco-friendly and power-efficient are being higher annually, we see the communication niche in terms of low local information about this strategy on particular local markets, including Slovak Republic. The company should state information about its green marketing activities and advantages of using the green products to their local consumers.

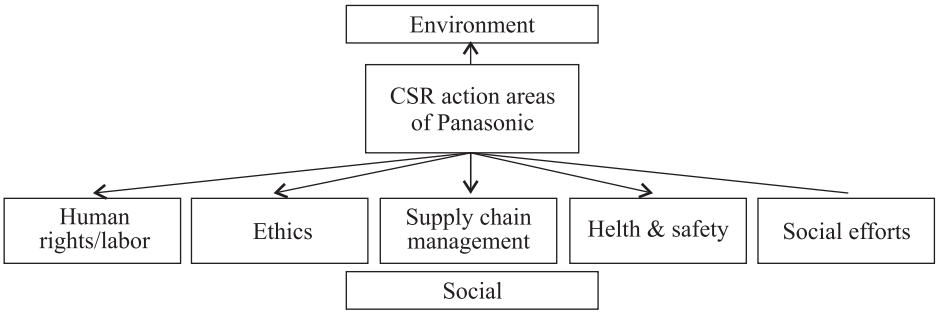

Figure 2. Corporate Social Responsibility action areas of Panasonic

Source: author adapted from Panasonic CSR Report 2017.

DELL. DELL has built in Slovakia mostly support and customer centres, that are effective for the wide part of the world. This centre focuses on green marketing activities mostly in terms of delivery, packaging and shipping. DELL uses strategy called "3Cs" – cube – content – curb. It is focused on the package box itself, the product that is being packaged, and the way how the product and box itself could be recycled. Through this policy, DELL tries to decrease the waste production among the company itself and for the customers. The major pillars are reducing the box sizes, where delivery companies are able to transport more products at one time and the box itself produces less waste, using natural materials in their packages, like bamboo cushions or straw initiative, and finally optimizing their logistics as environmental way as possible.

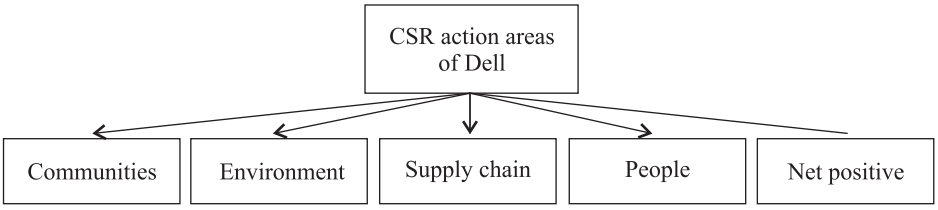

Figure 3. Corporate Social Responsibility action areas of DELL

Source: author adapted from DELL CSR Report 2017.

DELL green marketing activities are widely used and applied (see Figure 3), however for Slovak consumers they may not be clear, since activities are mostly focused on foreign customers and green marketing activities are promoted only on limited markets. We recommend to point at the green marketing activities even if DELL has only support and customer centre in Slovak Republic, to act as a global company, what not only employs local labour force, but also cares about the future of the nature and the world.

Samsung C&T. Samsung C&T is a global leader in carbon management. Slovakia based LED panels factory in Voderady (SDSK) has introduced technologies, that reduce gases from LCD screens. The plan is to reduce CO_2 production significantly during the manufacturing process, as well as using the products. Samsung C&T will proactively respond to global climate change. As part of the effort, they will reduce GHG emissions per sales by 20% from the 2017 levels and keep expanding the share of eco-friendly products in their portfolio. Other tool is to pack products into recyclable and eco-friendly packages, that can be reused or recycled. For example, ecological refrigerators are being packed to polypropylene packages instead of paper and polystyrene. These new reusable packages can be used more than 40 times for refrigerator packing. SDSK plans to use equivalent packaging material, with aim to reduce CO_2 production up to 99,7 per cent. Samsung factory accepts new work conditions aimed to reduce injuries risk during working hours, while maintaining work efficiency and be fully eligible with legal regulations in Slovak Republic. The important point is, that the company maintains and continually improves the effectiveness of environmental management system and health and safety management system. In the field of environmental care the company goal is to reduce inputs and save natural resources, careful protection of all environmental elements and optimized waste management. In terms of safety, in particular, they take care to minimize occupational risks and impact on health of employees, protecting the health, the prevention of occupational accidents and to ensure consistent fire protection. The company management provides the necessary sources and support to achieve goals by encouraging the programs of EHS management system based on ISO 14001 and OHSAS 18001.

We suggest to use the green marketing principles in the communication campaigns of the company. The company uses just the promotion in the general way of Samsung company, but not specified promotions and customized communication tools on local markets. Promoting these actions would give the customers knowledge, that Samsung does not only talks about environment, but means it and has implemented a set of measures that help the environment.

5. CSR in Central Europe vs. CSR in selected companies in Slovak Republic

According to Deloitte survey CSR Managers Survey 2015 in Central Europe, more and more companies in the region of Central Europe adapt certain type of Corporate social responsibility policies in their production processes, and focus on green marketing activities to provide cleaner, eco-friendlier products to their

customers. In the present, business is more oriented to solving social problems in countries of Slovenia, Romania and Lithuania. For the future, more than 86 per cent managers expect wider changes in CSR principles among large companies, but also SMEs segments. However, mostly respondents from Czech Republic, Hungary and Slovakia foresee stagnation in the future, and see moreover reluctance in local business environment. More of them see CSR activities to be shallow to be implemented with aim to preserve environment, but only to serve as marketing communication tool as the real purpose.

KPMG survey [2015] says, that the CSR principles and actions applied in the manufacturing processes in the world's 250 largest companies are not unified, and hardly to compare. However, more than two thirds of companies report their CSR activities publicly. Countries with highest CSR publicity rates in their annual reports in Europe are West European France, UK, Denmark and Norway (82 to 90 per cent). Slovak Republic reports, that only more than 40 per cent of companies state their CSR policies in their annual reports, as well as Czech Republic. These findings fit to findings of Deloitte survey, that companies in the region of Central Europe do not consider CSR policy implementation as an important part of their business.

As showed on selected subjects, one problem is that green marketing activities are not being promoted enough to their customers or any other consumers. Information is the basis for consumers to start sensing these companies and their products as eco-friendly locally and globally. Surveys analysed above verify our research, that CSR stating and actions are being underestimated in the region of Central Europe, especially in Slovak Republic. Deeper CSR principles implementation and interest in largest local companies could move SMEs into accept the same principles as one of the pillars of their business models. We see the largest foreign companies as an example for the local ones, however the weak promotion activities do not support other companies to follow these successful companies. The other tool that can motivate companies to think ecologically is the European authorities' green policy, where eco-friendly companies would be awarded for their nature preserve activities. This model has actually been implemented in many sectors of the economy, but corresponding promotion together with appropriate local authority tools would restart the ecological thinking of the whole economy.

Conclusion

As for the stated, we can build a set of suggestions and recommendations based on the data obtained in this paper, focused on the selected companies,

but also the whole sector of Slovak Republic. As the weakest point we see the marketing communication activities within selected companies, as well as the whole economy in Central Europe and Slovak Republic. Even when companies have implemented the green marketing tools into their manufacturing and support processes, we do not consider their communication of these processes as effective as sufficient to differentiate themselves from the other companies not using these processes. Even when these companies do not operate directly in the country, they should care about the goodwill in the country they operate in.

From the broader point of view, on the other hand, we are confident that green marketing activities as well as CSR principles are being skewed many times in the annual reports, or are missing completely in the companies' documents in the Slovak Republic. We think the local and European activities should receive a set of precautions to unify CSR statement methods within companies, and enforce compliance of these rules on legal base.

Last, but not least, we encourage the local and European authorities not only to penalize negative effort, but to award positive effort in CSR, with aim to motivate companies to bring more environmentally efficient production and products, and the change in the way of thinking among their customers.

Finally, we see green marketing and CSR as just one of the starting points to make our lives more ecological and to maintain sustainable development for future generations.

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Zelený marketing ako súčasť spoločenskej zodpovednosti firiem: IT spoločnosti v Slovenskej republike

Abstraktné. *Príspevok prináša prehľad o ekologickom marketingu a spoločenskej zodpovednosti podnikov v duchu štandardov vo vybraných spoločnostiach v Slovenskej republike. Autorka článku uvádza, prečo je dôležité budovať a udržiavať sociálnu zodpovednosť ako jeden z nástrojov sociálneho marketingu. Príspevok zdôrazňuje význam zeleného marketingu v modernom podnikaní a hospodárstve a jeho význam aj do budúcnosti. Štúdia, ktorá je súčasťou práce, pozostáva z kvalitatívneho výskumu vybraných podnikateľských subjektov v Slovenskej republike, je zameraná na ekologický marketing a CSR. Údaje získané z výskumu sa porovnávajú s medzinárodnými analýzami a výskumami. Kritická analýza sa používa na identifikáciu špecifických nástrojov ekologického marketingu používaných v rámci vybraných subjektov. Príspevok prináša empirické dôkazy o tom, ako sa miestne firmy v posledných rokoch približujú k sociálnej zodpovednosti podnikov a ekologickému marketingu v porovnaní so spoločnosťami v zahraničí a v regióne. Zdôrazňuje, že v Slovenskej republike sa v priemere kladie oveľa väčší dôraz ako v minulosti, ale prognózy vidia stagnáciu v CSR v regióne a plytké uplatňovanie zásad ekologického marketingu v miestnych podnikoch. Tento článok obsahuje zoznam odporúčaní pre miestne firmy, založený na osvedčených postupoch v zahraničí s cieľom zvýšiť efekt CSR. Ponúka vybraným subjektom konkrétne návrhy, ako zlepšiť svoje ekologické marketingové efekty v rámci spektra svojich spotrebiteľov. Príspevok prináša nový pohľad vybraným podnikom, ako aj celému odvetviu, v porovnaní s medzinárodnými štúdiami, ktoré navrhujú konkrétne kroky a úlohy s cieľom zlepšiť ekologický marketing vo všeobecnosti.*

Kľúčové slová: *yelený marketing, spoločenská zodpovednosť firiem, životné prostredie, determinanty*

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Reputation Risk Insurance as a New Product on the Insurance Market

Abstract. *Corporate reputation is nowadays exposed to a number of internal and external threats. In the current information age, reputation risk is being multiplied by technological advances in the field of IT. a particular danger is the growing use of the Internet and social media. Therefore, the need to protect reputation is increasing. One way to deal with this problem is to insure the reputation risk. The purpose of the article is to present the specificity of reputation risk insurance as a new product offered for several years on the insurance market and to indicate the development prospects for this sector.*

Keywords: *corporate reputation, reputation risk, reputation risk insurance, new insurance product*

Introduction

Reputation is an opinion of a company formulated by various stakeholder groups, based on their perception and evaluation of its activities. The results of many studies have shown that good reputation is a source of tangible benefits, while reputation deterioration has a number of negative effects: stock prices decrease, falling sales, goodwill decrease etc. Negative consequences may manifest themselves over a longer period of time, which may include: decrease in customer loyalty, loss of investors and cost of capital increase, higher costs of acquiring business partners, resigning from work by valuable employees [Gaines-Ross 2008; Burke et al. 2011; Szwajca et. al. 2014]. In recent decades, on the one hand, the

growing importance of reputation as a very valuable enterprise resource [Cole 2012], and on the other hand, an increase in the number of threats to reputation, i.e. growing reputation risk is observed. Reputation risk is considered one of the most dangerous and difficult challenges for today's enterprises. According to the survey results, conducted by EisnerAmper LLP in the USA (from October 2011 to February 2012) among directors of private and public sector enterprises (the sample consisted of 193 respondents) reputation risk (next to financial risk) was indicated as the most important [Reputational Risk in Banking... 2015]. The similar results shows Aon's 2017 Global Risk Management Survey gathered input from nearly 2000 respondents at public and private companies of all sizes and across a wide range of industries globally. For the second time running, damage to brand and reputation emerged as the top-ranked risk in this survey. Economic slowdown, increasing competition, regulatory/legislative changes and cyber crime/hacking/viruses/malicious codes took the next places [Global Risk Management... 2017].

Threats to reputation are generated both by external factors, from the environment, as well as by internal factors, regarding the decisions and behavior of the company's management and employees. a particular source of risk of reputation has now become the Internet and social media, in which there may appear various, favorable or unfavorable for the company information about the high power of expansion and impact on public opinion. Under these conditions, the need to protect corporate reputation from potential attacks is growing rapidly. Reputation risk insurance is one of the ways to protect company's reputation.

The purpose of the article is to present the specificity of reputation risk insurance as a new product offered for several years on the insurance market and to indicate the development prospects for this sector. The method of critical analysis of mainly foreign literature and comparative analysis of selected insurance companies offers was used.

1. What is a reputation risk?

The corporate reputation is of multi-aspect and complex nature. Its analysis and research is performed by specialists from several disciplines, such as management, economics, sociology, psychology, and marketing, who formulate various definitions [Fombrun, Van Riel 2003; Walker 2010; Highhouse et al. 2009a; 2009b; Lange et al. 2011]. Although there has not been developed a universal definition of reputation, general agreement exists that reputation is the collective judgment, opinion, evaluation based on perceptions, beliefs, knowledge and expe-

riences of external observers and stakeholders [see Walker 2010]. Michael Barnett et. al [2006] conclude that reputation is "the observer's collective judgments of a corporation based on assessments of the financial, social, and environmental impacts attributed to the corporate over time". Jonathan Low and Pam C. Kalafut [2002] notice that reputation is the ultimate intangible, it is slippery, volatile, easily compromised, amorphous and impossible to control. For these reasons reputation is a very difficult subject to evaluation and measurement. Many different approaches and solutions have been developed, such as archival third-party ratings, media rankings (most popular: Fortune's most admired companies), survey of buyers' perceptions, accounting measures such as asset quality [Fombrun, Foss 2001; Wartick 2002; Lange et. al. 2011; Clardy 2012]. So far, there has not been developed a universal method of reputation measurement.

Difficulties connected with reputation risk defining result from specific and complex nature of reputation itself. The approach by Arlo Brady and Garry Honey [2007] is easy in a form but difficult in a substantial part. They state that reputation risk occurs when the organization fails to meet the expectations of specific stakeholder groups. It is said that reputation risk lies in the gap between the expected and actual behavior of that organization. Any incident or circumstance that reduces trust among any particular stakeholder group has the possibility to create reputation damage. Reputation risk does not take place in isolation. Jenny Rayner [2003] maintains that there is no such thing as "reputation risk" – only "risk to reputation". The term "reputation risk" instead is a convenient catchall for all those risks, from whichever source, that may impact reputation. She proposes the following definition capturing the essence of reputation risk: reputation risk is any action, event or circumstance that could adversely or beneficially impact organization's reputation.

A similar approach is also represented by others authors, for example Alasdair Ross [2005] and Matteo Tonello [2007: 12] from The Conference Board. Tonello notices that reputation risk materializes when the negative publicity triggered by certain business event, whether accurate or not, compromises the company's reputation capital and results in value loss for the enterprise. Like other types of risk, reputation risk has a factual premise (i.e. negative business action), manifests itself through series of other factual circumstances (i.e. the bad publicity), and ends in a consequence (i.e. value loss). There is one thing distinguishing reputation risk: the triggering event also constitutes another business risk, with its own factual circumstances and consequences for the company. Because of this compounded nature, reputation risk has been qualified as a "risk of risks". For example Toyota, suffered a recent reputation failure as a result of technical defects – in spite of their reputational consequences, the accidents were – first in 2009 and foremost 2010 – serious operational risks.

2. Sources of reputational risk

The corporate reputation is of multi-aspect and complex nature. Reputation risk is generated when the enterprise does not fulfill expectations and does not keep promises made to its stakeholders. Because of the variety of needs and requirements of particular stakeholder groups the area of reputation risk creation is very wide. It concerns almost each aspect of enterprise's functioning – from the quality of offered goods and services, through financial results, law respecting, treating employees and business partners, to noticing problems and social-general issues [Rayner 2003].

Brady and Honey [2007] from the Chartered Institute of Management Accountants made a classification of reputation risk sources considering their character and possibility to control. They distinguished the following groups:

1) cultural risk (legal and ethical),
2) managerial risk (executive and operational),
3) external risk (association and environmental).

Cultural risk concerns standards and codes of conduct, systems of values, internal codes and procedure and therefore, is tied to the organizational culture of the enterprise. Rules and codes of conduct may also be imposed by external bodies, such as central and local administrative authorities, supervisory committees – not obeying them involves strictly defined legal sanctions. In such case one may speak about legal risk. In case of ethical risk, standards and values are set voluntarily by the company or suggested by various groups influencing opinions or those with strong authority. In ethical risk the discrepancy between promises as well as declaration and the actual actions is presented. Because the sources and causes of cultural risk are identifiable, the enterprises are (or at least should be) aware of the laws in force as well as of declared values and rules, the suggested strategy of actions is the avoidance strategy.

Managerial risk refers to the sphere of making decisions and executing tasks by all of the employees of the enterprise. Executive and operational risks are distinguished as parts of it. Executive risk concerns decisions made in the highest level and is reflected in the results of the enterprise as a whole. Operational risk on the other hand is a result of mistakes or omissions of lower level executives or of direct contractors. The mistakes made by them most often results in faults in products, mistakes in documents, shortcomings in service etc. The base for managerial risk is the sphere of competencies and skills of the employees of the company and the information system that provides them with guidelines for making decisions. In case of this type of risk the suggested strategy is the one of risk management.

Unlike the case of cultural and managerial risk, which have their roots inside the organization, the sources of external risk are in the environment of the enterprise. Association risk and environmental risk may be pointed out as parts of this type of risk. Association risk is tied to the fact that the enterprise cooperates with various cooperators: suppliers, distributors, service providers. Those subjects can make mistakes or may not keep the terms of an agreement which may influence on the level of service and reputation of a firm that chose a wrong partner, in a negative way. The causes of environmental risk are completely independent from the enterprise as they stem from events occurring in the natural, demographic, technological and competitive environment of the enterprise – such as for example hurricane, flood, computer virus, actions of the competitor. Those events cannot be predicted, therefore the only strategy is eliminating their negative results.

Taking into account somewhat different criteria W. Timothy Coombs [2007: 168] divided crisis situations into three groups:

1) independent from the power and activities of the organization (natural disasters, gossip and slander, violence in the workplace, attacks of foreign enemies) – the organization is a victim of the crisis,

2) dependent, but not intentional and unpredicted by the organization (accidents due to equipment failure, product defects caused by technological malfunction, inappropriate management decision e.g. based on wrong forecasts) – the organization led to the crisis by chance,

3) dependent and caused by the organization (accidents and product defects caused by people errors and negligence, board lies and deception, law violation) – the organization takes actions leading to crisis in a more or less conscious way.

Combining both approaches to reputational risk sources, each group can be assigned to a different scale of corporate responsibility that generates a different level of reputation risk (see Table 1).

As it is indicated in the Table 1, the lowest reputation risk refers to external, relational and environmental causes. Moderate, average level of reputation risk is caused by management or employee errors, leading to financial losses, product

Table 1. The level of reputation risk depending on the source of the crisis situation

Sources of crisis situation	Dependence on company	Scale of responsibility assigned	Level of reputation risk
External (associations and environment)	Independent and involuntary	small	low
Managerial (executive and operations)	Dependent, but not intentional	large	average
Cultural (legal and ethical)	Dependent and intentional	large	high

Source: Szwajca 2016b.

defects or deficiencies in service. The highest level of reputation risk and largest scale or responsibility are generated by the legal and ethical sources. It derives from specific features related to their cultural background. This is confirmed by the opinions of managers in the research by Weber Sandwick [2007]. As the greatest threat to reputation they considered: financial irregularities, unethical behavior and executive misconduct – all issues that could be prevented if companies had better controls in place.

In the contemporary reality, in the times of incredibly dynamic development of information technologies, new specific sources of reputation risk are born. Leslie Gaines-Ross [2010] brings attention to the threat to reputation stemming from the unlimited potential of modern media and social portals: blogs, tweets, text messages, online petitions, Facebook protest sites and digital video. The speed of their operations, widespread availability, relative anonymity and no possibility of controlling it, make them particularly dangerous tools of competition. Enterprises and other subjects may be surprised with false charges, unconfirmed rumors and baseless accusations. Such source of risk cannot be identified in time, kept under control and it is impossible to prepare for attack.

Verena Hausmann and Susan P. Williams classified the risks associated with the functioning of social media (Figure 1).

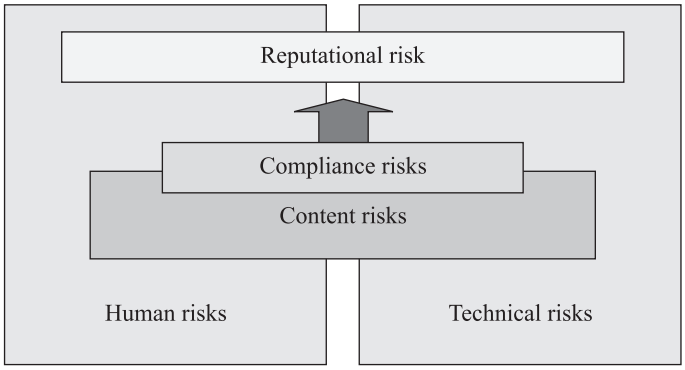

Figure 1. Preliminary social media risk categorisation

Source: Hausmann, Williams 2014: 9.

Having analyzed the types of risk listed in the Figure 1, it can be stated that the first two types are the cause for the next two, which in turn are the direct cause of reputation risk. All the risks associated with the functioning of the SM are the consequence of two primary factors:

– technological conditions that allow the installation of malicious software, hacking attacks, disk damage, etc. (technical risk),

– psychological determinants related to the way people use the media, being aware or not (risk related to the human factor).

These two factors generate the risk of loss, leakage or distortion of submitted and transmitted content (risk of transmission of content) and the risk of fraud, manipulation and law disobeying (legal risk). All of this ultimately influences the company's opinion as well as the level of confidence. This means that all potential risks will inevitably affect reputation, what confirms the thesis that reputation risk is a top risk. Rising threats from modern media are seen not only by theorists, but also by business management practitioners.

3. Reputation risk insurance as a new specific insurance product

The beginnings of the insurance industry date back to antiquity and concern securing trade expeditions, especially marine ones. Marine insurance in today's understanding was created in Italy along with the development of trade and the creation of commercial and financial capital in the first half of the fourteenth century. At the turn of the 16th and 17th centuries, property insurance started to appear, especially in the event of a fire or flood (when the so-called fire and flood casinos began to function). Much later, personal and life insurance appeared (in England at the turn of the 17th and 18th centuries). At the turn of the 19th and 20th centuries, insurance of economic risk coverage (insurance of mortgages, reduction of the price of securities, stagnation of enterprises, and strike) was introduced. At that time, the insurance market was fully formed [Luc 2018].

Currently, companies offer very many insurance products on the insurance market. The most frequently purchased products are: transport policies, home insurance, housing, life policies and civil liability. Reputational risk is a category for limited insurance. Reputation insurance reputation is a cyber liability policy, and a policy of return. For example AIG's CrisisResponse policy covered by crisis management costs [Sapona 2017]. It's not hard to understand why considering reputational damage is difficult to predict and quantify. Reputation risk as a subject of insurance is characterized by many specific features that significantly make difficult the preparation of the appropriate offer.

Firstly, the reputation risk as a "risk risk" is a consequential risk – it can be a consequence of many diverse events that can't be identified or calculated. Potentially, each type of risk ultimately affects the level of trust of stakeholders towards the company [Ross 2005]. From a legal point of view, insurance is a contract specifying the insurance company's obligation to pay compensation

in the event of the occurrence of an event specified in the contract, referred to as an insurance accident. The insurer must therefore precisely list and describe in the contract all events resulting in the payment of compensation. In the case of traditional property, communication or personal insurance, establishing a list of such events is relatively easy, developed on the basis of long-term experience. In the case of reputation risk, it is practically impossible to identify and calculate all potential insurance accidents.

Secondly, the reputation risk is qualitative and "invisible", which is why it is difficult to estimate and measure. The effects that deterioration of reputation can cause are manifold and multi-faceted, as they usually relate to the reactions of many stakeholder groups. This may be, for example, a boycott of products by customers, the departure of talented employees, the withdrawal of investors. Only some of the negative effects are measurable, e.g. customer returns, cost of stock destroyed, damages, penalties, costs of lawsuits. Companies do not see many other adverse consequences of losing the trust of stakeholders that are not visible and tangible. Expenses could come from having to find a new supplier, to replace a business partner, to gain new clients or employees, or having to implement a new management process. Specialists in the field of risk management and insurance estimate that overall, costs associated with remediating a reputational event can be two to seven times higher than costs related to the operational failure that caused the reputation damage in the first place [Dwyer 2016]. The qualitative nature of reputation risk makes it difficult to identify and estimate losses, thereby determining the amount of the premium and the insurance sum.

Thirdly, reputation risk is behavioral risk, determined by human behavior that is difficult to predict and evaluate in terms of real motivation. Due to the multifaceted and qualitative nature of reputational risk, there is a significant likelihood of fraud (moral hazard), conflicts between the insurer and the insured in resolving disputes regarding certain provisions in the contract (litigation risk) and the occurrence of selection against [Gatzert et al. 2015; Honey 2012].

Fourthly, the reputational risk, defined as the gap between the expectations of stakeholders and the level of their fulfillment by the company is relative in nature, because it refers to the reaction of different groups of stakeholders with different expectations of the company in given circumstances and time. Therefore, the same event as a source of reputation crisis in different enterprises may have a different course, intensity, may have completely different effects and costs. In addition, the diversity of the consequences of a given crisis situation also depends on the current reputation of the company, the reputation of the industry and the country of origin of the company, or regional cultural diversity [Szwajca 2016a].

The behavioral and relative nature of reputation risk makes standardization of the insurance service more difficult and the adoption of standardized rates. The

insurer must approach each case individually, they can't use universal solutions, which increases the costs of the policy.

All listed specific characteristics of reputation risk make developing an insurance offer a serious challenge for insurance companies. This challenge was taken by Zurich Financial Service, which was the first in 2011, together with the insurance broker Aon and WPP marketing, to develop the Brand Assurance policy offer. Then, in the years 2011-2012, the reputation insurance policy was introduced into portfolio by other companies, such as: Chartis, AIG, Munich Re, Kiln, Allianz.

4. Reputation risk insurances of selected insurance companies and perspectives of new sector development

Individual insurers offer policies that differ primarily: covered loss, coverage limits, coverage triggers. Offers of selected insurance companies are presented in Table 2.

As it can be seen in Table 2, reputation risk policies define covered loss as:

– crisis management and related costs (Allianz, Chartis, Zurich, AIG),

– lost profits and revenue (Munich Re),

– combination of both (Kiln, specifically offered for hotels only).

It can also be seen that most companies only offer coverage of the costs of managing a crisis situation. Much less frequently, the policy refers to coverage of financial losses or to the combination of both solutions. It can be assumed that this approach of companies results from two reasons: firstly it is relatively easier to predict and estimate the costs of crisis management than potential financial losses, and secondly, possible financial losses can be very large, which generates a much higher risk and costs for insurance companies.

Summing up, it should be stated that the insurance of reputation risk is a completely new, non-standard and very expensive insurance product, aimed primarily at very large and rich corporations. For example, Zurich Financial Services, prominent insurance company, offers a reputation policy that would pay out a limit of $100 million for any reputation-related incidents. The initial product was only offered to 30 of the top global companies like Dell and Tesco [Reputation insurance… 2017].

Despite these difficulties and problems, the reputation insurance market is rapidly developing. Insurers broaden their offers and develop new methods and algorithms for estimating and measuring losses. An example may be a parametric

Table 2. Comparison of reputation risk insurance policies

Assurance Policy Name	Covered loss	Limit	Coverage trigger
Zurich Brand Assurance (since 5/2011)	Crisis management consultancy fees plus extra expenses (to implement consultant's recommendations); client must use one of the listed consultancy firms.	Limit: $100m aggregate with sublimits per crisis event and for PR costs	**Crisis event** defined as one of 19 named perils (e.g. product boycott, product recall, breach of IT Security, terrorism) that has or is likely to lead to **adverse publicity** within 60 days of the start of the event, and **expected to lead to financial loss.**
Chartis Reputation Guard (since 10/2011)	Crisis management consultancy and communication costs; client must use one of the panel PR firms.	Limit: variable aggregate, up to $25m	No explicit "trigger" Coverage starts when policyholder hires any of listed expert Panel PR firms in response to **reputation threats or reputation attack.**
AIG's Reputation Guard (sine 10/2011)	Crisis communication costs incurred through our panel of experienced public relations experts. Coverage includes consultation, monitoring, mail, advertising and other communications costs recommended by panel experts in response to both actual and anticipated publicity that is potentially damaging to reputation or brand value.	Limit: up to €10m aggregate	Ten sources of reputational risk, e.g. Health and safety incidents, Operational crises and events (e.g. pollution), Product recalls and quality control errors, Business and service interruptions, Financial losses and irregularities and others.
Munich Re Reputation Risk Insurance (since 5/2012)	Lost profits due to reduction in revenue; requires decline in consumer perception (and change in consumer behavior) as well as related reduction in revenues.	Limit (per quarter and per year): €50m, in exceptional cases even up to €150m	Option 1: **all risks** (constant media and revenue declines) Option 2: **named six perils** (e.g. product recall, loss of key persons, breach of data privacy).
Kiln Hotel Reputation Protection 2.0 (since 5/2012)	Revenue loss (per available room "RevPAR") plus crisis management costs; specifically offered to hotels.	Limit: €25m aggregate	Adverse media event. Incidents covered: death of a guest, food-borne illness, outbreak of Norovirus and others.
Allianz (AGCS) Reputation Protect (since 10/2012)	Crisis management consultancy and communication costs; client may use own PR firm.	Limit: €10m aggregate	Crisis events listed in the schedule of the policy, e.g. a liability claim, D&O claim, property loss.

Source: own work based on: Gatzert et al. 2015; Holm 2011.

loss measurement approach used through Steel City Re. Steel City Re's Reputation Assurance is a proper tool for reputation risk management based on the use of sigma-style process audit. Using proprietary reputation risk metric including six critical parameters it is possible to monitor the company's reputation. When the insured's reputational value metric falls below a certain threshold, the insurer launches the procedure of financial sources payout to cover the losses. This parametric product has a three-step trigger:

1) first, there must be an adverse event related to one of six critical parameters: ethics, innovation, safety, security, quality or sustainability),

2) second, the event must be known publically,

3) third, the insured's reputational parameters must fall.

In comparison with the first insurance offers concerning reputation risk, Steel City Re's policies do not have a standard limit and they are tailored to each customer. Furthermore, the proposed tool mobilizes the company to protect its reputation better and to detect the potential threats earlier.

Specialists dealing with the insurance market anticipate the rapid development of a new segment of reputation risk insurance in the near future. In the current digital era, new reputation threats related to cyber attacks, the use of the Internet and social media have emerged. The expectations and requirements of stakeholders about the social responsibility and transparency of the business activities are growing. Researchers suggest that for these reasons, reputation risk insurance will become one of the major strategies for reputation protection and risk management in businesses. In turn, the representatives of insurance companies notice a sharp increase in demand for reputation insurance policies. Nir Kossovsky of Steel City Re points out that the reputation insurance activity has doubled between 2015 and 2016. He emphasizes, however, that the demand for these services, like for any others, will depend on the relation of the cost of insurance to the costs of self-protection and incurrence of reputation crisis effects. Kossovsky predicts that in the near future a day may come when the directors may require a company to have a reputation insurance before he/she accepts a position on the company's board [Sapona 2017].

Conclusions

Reputation risk the subject of insurance is a difficult and complex category, which is why it is a serious challenge for insurance companies. The specificity of reputation risk is that it is a secondary, behavioral, relative and qualitative risk. These features make it difficult to identify and list all insurance accidents, as well

as to identify and assess potential losses, especially financial ones. Nevertheless, insurance companies have been offering insurance reputation risk policies for several years as new products in their portfolio. These offers vary in terms of the scope of losses covered, coverage limits and the identification of insurance accidents. Reputation risk policies define covered loss as: crisis management and related costs (e.g. Allianz, Zurich, AIG), lost profits and revenue (e.g. Munich Re), or combination of both (e.g. Kiln).

Reputation risk insurance as a new, non-standard product is very expensive, because it involves a high risk for insurers, therefore they are addressed to large, rich corporations or specific industries (e.g. hotels). Due to the increase in the number and scale of threats to reputation in the current digital era, specialists in the field of risk management and the insurance market predict the dynamic development of the segment of reputation insurance services. The problem of insurance of reputation risk is a new research area for risk management theorists, and for management practitioners – a new difficult professional challenge.

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Ubezpieczenie ryzyka reputacji jako nowy produkt na rynku ubezpieczeniowym

Streszczenie. *Reputacja przedsiębiorstwa jest obecnie narażona na wiele wewnętrznych i zewnętrznych zagrożeń. W obecnej erze informacji ryzyko reputacji jest multiplikowane przez postęp technologiczny w dziedzinie IT. Szczególne zagrożenie stanowi rosnące wykorzystanie Internetu i mediów społecznościowych. Dlatego wzrasta potrzeba ochrony reputacji. Jednym ze sposobów rozwiązania tego problemu jest ubezpieczenie ryzyka utraty reputacji. Celem artykułu jest przedstawienie specyfiki ubezpieczenia ryzyka reputacji jako nowego produktu oferowanego od kilku lat na rynku ubezpieczeniowym oraz wskazanie perspektyw rozwoju tego sektora.*

Słowa kluczowe: *reputacja przedsiębiorstwa, ryzyko reputacji, ubezpieczenie ryzyka reputacji, nowy produkt ubezpieczeniowy*

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Perception of the Euro vs. the Economic Performance of EU States*

Abstract. *While it is true that the euro area states have seen multiple benefits from the adoption of a single currency, some of them turned out to be disconcertingly vulnerable to the impacts of the 2007--2008 financial crisis. As a result, the vague prospect of a multi-speed Europe that had not received much attention prior to the financial crunch has become fairly likely to materialize. Although Euro-skeptics and pro-Europeans alike argue that the monetary union is an unfinished project, they tend to advocate radically different solutions: while the former would opt for its decomposition, the latter would further pursue integration by establishing a fiscal union. The paper addresses the question of how the euro is perceived in both EMU and non-EMU states vis-à-vis the countries' economic performance assessed against the EMU nominal convergence criteria. In doing so, it explores a body of data sourced from the European Commission and the European Central Bank using the k-means cluster analysis. The analysis aims to highlight heterogeneity in perceptions as well as in economic convergence across the European countries.*

Keywords: *European integration, eurozone, perceptions of the euro, cluster analysis, k-means*

Introduction

The paper seeks to highlight heterogeneity in the perceptions of the euro and its benefits across eurozone and non-eurozone states by reporting the findings of

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k-means cluster analyses employing data sourced from the European Commission and the European Central Bank. The first analysis is focused on economic indicators, illustrating the extent to which the countries under investigation (all EU member states except Denmark and the UK, for which relevant data was not available) meet the convergence criteria set out in the Maastricht Treaty; the second analysis incorporates attitudes toward the euro in an intent to capture the extent to which euro area membership might be a political and social rather than an economic issue.

Chapter one describes the cluster analysis methodology used, while chapter two delivers the findings. The closing chapter offers tentative conclusions and indicates strands for further research.

1. Cluster analysis methodology

Cluster analysis is a multivariate statistical method whose objective is to classify objects into groups called clusters. It belongs to the class of unsupervised learning methods [Hastie et al. 2009: 485-586], representing a statistical approach targeted at e.g. grouping organizations into business model types or strategic groups. There are a large variety of clustering criteria that can be applied depending on the purpose of analysis and the nature of input data to be processed [Löster 2017; Řezanková, Löster 2013; Sobíšek, Stachová 2012; Mackovičová, Stachová 2012].

Essentially, cluster analysis looks for similarities in a set of data and attempts to group them into relatively homogeneous clusters [Řezanková et al. 2009; Löster 2016]. There are a number of procedures to accomplish that, differentiated mostly by the criteria used for linkage [cf. e.g. Gan et al. 2007; Kráľ et al. 2009; Řezanková et al. 2011]. A distinction is usually made between traditional methods and new approaches. Traditional, or standard, methods have been thoroughly researched and developed to a point where they can be widely implemented in commercial software.

The most popular clustering methods are labeled as hierarchical clustering and include the nearest neighbor method, the farthest neighbor method, the average distance method, and the centroid method.

The nearest neighbor method is the oldest and simplest one. Under this approach, two objects are searched between which the distance is the shortest, and then a cluster is formed containing these two objects. Another cluster is created by linking the third closest object. The distance between two clusters is defined as the shortest distance between any point in the first cluster and any point in

the other cluster [Gan et al. 2007]. The farthest neighbor method is based on the reverse of the principle that drives the nearest neighbor method. Its greatest advantage is that it yields small, compact and clearly separated clusters. Under the average distance method, the criterion for combining clusters is the average distance between all objects in one cluster and all objects in another cluster. The outcomes produced by this method are not influenced by extreme values as is the case with the nearest and the farthest neighbor methods, because cluster fusions are dependent on all of the objects encompassed by the analysis. The centroid method involves the use of a yet another criterion for cluster merges: rather than at inter-cluster distances in data sets, it looks at distances between cluster centroids, where the centroid is designated as an average of the variables in each cluster. What determines whether a pair of clusters will be merged is the minimum distance between their centroids. The advantage of this method is that remote objects do not have a significant effect on the outcomes. The median method may be seen as an analog of the centroid method, while it differs in that, instead of on the distance between cluster centroids, it focuses on the distance between the medians of those clusters. The median method hence eliminates the shortcomings of the centroid method by abandoning weights that have to be assigned to differently sized clusters.

Ward's method, on the other hand, is designed to minimize the heterogeneity of clusters, i.e. in forming clusters it aims at maximizing intra-group homogeneity. The measure of cluster homogeneity is called the minimum variance criterion, or Ward's criterion, and is conceived as the intra-group sum of squares of deviations in values from the cluster average. The criterion for linking clusters is founded on the idea that in each clustering step a minimum increment of intra-group variance is pursued. The method is capable of creating clusters of approximately the same size, while small clusters are few or none.

More detailed descriptions of the different methods and formulas used for clustering can be found e.g. in Řezanková et al. 2009], Gan et al. [2007] and Dias [2017].

Research on the class of clustering techniques termed as "*k*-means" has produced algorithms capable of supporting dimension reduction within classification schema. *K*-means clustering is a partitional, as opposed to a hierarchical, clustering method, i.e. such as generates an unnested classification of the given objects into clusters. The name "*k*-means" refers to the prototype-based nature of this class of algorithms that generally geared to iteratively identifying the (*k*) centroids of each cluster as the means of the participating objects [Farnè, Vouldis 2017: 13-16].

Although the original *k*-means algorithm [MacQueen 1967] did not provide any low-dimensional representation of the data, this feature has been added in

its subsequent versions. For example, Geert De Soete and J. Douglas Carrol [1994] developed a method for clustering objects in a low-dimensional space while simultaneously identifying the subspace of the observed data having the largest clustering power [Farnè, Vouldis 2017: 13-16]. Maurizio Vichi and Henk A.L. Kiers [2001] subsequently forged a factorial *k*-means algorithm where a subspace is defined such that the projected data points on this subspace are closest to the centroids. As the name of the procedure suggests, it involves both a factor analysis (reducing dimensionality) and a *k*-means procedure (clustering objects and indentifying their centroids in this low-dimensional subspace).

This paper adopts an enhanced version of this clustering approach that seems to best combine the two essential features: dimensionality reduction and clustering. The clustering algorithm incorporates an intrinsic procedure to identify outliers within clusters using factor scores obtained from the iterative algorithm.

Hence, in this study, Hartigan's method of *k*-means clustering is used, assuming *k* clusters $\{C_j\}_1^k$ to minimize:

$$\sum_{j=1}^{k} \inf_{y_j \in \chi} \sum_{i \in C_j} \left\| x_i - y_j \right\|^2 \tag{1}$$

where $\chi = \Re^d$ and $\|\cdot\|$ denotes the Euclidean norm. Conveniently, the inf is realizable – indeed, it is always $\mu(C_j)$, being the barycenter (or mean) of C_j. a standard outcome is the following bias-variance decomposition of the *k*-means cost (trade-off):

$$\phi(C, z) = \phi C + C\left\| \phi C - z \right\|^2 \tag{2}$$

The cost of merging two clusters *A*, *B* is denoted as follows:

$$\Delta(A, B) = \phi(A \cup B) - \phi(A) - \phi(B) \tag{3}$$

For non-empty *A*, *B*, the formula given below yields:

$$\Delta(A, B) = \frac{AB}{A + B} \left\| \mu(A) - \mu(B) \right\|^2 \tag{4}$$

When either *a* or *B* is empty, the set $\Delta(A, B) = 0$ [cf. Telgarsky, Vattani 2010].

2. Findings from the cluster analysis of empirical data

The analyses involve both EMU member states and non-member states and aim, in the first step, at clustering those that exhibit similar characteristics in terms of economic performance assessed against the Maastricht criteria. Then the analysis is extended by overlaying it with input on prevalent societal attitudes toward the adoption of the euro, to see how it affects the initial clustering.

Table 1. Performance on nominal convergence criteria and societal attitudes towards the euro in 2016

Countrz	HICP	Interest rate	Deficit/GDP	Debt/GDP	Perceptions
Austria	1.00	0.38	0.47	83.57	0.74
Belgium	1.80	0.48	0.38	105.71	0.59
Bulgaria	–1.30	2.27	0.86	29.03	0.49
Cyprus	–1.20	3.77	3.02	107.15	0.46
Czech Republic	0.60	0.43	1.67	36.77	0.29
Germany	0.40	0.09	2.14	68.07	0.71
Denmark	0.00	0.32	0.73	37.70	–
Spain	–0.30	1.39	–1.70	98.99	0.66
Finland	0.40	0.37	–0.69	63.07	0.77
France	0.30	0.47	–1.52	96.51	0.59
Greece	0.00	8.36	3.70	180.85	0.63
Croatia	–0.60	3.49	2.28	82.91	0.51
Hungary	0.40	3.14	1.32	73.87	0.61
Ireland	–0.20	0.74	1.55	72.79	0.89
Italy	–0.10	1.49	1.46	132.01	0.47
Lithuania	0.70	0.90	1.60	40.12	0.48
Luxembourg	0.00	0.26	1.95	20.80	0.81
Latvia	0.10	0.53	1.06	40.49	0.48
Malta	0.90	0.89	3.25	56.20	0.78
Netherlands	0.10	0.29	1.44	61.80	0.69
Poland	–0.20	3.04	–0.77	54.14	0.42
Portugal	0.60	3.17	2.21	130.12	0.61
Romania	–1.10	3.32	–1.50	37.60	0.66
Sweden	1.10	0.54	1.57	42.20	0.31
Slovenia	–0.20	1.15	1.15	78.51	0.69
Slovakia	–0.50	0.54	–0.54	51.82	0.72

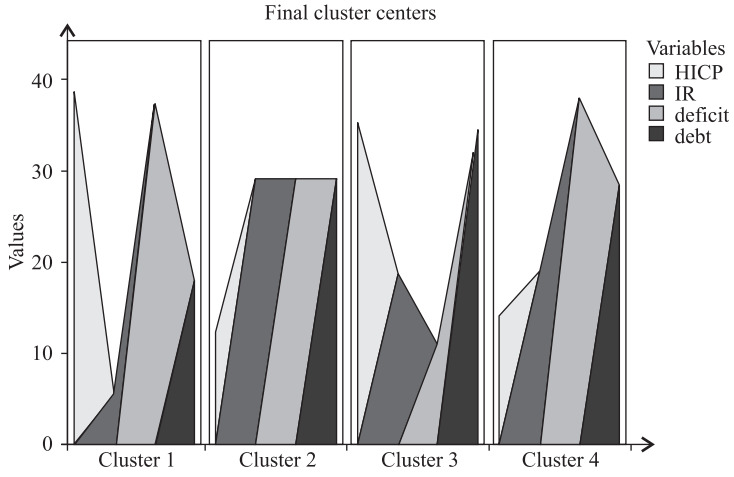
Source: ECB; European Commission.

The Maastricht criteria employed for gauging the countries' economic standing are: the inflation rate, as measured by the harmonized index of consumer prices (HICP); the long-term interest rates, estimated by looking at 10-year government bond yields; the primary balance over gross domestic product; and public debt over gross domestic product – the latter two assumed to be indicative of a country's fiscal performance. All of the relevant data were retrieved from the Statistical Data Warehouse of the European Central Bank (ECB).

Information on perceptions of the euro prevalent in respective societies was sourced from two Eurobarometer reports: Flash Eurobarometer 446 of December 2016 – for the EMU countries; and Flash Eurobarometer 453 of April 2017 – for the euro non-adopters.

Table 1 summarizes the pre-processed source data for the subsequent cluster analyses. It should be noted that the 2016 survey data, alongside the 2016 ECB estimates, were used, since this was the most recent input available for all of the countries covered by the study (Denmark and the UK were not included beyond this year).

First, the economic data were examined, for both the euro area countries and non-members. In doing so, the authors adopted an enhanced version of the *k*-means clustering approach that seems to best meet two key requirements: reduction of dimensionality and clustering potential. In addition, the clustering algorithm deploys an exceptionally effective procedure aimed at identifying outliers within clusters. Graph 1 depicts the four cluster centers (mean squares) that emerged from running the algorithm on the economic variables, not yet including the attitudinal data.



Graph 1. Cluster centers without perception of the euro (2016)

Source: own.

Table 2. Cluster mean squares – without perception of the euro (2016)

Selected parameters	Cluster		Error		Sig.
	Mean Square	df	Mean Square	df	
HICP	0.181	3	0.039	22	0.011
Interest rate	0.309	3	0.013	22	0.000
Deficit/GDP	0.468	3	0.021	22	0.000
Debt/GDP	0.208	3	0.030	22	0.002

Source: own.

Table 3. Resulting cluster membership – economic performance without perception of the euro (2016)

Cluster membership			
Case Number	Country	Cluster	Distance
1	Austria	1	0.278
2	Belgium	1	0.533
3	Bulgaria	4	0.513
4	Croatia	4	0.127
5	Cyprus	4	0.320
6	Czech Republic	1	0.133
7	Germany	1	0.178
8	Estonia	1	0.424
9	Finland	3	0.260
10	France	3	0.284
11	Greece	2	0.000
12	Hungary	1	0.312
13	Ireland	1	0.258
14	Italy	4	0.311
15	Lithuania	1	0.119
16	Luxembourg	1	0.295
17	Latvia	1	0.180
18	Malta	1	0.367
19	Netherlands	1	0.153
20	Poland	3	0.207
21	Portugal	4	0.416
22	Romania	3	0.399
23	Sweden	1	0.204
24	Slovenia	1	0.279
25	Slovakia	3	0.201
26	Spain	3	0.217

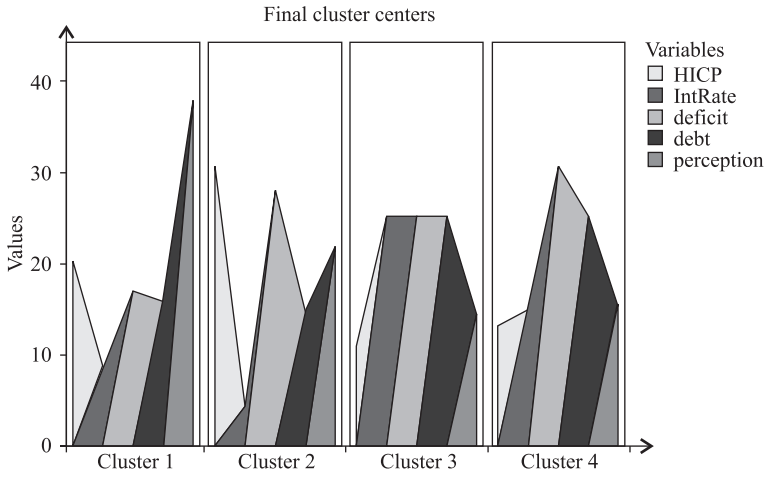
Source: own.

Table 3 thus shows the resulting country breakdown into the four clusters, presenting the outcomes of the cluster analysis conducted on economic indicators vis-à-vis the euro convergence criteria. Cluster 1 comprises top-performing economies, such as Austria, Belgium, Czech Republic, Germany, Estonia, Hungary, Ireland, Lithuania, Luxembourg, Latvia, Malta, Netherlands, Slovenia, and Sweden (notably, not all of them being EMU member states). Cluster 2 includes Greece only, the outlier on most, albeit not all, economic indicators. Cluster 3 groups countries whose performance is ambiguous or leaves somewhat to be desired (Spain, Finland, France, Poland, Romania, Slovakia), while the fourth puts together the poorest performers that evidently fall behind: Bulgaria, Cyprus, Croatia, Italy, and Portugal.

In the next step, Eurobarometer report findings on societal attitudes toward the euro were added on top of the economic parameters to inquire into whether eligible countries' refusal to join the eurozone might correlate with their perceptions of the euro.

To reflect the perceptions of the euro in specific countries, the cluster analysis incorporated two Eurobarometer questions: "Having the euro is a good or a bad thing for your country" – for the euro area countries [Flash Eurobarometer 2016]; and "Generally speaking, are you personally more in favor or against the idea of introducing the euro in your country?" – for the non-eurozone states [Flash Eurobarometer 2017].

Graph 2, Table 4 and Table 5 illustrate how the cluster arrangements were altered as the attitudinal factors were brought into play.



Graph 2. Cluster centers with perception of the euro

Source: own.

Table 4. Cluster mean squares – including perception of the euro (2016)

Selected parameters	Cluster		Error		Sig.
	Mean Square	df	Mean Square	df	
HICP	0.190	3	0.037	22	0.008
Interest rate	0.295	3	0.015	22	0.000
Deficit/GDP	0.343	3	0.038	22	0.000
Debt/GDP	0.258	3	0.023	22	0.000
Euro perceptions	0.109	3	0.062	22	0.186

Source: own.

The second iteration of the analysis offers an economic-attitudinal outlook on the adoption of the euro, and represents an effort at unveiling links between the tide of public opinion on the common currency and actual eurozone membership. Hence, its findings might be regarded as emblematic of the need to raise and explore the question of whether some countries' decision to remain outside the euro area might be underpinned by non-economic factors.

This analysis again divides the countries into four clusters. Yet, the first cluster now comprises states where either positive attitudes toward the euro (or its immediate adoption) or sound economic policy supports eurozone membership. The cluster includes such countries as Bulgaria, Estonia, Finland, France, Ireland, Luxembourg, Poland, Romania, Slovakia, Slovenia, and Spain. Nevertheless, some of these countries have so far opted for non-adoption of the common currency.

Cluster 2 comprises countries where rigid economic discipline is not always associated with prevailing positive attitudes toward the euro. Not surprisingly, the cluster includes prosperous economies, such as Austria, Belgium, the Czech Republic, Germany, Hungary, Latvia, Lithuania, Malta, the Netherlands, and Sweden, even if not all of them are EMU member states. Again, as is the case with cluster 1, some of these countries remain outside the euro area.

Both the two clusters contain cases to be studied in more depth with a view to discovering the factors that have been keeping some countries outside the euro area despite their fairly close economic alignment with eurozone convergence criteria.

Cluster 4 includes the worst economic performers with negative or moderately positive attitudes toward the euro, such as Cyprus, Italy, and Portugal – possibly indicating disappointment with the common currency – alongside Croatia whose rather positive perception of the euro cannot offset its inferior economic performance.

Greece is again an outlier, forming a cluster of its own. It has to be noted, however, that the Greeks' perception of the euro is not at all negative, despite an ongoing economic downturn, oscillating slightly above either the mean or the median value for the countries under examination.

All in all, the analyses provided fairly ambiguous results, revealing that, although superb economic performance among the EMU member states generally goes hand in hand with a positive attitude toward the euro, there are countries

Table 5. Resulting cluster breakdown – including perception of the euro (2016, 2017)

Cluster membership			
Case Number	Country	Cluster	Distance
1	Austria	2	0.389
2	Belgium	2	0.487
3	Bulgaria	1	0.545
4	Croatia	4	0.206
5	Cyprus	4	0.343
6	Czech Republic	2	0.487
7	Germany	2	0.300
8	Estonia	1	0.504
9	Finland	1	0.286
10	France	1	0.428
11	Greece	3	0.000
12	Hungary	2	0.319
13	Ireland	1	0.480
14	Italy	4	0.276
15	Lithuania	2	0.190
16	Luxembourg	1	0.505
17	Latvia	2	0.284
18	Malta	2	0.486
19	Netherlands	2	0.283
20	Poland	1	0.501
21	Portugal	4	0.358
22	Romania	1	0.471
23	Sweden	2	0.471
24	Slovenia	1	0.273
25	Slovakia	1	0.157
26	Spain	1	0.389

Source: own.

remaining outside the eurozone that perform well enough but are reluctant toward the adoption of the single currency, and that some of the poor performers have been able to sustain a favorable perception of the euro notwithstanding the economic difficulties that they might be experiencing.

Conclusions

The cluster analyses presented in this paper aimed to highlight stunning heterogeneity in the perceptions of the euro across European countries and to begin exploring its linkage with economic performance, viz. the countries' ability to meet the eurozone convergence criteria.

The research findings have demonstrated that while, on the one hand, in most states strong economic standing is coupled with positive attitudes toward the common currency, the reverse in not true: economic distress need not be associated with negative perceptions of the euro, as evidenced by the examples of Greece and, to a lesser degree, Portugal or Spain. At the same time, the analyses singled out a few countries that have so far refrained from joining the eurozone even though their thriving economies make them eligible (e.g. the Czech Republic, Poland, Sweden).

What could be hypothesized, in purely speculative terms, about the findings of these cluster analyses is that reasons for non-entry of economically eligible countries are probably varied and should rather be sought in political and social factors.

In Poland or in the Czech Republic, for example, the adoption of the euro has never been on the agenda of an incumbent party, with few significant political actors declaring explicit support or at least trying to center public attention on the issue. Given humans' intrinsic fear of the unknown, it is not surprising then that its absence from public debate has turned the tide of Poland's public opinion against the common currency.

As far as the Czech Republic is concerned, it seems likely that its non-commitment to the adoption of the single currency can be seen as an offshoot of its long-standing avoidance to broadly engage in European policy rather than of any specific fears – a stance that oddly contrasts with the nation's high aspirations and its confidence in being part of the Western world.

These are just some of the questions that could be posed; many more are implied by the findings of this study, yet their more in-depth treatment should become the objective of further research involving, in the first place, political scientists.

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Wyniki ekonomiczne krajów UE a stosunek społeczeństw do wspólnej waluty

Streszczenie. *Jakkolwiek prawdziwe wydaje się stwierdzenie, że kraje strefy euro doświadczyły licznych korzyści z przyjęcia wspólnej waluty, niektóre z nich okazały się niepokojąco nieodporne na siłę rażenia kryzysu finansowego z lat 2007-2008. W efekcie dość mętna perspektywa Europy różnych prędkości, której przed rozpoczęciem wspomnianego kryzysu nie traktowano zbyt poważnie, stała się czymś całkiem realnym. Choć eurosceptycy i euroentuzjaści są zgodni co do tego, że unia monetarna to projekt niedokończony, opowiadają się za radykalnie różnymi terapiami: ci pierwsi optują za jej rozwiązaniem, podczas gdy ci drudzy chcieliby podążać ścieżką dalszej integracji, tworząc unię fiskalną. Artykuł odnosi się do kwestii, jak postrzegana jest wspólna waluta zarówno w państwach członkowskich strefy euro, jak i w krajach pozostających poza strefą w kontekście ich wyników ekonomicznych mierzonych w stosunku do kryteriów konwergencji określonych w traktacie z Maastricht. Posłużono się w tym celu analizą skupień opartą na algorytmie centroidów (k-średnich), korzystając z danych dostarczanych przez Komisję Europejską oraz Europejski Bank Centralny. Analiza ta ma uwypuklić heterogeniczność panującą na obszarze Unii Europejskiej tak w postrzeganiu waluty euro, jak i w ekonomicznej konwergencji.*

Słowa kluczowe: *integracja europejska, strefa euro, postrzeganie wspólnej waluty, analiza skupień, algorytm centroidów, algorytm k-średnich*

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Specification of Cryptocurrency as a New Element of the Financial Technology Market

Abstract. *Cryptocurrency is a media sensation and/or investment fad. The issue is no longer whether cryptocurrency will survive, but rather how it will evolve. Each of the five key market participants such as: merchants and consumers, technology developers, investors, financial institutions, and regulators will play a critical role in this innovative process. That is way it is good to learn more about this exciting new technology element, as well as the strategies to best aid its growth and harness its potential. As central banks and governments around the world continue to experiment with new money, businesses of all sizes will continue to innovate.*

Keywords: *cryptocurrency, finance, investors, technology, market, consumers*

Introduction

The conception of digital currencies has subsisted for years. However, regardless of a few attempt on the part of programmers, none proved viable. Then, less than a decade in the past, bitcoin exploded into the world of cryptocurrency. Now, bitcoin has turn out to be no longer most effective a cultural phenomenon, but a political and monetary one as nicely, conserving the monetary eye of the world captive thru its tumultuous course. It has currently been widely mentioned and used in many advanced international locations. But bitcoin affords a wonderful advantage to populations residing in underdeveloped and struggling economies, due to the fact that it's miles solves the troubles of hyperinflation, trade, counterfeiting, and inaccessibility. This paper additionally proposes that the three factors

that would avert the big adoption of bitcoin in those struggling Economies is loss of infrastructure, unrealized issues with the bitcoin community itself, and worry of the unknown. The aim of the articles is to present how this innovative element of finance-technology can affect individual recipients and also what will have this impact on global financial markets. It is necessary to demand that a cryptocurrency is a good not classified anywhere in the financial world, but its impact on it is enormous. Therefore, this article, in the light of the analytical and descriptive method, will present the phenomenon of cryptocurrencies and a number of changes that they introduced in the world of traditional finances.

1. What is cryptocurrency?

On Halloween of 2008, an entity named Satoshi Nakamoto allotted a white paper throught metzdowd.com, an digital mailing listing that tracks developments in cryptography.

Entitled "Bitcoin: a peer-to-peer electronic coins device," its dense, 9-web page summary of an open source, community controlled electronic foreign money machine rocked the arena of Cryptography [Nakamoto 2009]. It wasn't the primary online cryptographical fee machine.

David Chaum had attempted as early as 1982 to produce an electronic, blind signature transaction Machine [Chaum 1983], however it by no means gained big recognition. Other small attempts

Periodically attracted a small following, however all were either centrally regulated or lacked the identity of satoshi nakamoto has but to be confirmed. Some speculate that, due to the first-rate coding of the primary microsoft visible studio implementation of Bitcoin (History of Bitcoin) and the use of 1/3 individual within the white paper, nakamoto is probably a group of human beings. Although, during this document, i'm able to anticipate that nakamoto is an man or woman and reference him as such. As nakamoto states in his white paper, "what is wanted is an electronic charge gadget based totally on cryptographic proof rather than accept as true with, allowing any two willing parties to transact at once with every different without the want for a depended on 0.33 celebration".

A cryptocurrency is a medium of trade together with america greenback. Bitcoin, the first cryptocurrency, regarded in January 2009 and became the advent of a pc programmer the use of the pseudonym Satoshi Nakamoto.

Like the US dollar, cryptocurrency has no intrinsic value in that it isn't redeemable for some other commodity, inclusive of gold. Unlike america greenback, but, cryptocurrency has no bodily form, isn't legal smooth, and isn't presently

backed through any authorities or legal entity. Similarly, its deliver is not decided by way of a imperative bank and the community is completely decentralized, with all transactions performed by using the users of the machine.

The term cryptocurrency is used due to the fact the generation is based totally on public-key cryptography, which means that the conversation is at ease from 0.33 events. This is a famous era utilized in each bills and communication systems [Bitcoin: Questions… 2015].

In recent years, cryptocurrency – and especially, Bitcoin – has established its fee, now boasting 14 million Bitcoins in circulation. Traders speculating in the future possibilities of this new technology have pushed most of the cutting-edge marketplace capitalization, and this is in all likelihood to stay the case until a certain measure of fee stability and market reputation is executed. Apart from the declared rate of cryptocurrency, those invested in it appear to be counting on a perceived "inherent value" of cryptocurrency. This consists of the era and network itself, the integrity of the cryptographic code, and the decentralized community. This instills self belief that this new form of fee carries attributes in commonplace with other longstanding stores of fee, as well as some attributes particular to this new generation [What is Bitcoin... 2015]. For most cryptocurrencies, these attributes consist of the subsequent:

– the code's resistance to counterfeiting.

– the network's ability to prevent "double-spending" (that is, spending money you do not own by use of forgery or counterfeiting) by verifying that each transaction is added to a distributed ledger or a blockchain.

– the limited supply, and the market's ability to divide single units into smaller fractions on a practically unlimited basis.

– the nearly instantaneous and irreversible transmission of value that takes place over the Internet, without the need for a trusted third-party intermediary.

– the decentralized network, which provides network security and transaction verification.

– the incentives embedded in the network protocol, which encourage participants to contribute computing resources for network support.

– the publicly available knowledge that a transaction has been posted to a global public transaction ledger.

– the personal data security enabled by public-private key cryptography.

– the dedicated core team of developers and miners who continually support and improve the code, help secure the network, and validate transactions [Money is no Object... 2015: 3].

Some other vital element linked with cryptocurrency is blockchain generation. It's far a ledger, or list, of all of a cryptocurrency's transactions, and is the technology underlying bitcoin and different cryptocurrencies. This decentralized

public ledger keeps a file of all transactions that take vicinity throughout the peer-to-peer community. Users can contribute to the community through providing computational energy to assist with the verification of transactions in real time (referred to as "mining").

This technology permits marketplace individuals to switch belongings across the net without the need for a relevant 0.33 part. Mainly, the consumer and vendor engage at once with each different and there may be no need for verification by way of a relied on 1/3 part intermediary. Figuring out data is encrypted, and no private statistics is shared. But, a transaction document is created. For this reason, transactions are considered pseudonymous, not nameless.

The blockchain public ledger generation has the capacity to disrupt a wide sort of transactions, further to the traditional bills device. Those consist of stocks, bonds, and different monetary assets for which facts are saved digitally and for which currently there may be a need for a depended on 1/3 part to provide verification of the transaction [Bitcoin: Questions… 2015]. Blockchain technology and cryptocurrency process is better understand on a schedule presented in Figure 1.

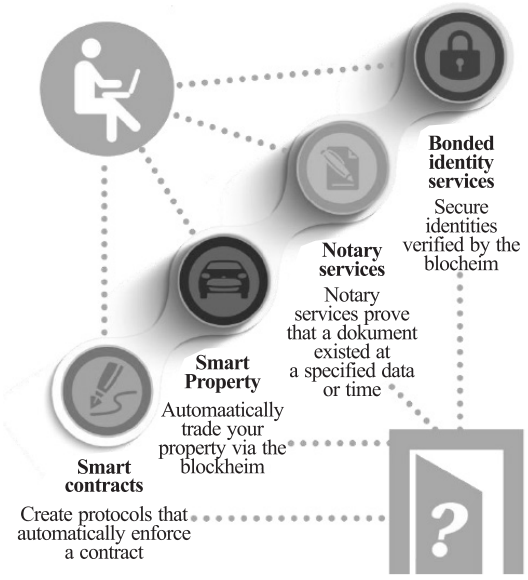

Figure 1. Blockchain technology and cryptocurrency

Source: Bitcoin: Questions… 2015; Money is no Object… 2015: 4.

The inherent value of cryptocurrency as an alternative approach to save and transmit devices of value has gained popularity from a crucial mass of buyers, technologists, regulators, merchants, entrepreneurs, and customers. It's clean

that cryptocurrency is extra than a passing phenomenon. In truth, in our view, cryptocurrency represents the beginning of a new section of technology-pushed markets which have the potential to disrupt conventional marketplace techniques, longstanding commercial enterprise practices, and hooked up regulatory views – all to the advantage of consumers and broader macroeconomic efficiency. Cryptocurrencies convey groundbreaking capacity to allow consumers get admission to a worldwide fee system – everywhere, anytime – wherein participation is confined handiest by using get admission to to technology, in place of via factors inclusive of having a credit score history or a bank account. The discussion is not one among whether or not cryptocurrency will live to tell the tale, but rather how it will evolve, and whilst it'll attain adulthood.

Growth inside the cryptocurrency market has been driven in large part via challenge capitalists making an investment in generation infrastructure, and different investors looking for to profit from price fluctuations, as opposed to through clients surely using cryptocurrency. This carries with it uncertainties: in step with one estimate, the volatility of bitcoin against the dollar on a bitcoin alternate is about five to seven times the volatility of traditional foreign exchange buying and selling [Bradbury 2014].

Figure 2 indicates the relative alternate price between Bitcoin and the US dollar from January 2013 to may additionally 2015. It seems that the total capability of cryptocurrency can be realized simplest whilst the marketplace makes the bounce from the investors to the consumers.

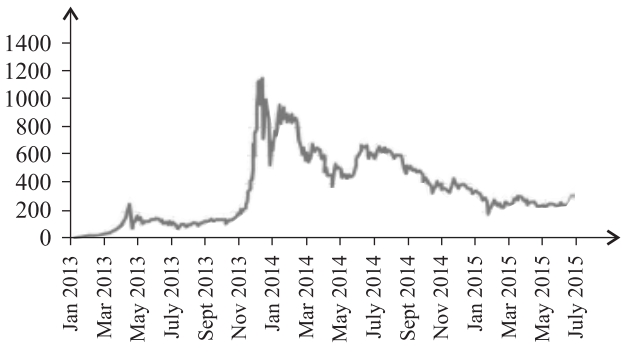

Figure 2. Cryptocurrency volatility from the year 2013 to the year 2015

Source: Bitcoin Price Index 2015; Money is no Object… 2015: 5.

Notwithstanding the good sized capacity of this new generation, and its established potential to live on several ambitious exams of its legitimacy, the cutting-edge country of the market stays fragile. That is due in huge element to the severe threats uncovered by means of the liberty reserve and silk street

money laundering schemes6, and the extra current cybertheft that rapidly drove the bitcoin trade Mt. Gox into bankruptcy. These are most effective the first threats to have surfaced. Within the coming years, we anticipate greater hazard-based totally demanding situations, along with tax evasion, bribery bills, terrorist financing, and financing counterfeit merchandise, may observe. There have already been glimpses of interest from terrorist businesses discussing its makes use of in chatrooms. Actually placed, the technological innovation of cryptocurrency, with its nice attributes, has added with it a "dark aspect" in which its most fundamental improvements – velocity, secure transfer and keep of fee, and constrained private facts exposure – are exploited by using hackers and criminals. In our view, the cryptocurrency marketplace will increase at a pace set by the important thing members, characterized with the aid of likely growth spurts of legitimacy from one or greater of those participants in what we name "credentialising moments." for the marketplace to reach the following phase in its evolution closer to mainstream popularity and solid enlargement, each of the 5 key marketplace members – traders and consumers, generation developers, buyers, economic institutions, and regulators – will play a function [Money is no Object… 2015: 6].

2. The vulnerabilities of Bitcoin

The decentralized property of the Bitcoin network protects it from attacks. a decentralized system can protect itself better from an attack but it is not completely invulnerable. Some attacks on Bitcoin are still theoretically possible [Massive Bitcoin… 2015]. Research has shown that Bitcoin miners have spent much more on electricity costs and specialized equipment than the overall worth of the Bitcoins they mined.

People had spent $17 million on mining while the rewards amounted up to $4.4 million. As mentioned before it becomes progressively harder to mine Bitcoins over time and it slowly becomes less profitable. Miners have tried to combat this by pooling their resource together, producing a synergy to increase computational power and share the bigger rewards [Bitcoin, Market… 2014]. In theory, by pooling together resources like this an entity with enough computing power could control the majority of the mining (over 50% of hash rate mining by one entity) and in doing so take control of the network and then have the ability to manipulate the block chain, this is called a 51% attack. This would make it possible to reverse transactions and spend the same Bitcoins multiple times (otherwise known as the double-spending problem). This problem however

has been mitigated by the developers of the Bitcoin protocol. Mining is already designed to constantly switch pools, which keeps any one individual from graining 51% power. The network also requires six confirmations of each transaction in a separate block, which makes reverting transactions and getting them confirmed more difficult. This is however still a legitimate concern for Bitcoin. Computer technology is continually improving and problems such as this serve to increase motivation for Bitcoin miners to figure out ways to attack the system and profit from it. Another problem with Bitcoins are dust transactions [Massive Bitcoin… 2015: 1-3].

Dust transactions, otherwise known as denial of service attacks (DOS), are attacks which interrupt a service. In the past, it was possible to send multiple transactions of a minimum of $0,00000112 to one user, which would fill up and bloat the block chain, making it too large and crashing the network. This problem has been patched by the developers by putting a fixed limit on the amount of transactions allowed to be sent to one client but there is still the risk of talented code hackers to bring down the network. Since Bitcoins and cryptocurrencies are a code-based currency, there is always the present danger of code-based attacks [Bradbury 2013]. Bitcoin has been in the center of controversy for many massive digitally related thefts. An example of this is the Sheep Marketplace – a marketplace that opened following the shutdown of the Silk Road black market. The website announced a security breach and eventually went offline with over $40m worth of Bitcoins lost. People have speculated that the website was set up with fraudulent intentions from the start to rob users of their Bitcoins. Given the anonymous nature of the cryptocurrency system, it may be impossible to track down these thieves. In Denmark, a Bitcoin payment processor, had security faults which had the company lose, at the time, 1$m worth of Bitcoins [Massive Bitcoin… 2015: 1-3]. The biggest international Bitcoin exchange in the world, Mt. Gox, also crashed down by the thieves. As Bitcoin is open source developers are continually adding new features. During this process new bugs may come to the surface which hackers can take advantage of to attack the network. Although many people carefully examine the source code before a release, there is still a possibility that major security vulnerabilities get through, as they can be difficult to spot [Bradbury 2013].

The fall of Mt. Gox, which at one point was regarded as the pinnacle of Bitcoin trading and estimated to count for 70% of global cryptocurrency transactions is an example of the dangers of code-based attacks on Bitcoin and cryptocurrency. The fall of Mt. Gox which accompanied a loss of over 700,000 Bitcoins, was attributed to a code-based theft attack. This attack is the biggest digital currency theft in history. With the bankruptcy of the largest international exchange, hundreds of millions dollars' worth of Bitcoins disappeared.

The effect of this brings up the problem that comes with decentralization [Schumpeter 2014].

As the currency is designed to be decentralized to prevent any kind of interference it also does not have the safety guarantee that fiat currency has. When Mt. Gox fell, there was no entity or financial regulator that would come to the rescue. The money was all gone with no way of getting it back or to get any kind of support. This shows a glaring problem with Bitcoin and cryptocurrency – there is no insurance or guarantee after a loss and there is a big danger of code-based attacks or other kind of attacks as people get increased knowledge of coding and computer technology.

3. Consumers and Merchant in cryptocurrency market

For clients, cryptocurrencies provide less expensive and faster peer-to-peer price alternatives than the ones presented with the aid of conventional cash offerings companies, without the need to provide non-public information. Even as cryptocurrencies continue to benefit some acceptance as a fee option, charge volatility and the possibility for speculative investments inspire purchasers now not to use cryptocurrency to buy items and offerings however as a substitute to alternate it.

Clients will take delivery of and adopt cryptocurrency on a large scale simplest when they gain better information of it and notice improved availability, reliable coins change, and an low-priced degree of effective consumer safety. This degree of recognition could be much more likely when clients have get admission to to innovative services and services now not in any other case to be had thru conventional charge structures. One proscribing issue for better cryptocurrency adoption is client awareness. As proven simplest 6% of respondents in 2015 customer cryptocurrency survey say they may be both “very” or “extraordinarily” acquainted with cryptocurrencies. Moreover, there’s a completely constrained person base: simplest three% of survey takers mentioned having surely used cryptocurrencies within the ultimate 12 months. a not unusual misconception approximately cryptocurrencies is that the transactions are absolutely nameless. As an alternative, what cryptocurrencies provide is merely the potential for clients to finish transactions while not having to provide merchants with personal information for the motive of verification or garage. From a regulation enforcement attitude, the transaction may be traced to the character/entity (if illegal hobby is suspected) using a combination of methods that includes figur-

ing out the vacation spot of the transaction through the publically to be had transaction ledger. Despite the fact that, amid growing issues of identification theft and statistics privateness, this "pseudo-anonymity" does offer advantages to clients.

The takers who had used cryptocurrencies within the final year 2014, 17% declare "anonymous transactions" as one of the pinnacle advantages. The most popular use (81% of survey respondents) is "on-line buying." different top uses consist of "on-line gaming" (17%) and "price of credit score card bills" (14%). Of those purchasers who had used cryptocurrency inside the beyond 12 months, 86% imply that they expect their use of it to seriously increase inside the subsequent three years. From the attitude of companies and traders, cryptocurrencies provide low transaction charges and lower volatility danger as a result of almost on the spot settlement, and that they get rid of the opportunity of chargebacks (the call for by a credit card provider that a store make correct the loss on a fraudulent or disputed transaction). Within the future, we might also see these blessings diluted with the aid of new regulations covering items which includes chargeback policies or consumer safety. The best possibility for enterprise right here is not in enterprise-as-standard, however as an alternative in supplying innovative and disruptive products, offerings, and commercial enterprise models driven by way of international purchaser needs, particularly the ones that target tech-savvy customers. This technique need to not most effective meet consumer call for but also reduce merchant risks associated with payment settlement, cybersecurity, and regulatory requirements.

Another mission for traders is the unstable charge of cryptocurrencies. Currently, the marketplace for even the most popular cryptocurrencies is illiquid, fragmented, and enormously risky – an awful lot greater characteristic of a thinly traded commodity than of a widely conventional foreign money. The dearth of liquidity leads to massive fees related to exchanging fiat forex into cryptocurrency, and vice versa, in the shape of huge bid/ask spreads, significant charges, or both. Fee volatility additionally generates massive alternate-price hazard, which understandably discourages both merchants and purchasers from holding cryptocurrency for any massive period of time. Fortunately, the two most famous us-based totally cryptocurrency fee processors have hooked up a brand new level of maturity via adopting a enterprise model wherein they immediately convert cryptocurrency into us dollars on the spot trade fee. While the transfer of cryptocurrency itself throughout the peer-to-peer network is immediately and nearly value-loose, there are "toll charges," which include trade prices and fee volatility, which practice at the change point among fiat currency and cryptocurrency. These toll expenses produce additional expenses for all and sundry now not looking to take a internet-lengthy function in this new asset.

At the plus side, as the cryptocurrency marketplace maintains to grow and mature, we can also see liquidity increase. This would cause tighter bid/ask spreads and considerably decreased change prices. It additionally might lessen fee volatility, which would decrease alternate-charge hazard and lessen the stress on danger-averse merchants and customers to without delay convert cryptocurrency back into fiat currency. Widely speaking, accelerated liquidity would help cryptocurrency broaden traits which are more like broadly usual fiat forex, rather than those related to a commodity.

Regardless of changes to the incentive shape over time, minimal transaction expenses may assist cryptocurrency dominate traditional payments and switch strategies [Money is no Object… 2015: 7].

4. Technology developers and their experience in cryptocurrency market

Technology builders have committed their efforts to cryptocurrency mining, whilst others have fixated on more entrepreneurial pastimes including developing exchanges, pockets offerings, and opportunity cryptocurrencies. In our view,the cryptocurrency rialto has only commenced to draw aptitude with the depth, breadth, and rialto cognizance had to take the industry to the subsequent degree.

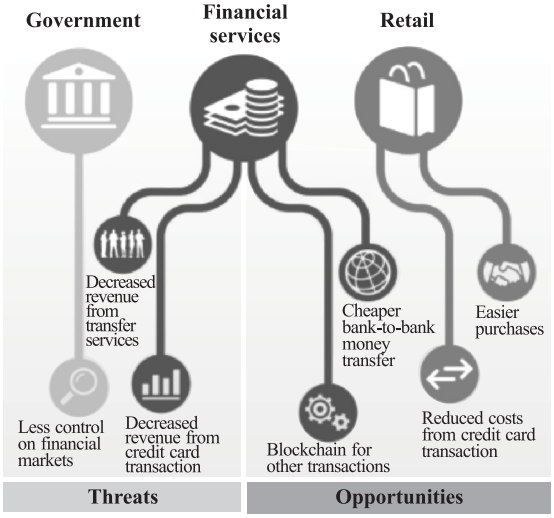

Figure 3. Potential impact of digital currency

Source: Bitcoin: Questions… 2015; Money is no Object… 2015: 10.

For the emporium to advantage mainstream popularity, however, consumers and companies will require to look cryptocurrency as a utilizer-congenial strategy to their not unwonted transactions. Further, the industry will require to broaden cybersecurity generation and protocols. There may be withal substantial market For the emporium to advantage mainstream popularity, however, consumers and companies will require to look cryptocurrency as a utilizer-congenial strategy facility for builders who're capable of engender incipient packages predicated consummately on the underlying era.

As shown in discern three, the cryptocurrency protocol ought to introduce principal modifications across multiple industries, which includes regime, economic accommodations, and retail. Examples consist of more frugal bank-to-bank mazuma transfers in economic accommodations and less perplexed purchases in retail. In our view, any industry that is predicated on a depended on one of the third day of inchoation party clearing system could be influence [Money is no Object… 2015: 10].

Potential impact of digital currenc is power full what you may see in Figure 3.

5. Investors, financial institutions and cryptocurrency market

Traders normally look like assured about the opportunities related to cryptocurrencies and cryptography. The "inherent fee" of the underlying generation, discussed above, offers these buyers true reason to be positive. As a result, simplest these days have a number of the more hooked up cryptocurrency corporations attracted institutional buyers. Up to now, the cryptocurrency market has been pushed overwhelmingly by way of undertaking capital. In quick, task capitalists – many with bold enjoy making an investment inside the era sector – have been pouring capital into the marketplace, having a bet that consumer call for will pressure destiny increase. a few entrepreneurial examples encompass growing and mining cryptocurrency, and developing cryptocurrency exchanges, transaction processors, and cryptocurrency storage and back up.

There are key differences among traditional era startups and cryptocurrencies which can basically affect investment approach. Traditional technology startups commonly contain new thoughts that feature both outdoor of present policies or thoroughly within their obstacles. Through assessment, cash is arguably the most fairly regulated factor inside the global, and cryptocurrencies face a bunch of complex policies.

For this reason, cryptocurrency will not attain its authentic marketplace potential except and until it develops in concord with applicable policies. Traditionally,

banks have connected people with money to folks that need it. However in recent years, this middleman function has been diluted, and disintermediation in the banking sector has evolved swiftly. This has resulted from the upward thrust of net banking; increased purchaser utilization of opportunity payment techniques like amazon gift playing cards, apple pay, google wallet, and paypal; and advances in mobile payments. However, even the most recent sorts of cell bills nevertheless in the long run rely on conventional financial establishments to system transactions.

Cryptocurrencies allow a fast, comfortable, low-value opportunity for clients to apply, shop, and transmit cash over the internet. However, what units cryptocurrency other than different latest fee improvements is its capability to dramatically restriction the function of conventional economic establishments in clearing and settling payments.

Cryptocurrency transactions are processed using cryptographic code verification that clears and settles transactions inside mins, at 0 or nominal fee. Theoretically, no traditional banking gamers are essential. Conventional clearing and settlement services are required most effective at the factor of alternate for fiat currency. For that reason, the more that cryptocurrency profits recognition among traders and purchasers, the less there might be a want for classic economic establishments to offer clearing and agreement services. Although cryptocurrency will by no means update banks, it contains remarkable ability to convert them. Thus far, economic establishments have appeared reluctant to involve themselves within the cryptocurrency environment, which is expected due to regulatory uncertainty, the charges of integrating new era, and the shortage of widespread client call for. However, as cryptocurrency continues to benefit mainstream attractiveness, monetary establishments turns into more and more interested by exploring how quality to harness this new generation [Money is no Object… 2015: 11].

6. Using Bitcoins in the corporate world

People use virtual currencies everyday so the concept is not a brand new phenomenon. Examples range from credit card reward points and airline miles to online video game currencies. It is the decentralized peer-to-peer function of Bitcoin that gives it unique properties. Businesses and corporations are continuously looking for new ways and innovations to increase sales. Bitcoins have some advantages and disadvantages in the corporate world. Bitcoin does, in a way, protect itself from a country's economic instability.

Bitcoins are digital and float against other currencies and as such are protected against economic instability or issues such as political unrest. Despite

this, as discussed before, the price of Bitcoins is very volatile which comes from speculations, media coverage and uncertainties as the currency is still in its infancy. For corporations, this amount of volatility is unacceptable. Virtual currencies also lack liquidity to the point that it would be very hard to use it as an alternative to fiat currencies. If most corporations decided to actively use Bitcoins in their daily business, the demand for virtual currency would create an imbalance in supply and demand, further increasing price volatility [Stark 2013]. However this is quite appealing to those who are wary of high inflation from badly run monetary policies of central banks supply that miners can add into the circulation is too limited for widespread use. The currency also lacks a formalized market [Wu, Pandey 2014].

The decentralization, one of the core designs of the currency, also limits options for corporations when looking to transact. This will increase the cost of transaction as more time and resources will be required by corporations for each transaction. The lack of security that comes with decentralization is also a huge risk for corporations. If something goes wrong, corporations will have no source of help. This will increase the risk of theft as it will have a much bigger impact and bigger risk of bankruptcy than with fiat money. An example of this kind of bankruptcy is the fall of Mt. Gox [Stark 2013].

Virtual currency such as Bitcoins, although decentralized, are not exempt from taxation. "According to the IRS, virtual currencies are treated as property for taxation purposes. As such, wages and payments to independent contractors paid in the form of Bitcoins are taxable using applicable income tax rates" [Wu, Pandey 2014]. Thus the currency cannot be used by corporations to avoid taxes. Bitcoins could however be used by corporations to bypass capital control.

In Iceland, capital controls were implemented in the wake of the 2008 crisis. The purpose was to prevent further depreciation of the Icelandic Krona. Capital controls give homes and corporations limited investment opportunities internationally. Buying large amounts of foreign currency with Icelandic króna was made impossible with these controls which were originally supposed to be short term but have now lasted over six years. Since then companies and investors have attempted to bypass these controls as investing internationally can be very lucrative [Björnsson 2014].

Bitcoin has currently not been accepted as an official currency by the government in neither Iceland nor any other country. Investors are free to buy Bitcoins with their domestic currency. The Bitcoins can then be moved out of the country and sold for a foreign currency. This method however does not apply for Icelandic investors as foreign exchange activities using Bitcoin has been prohibited in Iceland. Bitcoins cannot be used as a way to bypass capital controls for Icelandic investors [Bitcoin, Market… 2014]. This method was

popular in China where similarly strict rules govern the supply of foreign currency. The Chinese government subsequently responded with laws that make Bitcoin transactions considerably harder and banned financial corporations from accepting the currency. It is thus difficult to determine how effectively Bitcoin can bypass capital control but in theory it is possible.

7. Regulating Bitcoins and as an element of investment tool

Due to the anonymous nature of the currency, Bitcoin has the foundations to be used for illegal activities such as theft, money laundering and tax evasion. Few governments have set strict capital controls on the currency and many have covered it in tax laws. Central banks around the world have warned consumers on the risks that come with the currency such as lack of consumer protection and high price fluctuations. Research on fraudulent activities with the currency is limited due to the anonymity of the currency making it difficult to obtain data [Bitcoin, Market… 2014].

Identifying traders is difficult as transactions do not require a bank account and no third party organizations are involved in trading. Bitcoin has possibilities for tax evasion but most likely not at a large scale as the number of Bitcoins in circulation is limited and the volatility in its price is high. Security experts worry that drug cartels have used this digital environment to launder their profits and technically proficient criminals may have thought of additional ways to bypass the system. The first arrest of Bitcoin money laundering was made in the US in January 2014, following the introduction of anti-money laundering guidelines that apply to the use of Bitcoin. The EU has not created any specific regulatory laws on Bitcoin. The biggest issue with regulating Bitcoin stems from the fact that it cannot be classified as a legal tender or a financial derivative/commodity. Japan has announced it as a commodity, the US treats it as property while Germany classifies it as private money. The biggest restrictions on Bitcoin is in countries with strict capital controls such as China or Iceland.

In China, people are free to trade Bitcoins while banks are not allowed to transact with them. Bitcoin use is prohibited by legal entities as well as citizens in Russia and any foreign exchange activities with Bitcoins are banned in Iceland. In Germany, Finland, Japan and the USA, profits from mining, profits from increase in value or profits from currency exchange are all subject to taxation. In Japan banks are prohibited from exchanging Bitcoins. The specific regulations on Bitcoin from a few different countries are presented in table 1.

Table 1. The regulations on Bitcoin from a few different countries

Scope	Country	Informatiom
Prohibited	China	Banks prohibited from transacting with Bitcoins. Citizens allowed to trade.
	Russia	Bitcoins prohibited to be used by citizens and banks.
	Iceland	All foreign exchange activite using Bitcoin prohibited.
Protection from illegal activities such as money laundering and illegal financing	USA	Bitcoin exchanges and miners have an obligation to report any suspicious activities/transactions to the federal government. Selling or trading Bitcoins for real world economic commodities (non-digital) are subject to tax liability.
Subject to taxaton	Japan	Any purchase and revenue from trading with Bitcoins are subject to taxation. Banks and other official entities are prohibited from trading with Bitcoin.
	Finland	Any profit made from transacting with foreign currency using Bitcoins is subject to taxation. Profit from increases in Bitcoins value after obtaining it as payment is subject to taxation.
	Germany	Any profits accurued from mining Bitcoins or trading are subject to capital gains tax.

Source: Bitcoin, Market… 2014.

In 2013 the price of Bitcoin grew exponentially and the media reported many stories of people getting very wealthy due to Bitcoin investments. a research paper conducted by Chen Y. Wu and Vivek K. Pandey, researched Bitcoins ability to act as an investment in a portfolio. They attempted to examine if Bitcoin could act as a normal currency and did this by examining its correlation of daily returns compared to other major currencies, stocks, real estate, multiple indexes and gold. The research concluded that due to the limited daily transactions of Bitcoins they failed to serve as a general medium of exchange. Stores that have accepted Bitcoin still tend to price their goods with fiat currencies and the volatility of the price of Bitcoin suggests the currency is very risky. The paper considers Bitcoin to be more of an illiquid financial asset, rather than an efficient medium of exchange. Although the media has reported stories of people getting very wealthy, the daily returns were accompanied by the largest risk of any of the currencies examined in the paper and Bitcoin had the largest standard deviation. However Bitcoin does seem to serve for diversification in an investment portfolio.

The paper concluded that daily returns of all of the major currencies and major asset classes had little to no impact on the returns of Bitcoins. Wu and Pandey found that Bitcoins added to an investment portfolio increased returns and lowered risk of loss. Thus it can be concluded that Bitcoins act as a financial

asset that enhances a portfolios efficiency with diversification due in big part to its unique properties of floating above the market [Wu, Pandey 2014].

As a monetary tool bitcoin is as a result too volatile and volatile to act because the center asset. However its unique layout approach that it is rarely affected by economic unrest and different property or currencies making it very beneficial for diversifying a portfolio.

8. The future of cryptocurrency

Even though presently bitcoin appears to live in evolved, wealthy, tech savy cultures, the future adoption of bitcoin is every other rely. With the aid of analyzing the foreign money's factors of difference, we are able to assemble a profile of nations prime for the adoption of bitcoin. Bitcoin solutions the troubles of inflation, trade, fraud prevention, and accessibility.

Cryptocurrency growth over the subsequent year is anticipated to be stable however not surprising, and it's miles critical to word that this growth starts from a very low base. Frequency of use is expected to remain low.

The ones who have used cryptocurrencies inside the final 12 months, most effective 17% are "very" or "extremely" concerned approximately cryptocurrencies. Almost half (48%) say they are most effective "barely" involved for any reason, and 12% say they're never concerned. When requested approximately their issues, cryptocurrency users cite fraud, followed by using fluctuations in price, and attractiveness amongst providers. Those issues are realistic and constitute full-size hurdles that need to be addressed earlier than cryptocurrency is extensively well-known.[1]

Respondents are bullish about cryptocurrencies' potential effect on banking and retail. a majority (76%) of modern-day customers say cryptocurrencies will redefine banking as we comprehend it, and fifty nine% say their banking experience would be advanced in the event that they had more get admission to to cryptocurrencies [NYDFS Grants Ffirst… 2015].

In the quick time period, companies will locate success if they could strike the proper stability among developing marketplace call for and an evolving regulatory panorama. For example, strategic partnerships shaped by agencies including coinbase and bitpay serve as bitcoin "wallets" and payment processors for traders. Via retaining the virtual wallets that acquire bitcoin bills from customers, and then at once paying the ones merchants the coins fee of these

[1] According to PWC survey of 2015 about cryptocurrency *Consumer Cryptocurrency Survey*.

bitcoins, coinbase and bitpay efficaciously allow traders to accept cryptocurrency payments without taking on the dangers of holding bitcoins on their books. Forging these kinds of strategic partnerships and solutions is the key to using the market forward in the brief term.

As the regulatory landscape develops and the marketplace matures, greater traditional commercial enterprise techniques may additionally begin to play a extra position in accomplishing success. However, as with maximum ground-breaking markets, the combination of ingenuity and pace to market is possibly to distinguish the marketplace leaders. Perhaps the greatest opportunity for the ones involved within the cryptocurrency surroundings is inside the ability this generation has in growing economies. In truth, swiftly developing generation has enabled many rising economies to completely bypass whole degrees of development. As an example, cellular phones made it useless for african nations to build phone lines. Further, cryptocurrency may one day enable developing economies to forgo the want to construct massive financial infrastructures, clearing houses, and other 1/3-party intermediaries.

There is already sturdy proof of this concept at paintings within the M-pesa and M-paisa structures which have developed in Kenya and India.[2] Cryptocurrency will in all likelihood build on those improvements to provide the ability for micropayments and cheaper remittances throughout borders. If cryptocurrency is able to offer lower value answers for economically deprived populations, this could be the generation's best legacy.

The cryptocurrency marketplace continues to be in its infancy. Sturdy boom may additionally take root first in worldwide markets in preference to within the U.S., where a sturdy economic gadget makes the need for a foreign money revolution less than obvious. Our survey reinforces the idea that cryptocurrencies as a whole remain a gap product, but key indicators – purchasers' expectancies that their use of cryptocurrency will growth and the developing use of virtual wallets – factor to a consumer base this is open to exchange.

Surely, there are demanding situations for cryptocurrency within the near term. With so a lot of its traits falling between a foreign money, a monetary asset, and a era protocol, the tempo of growth and adoption can also splinter the enterprise. This can show up as diverse participants are searching for their very own way to derive cost from the idea of cryptocurrency. As a disruptive generation, it'll hold to divide opinion and face skepticism. As regulatory requirements are followed and subtle, innovative merchandise input the market, and the costs of the diverse cryptocurrencies stabilize, we'll see more confidence on the a part of all marketplace contributors.

[2] M-Pesa and M-Paisa are text-message-based money transfer systems that are offered through retail stores and door-to-door sales.

This self assurance and accept as true with will need to be nurtured via the industry itself, the usage of the guidance of relied on advisors to bridge the gaps among this new era, the set up principles that govern it, and the marketplace needs that force it.

If the tempo of boom keeps at a constant tempo, it can not be long earlier than the subsequent iteration of cryptocurrency gives new methods of switch, as well as wealth and asset creation that could reshape lots of what we formerly concept was feasible on the net.

On this factor of view, however, the greater important ability disruptor is the blockchain public ledger technology that underlies cryptocurrency. This era has the ability to open the door to innovative opportunities in a couple of industries. Escrow accounts, securities and economic device services, "clever contracts," and electoral systems are only some of the concepts that are being discussed. Any financial asset that currently requires a depended on one of third birthday to offer verification [Money is no Object… 2015: 15-16].

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Specyfika kryptowalut jako nowego elementu rynku *finance-technology*

Streszczenie. *Kryptowaluta to „sensacja medialna" i/lub „moda inwestycyjna". Problemem nie jest już to, czy kryptowaluta przetrwa, ale raczej jak się rozwinie. Każdy z pięciu kluczowych uczestników rynku, takich jak: kupcy i konsumenci, twórcy technologii, inwestorzy, instytucje finansowe i organy regulacyjne, odegra kluczową rolę w tym innowacyjnym procesie. Z tego powodu dobrze jest dowiedzieć się więcej o tym ekscytującym nowym elemencie technologicznym, a także o strategiach, które najlepiej wspomogą jego rozwój i pozwolą wykorzystać jego potencjał. Ponieważ banki centralne i rządy na całym świecie nadal eksperymentują z nowymi pieniędzmi, firmy będą nadal wprowadzać innowacje w tym zakresie, żeby jeszcze bardziej wybić się na rynku.*

Słowa kluczowe: *kryptowaluta, finanse, inwestorzy, technologia, rynek, konsumenci*

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Determinants of Changes in the Structure and Business Models of Banks in Germany

Abstract. *The aim of the study is to present the changes that take place in the structure of the German banking sector as a result of the development of the Internet, smartphones, digitization and the impact of the policy of low interest rates and Basel III regulations, which require changes in the existing traditional business models of the German banking sector. On the basis of literature studies, development trends of business models of banks were presented, which were included in four basic categories.*

Keywords: *traditional banks, cost-income ratio, ECB monetary policy, future-oriented banking models, development trends of banking business models*

Introduction

The presented study based on the reports and statistical data of the German central bank (Deutsche Bundesbank) and the European Central Bank (ECB) shows changes in the structure of the German banking sector in the number of independent banking institutions, their branches and subsidiaries, and especially in the area of the shaping the costs and incomes as well as changes taking place in the bank business models. The main driving force behind these changes is the technological breakthrough observed every day, especially in the field of information and Internet technology and digitalization, as well as new regulations concerning the size of the banks' equity required.

The basic research question resulting from the presented objective is meant to determine: how new technologies and regulations force changes in the

existing traditional business models of the majority of the German banking sector.

The research used classic forms and methods of research, namely: quantitative, causal and descriptive analysis.

1. Models of the banking system

The specificity of the business model of German banks is historical and is a consequence of the development of the so-called the continental (banking) model of the financial system. In the historical development of the global financial system, two basic models of the banking system were developed, that is the Anglo-Saxon and continental ones.

The Anglo-Saxon model is characterized by a strict separation of deposit and credit banking from investment banking related to the capital market and a strong tendency to create specialized banks.

The continental model, also called the German-Japanese, was mainly based on deposit and credit activities. Over time, it evolved towards a universal bank model combining deposit and credit banking with investment banking under one roof, which allows the clients to use many financial services in one place [Iwanicz-Drozdowska et al. 2008: 25].

The Anglo-Saxon model was created in Great Britain and spread in other English-speaking countries too. In the years 1933-1999, i.e. from the moment of passing the Glass-Steagall Act introducing a ban on combining commercial banking with investment banking, until its repeal in 2000 under the Gramm-Leach-Bliley Act, this model also existed in the USA [Gostomski 2008].

The continental model is now dominated by universal banks, while investment banks (but also investment, pension and insurance funds), that are strongly linked to the capital market, still play an important role in the Anglo-Saxon model. In the meantime, however, investment banks have broadened the scope of their operations by taking over a part of the activity from deposit and credit banks. There has been a significant approximation of the activity of both banking models in continental European countries, Japan and many other regions of the world [Klimiuk 2008: 25].

The prototype of the universal banking system is Germany, where already in the second half of the 19th century strong universal banks have become crystallized, becoming "home banks" (Hausbanken) for the institutional and private clients offering them a wide range of financial products and services, including those related to the capital market and money [Klimiuk 2008: 34]. Both models have their own advantages and disadvantages. In the continental model, also called banking model,

the role of banks comes down to the transformation of deposits acquired into the various kinds of loans and credits for the current and investment operations of the business entities. The advantages of the banking model include the fact that it has a greater ability to collect information about the companies, what enables the banks to allocate capital in an optimal manner and is associated with a lower inclination to take risks [Thorek 2010: 141-143]. In contrast, in a market-oriented system (Anglo-Saxon model), the capital market provides the entities with easier access to capital at a lower price, offers a greater variety of financial instruments, especially for financing new ventures. Therefore, it is believed that the Anglo-Saxon model ensures a greater innovativeness in the economy, promotes innovation and increases the efficiency of enterprises [Thorek 2010: 141-143]. Despite the significant advantages of the Anglo-Saxon model, in Europe the raising of funds for the current operations and development continues to dominate in almost 70 up to 80% through the banking sector [Flejterski 2006: 239]. The banking sector operating in Europe is subject to the gradual decline in the number of independent banking institutions and assets held by these institutions. The analysis of these processes will be carried out on the basis of statistical data contained in the ECB reports on the banking sector structures in the European Union (EU) for the years 1998-2016. The shrinking process of banking institutions, their branches and subsidiaries is observed throughout Europe (as shown in Table 1).

The decrease in the number of independent credit/banking institutions in the EU from 9260 in 1998 to 6648 in 2016, i.e. by 2612 independent banking institutions, was caused by many different factors. In 1998-2008, it was primarily a consolidation involving mergers and acquisitions. Mainly weaker institutions

Table 1. The number of banking institutions in the selected years and countries of the European Union and the euro zone

Country	Years										
	1998	2004	2008	2009	2010	2011	2012	2013	2014	2015	2016
Germany	3238	2148	1882	1840	1819	1789	1762	1734	1698	1666	1600
Spain	402	346	282	271	255	249	230	204	144	134	125
France	1226	1050	672	660	635	611	596	579	413	416	391
Italy	934	787	729	717	697	672	635	611	592	575	527
Netherlands	634	461	266	262	254	250	224	204	177	161	51
Austria	898	796	771	760	750	736	721	701	677	648	586
Euro zone	8379	6403	6062	5943	5819	5776	5501	5347	4910	4769	4385
European Union	9260	–	8570	8383	8237	8062	7868	7747	7331	7111	6648

Source: author's work based on: Structural Analysis of the Banking Sector, ECB 2009 and Report on Financial Structures 2017: 72.

were taken over by stronger ones. The crisis related to the bursting of the internet bubble in the mid-2000s, which caused a recession lasting until March 2003, played a role in accelerating this process. The economic recovery in 2003-2007 somewhat restrained this decline. In the subsequent years (2008-2016), the number of credit institutions began to decrease strongly again. At the same time, this process in various EU countries proceeded with varying intensity. The strongest reduction of independent credit institutions occurred in the German banking sector (Table 1). In absolute numbers, it was 1638 institutions. The second position was taken by France with 835 reduced institutions. The process of consolidation and liquidation of smaller and weaker banking institutions was exceptionally strong in the Netherlands. There, the number of banks dropped from 634 in 1998 to 51 in 2016, that is by 583 banks. Next places were taken by Italy (407 institutions), Austria (312) and Spain (277) [Report on financial... 2017]. The significant decline in the number of independent credit institutions in 2008-2016 was mainly caused by the crisis of 2007-2009 and the intensive development of new technologies (internet, smartphones, tablets, digitalization). As a result of the introduction of new information and communication technologies, some credit institutions and their branches with rigid working hours proved unacceptable to many customers. As digital technologies become more and more accepted, the customers are increasingly using online banking. In addition, the new technology creates the possibility of using banking services 24 hours a day, seven days a week, regardless of where the customer is staying. New technologies have also resulted in the emergence of new providers of financial services on the internet, which are similar to banking operations. These are various types of credit platforms, start-ups, FinTechs.

The analysis of the data contained in Table 1 shows that the largest number of independent banking institutions disappeared in Germany, and yet the experts believe that the German banking sector still has an excessive number of banks and bank branches, or is "over-committed" [Maisch, Osman 2018].

2. The German banking sector, its structure, costs and incomes

In the German banking sector there are three basic groups of banking institutions. According to the ownership criterion, they can be divided into private banks, public-legal credit institutions and cooperative banks.[1]

[1] According to Wolfgang Schauble, a former German Minister of Finance, Germany's banking market consists of private banks, savings banks and cooperative banks, and is a mirror reflection

Table 2. Dominant banking groups of the German credit sector in 2014-2016

Banking groups	Number of independent credit institutions*			Number of bank branches**			Share out of total [%]
	2014	2015	2016	2014	2015	2016	2016[3]
All banking groups	1830	1793	1724	35264	34001	31974	–
Commercial banks (credit institutions), including:	295	287	280	9954	9697	9406	16.2
Large banks	4	4	4	7443	7240	7005	0.2
Regional banks	176	171	166	2363	2312	2245	9.6
Domestic banks (Landesbanken)	9	9	9	408	402	384	0.5
Savings banks	416	413	403	11951	11459	10555	23.4
Cooperative banks	1050	1025	975	11169	10822	10156	56.6

* Credit institutions in accordance with the guidelines contained in Directive 2006/48/EC. L 177 of 30.06.2006. The notion of banks and credit institutions will be used interchangeably in this work.

** Branches are understood as branches and subsidiaries. 3. Shares of individual banking groups in relation to the number of all banking groups in 2016

Source: Bankstellenstatistik, Bankeninstitute, Monatsbericht 2017: 61.

Taking into account the subjective and objective scope of the operational activity, the German banking sector can be divided into universal banks and special banks. Universal banks are made up of commercial banks, domestic banks, savings banks and cooperative banks. In turn, the group of special banks includes: mortgage banks, savings banks, building societies, banks for special tasks and other banks [Monatsbericht 2017: 61]. Despite the large diversity of banks, the main pillars of the German banking sector are commercial banks, savings banks and cooperative banks. The German banking sector belonged and still belongs, despite the dynamic quantitative changes, to the most developed banking sector in Europe, which for many years after the Second World War was considered a model example of a well-functioning and effective banking sector, with a large number of bank branches and, thanks to that, with easy access to banking services [Żabińska 2004: 18-20]. The first scratches in this image appeared in the late 90s of the last century, and especially after the burst of the online bubble (year 2000). Already at that time, it turned out that some indicators characterizing this sector are worse than those in other countries,

of the German economy, in which, apart from large enterprises, there is a great number of small and medium enterprises that operate locally and are mainly the clients of savings banks and cooperative banks [Wir sind nicht… 2017].

especially as regards the relation of costs to income. It was connected with the excessively developed and expensive network of bank subsidiaries (branches and local units) and strong competition between private banks and savings banks as well as cooperative banks.

In the German banking sector, due to the number of independent banking institutions, the number of bank branches as well as the balance sheet sum is dominated by: commercial banks, savings banks and cooperative banks (see Table 2).

2.1. Commercial banks

Commercial banks (Kreditbanken) are a diverse group of banks in terms of the size and scope of their operations. This group includes large, and often international, banking groups with a large branch network as well as a large group of small and medium private banks operating in the legal form of a sole proprietorship or joint-stock company. The business models of small, regionally oriented banks over the last 50 years have not undergone any major change. The basic principle of their operation is to be small

Table 3. Selected items of profit and loss account by banking groups in 2011-2016 in EUR million

Years	Number of institutions	Income on interest balance	Income on commission balance	Balance sheet sum
All banking groups				
2011	1801	94 725	28 281	9 167 921
2012	1776	95 504	27 493	9 542 656
2013	1748	89 485	28 039	8 755 419
2014	1715	93 398	29 297	8 452 585
2015	1679	95 887	30 461	8 605 560
2016	1611	91 146	29 777	8 355 194
Commercial banks				
2011	183	32 580	16 136	3 825 768
2012	183	34 935	15 424	4 132 098
2013	183	32 689	15 946	3 669 592
2014	183	34 370	16 086	3 532 938
2015	177	36 282	17 337	3 678 042
2016	171	34 768	16 236	3 580 873

Source: Monatsbericht 2017: 82-83.

private banks there are many institutions that are profitable and even very profitable, often with specialized business models. They can maintain this profitability provided that they closely monitor changes and constantly seek new sources of income.

Table 4. Cost-to-income ratio in the selected German banking groups as a percentage

Group	Years					
	2011	2012	2013	2014	2015	2016
All banking groups	63.9	64.3	69.1	69.2	70.4	69.2
Commercial banks, including:	67.9	67.2	72.8	73.4	75.6	74.2
Large banks	72.5	68.7	78.3	78.1	82.9	81.4
Domestic banks (Landesbanken)	59.8	59.6	61.8	70.9	69.1	63.5
Savings banks	62.6	65.6	67.2	68.3	68.8	67.7
Cooperative banks	63.9	65.9	64.6	65.9	66.6	66.6

Source: Monatsbericht 2017: 82-83.

Commercial banks (Kreditbanken) have the largest balance sheet sum constituting 42.8% of the total balance sheet sum of all banking groups. In the balance sheet sum of the group of commercial banks, the major banks included in this group have a dominant share. The share of the balance sheet sum of large banks in relation to the total number of commercial banks amounts to 71.9%. These banks also have the highest cost/income ratio (see Table 3). To reduce the costs, they had to reduce strongly the network of their subsidiaries. Within 3 years from 2014 to 2016, these banks closed 438 of their branches. Data included in the Table 4 (relation of costs to income) show that this ratio in large banks is very high in both international and German banking sector comparisons, where it is the highest and shapes at the level of 81.4% (see Table 4).

2.2. Savings banks

The second place in terms of the balance sheet sum in the German banking sector is occupied by savings banks. These banks are characterized by great social trust, as evidenced by 50 million clients of German branches and subsidiaries of savings banks. Half of all savings in Germany is located at savings banks (see Table 5).

Table 5. Selected items of profit and loss account of the savings banks in 2011-2016 in EUR million

Years	Number of institutions	Balance sheet sum	Income on interest balance	Income on commission balance
2011	426	1 078 892	23 791	6 182
2012	423	1 096 261	23 280	6 137
2013	417	1 098 581	23 117	6 241
2014	416	1 110 362	23 237	6 441
2015	413	1 130 688	23 285	6 776
2016	403	1 154 475	22 667	6 970

Source: Monatsbericht 2017: 82-83.

The owners of the savings banks are municipalities and poviats. That is where the strong orientation in their activities for the common good comes from [Strukturale entwicklungen 2015]. The main type of the activity of savings banks is granting loans based on the accepted contributions. The balance sheet sum of savings banks in the total amount of the balance sheet sum of all banking groups is 13.8%. The cost/income ratio of 67.7% is lower than in large banks, but since 2011 it has slightly increased. In addition to financial functions, the savings banks through their foundations have traditionally played a large role in supporting cultural, sports and social projects in their region [Korzeniowska, Węcławski 2016: 405]. In the recent years, savings banks have been facing serious problems caused by the policy of low interest rates, digitization and stricter regulation of equity and liquidity, which negatively affected the amount of interest margin obtained, and launched deep restructuring undertakings that resulted in the liquidation of some savings banks and a significant amount of branches. In years 2014-2016 subject to analysis, 1396 branches and subsidiaries of savings banks disappeared. The network of branches and subsidiaries was expanded while the customers were physically going to banks, but the behavior of customers has changed and many operations that were arranged on-site at a branch or subsidiary, now faster, more convenient and cheaper can be done online, which meant closing the some not visited branches. This was reflected in the decrease in the amount of income and profits of this group of financial institutions. To compensate for this, the savings banks started collecting higher fees for certain services and products. Some savings banks have already resigned from the free giro account in 2016 [Deutsche Banken vor dramatischen… 2016].

2.3. Co-operative banks

Co-operative banks have a long tradition in Germany, which dates back to the nineteenth century and is associated with the creation by H. Schultze-Delitzsch of the so-called. Volksbanks (people's banks), supporting production activities in the urban areas as well as credit banks founded by Fryderyk W. Raiffeisen, supporting farmers and craftsmen in rural areas, which were later named as Raiffeisen banks after his name. They are currently an important element of the cooperative banking segment. Currently, the main function of these banks is to grant refinanced loans, to a large extent based on the deposits that they obtained [Korzeniowska, Węcławski 2016: 407].

Table 6. Selected items of profit and loss account of Kreditgenossenschaffen Banks in 2011-2016 in EUR million

Years	Number of institutions	Balance sheet sum	Income on interest balance	Income on commission balance
2011	1121	711 046	16 331	4 091
2012	1101	739 066	16 354	4 107
2013	1078	750 899	16 681	4 182
2014	1047	771 932	17 063	4 324
2015	1021	798 178	17 077	4 564
2016	972	832 394	16 581	4 578

Source: Monatsbericht 2017: 82-83.

The share of cooperative banks in the total number of banks in Germany is the largest and amounted to 56.5% in 2016. In the audited period covering the years 2014-2016, we may observe the strong consolidation processes in this group of banks, resulting in a reduction in the number of cooperative banks from 1050 in 2014 to 972 in 2016 (see Table 6). Accordingly, in the second half of the 1990s there were about 3,000 of them [Żabińska 2004: 27]. The number of bank branches has shrunk from 11269 in 2014 to 10156 in 2016. Following the reduction in the number of cooperative banks and their branches, the number of people employed in these institutions has also decreased from 158700 in 2014 to 151050 million in 2016 [Monatsbericht 2017: 61].

Similarly to other financial institutions, cooperative banks, whose activity is mainly focused on taking deposits and granting loans based on them, experience negative effects of the policy of low interest rates. To prevent the income erosion and increase the ability to generate additional profits, in order to slow down the

losses and at least partially compensate them, the cooperative banks decided to charge higher fees for the services rendered and products sold. In addition, cooperative banks also have a considerably expanded network of branches, which generates high costs. In effect, the cost/income ratio in this group increased from 63.9% in 2011 to 66.6% in 2016 despite the closure of many branches, which means that the process of restructuring and rationalization of employment has not ended yet.

3. Causes and effects of low income of banks – survey results

From the previous considerations, it appears that the most serious problem of fundamental importance for the future of German banks is the issue of weak and constantly decreasing profitability of banks, caused mainly by the policy of low interest rates. The German Central Bank (Deutsche Bundesbank) together with the Bundesanstalt fur Finanzdienstleistungen (Ba-Fin) conducted a survey in the summer of 2017 among 1500 small and medium German credit institutions under the supervision of Deutsche Bundesbank and Ba-Fin regarding the effects of low interest rates policies. The banks surveyed account for 88% of all credit institutions in Germany and approximately 41% of the aggregated balance sheet sum. As a part of the survey, 5 scenarios were simulated, including developments over the next 5 years. The income capacity and the ability to repel threats by banks and savings banks were examined.

The survey showed that the ability to generate income by banks and savings banks in Germany in the next 5 years will clearly deteriorate. If the interest rates remain unchanged until 2021, then the return on capital of banks will decrease by 40%, in the case of a further interest rate reduction, it may fall by more than a half. The decreasing return on equity in the analyzed scenarios is related to the decrease of the interest margin as a result of the implemented policy of low interest rates [Ergebnisse der Niedrigzinsamfrage 2017].

As a part of the survey, credit institutions were asked about the situations regarding competition on the German banking market. The institutions participating in the survey are still facing fierce competition from other banks in their area and from Fin-Techs. More than 70% of the institutions surveyed now see a stronger competitive pressure than 10 years ago. Thus, there is a greater interest in mergers. Every tenth institution participating in the survey claims that it is in the process of merger or assumes such a merger. As far as costs are concerned, banks want to lower them, first by closing branches and cutting employment.

Based on this survey, it can be seen that both mergers and acquisitions are increasingly often taken into account by banks and savings banks and they are less critically perceived than in the past [Ergebnisse der Niedrigzinsamfrage 2017]. The survey also included questions about the credit institution's ability to resist shocks. The aim of the study was also to determine whether the credit institution is equipped with sufficient equity to counter the stress factors in the event of a downturn.

The results of the stress test showed that small and medium German credit institutions have a good ability to withstand the critical conditions included in the stress test. Only 4.5% of those participating in the survey of credit institutions were unable to meet the current equity requirements [Ergebnisse der Niedrigzinsamfrage 2017].

The results of the survey confirmed that the basic problem of German banks is low and declining profitability. There are many reasons for low profitability, but two reasons are fundamental. It is generally believed that low incomes are the result of the policy of low interest rates implemented by the ECB, which means that its effects also apply to all euro area banks. However, German banks have been particularly affected by the policy of low interest rates for two reasons.

The first reason is the strong dependence of German banks on the operations related to interest rates (interest margin). 75% of the income of German banks comes from the interest margin, while in other countries, the income comes from the transactions with securities [Ich sorge mich um die Ertragkraft... 2017], account maintenance as well as the sale of insurance products. Therefore, many experts recommend the German banks to reduce their dependence on banking operations related to the interest rates. For comparison, in France, Credit Agricole sells an average of 8 products to its customers, according to a representative of Credit Agricole, Xavier Musea, in a conversation with the journalist of the newspaper Frankfurter Allgemeine Zeitung.

The second reason for the low profitability of German banks is manifested in the poor result of the ratio of costs to income [Bankenkonsolidierung schreitet voran 2016]. Low incomes are also a result of fierce competition between the various forms of credit institutions in Germany, thanks to which in this country more financial products can be obtained with a lower interest rate than in other countries. The relation of costs to income also depends on high expenditures on new technologies and IT security. To change this, the experts call for mergers and acquisitions (economies of scale, lower costs). Mergers and acquisitions are not the only option to reduce costs. There are also alternative options to reduce the operating costs. Banks can take an advantage of the opportunities that the digitalization process brings [Deutsche Banken leiden besonders… 2017]. The point is to make the banking structures more cost-effective when implementing digitalization.

German banks and savings banks wanting to curb the declining income trend, to gain time and to compensate for declining income may in the short-term: solve the so-called "Quiet reserves", make a new transformation of terms, or enter into more risky operations that have higher interest rates. However, this will not solve the basic problem, which is to acquire the permanent ability to create higher income. Therefore, at the same time, one needs to decide on the difficult, structural adjustment processes that need more time to be implemented. These are changes in the income structure, reduction of operating costs, partial cost reduction through mergers and consolidations. The member of the Board of the Bundesbank, prof. Andreas Dombret, pays attention so that not to forget that mergers offer the possibility of reducing costs (economies of scale), but are not a remedy for healing the banking sector. He believes that a new profitable institution will not be created from two unprofitable financial institutions [Der Blick der Bundesbank… 2017]. That is why banks should look for the new fields of activity and new business models for their operations. This particularly applies to the financial institutions with a business model based on the interest rate. They must find other forms of activity that will provide them with higher incomes and enable them to function also at low interest rates. The level of income of banks should be such that they can be immune to shocks that may lead to bank bankruptcy. And that means they have to be more efficient, have lower costs and higher incomes [Der Blick der Bundesbank… 2017].

4. Business models of banks, their strategies and orientations

The conducted analysis showed that the current model of German banks, based mainly on deposit and credit activities, makes it impossible to obtain the higher income necessary to invest in new technologies and fulfill the requirements for equity and liquidity. This requires a new strategic orientation of banks' operations. Many banks are currently checking their business models, trying to diversify them into the areas not related to the interest rate. The business models currently developed by banks are a kind of survival strategies and in times of big changes they have to be shaped in such a way that they keep pace with dynamic changes in technology, economy and business environment [Dombret 2016].

Professor Dombret, a member of the Bundesbank board, at a conference in Munich on 24/10/2016, gave a presentation on business models of banks, in which he stated that there is no consensus on how to solve the problems plaguing the European and German banks. In his opinion, there are two groups

representing different positions in this case. The representatives of the first group are of the opinion that banks and savings banks must thoroughly change their business models, focus on digitization. In their opinion, new strategies and effective organizational forms related to digitization will lead to growing revenues, which will enable banks to regain stabilization.

The second group is more pragmatic. The representatives of this group, in turn, believe that digitization is not enough to end the weak income situation of banks, they believe that it is necessary to clean the banking sector from weak banks, which means a further reduction in the number of banks. Strong banks would remain on the banking market, which would allow them to obtain higher income on a sustainable basis. Therefore, new strategies and new models are necessary, which would enable banks to earn more money to develop and function effectively.

When it comes to banking models, there are no exemplary solutions in this area. Each bank must find its own strengths and reinforce them. This applies to both large and small and medium-sized private banks, but also to own specificity of cooperative banks and savings banks.

Generally, we can distinguish the supporters of two models of banks' functioning. Some support the introduction of new solutions based on the Internet, computers, digitalization and Fin-Techs. Others are the protectors of private banks focused on care and advising private clients. Although both models differ fundamentally, in reality, the mixed model is the most common. As new technologies are expensive, not every bank or savings bank can afford to use them in a comprehensive way. That is why we are dealing with a mixed model, because these two models can and should complement each other and a hybrid model should be created [Privatbank und Fin-Tech… 2017]. Especially that in the real economy the methods of introducing new technologies have only developed to certain areas of banking activity. Therefore, the question arises whether the new strategy for the development of the banking sector should be directed towards Fin-Tech, or rather one should strive to optimally combine the advantages of traditional banking and the advantages of new solutions in the form of Fin-Tech [cf. Żabińska 2016].

In practice, it is already observed that some institutions enter into strategic alliances between Fin-Tech and traditional banks. In the literature one can meet the constructions of the future business models of banks, which can be divided into four categories within the Open Banking [Baumgarten, Wellstein 2017].

1. Own development: banks develop and distribute services and products themselves.

2. White Label/OEM: banks offer products and services of other bidders under their brand.

3. Platforms: the bank acts as an intermediary platform between the client and external financial provider.

4. "Werkbank" (type of workshop): the bank puts its infrastructure at its disposal and acts as a back office. Third parties use the infrastructure offered.

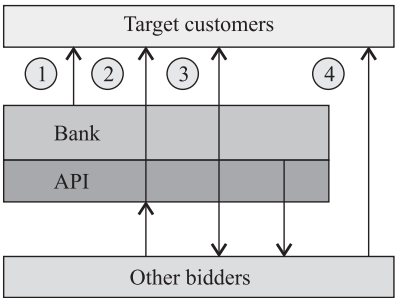

Figure 1. Expected business models in the Open Banking as a strategy for the digitization of banks

Source: Baumgarten, Wellstein 2017: 16.

The Open Banking is another component of the digitization strategy of many banks. Many banks have established their own incubators and implement the so-called „Program accelerator". It is supported from the financial and advisory side by the banks. For example, Deutsche Bank set itself the goal of developing 500 start-ups within a year, BNP Paribas predicted in its program the functioning of the start-ups accelerator and supporting them for 3 to 6 months. HSBC, on the other hand, invested US289 million in Chinese start-ups. All these programs are the foundation of the so-called Open Banking under which banks, through the standardized interface (API), offer their infrastructure to be used by other providers of services and products. According to some authors, the Open Banking will push the financial industry towards the so-called platform economy. Customers will focus on several platforms, as a result, there will be a few great bidders, as is already the case with Ebay, Amazon and Google. Other retail banks and FinTechs in this scenario will either be a part of this system or will take a niche position [Baumgarten, Wellstein 2017].

Conclusions

The analysis and research carried out show that the German banking sector has been in a difficult situation since the outbreak of the financial crisis. However, the difficulties were not caused only by the financial crisis, but also

by many other factors. a special role after the crisi was played by the phase of low interest rates combined with high capital requirements, which led to the fact that continuing the existing business model turned out to be irrational. New technologies, the Internet, computers, smartphones – caused a need for profound changes in the current profile of banks' operations. Already, the costs of developing digital infrastructure are a major position in the banks' balance sheets, which further drives the cost spiral. The investment costs associated with the introduction of new technology and the costs associated with the creation of capital buffers, with existing income opportunities, are difficult to implement. In other words, basing on the current business models, it is impossible to cover all the necessary expenses. And because the German banks have already come across the limits of the ability to create an adequate income through traditional banking, they must look for new models that would allow exceeding these limits and generating more revenues. It seems that such a solution is a mixed (hybrid) model.

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Determinanty zmian w strukturze i modelach biznesowych banków w Niemczech

Streszczenie. *Celem opracowania jest przedstawienie zmian, jakie dokonują się w strukturze niemieckiego sektora bankowego w wyniku rozwoju Internetu, smartfonów, cyfryzacji, a także oddziaływania polityki niskich stóp procentowych i uregulowań Bazylei III, które wymagają zmiany w dotychczasowych, tradycyjnych modelach biznesowych niemieckiego sektora bankowego. Opierając się na studiach literaturowych, zaprezentowano trendy rozwojowe modeli biznesowych banków, które zostały ujęte w cztery podstawowe kategorie.*

Słowa kluczowe: *banki tradycyjne, cost-income ratio, polityka pieniężna EBC, przyszłościowe modele banków, trendy rozwojowe modeli biznesowych banków*

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Financing and Support of Research and Development in Slovakia and Poland

Abstract. *Investment in R&D, that is the drive of technical progress, has a significant impact on economic growth as well as on the competitiveness of the country, and therefore it gains importance in the developed economies. This is not the case in Slovakia and Poland, as they belong to the European Union countries with a low R&D intensity and an inadequate structure of relatively low R&D expenditure. The paper examines the theoretical definition of R&D, conducts the assessment of the development of R&D investments and their structures in the most developed countries of the world, the EU as well as in Slovakia and Poland. The objective of the paper is to highlight the reasons for an insufficient level of funding and support for research and development in Slovakia and to propose the measures for improving the level of research and development in Slovakia and Poland.*

Keywords: *research and development, financing, support*

Introduction

The Slovak economy has been developing lately, it is one of the fastest growing economies in the European Union. Unemployment is falling, inflation is also not high and politicians are satisfied. Economists, however, have a different view. Slovakia (or Slovak Republic – SR) is one of the countries where economic growth is mainly driven by investment, while the source of growth in the most advanced economies is mainly a technological change and innovation. This is also reflected in the relatively low competitiveness of Slovakia, which

is the sixth worst rated countries by the EU. The worst results are achieved in innovations, which are currently among the factors affecting the productivity and competitiveness of the country [WEF 2017]. Research and development (R&D) is considered to be key activities that lead to innovation and productivity growth.

1. Theoretical definition of the subject

The most comprehensive definition of research and development is devoted to the OECD Frascati Manual, which is a recognized international standard for R&D around the world. According to him, research and experimental development includes creative work done on a systematic basis to increase the amount of knowledge, including knowledge of a man, culture and society, and use this amount of knowledge to design new applications. The term research and development includes basic research, applied research and experimental development. Basic research is experimental or theoretical work, conducted to gain new knowledge, to form the essence of phenomena and observed facts, but which are not primarily aimed at using new knowledge in practice. Applied research is an original research conducted to gain new insights, but primarily focuses on achieving practical goals. Experimental development is a systematic work based on the existing knowledge gained through research and practical experience that is gathered for the production of new materials, products or equipment, for the introduction of new processes, systems and services or for substantial improvements to those already in place. Research and development covers formal R&D in R&D departments as well as non-formal or random R&D in other units and includes various activities [OECD 2015]. In Slovakia the concepts of research and development are defined in Law 172/2005 on Organisation of State Support for Research & Development. According to this law, research is a systematic creative activity carried out in the field of science and technology for the needs of society and in the interest of developing knowledge. Research consists of basic research and applied research. Basic research is a systematic creative activity, the main aim of which is to gain new knowledge, regardless of the possibilities of its direct practical use. Applied research is a systematic creative activity aimed at acquiring new knowledge with a view to its direct use in economic and social practice. Development is a systematic creative activity in the field of science and technology using the rules and knowledge gained through research or based on practical experience in the creation of new materials, products, equipment, systems, methods and processes or their improvement [Zákon 172 2005].

Depending on where these activities are performed, which entities provide them, research and development is divided into five sectors. The business sector encompasses mainly private enterprises, but also public enterprises and non-profit organizations that focus on the production and marketing of the products. The government sector includes all bodies, authorities and government departments that provide but do not sell the ordinary services except higher education. The private non-profit sector is made up of private non-market, non-profit institutions that provide services to the public, as well as to the individuals or households. The university sector includes all universities, technical colleges and other institutions of post-secondary education, irrespective of their source of funding and legal status, but also all research institutions under the control of higher education institutions. The foreign sector includes all institutions and individuals located outside the country and all international organizations (excluding business entities) and facilities in the country concerned. In more detail, research and development can also be divided into specialized departments, but there is no single international classification of the leading disciplines that could be used [OECD 2015].

The level of R&D in a particular country is assessed by the total amount of R&D expenditure. According to the sources of funding, the total R&D expenditure is allocated to the expenditure from domestic sources, which includes the resources from the state budget, the business sector, the non-profit sector and expenditure from the foreign sources. Expenditure is divided into capital and current. Capital expenditure are the means to acquire tangible and intangible fixed assets. Current expenditure is the means for own activities of research and development organizations and workplaces as well as the cost of tasks solved by the organization's and the workplace's own capacity. The R&D intensity is measured by the percentage of R&D expenditure in GDP, which can also be compared internationally.

State aid for R&D is generally done through a direct and indirect support. The direct support means a direct funding of R&D expenditure from the public resources in the form of grants. The indirect support is the use of tax instruments to stimulate the growth of business spending on R&D. Both methods have their advantages and disadvantages. The advantage of direct R&D funding is that it allows the government to influence on the main R&D direction in the country, and thus also to address the most important socio-economic problems. That is why the direct support is a predominant form of support for research and development in most countries. The disadvantage is the relatively long time and administrative burden of such support, and also that only the selected entities can obtain funding for the projects that meet the demanding criteria. In most countries, the indirect support is rather a complementary form of support for research and development, and less administratively and financially demanding

for the state. Unlike the direct support, tax incentives can be repeatedly applied by all R&D entities meeting the conditions set.

2. Goal and Methods

The paper examines the theoretical definition of research and development, conducts the evaluation of research and development investments and their structures in the most developed countries of the world, the EU and the Slovak Republic as well as analyzes the system of support of research and development in Slovakia. The objective of the paper is to point out the insufficient level of funding and support for R&D in Slovakia and to propose the measures to improve the level of R&D, especially in the private sector, that is the drive of innovation.

The basis for assessing the level of funding and support for R&D in the Slovak Republic was a comparative analysis of research and development funding in the countries with the highest R&D intensity, which belong to the most economically advanced countries in the world and in the European Union. Since the Slovak Republic is a part of the European Union, the Authors have compared R&D expenditure and its structure with other member countries and with an average for the European Union. The paper analyzes the publicly available statistical data characterizing the development and structure of R&D expenditure as well as EU and OECD documents evaluating the level of R&D of its member countries. Tables were used for a more accurate viewing, and some were shown with graphs for clarity. When analyzing the system of support for research and development in Slovakia, the authors based on valid legal standards governing this issue in the Slovak Republic and on available information on such support in other countries.

3. Research results

3.1. Investment in research and development in the most developed countries of the world and in the European Union

Since 1984, the European Union has paid an extraordinary attention to R&D and innovation. In Europe 2020 program, adopted in 2010, R&D was identified as the crucial factor for ensuring smart, sustainable and inclusive growth in the European Union. However, the EU spends less on its funding compared to the

traditional competitors in the US and Japan, with a particular lag behind the level of private R&D investment. One of the five main objectives of this strategy is therefore to increase R&D investment by 3% of GDP by 2020. Not only the amount of R&D investment funds is important, Europe must also focus on the composition and improvement of R&D in the private sector [EK 2010].

In 2016, European Union countries spent on research and development more than €302 billion. The intensity of research and development, i.e. spending on R&D in % of GDP remained at 2.03% as in 2015. Compared with other advanced countries, R&D intensity in the EU in 2015 was much lower than in Israel (4.25%), in South Korea (4.23%), Japan (3.29%) and the United States (2.79%). However, it reached approximately the same level as in China (2.07%). Figure 1 shows the development of research and development intensity between 2000 and 2015, respectively 2016 (EU). While the R&D intensity in the European Union remained at a similar level, the US and Japan's results increased only slightly (by 0.26%, 0.17% and 0.38%), in China R&D expenditure increased by 1.17% and in South Korea by up to 2.05% of GDP. South Korea overtook US and Japan in terms of research spending for the past 15 years and has more than double of the R&D intensity compared to the EU. The European Union continues to stay behind with R&D when referring to the competitors, the same situation happens in case of the emerging Asian economies.

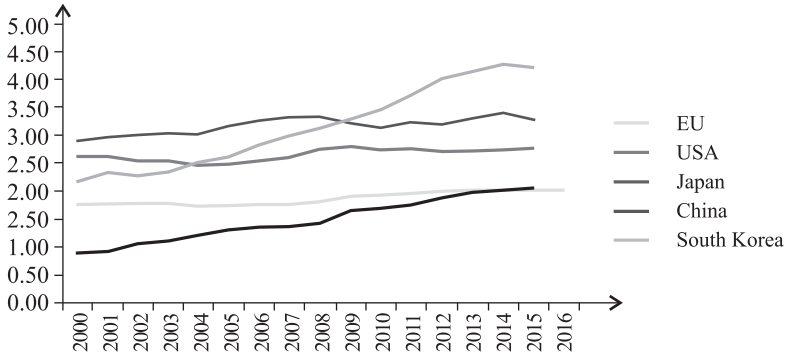

Figure 1. Development of R&D expenditure in % of GDP

Source: EU 2018.

As noted above, the average R&D intensity in the European Union reached 2.03% of GDP in 2016. However, the level of R&D expenditure in the individual Member States was very different, from 0.74% of GDP in Lithuania to 3.25% in Sweden. However, most of the Member States does not even obtain an average European level, what is more, 10 countries have the R&D intensity of less than 1% of GDP (Greece, Poland, Croatia, Slovakia, Bulgaria, Latvia, Malta, Cyprus,

Romania and Lithuania). By contrast, over-spending on research and development occurs in 7 countries (France, Belgium, Finland, Denmark, Germany, Austria and Sweden), with the results already exceeding 3% for Austria (3.09%) and Sweden (3.25%) [Eurostat 2017].

Table 1. R&D expenditure by sector in 2015 [%]

Country / Sector	entrepreneurial sector	National budget	Foreign sources	Other national sources
EU 28	55.5	31.1	10.8	2.6
USA	64.2	24.0	4.7	7.1
Japan	74.5	23.7	0.8	1.0
South Korea	74.7	21.3	0.7	3.3
China	78.0	15.4	0.5	6.1

Source: EU 2018.

Regarding the structure of resources invested in R&D, the sources from the private business sector dominate in the advanced economies, which also applies to the European Union (55.5%), but this indicator falls behind its competitors (see Table 1). China's business sector (78%) invests most in research and development, followed by South Korea (74.7%), Japan (74.5%) and the US (64.5%). The leading countries in the comparison with national budget funds are the European Union countries with R&D expenditure financed from the state budget (31.1%), mainly spent on university science and technology and also in terms of from foreign sources (10.8%), which consist mainly of financial resources from the European Union. Among the countries in the European Union with over-average spending in the business sector there are: Slovenia (69.2%), Germany (65.6%), Sweden (61%), Denmark (59.4%), Belgium (58.6%) and France (55.7%). Most of the funding for R&D from the state budget (over 40%) is used in Cyprus (50.6%), Luxembourg (47.7%), Estonia (46.4%), Portugal, Greece (42.5%), Poland (41.8%) and Romania (41.7%). In Latvia (45%), Bulgaria (43.8%), Slovakia (39.4%) and Lithuania (34.3%) the highest percentage of foreign sources for research and development funding was in 2015 (more than 30% and in the Czech Republic (32.5%) [EU 2018].

The level of investment in R&D, as well as its growth of dynamics, varies among the Member States of the European Union. Over the last ten years, R&D intensity has increased in 22 member countries, with Austria (0.73%) and Belgium (0.68%) with the largest growth. On the contrary, the intensity decreased in 6 member countries, most in Finland (0.59%) and Luxembourg (0.43%). Some new member countries have seen the highest dynamics of R&D intensity,

especially thanks to the European Structural Funds and their lagging behind the EU average is decreasing. Despite some positive trends in research and development in the European Union, there is a growing gap in investment in business research, which is also reflected in the lower growth of the European economy. The European Union should therefore reevaluate the system of public support for research and development implemented by the business sector [EU 2018].

3.2. Investment in Research and Development in the Slovak Republic

The Slovak Republic has been for a long time among the European Union countries with a low result of R&D intensity. The figures in Table 2 as well as the graph in Figure 2 show, since 2008, the increasing intensity of R&D in the Slovak Republic and the gradual increase of the average European level. In 2015, research and development intensity in Slovakia reached 58% of the European Union level. However, the positive trend changed in 2016 when the share of R&D expenditure dropped to the level of 2012 and reached 39% of the EU level. In 2016, spending on research and development of 0.79% of GDP placed Slovakia on the 22nd place among the 28 EU member states and the last place among the V4 countries (CR – 1.68%, Hungary – 1.21%, Poland – 0.97%).

Table 2. Development of R&D expenditure in EU and Slovakia (SR) in the period 2005-2016 [% of GDP]

Country	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
EU 28	1.74	1.76	1.77	1.84	1.93	1.93	1.97	2.01	2.02	2.03	2.04	2.03
SR	0.49	0.48	0.45	0.46	0.47	0.62	0.66	0.80	0.82	0.88	1.18	0.79
Difference	1.25	1.28	1.32	1.38	1.46	1.31	1.31	1.21	1.2	1.15	0.86	1.24
SK/EU %	27	26	25	24	24	32	34	40	41	44	58	39

Source: Eurostat 2018.

Table 3 illustrates the development of the R&D expenditure structure in the Slovak Republic between years 2007 and 2016. The data in the table show that the amount of expenditure invested in research and development increased in the SR in monetary units in the monitored period, with the exception of the 2009 crisis year. In 2015 R&D spending rose significantly by EUR 257.64 million to EUR 927.27 million, which was the result of a large drawdown of EU Structural Funds. Subsequently, in 2016, expenditure dropped to EUR 640.83 million. The

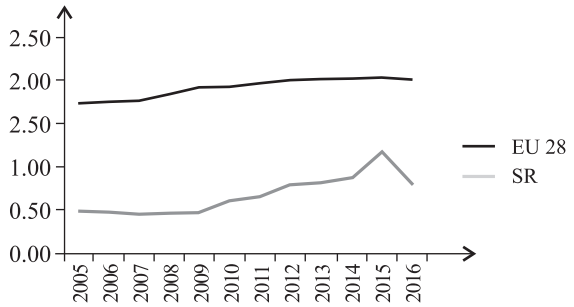

Figure 2. Development of research and development expenditure in the EU and the Slovak Republic

Source: Eurostat 2018.

Slovak Republic is characterized not only by insufficient R&D expenditure but also by its inappropriate structure. In Slovakia, the current expenditure on capital is significantly outweighed and accounts for up to 80% of the total expenditure on average. The reason for this is a lack of overall spending, which should be ensured in particular by routine research and development activities, and few resources remain to build and develop infrastructure. This is why research and development infrastructure in Slovakia is underdeveloped and obsolete.

The largest share of R&D expenditure is used by the Slovak Republic to fund basic research (2016 – 40%), while the developed countries provide more funding for applied research. It is positive that the basic research spending is gradually declining in favor of the funding for applied R&D. Another breakdown criterion is the division by funding sources. During the examined period, the resources from the state budget prevailed in Slovakia, while in advanced economies, research and development is financed mainly from business sources (in 2015 in Japan 78%, EU 55%, SR 25%). In 2016, the share of entrepreneurial resources increased to 46% and exceeded the share of state resources, which accounted for less than 41%. The specialization of R&D funding in the Slovak Republic as well as in other Central and Eastern European countries has also a high share of resources from abroad, thanks to the absorption of resources from the EU Structural Funds (EU 10.8% in the year 2015, SR 39.4%). The structure of expenditure according to their use in Slovakia corresponds approximately to the structure in the European Union, where the highest expenditure is directed to the business sector (EU 64%, SR 50%), followed by the higher education sector (EU 23%, SR 28%), and the private non-profit sector (EU 1%, SR 1%) (SO SR, 2018, EU, 2018). The insufficient level of R&D financing and inappropriate expenditure structure cause research and development to be considered a weak element of the Slovak economy in the long term, despite the fact that this problem

Table 3. The structure of expenditure on research and development in the Slovak Republic in the period 2007-2016

Indicator	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Expenditure on research and development in million Euro										
Together	282	316	302	416	468	585	610	669	927	640
Capital	29	29	31	63	95	109	97	115	374	45
Current	253	287	271	353	373	476	513	554	553	595
According to the R & D activity target in %										
Basic research	46.24	43.76	46.51	46.27	48.87	47.34	44.09	45.10	42.78	40.39
Applied research	24.51	27.39	24.19	23.67	24.63	23.46	23.83	28.42	30.26	23.67
Development	29.25	28.85	29.30	30.05	26.50	29.20	32.08	26.48	26.95	35.94
According to sources of financing – sectors in %										
Entrepreneurial	35.60	34.68	35.11	35.06	33.85	37.71	40.19	32.21	25.06	46.22
Public	53.92	52.33	50.56	49.57	49.75	41.57	38.90	41.38	31.94	40.99
National	0.24	0.69	1.55	0.70	2.24	2.07	2.94	2.72	3.57	2.08
Foreign	10.24	12.29	12.78	14.67	14.16	18.65	17.97	23.68	39.43	10.71
By use – sectors in %										
Business	39.55	42.88	41.05	42.09	37.18	41.35	46.26	36.84	27.95	50.36
Public	35.36	32.80	33.89	29.96	27.66	24.52	20.48	28.34	27.86	21.44
Higher education	24.99	24.26	25.03	27.64	34.95	34.03	33.10	34.42	43.79	27.71
Private non-profit	0.10	0.06	0.03	0.31	0.21	0.10	0.15	0.41	0.40	0.49

Source: own processing according to the ŠÚ SR 2018.

is addressed in many strategic documents. One of them is also the Strategy for Research and Innovation for Smart Specialization, which should start a research and development reform in Slovakia between 2014 and 2020. According to this document, R&D expenditure should rise to 1.2% of GDP by 2020. In particular, there should be an increase in resources from the business environment to make up 2/3 of the total resources in 2020 [RIS3 SK 2013].

3.3. Supporting R&D in the Slovak Republic

In the Slovak Republic, support for research and development is legislatively regulated by Act 172/2005 on Organisation of State Support for Research & Development. R&D support under this Act is implemented by providing funds from the state budget in the form of non-repayable, targeted and institutional support. The purposeful form of R&D support is provided on the basis of competition

for R&D projects and development projects. The institutional form of R&D support is established to provide research and development infrastructure to the Slovak Academy of Sciences and other research institutions, as well as to support research and development as a part of higher education [Zákon 172 2005]. The Act No. 185/2009 on incentives for research and development regulates the conditions for the provision of incentives for research and development in order to increase the level of R&D. Under this Act, legal persons – entrepreneurs can apply for two forms of incentives:

– subsidies from the state budget to support basic research, industrial research or experimental development, and to develop a study on the feasibility of research and development project,

– corporate tax relief [Zákon 185 2009].

The Ministry of Education decides to grant the incentives, it determines which of the applicants may receive them and how much it will contribute to the research and development projects. By 2015, the incentives in the form of subsidies were largely granted on a small scale, income tax concessions were used only to a minimum, despite the fact that this undemanding way of supporting of corporate R&D has been used for a long time by most advanced countries. In 2015 this type of support was introduced in the Slovak Republic.

In January 2015, Law 333/2014 of the Act came into force, amending the Act no. 595/2003 on income tax, which introduces additional tax concessions for R&D in private enterprises. The introduction of this indirect R&D support instrument allowed the R&D investment firms to reduce their tax base by 25% of R&D expenditure, by 25% of R&D expenditure for employees under 26 and allowed a rise by 25% per annum in R&D expenditure [Zákon 333 2014]. This tool is more acceptable to R&D-enabled enterprises than the direct support as "Supercomputers" are eligible for all businesses and no one has to approve it. It should be one of the main tools to motivate businesses to increase the investment in R&D, but it did not. According to the Financial Report of the Slovak Republic, the deduction of research and development expenditure for the year 2015 was only used by 82 companies in the total amount of EUR 9.2 million and in the year 2016 by 112 businesses of EUR 16.4 million. The Ministry of Finance expects it to be up to EUR 24 million per year. The tax savings in 2015 of EUR 2023825 and EUR 3626648 in 2016 mainly concerned successful large enterprises, but they had almost no incentive effect on new and small firms [Finančná správa 2017]. There are several reasons of the low interest of businesses in the deduction of R&D expenditure. According to a survey conducted by Deloitte, the deduction of 25% amount, especially for small enterprises, would require administrative costs related to the cost-accounting obligation, what would exceed the tax savings. According to some companies, the obligation to disclose

the objectives of research projects and the poorly understandable legislation regulating the tax deduction is also an obstacle. The R&D enterprises consider 25% of deduction at a low rate. For comparison, in the Czech Republic, Poland and Hungary, the deduction is 100% and in some Baltic countries up to 200% of R&D expenditure [Deloitte 2017]. In order to make the tax deduction of R&D costs more attractive for businesses, at the end of 2017, the amended Act no. 595/2003 on income tax was introduced, which brought a number of changes. From 2018 onwards, R&D expenditure tax deduction will be increased to 100% of R&D expenditure and will also be eligible for license and software spending used to implement the R&D projects. The deduction from the amount of R&D expenditure growth over the previous periods will also increase to 100%. The new law introduces a new instrument for the support of research and development, a "patent box" that will allow businesses to reduce their income tax on the commercial exploitation of their own research results, as 50% of these revenues will be exempted from tax [Zákon 344 2017]. However, the amendment to the Act did not change the complicated way of applying for the tax deduction of research and development costs, nor the obligation to disclose information about the projects that most impeded the enterprises. Therefore, it is unclear whether it will attract other businesses that have not yet implemented the incentives and will increase their resources to invest more in R&D.

3.4. Investment in Research and Development in Poland

In the course of the last couple of years in Poland an increase of financial expenditure on research and development activity has been observed. Gross domestic expenditure on research and development (GERD) in year 2016 was shaped on a level not much lower than in the previous year and amounted respectively at PLN 17.9 billion in comparison to PLN 18.07 billion from year 2015. The share of this expenditure in GDP, described as the indicator of intensiveness of R&D works was shaped at the level of 0.97%, which is presented in Table 4 and Table 5.

Table 4. Development of R&D expenditure in EU and Poland 2005-2016 [% of GDP]

Country	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
EU 28	1.74	1.76	1.77	1.84	1.93	1.93	1.97	2.01	2.02	2.03	2.04	2.03
PL	0.56	0.55	0.56	0.60	0.66	0.72	0.75	0.88	0.87	0.94	1.00	0.97
Difference	1.18	1.21	1.21	1.24	1.27	1.21	1.22	1.13	1.15	1.09	1.04	1.06
PL/EU in %	33	32	32	33	35	38	39	44	44	47	50	48

Source: own work based on the data of the Central Statistical Office 2018.

The indicator of intensiveness of R&D works in comparison to the average value for EU 28 was lower by half. In case of EU 28 it was oscillating in years 2005-2016 in the range of 1.74-2.03% GDP, and was also characterized, up to year 2015, by a steady progression while in year 2016 it slightly decreased by 0.01% GDP.

In case of Poland one can observe a similar trend of the increase of the examined indicator, however, in year 2005 it had the value of 0.56% GDP, in year 2015 of 1% GDP, while in years 2016 of 0.97% GDP. The difference between the indicator of intensiveness of R&D works in Poland and in the countries of EU 28 from the level of 1.18-1.27% GDP in years 2005-2011 decreased to 1.04-1.06% GDP in years 2015-2016. In year 2005 the evaluated indicator PL/EU 28 reached the value of 33% and in year 2015 of 50% which confirms the thesis that Poland incurs expenditure for R&D activity, which is lower by half in comparison to the average value of EU 28 countries. Based on the data contained in Table 5 it can be seen that GERD per capita increased from the level of PLN175 to around PLN470 in years 2015-2016.

Table 5. Indicators of expenditure on research and experimental development in Poland in 2007-2016

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Gross domestic expenditure on research and experimental development (GERD) in PLN billion (current prices)	6.68	7.71	9.07	10.42	11.69	14.36	14.43	16.17	18.07	17.95
Ratio of GERD to GDP in %	0.56	0.60	0.66	0.72	0.75	0.88	0.87	0.94	1.00	0.97
GERD per capita in PLN	175	202	238	207	303	372	375	420	470	467

Source: own study based on the data of the Central Statistical Office 2018.

The highest share in gross domestic expenditure on research and development activity belonged during the examined years to the business sector (BES) – 65.7% of total expenditure in year 2016. Gross domestic expenditure in this sector was shaped on the level of PLN 11.8 billion and was by 40.1% higher in comparison to year 2015 which is presented by the data in table 6. Therefore, it increased by more than twice in comparison to year 2007 in which it amounted to only 30.39% of total expenditure. The public GOV sector incurred expenditure for R&D in year 2007 at the level of PLN 2.19 billion and in year 2016 it doubled to PLN 4.41 billion, which constituted in that period 24.57% of total expenditure. On the other hand, the HES universities generated financial expenditure for R&D in the range of PLN 1.83-5.22 billion. The peak of the share in total expenditure occurred in year 2013 at the level of as much as 34.31% of total expenditure.

Basic research in the structure of total R&D expenditure oscillated from 30.1-39.7%, however, in year 2007-2010 its escalation has been noted and, starting with year 2011, it was characterized by regression from 36.4% to 30.1%. The expenditure on applied research oscillated between 15.7-24%, though the last years of the examined period were marked by a definite decrease in the structure of total expenditure (in year 2016 it achieved the value of 15.7%). Furthermore, the expenditure on development research from the level of 38.3% in year 2007 rose up to 54.2% in year 2016.

Table 6. Structure of expenditure on research and development in Poland in 2007-2016

Indicator		2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Source of funds for financing R&D in the sectors of performance											
Total gross domestic expenditure in PLN billion		6.68	7.71	9.07	10.42	11.69	14.36	14.43	16.17	18.07	17.95
Entrepreneurial BES	PLN billion	2.03	2.48	2.59	2.78	3.53	5.35	6.3	7.54	8.42	11.79
	in %	30.39	32.17	28.56	26.68	30.2	37.26	43.66	46.63	46.6	65.69
Public GOV	PLN billion	2.19	2.37	2.63	3.12	3.74	4.04	4.02	3.87	3.88	4,41
	in %	32.79	30.74	29	29.95	32	28.14	27.86	23.94	21.48	24.57
HES Universities	PLN billion	1.83	2.27	2.6	3.37	3.88	4.11	4.95	4.23	4.72	5.22
	in %	27.4	29.45	28.67	32.35	33.2	28.63	34.31	26.16	26.13	29.09
The structure of current gross domestic expenditure on R&D by types of research in %											
Basic research		37.8	38.2	38.4	39.7	36.4	36.7	35.0	33.5	31.9	30.1
Applied research		23.9	22.4	18.9	20.5	24.0	21.0	20.5	19.8	20.3	15.7
Experimental development		38.3	39.4	42.7	39.8	39.6	42.3	44.5	46.7	47.8	54.2
Gross domestic expenditure on R&D by types in PLN billion											
Total current expenditure		5.18	5.98	7.25	7.75	8.52	10.08	11.04	12.17	13.32	14.6
Investment in total fixed		1.51	1.73	1.83	2.68	3.17	4.28	3.4	4.01	4.75	3.36
Gross domestic expenditure on R&D by type		0.43	0.85	1.2	3.19	1.8	2.09	2.7	3.4	3.25	3.41

Source: own work based on the data of the Central Statistical Office 2018.

Based on the data contained in Table 6 one can additionally conclude that the current gross domestic expenditure rose from the level of PLN 5.18 billion during years 2007-2016 to PLN 14.6 billion, including investment expenditure

rising from PLN 1.51 billion to PLN 3.36 billion, even though in year 2012 it achieved the peak at the level of PLN 4.28 billion. Foreign expenditure was much lower and oscillated with various rate of variations in the examined period between PLN 0.43 billion and PLN 3.41 billion.

4. Discussion

Investing in R&D that is the drive of technical progress has a significant impact on economic growth and on the competitiveness of the economy, so more attention should be paid to Slovakia than it has been so far. If the Slovak Republic no longer wants to stay behind the advanced economies in the future, it needs to rethink its approach to supporting R&D. The solution to this problem lies in the current and future governments of the Slovak Republic, which should move from word to action, and a long-term verbally declared R&D support to a gradual real increase in the amount of funds invested in this area. The current strategic goals of Slovakia, however, do not indicate this. While the EU has set itself the objective of increasing R&D spending by 2020 to 3% of GDP, Slovakia's goal is only a little ambitious. The SR plans to increase R&D expenditure by 1.2% of GDP by 2020, which is only 40% of the EU level, and thus will not allow a stronger approximation to the average European level. More businesses than ever should increase spending. This implies greater involvement of entrepreneurs in R&D and, at the same time, changing the orientation of research to those which results will be usable in practice. Therefore, the state should take further measures that would in particular stimulate the successful entrepreneurs who already have R&D experience to engage more closely in these activities. For example, indirect support for R&D in the business sector can be mentioned, which could be made more attractive by accepting comments from businesses on the current system of support.

Since Slovakia is a small country with limited resources, it should preferably spend money on those areas of research and development that will bring its desired effects even in innovation. This means that the Slovak science and research base should be narrowly specialized in those areas of research and development, in which it achieves internationally comparable results, and should also prioritize the financial resources and should not be wandering over the non-perceptive areas. The problem of Slovak R&D is not only a lack of money, but also a poor management system and lack of performance, as the European Commission pointed out in its 2017 evaluation report. In order to increase R&D performance in the Slovak Republic, it is recommended to take several measures

to improve the management system of research and development, complete the R&D reform, focus on the priorities of smart specialization and support for business investment in R&D [JRC 2018].

Research & development activity is a significant component of innovative actions, therefore the fact that more and more enterprises in Poland conduct or order R&D works should be assessed positively. These actions are reflected in the level of their financing. Comparing the gross domestic expenditure aimed in Poland at R&D works in year 2016 with the expenditure in year 2005, one should note their significant increase. Expenditure incurred as a part of each of the three institutional sectors also increased, with the highest dynamics of changes characterizing the enterprise sector. The increasing financing of research and development activities by the entrepreneurs in Poland confirms that there is a need of investing in research and development which makes it possible to expect that the expenditure on this activity will maintain in the rising trend in the coming years. This assumption is additionally confirmed by the fact that, according to the development strategy chosen by Poland, based on the programme "Europe 2020", the GERD indicator in comparison to GDP is supposed to achieve the level of 1.7%, which means that the expenditure on the R&D sphere should be doubled. This factor is not sufficient to make it possible for Poland to compete on even ground with the global leaders in this area, however, it should allow the Polish economy to achieve a higher level of competitiveness and attractiveness on the international map of innovation.

Conclusion

If the Slovak economy is to be included in the future among the prosperous and competitive economies, it will not be possible without technological and innovative development based on effective research and development. R&D investment, especially those for business, is a prerequisite for innovative development that has a positive impact on both economic growth and competitiveness. The implementation of R&D activities, however, is particularly financially demanding for small and medium-sized enterprises, so the state should focus on their stronger support. The streamlining of the support system for research in Slovakia has tried to be reached for a long time. Although a number of strategic documents was drawn up on this subject, the expected results were not achieved. It means that the current system of support is inefficient and the state should change it as much as possible.

To conclude, the indicator of the intensiveness of R&D works in Poland and in Slovakia is characterized by a similar trend of changes and level, though in year 2016 higher expenditure was incurred in Poland, because the value of the PL/EU indicators amounted to 48% as compared to 50% from year 2015, while in Slovakia the SK/EU indicator amounted to 39% as compared to 58% from year 2015. Both Poland and Slovakia diverge significantly from the average values of EU 28 countries, it can be proven that the expenditure on R&D on average constitutes half of the expenditure of the European countries.

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Financovanie a podpora výskumu a vývoja v SR a Poľsko

Abstraktné. *Investície do výskumu a vývoja, ktoré sú výsledkom technického pokroku, majú významný vplyv na hospodársky rast, ako aj na konkurencieschopnosť krajiny, a preto nadobúda ich význam v rozvinutých ekonomikách. To však nie je prípad na Slovensku a v Poľsku, pretože tieto patria do krajín Európskej únie s nízkou intenzitou výskumu a vývoja a s nedostatočnou štruktúrou relatívne nízkych výdavkov na výskum a vývoj. Príspevok skúma teoretickú definíciu výskumu a vývoja, uskutočňuje hodnotenie vývoja investícií do výskumu a vývoja a ich štruktúr v najrozvinutejších krajinách sveta, EÚ, ako aj na Slovensku a v Poľsku. Cieľom príspevku je poukázať na dôvody nedostatočného financovania a podpory výskumu a vývoja na Slovensku a navrhnúť opatrenia na zlepšenie úrovne výskumu a vývoja na Slovensku a v Poľsku.*

Kľúčové slová: *výskum a vývoj, financovanie, podpora*

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The Efficiency of Investing in Shares of Innovative Companies – the Case of Investment Funds Available in the Polish Market

Abstract. *Given the growing interest of investors around the world in innovative companies, the purpose of the study described in this article is to examine the efficiency of investing in shares of companies with innovative characteristics by examining investment funds available in the Polish market. The efficiency of this investment strategy was measured using a number of assessment criteria used in risk-income analysis (expected rate of return, standard deviation, income per unit of risk) and specific portfolio management quality indicators (maximum drawdown, tracking error, additional rate of return, Jensen's alpha, beta coefficient, information ratio and Sharpe's ratio). The results obtained indicate that investments in innovative companies may be an interesting alternative to traditional forms of investment in the capital market.*

Keywords: *innovative enterprise, efficiency assessment, investment strategy, investment funds*

Introduction

Multiplication of capital in the financial market, in particular the stock market, is a complicated process, which involves a series of activities. One of them is choosing an investment strategy, which means, among other things, indicating specific characteristics of entities that the investor is interested in. It should be noted here that despite many popular investment strategies applicable to the stock market, regarding dividend, growing, or value-based companies [Zaremba 2013; Damodaran 2012], more and more attention has been paid lately to investments in stocks of innovative companies, also from the viewpoint of efficiency

[Hirshleifer et al. 2013; Prorokowski 2014]. Undoubtedly, the growing popularity of this group of companies with stock market analysts and investors is due to the dynamic development of a number of American technology companies, supported by an increasing number of quotations, which has led to the popularization of the acronym for the five most popular and best-performing ones – FAANG: Facebook, Apple, Amazon, Netflix, Alphabet's Google (rates of return on their shares over the last ten years are respectively: 404%, 779%, 2055%, 7990%, 301%, with the return of 220% according to NASDAQ-100 Technology Sector Index, and of 105%, according to S&P500 index). In the Polish capital market opportunities for investing in innovative companies are much more limited, although with each year there are more and more entities that may attract investors' interest. The systematic growth of this sector is supported by activities of venture capital and private equity funds and the launch of the New Connect market by the WSE in 2007, which is dedicated to start-up entities, especially innovative ones [Gorczyńska 2011]. As a result, there is a growing interest in shares of innovative companies, including the creation of dedicated investment funds. It is worth noting that according to one of investment fund societies operating in the Polish market, investments in shares of innovative companies are justified by a 60% bonus compared to entities that are not investing in innovation [Trigon TFI… 2015].

Therefore, in order to verify the attractiveness of investments in this type of entities, the main goal of the study was to analyse the efficiency of innovative companies and new technologies funds that are available in the Polish market. The study was conducted using standard measures of risk-income analysis and specific measures for assessing portfolio management area or investment funds.

1. The specificity of innovative enterprises and their identification

The term "innovative company" is intuitively associated with an enterprise that conducts activities involving the development and implementation of innovations – so-called innovative activities [Guidelines for Collecting… 2005: 18] – or is characterized by a certain above-average level of innovativeness. However, taking into account the ambiguity of the terms "innovation" or "innovativeness", it is difficult to determine the definition or attributes of "innovative company".

Since the introduction of the concept of innovation to economic theory by Schumpeter [Schumpeter 1960], its importance has evolved to adapt to the changes that took place in the global market economy, but a coherent theory

in this area has not been developed yet. Currently, this term is on the one hand related only to significantly changed or new solutions [Guidelines for Collecting… 2005: 17], and, on the other hand, is identified with all changes recognized as a novelty in relation to the previous state [Kotler 1994: 322; Brdulak, Gołębiowski (eds.) 2003: 16]. In the subject approach, innovations are also regarded as a result (here there is an additional distinction between product, process, marketing and organizational innovations), or, in functional terms, as a process [Pomykalski 2001: 13].

Like innovation, the notion of innovativeness is presented in the literature in various contexts, and in this case it is also difficult to speak of one, universally binding definition. Most often it is understood as a specific ability of an organization to constantly seek, implement and disseminate innovations [Pomykalski 2001: 15]. It should be noted that many of the definitions of innovativeness are not limited to the mere display of an ability or skills but also emphasize results achieved by putting them to use. In this approach, an organization's innovativeness is treated as the mastery and maintenance of high dynamics of value creation, which manifests itself in using opportunities for change and generating, processing and putting new ideas into practice [Jin et al. 2004], before other organizations do [Rogers 1995: 252]. It is also emphasized that innovativeness should not be an end in itself but should allow an enterprise to effectively allocate resources, leading to the creation of an optimal configuration of competitive advantages [Morgan, Berthon 2008]. In this understanding of innovativeness, the most important aspect is the link between the ability to implement innovations and final effects of this implementation [Prajogo 2006]. In relation to the above, on the one hand, one can speak about potential innovativeness, broadly understood as a potential for creating innovation and continuous involvement in its development, and on the other – resultative innovativeness, associated with specific effects of innovative activity and their impact on the financial results of enterprises [Nawrocki 2012].

In this context, it is also not surprising that the meaning of the term "innovative company" can be perceived differently. In the most narrow (minimalist) understanding, innovative entities are those that conduct research and development (regardless of whether it is successful or not), or those that implement at least one innovation in a given period [Guidelines for Collecting… 2005: 47], usually 3 years. In the broader sense, an innovative entity is not only involved in research and development activities or implementing innovative solutions [Jasiński 1992: 25], but can also anticipate and adequately react to changes in the environment [Francik 2003: 68] and stands out in terms of resources, including non-material resources, and efficiency of their allocation [Bielski 2000: 166-168], as well as the level of modernity and competitiveness [Sosnowska et al. 2000: 13].

Apart from the definitional differences regarding the term "innovative enterprise", it should be noted that even if some criteria for evaluating its innovativeness are adopted, including, for example, the intensity of R&D expenditures or the number of implemented new solutions or patent applications [Nawrocki 2015], it is difficult to determine the level of minimal valuation based on which a given entity can be considered to be innovative.

In addition, it should be noted that in business practice, various enterprises, depending on their resources, competences, vision of the future, market environment or stage in the life cycle, may also adopt different financing methods [Pomykalski 2014] and implementation of innovative activity [Janasz 2011] – the so-called innovation strategy (e.g. offensive, market creation, defensive, license purchase) – and also have a different purpose in this area (e.g. escape from competition, catching up with competitors). There are companies in the initial phase of development, whose activities focus mainly on research and development; then there are entities that are already a bit further in their life cycle and are undergoing a dynamic growth thanks to the marketization of an innovative solution and its further development; finally, there is a third group, consisting of mature companies, which have perfected their business model and conduct research and development activities mainly to maintain their position on the market.

Thus, instead of a sharp division into non-innovative and innovative entities, it would be better to talk about non-innovative entities and more or less innovative ones in a specific reference framework. The adoption of overly restrictive innovation assessment criteria may lead to a significant narrowing of the population of innovative companies, while relaxing them too much may result in a significant increase, with the level of diversity above a sensible range. If we additionally take into account the sectoral affiliation of individual enterprises and their information policy in the field of innovative activity, the task of identifying innovative entities can hardly be achieved without a certain dose of subjectivism.

2. Research methodology

The efficiency of investing in shares of innovative companies was analysed by focusing on investment funds available in the Polish market and using two groups of measures [Jajuga, Jajuga 2001; Reilly, Brown 2001; Oceny jakości… 2008]:

– standard measures applied in risk-income analysis (arithmetic rate of return, geometric rate of return, total rate of return, standard deviation, typical range of volatility and income per unit of risk, i.e. the inverse of the coefficient of variation),

– specific measures for the quality assessment of portfolio management or investment funds (maximum drawdown, tracking error, simple alpha, Jensen's alpha, beta factor, information ratio and Sharpe's ratio).

Arithmetic rate of return ($\overline{R_A}$) is one of the simplest measures of investment income, which is calculated on the basis of historical return rates, which are assigned the same weights. Its main advantage is the inclusion of all indirect prices/quotations on the basis of which the rates of return are calculated, and its disadvantage is the exclusion of the effect of price changes/quotations resulting from previously achieved rates of return (which is characteristic of compound interest). Taking into account historical data, it can be calculated using the following formula:

$$\overline{R_A} = \frac{1}{n}\sum_{t=1}^{n} R_t \tag{1}$$

where:

n – number of data periods,

R_t – rate of return in t-th period.

Geometric rate of return ($\overline{R_G}$), on the one hand, eliminates the above-mentioned disadvantage of the arithmetic average, but does not account for intermediate quotes, focusing only on the initial and final ones. It can therefore be said that what is a disadvantage of the arithmetic average is the advantage of the geometric average and vice versa. This measure is especially useful when analyzing investment results over a longer time horizon, being a more objective measure of income than the arithmetic average. Taking into account historical data, it can be determined using the following formula:

$$\overline{R_G} = \left(\frac{K_n}{K_0}\right)^{1/n} - 1 \tag{2}$$

where:

K_n – final price/quotation,

K_0 – initial price/quotation.

Total rate of return (R_C) is a measure of the overall profitability of investment in a given period and can be expressed by the following formula (symbols as previously):

$$R_C = \frac{K_n}{K_0} - 1 \tag{3}$$

Standard deviation (s), expressed as a percentage, indicates the average deviation of possible rates of return from the average rate of return. The smaller

(closer to zero) it is, the less risky a given action is considered to be. It is calculated from the variance of the rate of return, which is given by the formula (symbols as previously):

$$s = \sqrt{V} = \sqrt{\frac{\sum_{t=1}^{n}(R_t - \overline{R_A})^2}{n-1}} \tag{4}$$

Income per unit of risk, or the inverse of the coefficient of variation, is a measure of investment profitability in relation to its risk, which can be expressed as (symbols as previously):

$$\frac{1}{cv} = \frac{\overline{R_A}}{s} \tag{5}$$

Typical range of volatility complements the previous measure (income per unit of risk), which, being relative, may sometimes lead to inappropriate conclusions. This range is obtained by subtracting from and adding to the expected rate of return on investment its standard deviation (symbols as previously):

$$(\overline{R_A} - s, \overline{R_A} + s) \tag{6}$$

Maximum drawdown (*DD*) represents the maximum negative rate of return realized in a given period. Of course, the smaller it is, the better the quality of capital management. In the context of investment funds, this measure is particularly important with respect to funds of absolute return or capital protection, where it is much more difficult to make up larger losses than in the case of typical equity funds.

Tracking error (*TR*) is used to assess the effects of capital management in comparison with a benchmark (symbols as previously):

$$TR = \sqrt{\frac{\sum_{t=1}^{n}(R_t - R_{bt})^2}{n-1}} \tag{7}$$

where:

R_{bt} – rate of return on the benchmark in *t*-th period.

The lower the value of the *TR* indicator, the closer actual investment results achieved by a given manager are to the benchmark results. Conversely, higher *TR* values indicate that the manager applies a more active strategy and the investment portfolio performs differently from the benchmark. Generally, it is not a problem if the implementation of this active strategy produces better results than the benchmark. It becomes a problem when the opposite is true.

„Simple" alfa (α) or an additional rate of return is the surplus of the return on the portfolio or investment fund in a given period over the benchmark:

$$\alpha = R - R_b \tag{8}$$

Of course, the higher the alpha value, the better the assessment of capital management.

In the portfolio theory, the alpha ratio is more often identified with the so--called Jensen's alpha, which is the absolute difference between the rate of return on a given portfolio and the rate of return from a balanced market portfolio (the portfolio of a security market line 2 SML) with identical systematic risk:

$$\alpha_{Jensena} = R - \left[R_f + \beta \times \left(R_m - R_f\right)\right] \tag{9}$$

where:

R – average rate of return on the portfolio/fund,
R_f – average risk-free rate (e.g. 10-year treasury bonds yields),
R_m – long-term average rate of return from the stock market index,
β – the beta factor of the portfolio/fund to the stock market index.

Beta factor (β) is one of the most popular risk measures in the capital market and represents the approximate change in the rate of return on investment if the benchmark return rate (e.g. market index) increases by 1%. It can be expressed by a model:

$$\beta = \frac{cov\left(R_p, R_m\right)}{var(R_m)} = \frac{\frac{\sum_{t=1}^{n}(R_t - \overline{R_A}) \times (R_{mt} - \overline{R_{mA}})}{n-1}}{\frac{\sum_{t=1}^{n}(R_{mt} - \overline{R_{mA}})^2}{n-1}} \tag{10}$$

where:

R_{mt} – rate of return from the stock market index in the t-th period,
R_{mA} – the average arithmetic rate of return on the stock market index.

Beta factor values exceeding 1 indicate the aggressiveness of a given investment; when they fall within in the interval from 0 to 1 – a more or less defensive investment strategy; 0 represents an investment without risk, and values below zero – an investment underperforming in relation to the benchmark (rare case). It should be emphasized, however, that the beta factor is as popular as it is difficult to use in practice due to its susceptibility to distortion given a simple use of historical data [Tarczyński 2009].

Information ratio (*IR*) is the relation of the surplus mid-term rate of return to the risk of a specific strategy, not related to the benchmark (symbols as previously):

$$IR = \frac{\bar{\alpha}}{TR} = \frac{\frac{\sum_{t=1}^{n}(R_t - R_b)}{n}}{TR} \tag{11}$$

In practice, an *IR* of 0.5 is usually considered to be a good result. Values above 0.75 are treated as very good, and higher – as extraordinary ones.

An alternative to the information ratio is Sharpe's ratio (*Sh*), where the reference point for comparisons is not the mean result in the group or the benchmark, but the risk-free rate (symbols as previously):

$$Sh = \frac{R - R_f}{s} \tag{12}$$

An interpretation of the Sharpe's ratio is similar to the information ratio – in general, the higher the value, the better efficiency assessment of portfolio/fund management.

Table 1. Characteristics of the target investment funds of innovative companies and modern technologies

	Aviva Investors Modern Technologies	Investor New Technologies	PKO Technology and Innovation Global
Segment	Polish stocks	Foreign stocks	Foreign stocks
Geographical scope	Poland	Global	Global
Benchmark	40% WIG + 25% WIG Media + + 25% WIG IT + + 10% Citigroup PLN 1 Month Eurodeposit Local Currency	90% WIG + + 10% WIBID 6M	90% MSCI World (USD) + + 10% WIBID O/N
Investment policy	The Sub-fund invests 60% to 100% of its assets in Polish equities and other financial instruments with a similar level of investment risk. The sub-fund seeks to ensure that at least half of the value of its share portfolio comes from shares of modern technology companies, including the following industries: IT, telecommunications, media, biotechnology. 40% of assets are invested in safe instruments, such as bonds and treasury bills.	From 70% to 100% of assets are invested in shares of issuers from the IT services sector and new technologies. The remaining assets are invested in debt securities, money market instruments and bank deposits.	The Fund's basic investments (no less than 60% of assets) are equity instruments of companies generating income as a result of development, support and use of modern technologies and innovations, or owning unique intellectual property as well as fund shares whose policy involves investing capital in such companies.
Launch date	8th of April 2008	28th of January 2008	8th of April 2010
Currency	PLN	PLN	PLN

Source: based on www.analizy.pl/fundusze.

Based on the largest open-access database of investment funds in the Polish market, which is available on the website of Analizy Online (www.analizy.pl), six funds were identified which offer shares of innovative companies and new/modern technologies, of which only three have a longer (several years) record history enabling a credible/objective assessment of the efficiency of the implemented investment strategy. Their characteristics are summarized in Table 1.

Taking into account the dates of launching the target investment funds, the reference period for the analysis of their efficiency ranges from April 2010 to June 2018, with calculations performed monthly (thus the maximum time series of return rates is 98 observations).

To gain a better insight into the efficiency of the target funds, they were analyzed using the "rolling year" approach, where results are calculated monthly based on data from the last twelve months – and for the following time frames: 1 year, 3 years, 5 years, the entire reference period (from April 2010 to June 2018).

Despite its limitations (especially with respect to the funds with the global scope), WIG, the WSE's main index was used as a unified benchmark for the target investment funds. The 10-year Polish treasury bonds yield was treated as a risk-free rate (in both cases, monthly intervals were adopted).

3. Efficiency analysis of innovative companies and modern technologies investment funds

First of all, Figures 1-12 present the results of calculations concerning individual evaluation criteria for the funds, which were obtained using the "rolling year" approach. Regarding the criteria in the group of standard measures used for risk-income analysis, the results also include the "benchmark" WIG index – the main Polish stock market index.

Taking into account the results presented in Figures 1-12, it can be seen that, overall, it is PKO Technology and Innovation Global Fund that tended to outperform the other funds in terms of individual efficiency criteria. This fund most definitely stood out by relatively high rates of return, a lower risk level and higher values of portfolio management quality indicators. Of the other two funds, it is the Investor Fund of New Technologies that should be rated higher, despite weaker performance in the initial period of analysis, which more recently has been even more efficient than the previously mentioned PKO fund. The Aviva Investors of Modern Technologies Fund only matches its competitors in terms of specific criteria for certain periods of time.

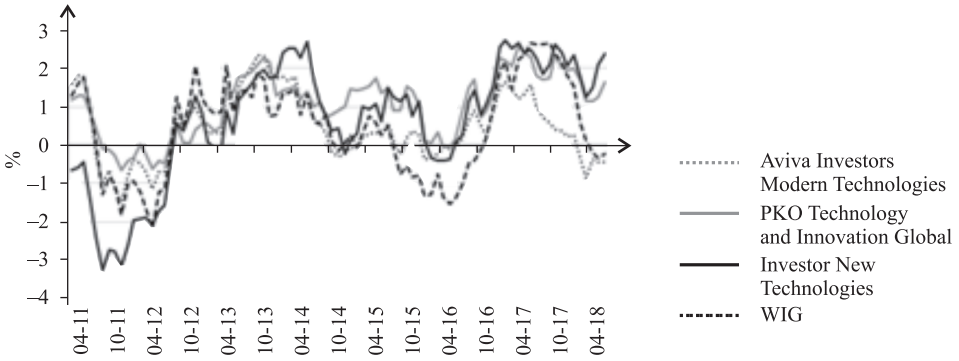

Figure 1. The average monthly arithmetic rate of return (“rolling year”)

Source: based on data the stooq.com website.

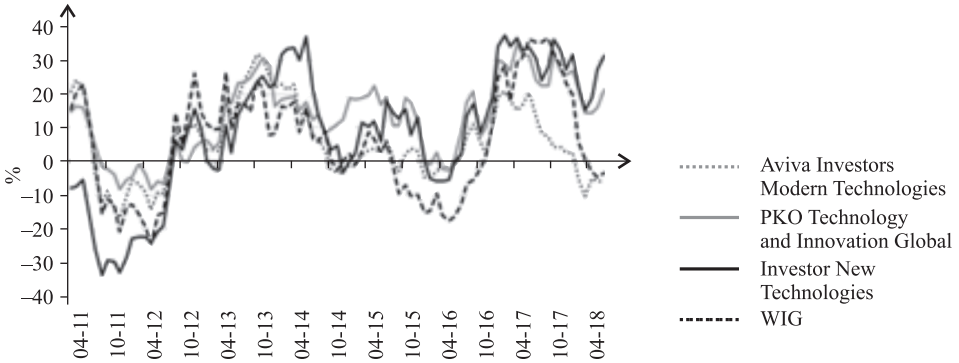

Figure 2. Total annual rate of return (“rolling year”)

Source: based on data from the stooq.com website.

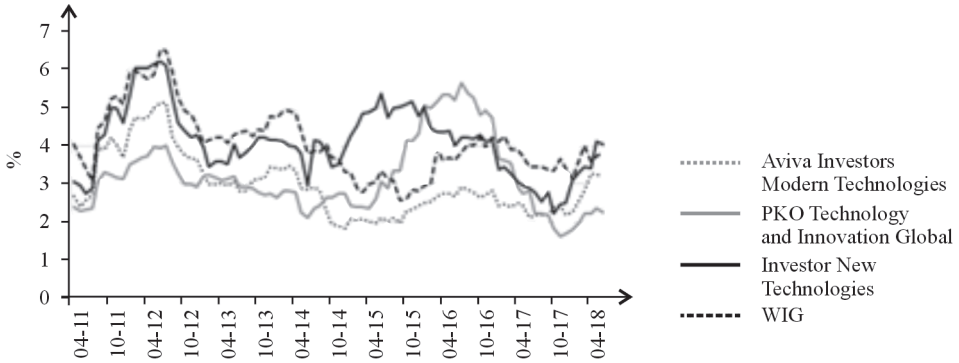

Figure 3. Standard deviation of the average monthly rate of return (“rolling year”)

Source: based on data from the stooq.com website.

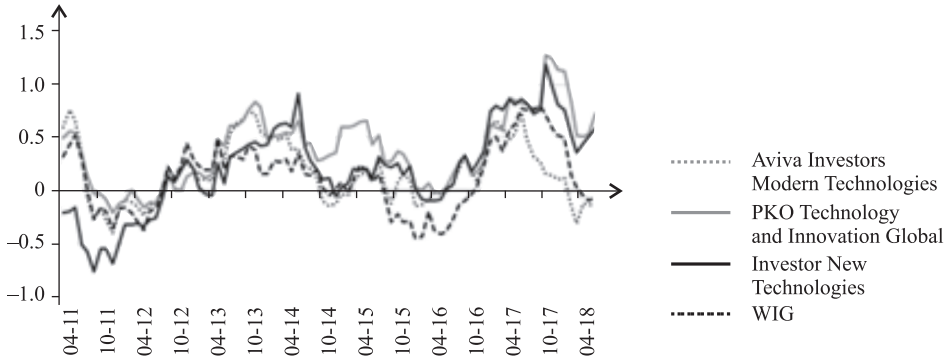

Figure 4. Income per unit of risk ("rolling year")

Source: based on data from the stooq.com website.

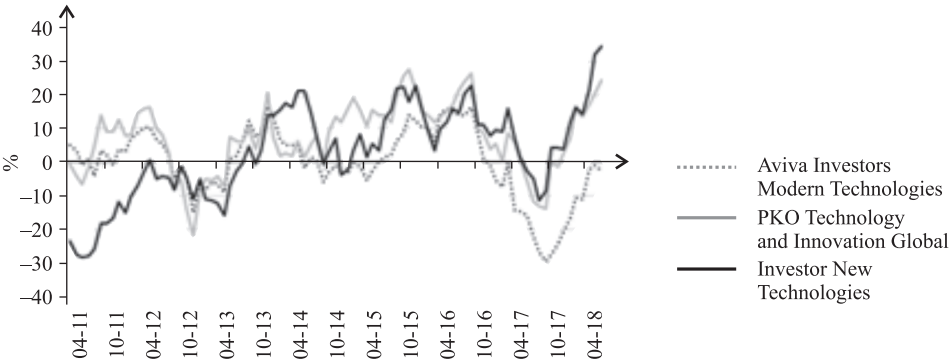

Figure 5. Annual "simple" alpha/additional rate of return ("rolling year")

Source: based on data from the stooq.com website.

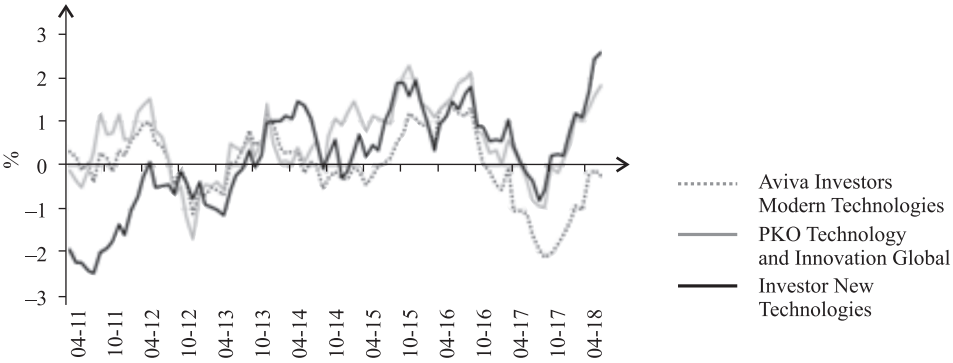

Figure 6. Average monthly "simple" alpha/additional rate of return ("rolling year")

Source: based on data from the stooq.com website.

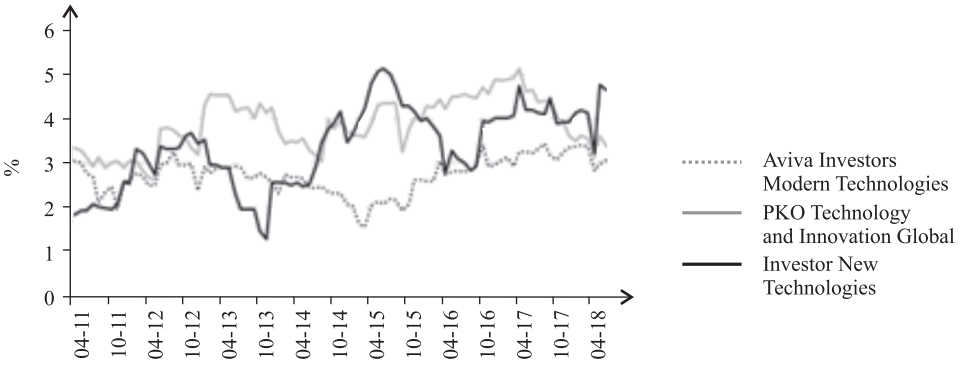

Figure 7. Average monthly tracking error ("rolling year")

Source: based on data from the stooq.com website.

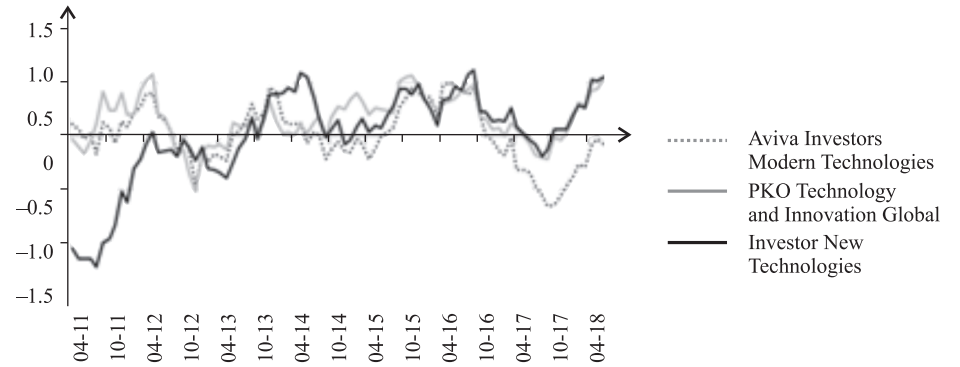

Figure 8. Information ratio ("rolling year")

Source: based on data from the stooq.com website.

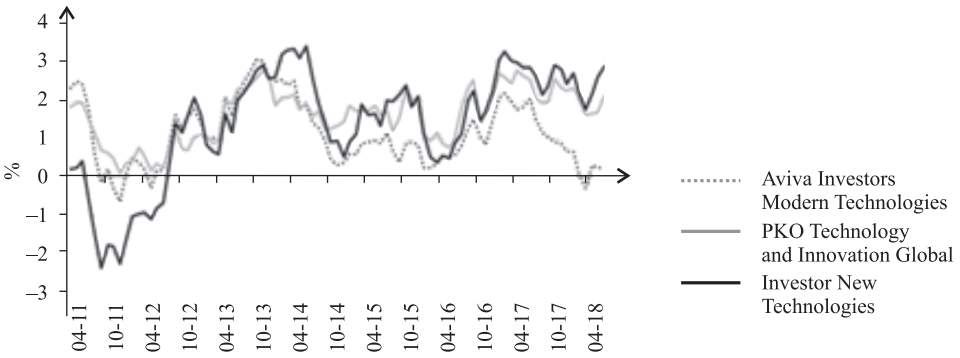

Figure 9. Jensen's Alfa ("rolling year")

Source: based on data from the stooq.com website.

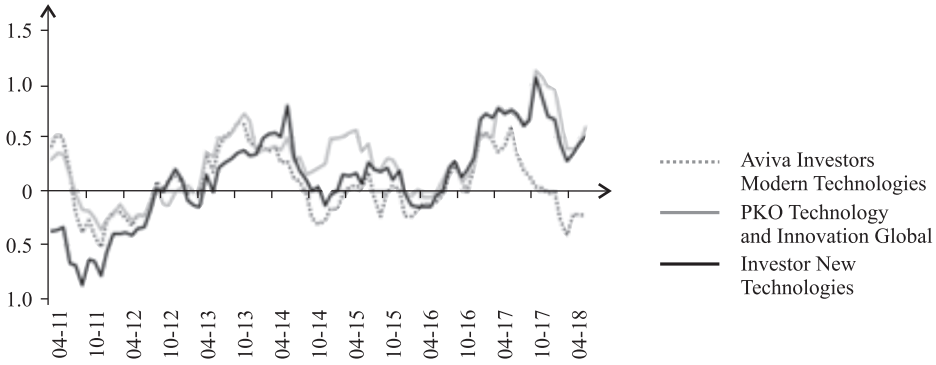

Figure 10. Sharpe's ratio ("rolling year")

Source: based on data from the stooq.com website.

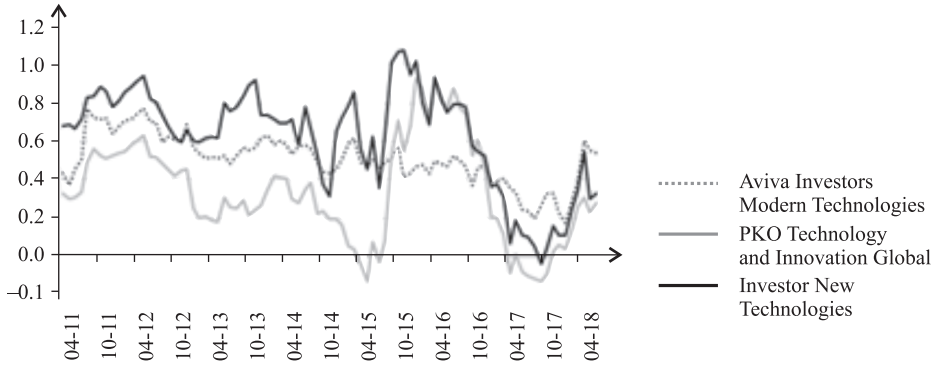

Figure 11. Beta factor ("rolling year")

Source: based on data from the stooq.com website.

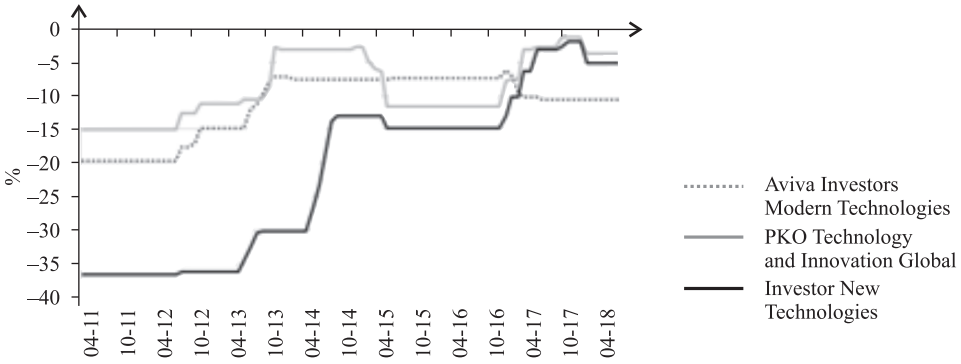

Figure 12. Maximum drawdown

Source: based on data from the stooq.com website.

Table 2. Values of the efficiency assessment criteria for the target investment funds and the WIG benchmark index for different time frames – 1 year, 3 years, 5 years, max (from April 2010 to June 2018)

Specification	Aviva Investors Modern Technologies				PKO Technology and Innovation Global				Investor New Technologies				WIG			
	1 year	3 years	5 years	max	1 year	3 years	5 years	max	1 year	3 years	5 years	max	1 year	3 years	5 years	max
[%]	–0.43	0.37	0.50	0.51	1.64	1.38	1.38	**1.08**	**2.37**	**1.64**	**1.65**	0.69	–0.21	0.36	0.53	0.41
[%]	–0.48	0.33	0.47	0.46	1.62	1.31	1.32	**1.03**	**2.30**	**1.58**	**1.58**	0.59	–0.28	0.28	0.46	0.32
R_c [%]	–5.60	12.57	32.26	56.90	21.20	60.02	120.24	**172.26**	**31.35**	**75.61**	**155.55**	78.63	–3.28	10.66	31.88	36.31
s [%]	3.25	**2.79**	**2.67**	**3.11**	**2.26**	3.68	3.26	3.25	4.07	3.77	4.00	4.36	3.84	3.94	3.76	4.24
/s	–0.13	0.13	0.19	0.16	**0.72**	0.37	**0.42**	**0.33**	0.58	**0.44**	0.41	0.16	–0.05	0.09	0.14	0.10
+*s* [%]	2.82	3.16	3.17	3.61	3.90	5.06	4.64	4.33	**6.45**	**5.42**	**5.65**	**5.05**	3.63	4.29	4.29	4.65
-*s* [%]	–3.68	–2.43	–2.17	–2.60	**–0.63**	–2.30	**–1.88**	**–2.17**	–1.70	**–2.13**	–2.34	–3.67	–4.05	–3.58	–3.23	–3.84
Beta	0.54	0.43	0.48	0.55	**0.28**	**0.36**	**0.30**	**0.38**	0.33	0.42	0.49	0.65				
DD [%]	–10.6	**–10.6**	**–10.6**	–19.6	**–3.7**	–11.5	–11.5	**–15.0**	–5.1	–11.6	–14.8	–36.5				
TR [%]	1.04	1.89	2.18	**2.80**	1.31	2.61	3.21	3.91	1.81	2.58	3.26	3.69				
alfa [%]	–0.22	0.01	–0.03	0.10	1.85	1.02	0.85	**0.67**	**2.58**	**1.29**	**1.12**	0.28				
alfa J. [%]	–0.42	0.67	0.90	0.88	1.77	1.68	1.73	**1.44**	**2.49**	**1.95**	**2.05**	1.07				
IR	–0.21	0.01	–0.01	0.04	1.41	0.39	0.26	**0.17**	**1.42**	**0.50**	**0.34**	0.08				
Sh	–0.22	0.04	0.09	0.06	**0.60**	0.30	0.34	**0.23**	0.52	**0.37**	**0.35**	0.08				

Source: based on data from the stooq.com website.

At the same time, while the target funds have a fairly distinct advantage in relation to the benchmark WIG index in terms of generated rates of return (Figure 1-2), including an additional rate of return/"simple" alpha (Figure 5-6), they score surprisingly low on Beta Factor (Figure 11), Information Ratio (Figure 8) and exceptionally high in terms of Tracking Error (Figure 7). This situation can be explained by the construction of individual risk indicators and management quality indicators derived from them, which treat risk as a deviation from the expected value or benchmark, regardless of whether the deviation is positive or negative from the view point of the given indicator interpretation. In the case of the funds in question, the situation with a positive deviation was relatively frequent.

The above conclusions are also confirmed by the results obtained for specific time frames, which are summarized in Table 2 (the most favorable results for each indicator are highlighted in bold).

In terms of generated rates of return and management quality indicators over shorter time frames (1, 3, 5 years), the Investor New Technologies Fund should be ranked as the most efficient, followed by the PKO Technology and Global Innovation Fund. Taking into account the entire reference period, the PKO fund is the clear leader.

At the same time, the relatively weaker results of the Aviva Investors Modern Technologies Fund should be attributed to its scope of investment. This fund is limited to Polish companies, while the competitors invest in innovative companies across the world, which gives them far greater opportunities when it comes to structuring their portfolios and diversifying market risk.

Conclusions

The results obtained in the course of analysis indicate that investments in innovative companies may constitute an interesting alternative to universal stock market funds, whose task is not to beat the benchmark index but to reflect its results. Considering the temporal scope considered in the analysis, it should be stated that in general all three funds of innovative companies and new/modern technologies have, to a greater or lesser extent, beaten the WIG index (with the exception of the Aviva Investors Modern Technologies fund over the last year).

At the same time, however, one also needs to be aware of some limitations of the conducted analysis and consider its possible modifications for further research.

First of all, it should be noted that the reference period for the analysis generally coincides with a period of good stock market conditions globally, in

particular in developed economies, which often stand out in terms of innovativeness. Hence, what remains unknown is how the target funds would perform in a period of less favorable economic conditions of a bear market. For now, one can only make certain assumptions by comparing the rates of return of the Aviva fund with the WIG index for the last year, which in the case of the domestic stock market was not successful.

Secondly, as already noted in the commentary on the results, the applied criteria for assessing the efficiency of funds are based on the general understanding of risk as a deviation from the expected value or benchmark, which means a negative assessment of efficiency even in the case of beating the benchmark. For this reason, one should consider using risk measures which are only sensitive to negative deviations from the expected value or benchmark (e.g. semi-deviation instead of standard deviation).

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Efektywność inwestycji w akcje spółek innowacyjnych na przykładzie dostępnych na polskim rynku funduszy inwestycyjnych

Streszczenie. *Biorąc pod uwagę rosnące w skali światowej zainteresowanie środowiska inwestycyjnego podmiotami innowacyjnymi, jako cel opracowania przyjęto zbadanie efektywności strategii inwestycji w akcje spółek o charakterystyce innowacyjnej na przykładzie dostępnych na polskim rynku funduszy inwestycyjnych. Weryfikację efektywności rozpatrywanej strategii inwestycyjnej przeprowadzono na podstawie wielu kryteriów oceny stosowanych w analizie w układzie ryzyko – dochód (oczekiwana stopa zwrotu, odchylenie standardowe, dochód na jednostkę ryzyka) oraz specyficznych wskaźnikach jakości zarządzania portfelem (maksymalne obsunięcie kapitału, tracking error, dodatkowa stopa zwrotu, alfa Jensena, współczynnik beta, information ratio oraz wskaźnik Sharpe'a). Otrzymane wyniki wskazują, że inwestycje w spółki innowacyjne mogą stanowić interesującą alternatywę dla uniwersalnych funduszy rynku akcji.*

Słowa kluczowe: *przedsiębiorstwo innowacyjne, ocena efektywności, strategia inwestycyjna, fundusze inwestycyjne*

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Determinants of Changes in Stock Market Prices Based on Companies in the WIG-INFO Index

Abstract. *As a result of the development of information technology, IT companies have a growing impact on the development of the economy. This development requires the involvement of intellectual and financial capital. Hence, it can be expected that the ICT sector should attract increased interest from stock market investors in the coming years. This study analyses the relationship between stock market prices of shares of IT companies listed on the Warsaw Stock Exchange and their financial condition. Correlation ratios were used to evaluate these relationships. The study showed a limited (moderate) correlation between market prices of shares and the financial condition of the analysed companies. It can be assumed that most decisions of stock market investors are speculative. As a result, it can be claimed that the market prices of public companies are more influenced by technical and behavioural analysis than their current financial standing.*

Keywords: *IT companies, stock prices, market value, financial standing of companies*

Introduction

Maximizing the market value, despite being the subject of constant criticism [Ajbo 2014: 44-53; Fligstein, Shin 2007: 399-401; Jones, Felps 2013: 213-226; Magill, Quinzii, Rochet 2013: 14-25], continues to be treated as the primary objective of the company's operation [Dębski 2005: 14; Jensen 2000: 2; Michalski 2005: 23; Pluta 2004: 314]. This applies in particular to companies whose securities are traded publicly. These companies pursue this goal through product, geographic and technological expansion, etc. Indispensable funds are

obtained, to a large extent, through the issue of shares and bonds. The cost of capital obtained in this way depends on the company's financial condition and its development prospects. Investors are more inclined to acquire ownership and debt instruments when their issuers have a reliable history of functioning in the capital market and prospects for the growth of share prices.

In view of the above, the analysis of changes in stock prices and the identification of factors affecting these changes is an interesting research problem [Granger 1992: 3]. The purpose of the article is to identify determinants of changes in market prices of shares of companies included in the WIG-INFO index. The analysis focuses on the rates of return of shares of the surveyed companies as well as indicators of the capital market and the financial condition of the analyzed entities. The following research hypothesis was formulated: market prices of shares are only partly determined by the financial situation of the companies.

In order to achieve the goal and verify the hypothesis, the authors conducted literature review and analysed Warsaw Stock Exchange data and financial data available on the biznesradar.pl portal using tools of financial analysis and statistical techniques.

1. Growth factors of the company's market value

Market prices of shares are shaped by many external factors associated with the current market, internal conditions related to the macroeconomic situation [Plachy, Rasovec 2015: 101] and the company's financial condition, often identified with its ability to generate profits [Islam et al. 2014: 97]. Despite the fact that profit is one of the most important categories presented in financial statements of enterprises [Gajdka 2012: 15], there are situations when, despite generating a positive financial result, the company loses financial liquidity. Profit is necessary for long-term multiplication of value, but not every level contributes to its growth [Black, Wright, Bachman 2000: 51; Steward 1999: 24; Cornell 1999: 68; and others].

The economic and financial situation are just two of the many factors shaping the stock prices of listed companies [Boyadjian, Warren 1987: 309]. The stock exchange is often referred to as the economy barometer. Thus, if the trends prevailing in the stock market are indeed caused by the economic situation of a given country, companies operating in this market are affected by changes in this situation. Then, the macroeconomic situation is reflected by stock exchange quotations, but also by the rationality of valuation of public companies [Czekaj 2014: 33]. The company's value in the long run depends not only on the current situation in the capital market. To a large extent, it is shaped by decisions made within the organization. The skills of the management staff and the level

of economic risk associated with the conducted activity also play a crucial role [Arnold 2010: 280]. When analyzing the market capitalization factors of public companies, one cannot ignore behavioural elements. They affect the market price of shares in both the short and medium periods of time. Although this assumption is in contradiction to the hypothesis of effective markets [Timmermann, Granger 2004: 20-21], it is about their significance, among others, the difference between market and book share prices. „The value of an enterprise based on the concept of the value of its capital is not the same as the simple sum of the value of individual components of its assets (possibly reduced by the value of liabilities contracted)" [Borowiecki, Jaki, Kaczmarek 1998: 27]. The high volatility that characterizes the market value may result not only from pure economic calculation but may also be the result of certain preferences, fashion, whims, economic fluctuations or political changes. All this means that forecasting changes in market price levels of shares and providing rational explanations of what causes their volatility is extremely complicated, if not impossible [Akerlof, Shiller 2010: 174-176].

Decisions of investors who purchase shares of a company at a market price that clearly exceeds its book value can be explained by the perception of certain fundamental phenomena that go beyond the traditional accounting framework. This can be, for example, a recognizable brand, an extensive distribution network, trade contacts, intellectual potential of employees, i.e. factors that are not included in financial reporting. On the other hand, such decisions may be motivated by an irrational assumption about the company's ability to generate above-average financial results or to continue the upward trend in the equity market for an exceptionally long period of time.

Critics of using the market value to measure the company's value suggest that the capital market is governed by its own laws, and therefore the market prices of shares do not reflect their real value. However, despite these shortcomings, often resulting from imperfections of the market mechanisms, the hypothesis of an effective market assumes [Czekaj 2014: 9-10] "that the multiplication of the company's value is reflected in the increase in the market price of its shares over a longer period" [Strużycki (ed.) 2004: 293]. However, over shorter time intervals, this process can be disturbed.

2. Analysis of the determinants of changes in the price of market shares of companies from the WIG-INFO index

For a more detailed explanation of the reasons for the volatility of share market prices the authors analysed the correlation between return rates on shares

and selected indicators of the financial and economic situation of 26 public companies included in the WIG-INFO index. The correlation was studied for one-year, two-year and three-year periods using the Pearson's linear correlation coefficient [Sobczyk 2007: 238; Sandoval, Mullokandov, Kennett 2015: 230]. The time horizon included the years 2014-2015-2016. The use of Pearson's coefficient resulted from a preliminary analysis of diagrams and correlation tables. Owing to the multitude of financial factors that may affect market prices of shares of public companies, the analysis includes a wide range of indicators (market, property and capital structure, static and dynamic liquidity, profitability of sales and equity, asset productivity).

A moderate, positive level of correlation for all time intervals was observed for such indicators as profit margin on sales, return on equity and the ratio of financing fixed assets with equity (index of the golden balance rule). In addition, over one-year and two-year periods return rates on shares were found to be moderately and positively correlated with the net profit margin ratio and the fixed capital financing ratio (the golden financial rule). A moderate impact of productivity on return rates of shares was observed only for the two-year time horizon. There was a moderate, negative correlation for all time horizons between with the level of corporate debt (Table 1).

Based on the results, it can be concluded that the financial situation of companies has a rather limited impact on the market price of their shares. Out of the 17 analyzed indicators, only four were found to be moderately correlated with the rate of return of the companies' shares. In the case of 3 other indicators, moderate correlations were observed for one or two analyzed time intervals.

No significant relationship was found between the price of shares and ratios, such as financial liquidity or asset productivity, which are important for the financial situation of companies. Interestingly enough, the failure of most enterprises is caused by their inability to repay their debt on time. Debt itself turned out to be a factor with a moderate impact on the stock market price. An increase in debt, however, does not necessarily mean an increase in the risk of losing financial liquidity. Highly indebted companies can remain financially liquid, while those whose debts are relatively small can have repayment problems. It largely depends on the profitability of sales and the effectiveness of managing current assets (particularly on the collection of receivables).

The results of the analysis confirm the hypothesis formulated at the outset about the limited impact of the financial and economic situation of companies on the market price of their shares, which seems intriguing when one considers the assumptions underlying the fundamental analysis [Al-Shubiri 2010: 137-139]. Despite the growing number of educational projects on the functioning of financial markets and the dissemination of knowledge about investment risk factors, a large

Table 1. Values of Pearson's linear correlation coefficients for companies from the WIG-INFO index

Coefficient	Formula	Rate of return of companies shares		
		1-year-old	2-year-old	3-year-old
Price/Book value (P/BV)	Share price/book value per share	0.23	0.32	0.37
Price/Sales (P/S)	Share price/earnings per share	0.28	0.25	0.34
Price/Net profit (P/E)	Share price/net profit per share	0.31	0.07	0.14
Price/Operational profit (P/EBIT)	Share price/operating profit per share	–0.25	0.11	–0.04
Profit margin on sales (MZS)	Profit on sales/Revenues	0.47	0.42	0.45
Net profit margin (MZN)	Net profit/Revenues	0.43	0.53	0.36
Return on equity capital (ROE)	Net profit/Equity capital	0.40	0.58	0.42
Return on assets (ROA)	Net profit/Assets	0.30	0.47	0.39
Total debt ratio (WZO)	Foreign capital /Assets	–0.43	–0.40	–0.40
Index of the golden balance rule (WZRB)	Equity capital/Fixed assets	0.40	0.57	0.40
Indicator of the golden financial rule (WZRF)	Constant capital/Fixed assets	0.39	0.52	0.35
Current liquidity ratio (WBP)	Current assets / Foreign capital short-term	0.35	0.33	0.31
Fast liquidity ratio (WSP)	(Short-term investments + + Short-term receivables) / Foreign capital short-term	0.32	0.32	0.33
Cash liquidity ratio (WGP)	Cash / Foreign capital short-term	0.33	0.19	0.26
Total assets productivity (PAog)	Revenues/Assets	0.09	0.29	0.28
Productivity of fixed assets (PAT)	Revenues / Fixed assets	0.21	0.44	0.31
Productivity of current assets (PAO)	Revenues / Current assets	–0.01	0.07	0.21

Statistically significant correlation relationships at the significance level of 0.05 are shaded grey.

The formulas of financial ratios were taken from: Gabrusewicz 2014: 150-350; Janik, Paździor, Paździor 2014: 46-72.

Source: produced using tools from the site: www.biznesradar.pl/sektory-gpw.

number of stock investors still place more trust in technical analysis, or analysis of market behaviour using charts [Murphy 1999: 1] than in the evaluation of the current and forecast financial situation of companies. This situation cannot be changed even by cyclically emerging stock market situations (e.g. speculative

bubbles) [Brunnermeier, Oehmke 2014: 24-27; O'Brien, Tian 2006: 3-5], as a result of which, due to excessive exposure to risk, stock capital is transposed towards investors with greater knowledge and richer experience.

Summary

Based on the results of the analysis, it can be concluded that the analysed rates of return are only partly dependent on (moderately correlated with) some financial ratios, such as profitability of sales, assets and equity as well as the level of indebtedness. Financial liquidity and asset productivity ratios were found to be weakly correlated. This can explain the lack of interest in asset productivity on the part of investors. High productivity does not have to go hand in hand with high profitability. On the other hand, the low correlation between financial liquidity and the stock exchange price of shares may indicate that investors attach more importance to companies' development prospects than to their current financial situation. The study confirmed the research hypothesis formulated at the outset.

The literature review and the results of the analysis justify the conclusion that investors' decisions are motivated more by the results of technical analysis than by the assessment of the financial condition of companies. Many years of experience associated with sharp drops in stock prices caused by factors not directly related to the financial situation of listed companies do not seem to affect this behaviour. It can be assumed that the majority of investors' decisions are speculative, and the trends that can be observed in specific sectoral indices (including WIG-INFO) and broad aggregate indexes (e.g. WIG) may result from correlations of the Polish capital market with world stock exchanges [Walti 2005: 2], and the impact of macroeconomic factors [Rahman, Sidek, Tafri 2009: 104-105] rather than the current financial situation of companies. The behavioural aspect related to overconfidence regarding the development prospects of a specific industry may also be of considerable importance.

It should be admitted that the results of the analysis could change after accounting for time shifts of ratios in relation to share prices and including companies from other sectors, and possibly given different time horizons containing other business cycle conditions in the capital market. For example, one could try including a crisis phase, which is characterised by an increase in financial risk and involves active relocation of capital [Węcławski 2012: 22]. Finding an appropriate selection of the above-mentioned elements of analysis would make it possible to focus research on developing a model for generating economic benefits

for stock investors. However, this approach would probably be effective only for a relatively short period, taking into account adaptation capabilities of capital market participants. It follows that the algorithmization of investment systems should be a process of continuous adaptation to changing macroeconomic and microeconomic conditions.

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Determinanty zmian cen rynkowych akcji przedsiębiorstwa na przykładzie spółek z indeksu WIG-Informatyka

Streszczenie. *Rozwój technologii informatycznych powoduje, że spółki z sektora informatycznego mają coraz większy wpływ na rozwój gospodarki*[1]*. Rozwój ten wymaga zaangażowania kapitału intelektualnego oraz finansowego. Stąd można wnioskować, że sektor ICT powinien w najbliższych latach być przedmiotem zwiększonego zainteresowania inwestorów giełdowych. W niniejszym*

[1] W 2014 r. udział ICT w tworzeniu polskiego Produktu Krajowego Brutto wynosił ok. 5%. Szacuje się, że w 2020 r. udział ten ma kształtować się między 9% a 13% PKB, zaś według Ministerstwa Gospodarki nawet 15% [Potencjał wzrostu sektora ICT… 2013].

opracowaniu przeprowadzono analizę zależności między cenami giełdowymi akcji spółek informatycznych notowanych na GPW w Warszawie a ich kondycją finansową. Do oceny tych zależności wykorzystano wskaźniki korelacji. Przeprowadzone badanie wykazało ograniczoną (umiarkowaną korelację) zależność cen rynkowych akcji od kondycji finansowej badanych spółek. Można przypuszczać, że większość decyzji inwestorów giełdowych ma charakter spekulacyjny. Wobec tego większy wpływ na nie mają rezultaty analizy technicznej i behawioralnej niż bieżąca kondycja finansowa spółek.

Słowa kluczowe: *spółki internetowe, zysk, cena akcji, wartość rynkowa, kondycja finansowa spółek*

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The Role of Statistics in Banking Research

Abstract. *This article addresses the place and role of statistics in economic research. After giving a brief outline of the creation of economic statistics and problems they can help to solve, the author provides a detailed discussion of the use of statistical methods for estimating risk of banking activities.*

Keywords: *research tasks, applied statistics, statistical methods, risk associated with banking activities, banking statistics*

Introduction

The aim of the study is to define the place and the role of statistics in economic research. To reach this aim, it is necessary to identify the tasks of economic management, which requires the use of statistical methods. In particular, it is necessary to consider peculiarities of applying statistics for estimating investment attractiveness, which is one of the most important and complicated tasks in the financial market.

1. The current state of knowledge

The development of modern economic science requires high rates of scientific development. All areas of science must develop at equally high rates. For this

to happen, society needs to understand the importance of the development of each scientific discipline. Sciences are commonly divided into 2 categories – fundamental and applied. This leads to the following situation:

1) those pursuing fundamental sciences usually interpret applied sciences as the application of fundamental sciences to their own specific object of research,

2) applied scientists oversaturate their works with concepts taken from fundamental sciences fearing that otherwise they will not be considered scientific,

3) practitioners, who mainly rely on conclusions and recommendations provided by applied sciences to solve problems, cannot find proper concepts of applied sciences because of the complexity of fundamental terminology, and that is why they take the position of fundamental scientists.

And as a consequence:

1) applied scientists find it difficult to finance their research when obtained results do not have enough relevance for fundamental sciences, although, at is well-known, ideas which can be introduced in practice are made only based on results of applied research,

2) with the development of computers applied tasks can often be solved by making calculations involving various mathematical methods but without explaining the practical benefit of the received results,

3) inability to determine the practical aim of scientific research by most of fundamental scientists brings us back to the perspective of applied scientists [Leontief 1980: 126].

To confirm these theses it is quite enough to look through the works of the best known scientists in the field of the so-called "applied" science – economics. In the modern world Nobel laureates are considered to be such scientists. 65 prizes in economics have been awarded so far, but it is no use going into details of all their works. Some generalizations concerning their biographies and the form of their scientific publications justify the conclusion about the continued "priority of fundamental sciences" (i.e. mathematics) in determining the aims and tasks of economic research.

The first and the main consequence of this attitude is the desire on the part of the authors-laureates to substitute economic terms and concepts in their works with others. Very often these "new" terms are not understood even by their inventors. But the authority of famous scientists facilitates the spread of such inventions, whose meaning nobody tries to explain. One example of this can be a statement by Ragnar A.C. Frisch, who as chief editor of the journal "Econometrics", wrote in 1933 the following: "Econometrics is by no means the same as economic statistics. Nor is it identical with what we call general economic theory, although a considerable portion of this theory has a definitely quantitative character. Nor should econometrics be taken as synonymous with

the application of mathematics to economics.. Experience has shown that each of these three viewpoints, that of statistics, economic theory, and mathematics, is a necessary, but not by itself a sufficient condition for a real understanding of the quantitative relations in modern economic life. It is the unification of all three that is powerful. And it is this unification that constitutes econometrics" [Frisch 1967: 134].

This long quote is included here in order to show that it is possible to use a lot of words but say nothing if there is nothing to say. Frisch, who is considered to be the author of the main concepts of econometrics, as we see, himself could not give a definition of this science. Neither could Trygve Haavelmo, who is called "the father of modern econometrics". All he could do was write that in his research he used the approach, which he called "the main law of econometrics: economic theory can be considered viable only after being checked by mathematical and statistical methods". He also writes about "statistical analysis of econometric models", and that he developed "a statistical theory for analyzing dynamic models" [Haavelmo 1954: 720].

As can be seen, the above mentioned authors, like many other Nobel laureates in economics, could not give an accurate definition or identify the aims, methods and results of their research. In many cases they used different notions to describe the same events and phenomena. For example, to analyze economic processes they suggested using such methods of analysis as mathematical, statistical, economic-mathematical, quantitative economic, econometric for the purpose of building models with corresponding names. However, they did not bother to explain the difference between them [Dovbenko 2005: 149].

The reason for this terminological mess produced by such famous scientists is quite simple: most Nobel laureates in economics were educated as mathematicians and mathematics was their first area of scientific interest! However, there have been no economists among laureates in mathematics, physics or chemistry!

Nobody doubts that the works of Nobel laureates in economics comply with the highest scientific standards. But their form is the main reason for the continued antagonism between fundamental and applied scientists: if there are few formulas, then a given study cannot be considered as scientific. It is important to say that the same laureates paid attention to the changing role of science and its results in modern society. For instance, George J. Stigler avoided using mathematics in his works giving priority to a simple literary style. This is why he gained general acceptance for accuracy and elegance of exposition and erudition. But he was an economist by education [Stigler 2000: 232].

What has been the result of excessive mathematisation of economic and statistical research? In short, the necessity of double work, as has been the case with Nobel laureates: first – the scientific (i.e. mathematical) formatting of the

results, and second – explaining the gist of the problem (its practical significance) and showing stages in which these results were achieved to practitioners of all levels.

All of what has been mentioned above concerns statistics, particularly, economic statistics. And the main reason why most practitioners interpret statistics not as a science but as a method of analysis is the creation of new "sciences" by borrowing some of their elements from statistics

For example, statistical formulas and methods used for deriving these formulas were called "mathematical statistics". Having found out that the interpretation of calculation results has a probabilistic character, the methods of probability theory were added and the new "science" was called "probability theory and mathematical statistics" [Fogel 1964: 34].

The statisticians were upset and in order not to lose the integral part of their science, in turn created a separate field of study called "the theory of statistics". As time went on, more subfields were created: "the theory of statistics" was divided into "descriptive" and "analytical". And based on the fact that economic phenomena and processes can be regarded both as functional and stochastic, "economic analysis" and "econometrics" were invented. But it did not stop there: different kinds of statistics appeared to cater for the needs of every branch and type of economic activity: economic, demographic, social, international and so on. Including the science of "simulation and forecasting", also separate from "Statistics".

As a result, "economics" does not consider statistics to be a science, but only a collection of mathematical methods for carrying out economic calculations. And in economic universities teach the subject called "mathematical economics", instead of "statistics" in the wide scientific sense of this word. And this despite the fact that all the concepts of this subject are based on the use of statistical indices and statistical methods.

Oversaturation of economic publications with mathematics in the 21st century is the legacy of the 19th and 20th centuries. In earlier times, the universalism of knowledge and skills was appreciated at all levels, not only in the scientific community. In the 21st century, this is no longer the case, since specialization gives better effects than an attempt to know everything and learn everything. And the manager (of any business, territory, any type of economic activity or even country), in order to make effective managerial decisions, must not only be able to make calculations but also to define tasks for those who can analyze, simulate and forecast. But if these three "sciences", as is the case in universities and in scientific publications, suggest that an economic process should be considered from their own point of view, then it is very difficult for them to be favorably received be practitioners [Stiglic 2003: 248].

And it is impossible to change the practice, established over 80 years, of dividing statistics into parts. But it can be done and must be done. Otherwise, in some time, the term "statistics" will go out of use among practitioners and will be transferred from the category of "applied sciencs" to the category of "fundamental sciences". But originally, "statistics" was created as exclusively "applied science".

2. The research procedure

In order to strengthen the status of statistics as a major science (and the role of statisticians) in ensuring the efficient management of economics, statisticians should define and use in their research two basic concepts – the aim and the tasks.

As a single science which "branched off", statistics never defined its object of study. The need to use statistics while researching those "mass phenomena and processes", investigated by modern economics at micro-, mezzo- and macro-level, requires no special proof. Simply speaking, "What is the benefit of using statistics in management?". "The benefit", in other words ,"the ultimate result", which the activity of an economic entity is designed to attain, is an growth in profit, which is achieved by increasing the efficiency of this activity. This means that the main task of the manager of an economic entity is to ensure that this aim is attained [Stiglic 2003: 58].

For that it is necessary:

– to estimate the results of the past work,

– to compare the extent to which specific factors contributed to reaching the result,

– to determine the future level of these factors taking into account investments which the entity can make,

– to calculate the forecasted level of profit using the forecasted level of the factors,

– to create two versions of the forecast: pessimistic and optimistic,

– all estimations and calculations should be done by persons responsible for the fulfillment of each solution.

It is impossible to make well-grounded decisions concerning each step without using statistics, which will be used to:

– collect necessary data,

– prepare them for analysis,

– carry out the analysis,

– draw conclusions about what happened in the past,

– create an information base for building and correcting the models of the entity's activity,

– calculate the forecasts.

Starting with the aims and tasks of users of statistics – managers of economic entities – one should proceed to defining the aim and tasks of statistics for economics:

1) the aim – to constantly update the information base, which is necessary for making effective managerial decisions,

2) the tasks – to provide answers to the following questions:

– What happened to the entity?

– Why did it happen?

– To what extent did certain employees contribute to what happened?

– To what extent will financial resources be required to change the level of the factors?

– What change in profit can be expected?

The aim and the above mentioned tasks can be achieved by performing well-known stages of statistical research – statistical observation, data processing and analysis, formulating the results, simulating and forecasting the process and phenomena. That is why, if statistical publications, in addition to statistical terminology, include applied economic terminology, most users – managers and analysts – will easily understand the advantages of the integrated use of one statistical science, instead of dozens of its derivations. These advantages will become apparent while formulating the tasks, which demand special statistic calculations to produce solutions which help to make effective managerial decisions [Tinbergen 1967: 293].

The banking system, in all its complexity – multiplicity and diversity of bank institutions, and the functions which they perform – generates a large flow of information. This information is used by bank institutions, their customers and partners in the country and abroad – in other words, by the world financial--economic system.

The demand for information is caused by the presence of risks in bank activities and the desire of those who use bank services to lessen the level of risk involved. A lot of scientists and practitioners have dedicated thousands of studies to the estimation of risks involved in banking activities. All of these studies make use of statistical methods. Because it is impossible to describe a bank institution, its operation and its customers using only 1 or 2 indices, methods of estimating risk proposed by the majority of these authors are cumbrous and unreliable.

The result of calculating the bank's ability to incur a risk-related loss consists in determining the limits both for the portfolio and for every item separately, while the probability of risk is calculated to determine a risk premium.

In banking practice, risks are calculated from two perspectives:

– the calculation of the bank's ability incur a risk-related loss without breaking its financial stability and reliability,

– the calculation of risk probability, which can be used to determine the expected profit of the bank, under conditions of responsible risk.

The wave of bank failures in 1990s prompted some agencies of bank supervision to strengthen their control over risks incurred by banks. The main tool of such control that the Basel Committee on Banking Supervision recommended in 1995 to central banks of the world was to use VaR-methodology for calculating the reserves necessary for covering possible risk-related losses.

The scope of application of the VaR-methodology is wide and includes various aspects. It is used as a tool:

– for inherent monitoring of the risks within the bank,

– for supervision by the central bank of capital adequacy necessary to cover risks (outward monitoring),

– for making decisions about the expediency of hedging risk operations (the comparison is done using VaR before the hedge and after it is carried out. If the difference between VaR before and after the hedge is not considerable, then the expediency of the hedging is doubtful),

– for determining the limits for dealers of the bank and for controlling the observance of these limits,

– for estimating different bank projects,

– for determining the efficiency of using the bank capital taking into account the risks,

– for estimating the efficiency of the bank's activity both as a whole and in each of its branches,

– for motivating bank dealers, as their reward is defined by taking into account the amount of received income from the bank's operations carried per one unit of VaR.

In comparison with other methods of risk calculation, the VaR methodology has some advantages:

– its wide scope, which means that it is possible to calculate risks for different markets including those characterised by high changeability, namely the markets of CIS,

– universality, which means that the risk is calculated not only for one position, but for the whole portfolio of the bank,

– simplicity of applying methods based on VaR-methodology,

– convenient form of user information: using one number expressing monetary value, it is possible to quantify the risk in the form of the maximum possible losses of the bank capital,

– takes into consideration the volatility of market securities, the value of risk position and the period of its supporting.

The VaR-methodology has also some disadvantages, in particular:

– it doesn't secure the accuracy of the result, which leads to the insufficiently correct estimation of the bank's risks, because calculations of VaR are based on the assumption of the normal distribution of random variables. In practice, it does not always hold true,

– it does not give indication as to the specific amount of risk-related losses,

– it is accompanied by rather big financial expenses, as it requires highly qualified staff and computerization of calculation procedures.

As is well-known, three main components need to be taken into account when calculating VaR:

– content and size of the bank's portfolio (risk position),

– time period for which it is calculated,

– the function of the distribution of the risk parameters (in the case of calculating the VaR-portfolio – the distribution of its current income).

Studies of calculation procedures in some banks have revealed a number of problems, in particular:

1. VaR for the bank's investment portfolio cannot be calculated because market prices of shares of most companies are not available.

2. There are some technical difficulties in calculations, when a bank's portfolio contains more then ten different financial tools, which requires the of use of a big correlation matrix. This poses a big problem in the conditions of partial automation [Sushko 2010: 10-17].

At present the banking system of Ukraine is in the stage of formation. The lack of knowledge and experience as well as corresponding normative demands on the part of the National Bank of Ukraine are the main reasons why the majority of banks do estimate risks.

The study of the practice of calculating risks by banks in Ukraine conducted by the author of this article indicates that in most cases the bank's ability to incur risk-related losses is calculated empirically, while risk probabilities are not calculated at all.

There are following reasons for this situation:

First – the instable macroeconomic situation in Ukraine, which makes it difficult to create an objective informational base that could serve as the basis for estimating and calculating risks, for predicting their occurrence and for determining their influence on banking activity.

Second – a very low level of methodological expertise and informational resources required for calculating bank risks. Taking into account the level of methodological expertise and practical experience in the estima-

tion and calculation of risks, the banks of Ukraine can be divided into three groups:

1. Subsidiaries of established foreign banks. It is necessary to stress that these banks have definite experience in the calculation of risks, but their experience was not elucidated through mass media.

2. Big banks, which are engaged in the process of creating a system of risk management using modern tools for calculating risks. Of the whole repertoire of modern methods of risk calculation (historical simulation, method of Monte-Carlo, test simulation, analytical method and so on) only the analytical method is sometimes used.

3. Mid-sized and small banks. These banks account for approximately 86% of all banks. The specific feature of this group is the lack of methodological expertise, informational resources and staff to carry out risk calculation. That is why they practically do not conduct quantitative estimation of risks using VaR-methodology.

Third – an insufficient level of IT technologies in banks, above all as far as software is concerned, which makes it impossible to completely automatize the process of risk calculation. This prevents the use of modern approaches to risk calculation in Ukraine. The main reason for this situation, in our estimation, is the high cost of software for risk calculation in relation to the level of profits earned by the banks of Ukraine, and also the insufficient economic advantage of introducing calculation procedures relative to the cost of their elaboration [Sytnikova, Hominich 2009: 17-25].

In some cases, multi-regression analysis can be used to determine the influence of various factors on the generalized estimation of risk. This gives users of bank services the possibility to compare the risk and profitability of specific bank operations and choose a given bank, to fix the cost of a specific bank operation, to prioritize a decision concerning a given bank branch and so on.

This explains the wide spread of comparative analysis for estimating risks of bank operations or risks faced by users of bank services and choosing ways of reducing them. In modern banking such comparisons are necessary:

– to help investors choose objects of investment,
– to help bank fix individual credit rates,
– to help clients choose a bank for cooperation,
– to estimate the financial conditions of the bank's branches, and so on.

Of course, comparisons are simultaneously made according to several indices. The main problem is to define the list of indices used for such comparisons. But this problem is not considered in this article.

Let's assume that a set of indices has been selected, then the problem is to determine the relative contribution of specific elements on the basis of these indices. The difficulty is that often the indices cannot be used to draw a simple

conclusion: values of some indices indicate that a given element should be included in the "best" group, while according to the values of others – it should be assigned to the "worst" group.

The generally known solution in this case is to calculate a multidimensional mean. The methods and peculiarities of its calculation are discussed in many scientific publications. But one of the most important questions about the grounds for the accuracy of conclusions reached in this way hasn't been discussed in applied statistical studies so far. It should be stressed that this observation refers only to applied studies, because the theory of statistics contains the description of the answer to this question. The separation of theory from practice in this case once more shows the distrust of economists-analysts to statistics and their inability (and very often – unwillingness) to operate with precise data [Hadjijev 2008: 23-31].

3. The methods of research

This article deals with the kernel of the problem of improving the precision of comparative analysis and its solution. A banker will say that the choice of the best (worst) branch must be done based on the "profitability of the assets", which is a general statement. But he must also take into consideration other indices, which contribute to the "profitability of assets" [Dovbenko 2005: 249].

For example:

– profits per one employee,
– profitability of credits,
– number of clients per one employee,
– proportion of interest-bearing income in the total sum.

To calculate multidimensional mean the following formula will be used:

$$\overline{P_i} = \frac{\sum p_{ik} \quad d_k}{k} \tag{1}$$

where:

p_{ik} – standardized values of original indices,
d_k – weights (the level of influence) of these indices,
k – number of indices.

The accuracy of the result depends, first of all, on substantiating the weights used for calculating $\overline{P_i}$. In practice, this is commonly done by relying on the opinion of experts.

Insufficient accuracy of determining the weights by relying on expert estimation is caused by the following:

1) the concepts such as "opinion" and "expert" are not statistical because they don't have generally accepted definitions,

2) an expert can determine the difference between the weights only in the form of conditional "unity", which has not got an economic interpretation,

3) if the conditions in which the event takes place change, another expert estimation is necessary.

At the same time the theory of statistics offers a very simple method of precisely determining the contribution of every factor in the variation of the result, which can be easily implemented using a computer.

As is known, the coefficient of multiple determination is given by the following formula:

$$R^2_{y12} = \frac{\sum (Y_i - \bar{y})^2}{\sum (y_i - \bar{y})^2} \tag{2}$$

where:

Y_i denotes theoretical values of the indices calculated according to the equation of regression.

It is also known that in the case of correlation, for example, between three variables:

$$Y_i - \bar{y} = b_1(x_1 - \bar{x_1}) + b_2(x_2 - \bar{x_2}) \tag{3}$$

where:

b_k – the coefficients of regression.

Taking into account the formulas for calculating variances s_1^2 and s_2^2 , and also s_{12}, and substituting (2) with (1) we receive:

$$R^2_{y12} = \frac{b_1^2 s_1^2 + 2b_1 b_2 s_{12} + b_2^2 s_2^2}{s_y^2} \tag{4}$$

If, instead of using original data, their standardized forms are used to derive the regression equation:

$$y' = \frac{y - \bar{y}}{s_y} \qquad\qquad x'_k = \frac{x_k - \bar{x_k}}{s_k} \tag{5, 6}$$

where:

s_y and s_k – standardized deviations

then the coefficient of regression b'_k will correlate with b_k in the following way:

$$b'_k = b_k \frac{s_k}{s_y} \tag{7}$$

Then:

$$R^2_{y12} = (b'_1) + (b'_2) + b'_1 b'_2 r_{12} \tag{8}$$

from this:

$$R^2_{y12} = R_{y1} b'_1 + R_{y2} b'_2 \tag{9}$$

and summarizing:

$$R^2_{y12...k} = R_{y1} b'_1 + R_{y2} b'_2 + ... + R_{yk} b'_k \tag{10}$$

where:

r_{yk} – bivariate correlation coefficient.

The sense of (7) lies in the following:

R^2_{y12} measures the influence of all x_k;

R_{yk} measures the influence of x_k on y including the indirect influence of other variables, if these other variables influence x_k: b'_k measures in terms of standardized deviations of y' the "clean" influence of x_k on y.

So, by multiplying r_{yk} by b'_k influence of x_k on y is corrected (the indirect influence of other factors is removed). It means that $r_{yk}\ b'_k$ become similar to the partial coefficient of determination, but, additionally, has its own advantages:

– it is much easier to calculate,

– it is always positive,

– it is additive.

Just this last property (7) makes it useful for determining weights in the calculation of $\overline{P_i}$:

$$d_k = \frac{r_{yk}\, b'_k}{R^2_{y12\,...\,k}} \tag{11}$$

The above mentioned approach to banking research raises considerably the quality and relability of the results of the research.

Conclusions

In summary, the following conclusions can by made:

– correlation – regression analysis can be used to determine the individual contribution of each index to the estimation of the results of activities of branches,

– multidimensional mean can be used to account for the influence of each index in the form of one multidimensional index,

– the ranking of branches made on the basis of correlation – regression analysis provides an objective comparative estimation of the risks of activities conducted by the branches and helps to identify those most urgently in need of an intervention from the bank's top management in order to prevent a deterioration of the economic situation of the bank as a whole.

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Rola statystyki w badaniach bankowości

Streszczenie. *W artykule zostało rozpatrzone miejsce i rola statystyki w badaniach ekonomicznych. Zaprezentowano krótki przegląd kształtowania się statystyki ekonomicznej i problemów, które są rozwiązywane za jej pomocą. Bardziej dokładnie omówiono stosowanie statystycznych metod w ocenie ryzyka działalności bankowej.*

Słowa kluczowe: *zadania badania, statystyka stosowana, metody statystyczne, ryzyko działalności bankowej, statystyka bankowa*

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Focusing on Financial Literacy among University Students

Abstract. *Financial knowledge has important implications for welfare and policies intended to enhance levels of financial knowledge in the population at large. Despite the rapid spread of financially complex products in the market, including loans, mortgages, credit cards, and pension accounts, many of them are difficult to master for financially unsophisticated people. The article is an assessment of a rapidly growing body of economic research on financial literacy in general, and in particular that of university students. Based on selected surveys of financial knowledge, and using results of her own research, the author evaluates financial literacy of university students. The article also provides recommendations for further financial education at universities with different professional orientations and proposes a set of recommended financial abilities and knowledge for graduates.*

Keywords: *financial literacy, financial education, university students, standard of financial literacy*

Introduction

The issue of financial literacy and the need to develop financial knowledge in individuals and the society as a whole is of great relevance nowadays. The financial market is constantly supplied with a growing range of products and services, which also keep changing in their mechanisms and characteristics.

The financial dictionary is constantly supplied with new terms representing innovative financial products and services while traditional forms and methods of handling finance are becoming obsolete. Potential customers are faced with strategic decisions, risk diversification, a combination of products, services and

financial market instruments that enhance the appreciation of financial sources and well-being and satisfaction. Despite, or because of the rapid spread of financially complex products in the marketplace, including student loans, mortgages, credit cards, and pension accounts, many of them have proven to be difficult for financially unsophisticated investors to master.

It is impossible to navigate this endless sea of financial products and services for someone equipped with financial market knowledge gained years ago. Financial markets around the world have become increasingly accessible to "small investors," as new products and financial services become widespread. Financial knowledge of the general population is therefore becoming one of the most relevant topics nowadays. The European Commission [2005] and other major intergovernmental agencies are focusing more and more on financial literacy and financial education in addition to the well-established approaches of consumer protection and consumer information. The Commission's Green Paper on Financial Services Policy regards financial education initiatives as an area of significant future action.

1. Financial literacy and financial education – importance and definition

The term "literacy" encompasses many areas and includes a general term "functional literacy." The components of functional literacy include e.g. health, institutional, cartographic, media, emotional, cultural, digital, and financial literacy. According to Irwin S. Kirsch and Ann Jungeblut [1986: 27], functional literacy is the ability to use printed and written material to fulfil one's different needs at home, to function in society, to achieve one's personal and professional goals, etc., it is also a tool to broaden knowledge and develop one's potential.

The European Commission [2006] explains financial literacy as the capability of consumers and small business owners to understand retail financial products with a view to making informed financial decisions.

The Organization for Economic Cooperation and Development (OECD) defines financial literacy and education as the processes by which individuals improve their understanding of financial products and concepts; and through information, instruction and/or objective advice develop the skills and confidence to become more aware of financial risks and opportunities, to make informed choices, to know where to go for help, and to take other effective actions to improve their financial well-being and protection [OECD 2005].

Havran Čarnogurský [2011] highlights the need to increase financial literacy due to the high risk of investing and solving problems of lack of finance. Many

speculators have taken advantage of the opportunities created by the liberalization of business and the revitalization of the economy in the countries of the former Eastern Bloc.

Financial knowledge or financial literacy can be explained as an ability to understand basic financial products and services the people are dealing with in their lives daily. All these products and services considerably affect their economic situation and welfare.

Tullio Jappelli and Mario Padula [2013: 2779] predict that "financial literacy and wealth will be strongly correlated over the life cycle, with both rising until retirement and falling thereafter". According to authors in countries with high accumulation wealth and advanced social security systems, there is a low level of investment in financial literacy.

As Ben Bernanke, former U.S. Federal Reserve Board Chairman, noted [2011: 2] "in our dynamic and complex financial market-place, financial education must be a life-long pursuit that enables consumers of all ages and economic positions to stay attuned to changes in their financial needs and circumstances and to take advantage of products and services that best meet their goals. Well-informed consumers, who can serve as their own advocates, are one of the best lines of defence against the proliferation of financial products and services that are unsuitable, unnecessarily costly, or abusive".

In the last few years, scientists have started to examine the decision to acquire financial literacy and to study the links between financial knowledge, saving, and investment behaviour [Delavande, Rohwedder, Willis 2008; Jappelli, Padula 2013; Hsu 2011; Lusardi, Michaud, Mitchell 2013]. However, the authors do not concur on the existence of the correlation between financial literacy level and particular conditions and assumptions.

Some authors [Guláš, Pilch 2014] argue that financial literacy is not determined by education level, i.e. there is no link between the attained level of education and the level of financial literacy. Others [Lusardi 2008; Lusardi, Michaud, Mitchell 2013; Lučeničová 2015; Jappelli, Padula 2013] believe that the level of ability to make effective financial decisions, to cope with personal finance, i.e. financial literacy, is correlated with the level of education and also depends on other external and internal factors, such as age, gender, standard of living, level of salaries, wages and pensions.

2. Financial literacy – myths and facts

Financial literacy has a potential to affect the economic growth by making contribution to savings and the development of the financial sector in general but

poor financial literacy at least prevents financial services from realising their full potential for individuals and, consequently, for the national economy.

The assessment and measurement of the level of financial literacy is of key interest to international institutions and national authorities of state administration, the academic community, and the business sector. There is a lot of macroeconomic research aimed at investigating the impact of financial literacy on the economic level and prosperity of the region, state, economy.

The OECD survey on financial literacy [OECD/INFE 2016], using the OECD/INFE toolkit was conducted on a sample of 51,650 adult respondents aged 18-79. A total of 30 countries, including 17 OECD member countries, were involved in the research. The main research questions concerned three areas of financial literacy: the levels of knowledge, attitudes and financial behavior of respondents.

The average score of the participating countries was relatively low and reached only 62.8%, which creates a prerequisite for a significant improvement in the level of financial literacy. Surprisingly realistic was the level of financial literacy that was relatively realistic.

In 2007, the Slovak Banking Association [SBA 2007] conducted a joint survey on the level of financial literacy of its clients. Altogether 1107 people aged 18 and over were interviewed. As a research method, a standardized interview was conducted by the MVK Survey Agency. The response rate was 96.3% and the interviews were held in September – October 2007. The survey highlighted the disproportionately high self-assessment of the financial literacy of respondents, while the actual level of their financial literacy was lower. The average index value of financial literacy scored by the survey respondents reflects their average knowledge about personal finances. The highest level of the financial literacy index was achieved in the socio-demographic groups of respondents with a university degree and by entrepreneurs.

Bohuslava Mihalčova et al. [2014: 321] mentioned a survey of financial literacy conducted by companies Partners Group and the Focus agency among Slovak inhabitants (720 respondents over age 18) in August 2012. Outcomes have confirmed that "the level of financial literacy represents the same problem as in many countries worldwide. The average level of financial literacy of Slovaks was 62,5%. Investment and bank products were identified as the weakest areas; better results were obtained in the areas of pensions and insurance. More than half of the respondents were not able to judge if a loan was worth taking or not and did not know that the amount of gains was dependant on the size of the risk. Furthermore, over 70% had a problem to differentiate between various types of investment and the risks associated with them and almost half of the interviewed did not save absolutely anything from their monthly salaries. Comparison of the results of surveys carried out in the year 2007 and 2012 shows that financial

literacy has somewhat improved (scores rose from 56% to 62,5%) as well as the trend of financial education and more responsible approach of consumers themselves. In spite of that fact the level of financial education in the Slovak republic is below European average" and represents approximately 75% of it.

Summarizing the above results, it can be concluded that there is a large group of retail financial service users who lack the clarity and comprehensibility of information, or are unable to orientate themselves, are easily influenced and vulnerable, or use only a limited range of simple financial products and services. At the same time, there is a huge increase in the amount of free financial resources that, thanks to modern ICTs, are moving very fast around the world in an effort to increase their value. The complexity and diversity of financial market instruments is also growing. People in general have enough information to go through complex financial markets.

When comparing the results of selected research, it can be stated that one of the most serious findings is the non-objective of self-assessing the level of financial literacy. Inadequate levels of knowledge of people in the field of investing, lending, pension provision are causing problems especially in the management of households and often lead to deterioration in their financial well-being, even personal bankruptcy. The inconclusiveness in the area of personal finance of inhabitants forces the governments of the countries to deal with the issue and to deal with it in the form of legal adjustments to personal bankruptcies and raises the need for continuing education and raising the level of financial literacy of the whole population.

2.1. Financial literacy standard and financial literacy among university students in Slovakia

Through the Ministry of Education, the government addresses the issue of financial literacy, especially at elementary and secondary schools in Slovakia. The National standard of financial literacy [MESR, MFSR 2008] determines the extent of knowledge, skills and experience in the area of financial education and management of personal finances.

There is no definition of financial literacy standards at university level. Financial literacy of university students of non-economic faculties (issues of financial education are included in study curricula of faculties of economics) must be undertaken by faculties or students themselves in their course of their individual education.

A study conducted at one of the largest universities in Slovakia (Matej Bel University in Banska Bystrica) was intended to investigate financial literacy

of its students and compare its levels between students from the Faculty of Economics and other "non-economic" faculties. The study, carried out in the period 2016-2017 involved 418 respondents studying at one of the four faculties selected.

One of the research assumptions was that students, considered to be financially literate, would respond correctly to most of the questions related to specific areas of financial literacy (savings, interest, investment). This hypothesis was confirmed only for students of the Faculty of Economics, where almost 68 % of respondents reached the required level of financial literacy. The second highest level of financial literacy was achieved by students of the Faculty of Natural Sciences. The worst results were recorded for respondents from the Faculty of Education.

It was found that students of economics study programmes are able to accept higher levels of risk in the area of finance, and their strategic thinking ability is significantly better. Students of other faculties prefer traditional forms of investment and savings, and tend to be conservative in their financial decisions. The assumption that there is a direct correlation between the level of financial literacy and the type of study program was confirmed.

In addressing potential financial problems, students rely more on family and advice from close friends and do not trust the state or financial institutions. This indicates a low level of self-confidence and independence of university students in matters of personal finance management. It can be considered to be one reason for strengthening the focus on finance and financial well-being in the field of university education.

The main categories of financial literacy included in the aforementioned standard are as follows: management of personal finance, work and income, credit policy, saving, insurance, and investment. Taking into account the research findings the intention of the researchers was to set the level of basic financial literacy in its individual areas for university graduates. Specific areas of financial literacy for a university-educated person should include the following skills and topics:

– assess the impact of inflation on value and purchasing power, the effect of inflation on income, how inflation affects investment returns, etc.,

– characterize the tax and deduction system, ability to fill in the income tax declaration,

– identify items normally deducted from gross earnings,

– explain compound interest; characterize the annual percentage rate of charge,

– understand the issue of virtual currencies,

– compare the investment into individual types of shares, bonds, etc.,

– characterize pension insurance, explain the functioning of individual pillars of pension insurance.

University studies provide students with insights that change their thinking, allow them a qualified and innovative view of different situations or facts and encourage them to make the right choices. Since products and services of the financial market can be encountered in everyday situations, it is essential that each graduate possesses the proposed scope of basic financial knowledge.

Conclusion

The low level of financial literacy (particularly financial knowledge) in the adult population highlights the importance of developing such competencies early in life and ideally in schools. Financial education in schools can make sure that the next generation acquires relevant financial knowledge and the confidence to apply numeracy skills in a financial context even when "many of the adults around them are unable to achieve the minimum target score of 5 out of 7 for financial knowledge" [OECD 2005].

Schools can also assist children and young people in developing the skills and attitudes that will help them to achieve financial well-being, and encourage positive habits and behaviours such as making spending plans, saving and planning ahead [OECD/INFE 2016].

Without better financial literacy, people will be at risk of making poor financial decisions which could leave facing difficult financial situations, including insecure old age. Financial illiteracy undermines not only individual retirement security and financial well-being but also the stability of the financial system in a given country or economy. For these reasons, the development of financial literacy skills is critically important for economic and social welfare not only of this generation, but of those to come.

Finding out which sorts of programs and financial decision-making structures are most effective is a task of high importance. Further analysis will require evidence-based research, with solid evaluation efforts. Policymakers need to take into account that today's students are tomorrow's employees, entrepreneurs and financial knowledge is in fact a form of human capital. Ensuring a better use and appreciation of human capital is one of the paths for the successful development and prosperity of the whole economy. When investing in financial education, the rule that investing in education is the best investment for the future of the individual, the state, the nation has been confirmed several times.

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Zameranie sa na finančnú gramotnosť medzi vysokoškolskými študentmi

Abstraktné. *Finančné poznatky majú dôležité dôsledky na blaho a politiky zamerané na zvýšenie úrovne finančných poznatkov v populácii ako celku. Napriek rýchlemu rozšíreniu finančne kom-*

plexných produktov na trhu, vrátane úverov, hypoték, kreditných kariet a dôchodkových účtov, sú mnohé z nich ťažko zvládnuteľné pre finančne náročných ľudí. Článok je hodnotením rýchlo sa rozvíjajúceho ekonomického výskumu finančnej gramotnosti vo všeobecnosti, a to najmä študentov vysokých škôl. Na základe vybraných prieskumov finančných poznatkov a využívania výsledkov vlastného výskumu autor hodnotí finančnú gramotnosť študentov vysokých škôl. Článok tiež poskytuje odporúčania pre ďalšie finančné vzdelávanie na univerzitách s rôznymi profesijnými orientáciami a navrhuje súbor odporúčaných finančných schopností a poznatkov pre absolventov.

Kľúčové slová: *Finančná gramotnosť, finančné vzdelávanie, študenti vysokých škôl, úroveň finančnej gramotnosti*

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E-learning as a Tool in Spreading Knowledge in Organization Management

Absctract. *Thanks to e-learning employees of an organization learn what they need at a given moment, what they need to learn in a specific place and time, at their own pace and in their preferred way. E-learning provides the standardization of knowledge, facilitates contact with the environment, makes training convenient, provides conceptuality, multithreading and individualization of training, and is an interactive and engaging form of training. E-learning is a tool that should be more widely used in the future in the dissemination of knowledge, including in the field of finance and accounting, and its effective use requires a wider integration of international experts in the development of training programs and workshops. The aim of the article is to discuss e-learning as a tool for management, characterizing the system of learning management and effective management of information technologies in organizations, including public ones.*

Keywords: *e-learning, knowledge, management, organization personnel*

Introduction

In the future, public administration offices will make increasing use of electronic resources, thanks to the development of communication via the Internet. This will change the organization of work in individual offices: not only the character of work but also the management of office space. The importance of teleworking, meaning work outside the office, using modern technologies and

information resources will increase. Management in public administration is becoming more and more associated with technology, communication and IT systems, which will result in the integration and new configurations of posts and functions performed in individual public administration entities. Therefore, the use of e-learning as a tool in the dissemination of knowledge among employees and employers of many organizations, including public ones, is important in many areas. The dynamically developing theory of organization management keeps providing new models, tools and instruments that increase the company's effectiveness. One of such tools is e-learning. The turbulent environment requires organizations to develop their potential for mobility and flexibility. The creation of a competitive advantage of a modern organization is greatly affected by learning processes, called the learning organization model, i.e. the concept of knowledge management [Stańczyk-Hugiet 2006: 18].

The aim of the article is to discuss e-learning as a tool for management, characterizing the system of learning management and effective management of information technologies in organizations, including public ones.

1. E-learning as a learning management tool

When looking at e-learning from a global perspective, one can divide the whole issue into several aspects. Broadly speaking, e-learning consists of users, study materials, and some teaching management system. The user is anyone who enters the learning process in some way. In addition to students, who are the biggest group, there are also teachers or managers of education, or lecturers. A particular person involved in the process of learning can act as a student in one situation and as a lecturer in another situation. Within the system that drives and covers the entire education, it is possible to assign different roles to specific individuals. Secondly, the whole system would lose its meaning without teaching materials or a curriculum. Study materials must be accessed through a control system that guides the students. It is important that the control system should be able to handle different forms and types of materials. The study materials can include presentations, text documents, pictures, videos, audio recordings, animations, and so on [Šimonová 2009]. E-learning instruction management systems should accept standardized formats of learning materials, such as SCORM and AICC. SCORM stands for Shareable Content Object Reference Model. It is a popular standard for e-learning, which describes the ability to share SCORM-compliant learning content among all e-learning management systems that accept this standard. SCORM is a simplified set of rules and standards that

must be met by the learning content. All learning materials consist of basic components known as SCOs (Shareable Content Object). In the final form, a SCO is a lesson or a course page, depending on the specific implementation of the control system. The aforementioned rules of learning units complying with SCORM rules are stored in XML-written descriptors. These descriptive SCORM objects have 64 elements and are divided into 9 categories. AICC is another relatively widespread standard in e-learning. Unlike SCORM, where the base unit is a page (SCO), the basic AICC unit is a more comprehensive set of lessons. From the viewpoint of the control system, this unit is no longer indivisible. The AICC itself consists of pages and chapters. Inside AICC lessons, in addition to the learning content itself, pages are also integrated within a lesson. The notes from the lesson, along with other data, need to be shared with the control system. Supporting the AICC control system is another ability to pass these data between the lesson and the system. Furthermore, the e-learning management system, known as Learning Management System (LMS), is the most important and most complex element for users and the content section. In real life, the LMS could be compared to the school's management. The whole process present in the traditional school system should also be included in the LMS. It may be implemented differently but there are some essential features that each LMS should have:

– user management – the users access the system using an identifier and a password. Identity must be preserved, everyone should only see their own area and no one should be anonymous or use false identity in the system,

– group management – the system can combine a large number of users, and for clarity, the users are divided into groups. This is a hierarchical structure, where one user can be a member of multiple groups,

– content management – the term content is used intentionally, not a course, a test, or a lesson. Content describes a comprehensive element of the teaching material that can be provided to the student. It is included in a specific implementation and philosophy of each LMS, as it divides and classifies the study materials. Typically, courses are divided into lessons, and even finer divisions are possible. For example, in the SCORM standard a page is the base unit. Of course, the courses themselves can still take different forms and types,

– group content management – similarly to the users, the content grouped together, should be divided into some groups/categories,

– role management – users of the system are not necessarily of equal status. That is why it is very important to define specific roles. Regardless of whether the user is a student or a lecturer, the system should still be accessed using the same login name. If a person is a lecturer, it should be possible to assign them the role of a lecturer, or another role that ensures that they can act as a lecturer

in the system. It is necessary to ensure that the role can be added and removed at any time during the user's lifecycle,

– allocation of learning units to students – the authorized staff must be able to allocate the study materials to particular students. The form of implementation may vary again. Either the tutor or the system administrator assigns hard-to-learn courses, or students select courses themselves, and the lecturer only gives them access or approves their selection. A mixed form is acceptable and used, the system may be based on the principle of choice and include optional courses,

– lecturer checking the learning process – first, the student must be able to know how to check the status and advancement in the courses, but his/her teacher/lecturer/manager must have this option,

– student testing – the testing tools also include examination. The system must have a tool for objective testing. Test results must be stored and made available only to eligible persons, but at least to the tested student and to their lecturer/manager.

Furthermore, there are other features and tools that are not necessary for LMS utilization, but have the same standards as in LMS systems:

– evaluation – not only the student's assessment for completed courses, but also the assessment of the course by the students or by the lecturers,

– communication tools – because of the absence of a physical encounter, communication is of utmost importance. Communication can take place between a student and a lecturer, among students, lecturers, or between students and the administrator. Communication can exist in various forms: e-mail, chat, forums, message boards, or an electronic conference. In addition, the system should alert users about events that have occurred or will occur in the near future,

– reporting – all that is happening in the system should be recorded, summed up, compared,

– the Content Creation Tool can be used to create tutorial content directly in the LMS or using a tool that works with the LMS,

– generating certificates – it is often necessary to confirm the passing of a course in places outside the LMS. For this reason, it is good to be able to produce a certificate that clearly demonstrates the course attendance by the person concerned,

– import and export of the learning content – the system should contain an interface through which the learning material enters the system or goes out of the system. A broader range of formats that can be transferred makes the system more compatible. There is a lot of support for typical e-learning formats, especially SCORM and AICC,

– course catalogue – it is important if the student can also choose/book courses/trainings freely, including the list of free courses,

– approval – relates to the previous point. If a student has the opportunity to freely choose the courses,

– planning – it is possible to develop learning plans for a longer period of time,

– budget – this feature is mainly used in commercial organizations, where the employer must also deal with the financial side of courses,

– user synchronization – an organization that uses the LMS can have several systems that require staff records. To avoid the need of modifying the user management functions in all the systems, it is practical if these systems are connected to a system that has a primary purpose of managing users. In addition, such automation is also important in the implementation of the LMS, especially in large organizations.

2. Learning management system

LMS is a system that integrates a variety of on-line tools for communication and management of study (bulletin board, discussion forum, chats, boards, records, etc.) and also makes available the learning materials or educational content online or off line to the students. When defining concepts related to the use of digital technologies in teaching, most authors put an emphasis on the pedagogical nature of the product that has been designed, built, tested in practice and further developed specifically for the educational purposes as a tool for learning or teaching. Some authors impose strict limitations on what can be regarded as educational solutions. These attitudes are based on the premise that any software becomes truly educational at the moment of its application in the learning process, or in the way it is used. For this reason, it is necessary to extend the concept of educational technologies to specific software products that, despite not being specifically designed to support the pedagogical process, have naturally found their application and have become popular among the teachers or pupils. The vast range and variety of educational software applications and interactive learning environments makes it impossible to introduce simple templates for an objective assessment of system quality. Thus, it is necessary to determine the basic criteria of existing software solutions and to jointly evaluate these products within a single set group. The software products can be divided into three basic groups – Comprehensive Learning Environments; Instrumental Programs and Applets, Software Modules and Add-ons, with the main distinguishing feature being the range of electronically-processed information and the range of application possibilities for using the product in the learning process. In addition, there

is a specific category of software tools that do not offer didactically processed electronic content and are intended for management, directors and support of learning and teaching – LMS, Videoconferencing Systems, Presentation Programs and others, one-sided and narrowly specialized digital teaching aids. As in the case of e-learning, even in the case of these systems, there is no uniform terminology and precise definitions of some basic terms. Based on these discrepancies, it is not easy to define the content and scope of individual notions, which is also reflected in the diversity of individual LMS concepts. This is also due to the fact that these are new systems that are constantly evolving and there is no "standard" to refer to. Most information resources are in the form of websites or on-line databases that can respond more flexibly to possible adjustments according to current development of these systems. LMS can be classified as a online application. This is an environment provided by web browsers, designed to manage educational content, its distribution, and to manage the learning process. This is often a modular system where the use of LMS can be adapted depending on individual ideas of its operator. The structure of the LMS largely reflects a modular layout. The operator may or may not use different elements the LMS system according to the range or character of education provided. The structure of an ideal LMS system, where all its tools are used, can be divided into the following areas:

Tools for the presentation and distribution of educational content:

– instruments ensuring the availability of the course (adequate hardware and software difficulty),
– clear learning environment,
– creative tools for developing educational content,
– search capability,
– multimedia features,
– tools for easy content updating,
– instruments for replenishing educational content directly via the website,
– e-materials library.

Communication and cooperative tools:

– moderated debates linked to the disciplines,
– creating discussion forums, groups,
– chat,
– collaborative communication environment,
– videoconference,
– internal email,
– whiteboard, shared application.

Tools for the verification and revision of the curriculum:

– course delivery system, ability to comment on the tasks,

– the ability to send attachments to the tasks,
– teamwork tools for the task development,
– task and test assignment tools,
– system for creating and processing self-tests,
– system for creating and processing polls.
Course management tools:
– course management tools (schedule, timetable),
– calendar with important dates,
– tools for the student activity monitoring,
– statistics,
– export options,
– tools for creating virtual classes,
– tools for creating and managing the user accounts.
Supporting tools:
– help – support.

3. A comparison of competing LMS

Before starting any analysis of competing products, it is useful to clarify some things. A Learning Management System is basically like any other kind of software, so there both are commercial and free LMS. They are free when it comes to operating expenses, but they often do not guarantee completeness and flawlessness. Since the system itself contains data about employees or students, a potential leakage is quite a serious security risk in some cases. If an organization decides to run an LMS under a contract with a service provider, the customer can usually rely on long-term customer support. For more demanding and complex systems, larger companies welcome the offer of support from the supplier. The truth is that there are many providers of such services, but the choice of a suitable e-learning system is often determined by whether it supports the local language. Taking into account only the instruments that are offered in the Czech or Slovak Republic, the range of available options is much smaller. There are, of course, international companies, but their tools do not use the local language as the basic language of communication.

Moodle LMS (platform). Moodle is available as an open source software under the GNU Public License. It requires a PHP server supporting several types of databases, especially MySQL. Moodle stands for Modular Object-Oriented Dynamic Learning Environment. As the full name suggests, it is a learning environment that is object-oriented and modular. The system also features a simple

interface, easy orientation, and each feature has a color matching logo, which accelerates work a lot. The entire desktop is divided into logical components that are embedded in blocks. Each block is distinct. The advantage is that all the features are available from the basic level on the home page, without a problem. This can be especially beneficial for beginners. However, if an emphasis is put on the curriculum, the time is not wasted to analyze the system. Compared to other e-learning systems, there are some new elements. One of them is a scorecard. It takes into account all tests passed, displays their score range and what success level has been achieved. The system displays the average of all tests at the end of the table. More detailed data about test completion is obtained by clicking on the test name. Below are displayed the test levels. Besides, navigation between the test levels is incredibly simple. For this purpose, the top bar of the menu is used to list the individual levels that the user can choose. The required level is selected by clicking on the level name. The learner view is interesting, too. First, after selecting and entering the course of interest, the student sees all the options and features. The appearance of the whole system is adapted to serve the needs of this course. There are separate elements, such as lectures, study materials, tests and tasks. On the one hand, it provides a clear outline of the course, on the other hand, the student cannot see the contents of the course or lecture. He finds this only by clicking on the lecture component and looking at the contents. The study materials or tasks are selected like tests. Unlike other systems, Moodle also contains a survey function and a dictionary component. Also, before applying any changes, the lecturer is able to determine the extent to which the desired goals are achieved, based on survey results. In some cases, it can help to avoid an unnecessary strain or correction of the original plan to meet the original intention of the lecturer. Each system user has the ability to view information about course participants, such as name, surname, community, and last access to the system. In the case of lecturers and administrators this is quite clear, but for students the relevance of access to these data is questionable. While there are some additional features that are not available in other evaluated systems, it is also worth pointing out the elements that are missing. One such example is videoconferencing. It is a higher form of communication, but it is no longer exceptional, especially when it comes to e-learning.

Eduland LMS. Eduland is a company that provides services in a different form than the systems already discussed. It does not focus on the creation and provision of e-learning education, but rather on the development of course content for such systems. These courses can be studied in several ways. Since Eduland courses support the standard features, they can be used in existing systems. In this case, it is just a matter of supplying the teaching personnel, not the environment itself. If the customer does not yet have any e-learning system, Eduland

can deliver and install an existing e-learning system, for example the already--described Moodle platform. The third option is to use the Eduland's own online environment by connecting to the eduland.cz server. The principle is similar to other systems, except that there is no administrator role for the customer, who can either be a student or a training manager. The content of the education manager differs considerably from that of the lecturer in the systems described so far. While in the previous cases, the education manager is act as a teacher, here we deal with a manager of education rather than a supervisor. His job is to arrange the order of a given course for a given number of people who want to follow the course. After buying the necessary number of licenses, the company issues an adequate number of training codes to the training manager to make the course available to the students. After these codes have been distributed by the student managers, the students have access to the course. After this step, the students are able to activate the course. This is where the role of the training manager ends. As far as the environment itself is concerned, it is extremely user-friendly and but do has a very simple user interface. In this case, it is not even possible to talk about a possible competitor. The main activity is to create courses. So, with regard to Eduland, what really matters are the courses, not the environment itself. Eduland's courses are focused on four areas: law, languages, computing, and bookkeeping. The courses themselves are graphically colorful, compositionally interesting, with a number of interactive elements that attract the student's interest.

eDoceo LMS. It is one of the most important providers of e-learning in the Czech market. The project was launched in 1999 when the market for education management systems was still in its infancy. The first version was co-developed with IBM CR and introduced in 2000. Over ten years, three more versions were launched and the company has become the leading provider of electronic education services in the Czech market. The developer is Trask solutions. It is a fully-fledged management system with the possibility of testing, evaluating the results, certification and approval processes. The system is developed for Czech customers but also supports English and Slovak versions. It also supports the e-learning standards, such as IMS, AICC and SCORM. From the point of view of technologies, there is also Java and XML.

The whole concept consists of three main parts: eDoceo LMS, off-line Student and Author, Course creation tool.

Like other systems, EDoceo consists of modules. The basic modules are:

– student,
– manager,
– administrator,
– tutor,
– educator.

The entire application is based on four basic IT pillars:
– operating system,
– application server,
– database environment,
– SMTP server.

EDoceo supports MS Windows, Linux, AIX, Unix, AS 400 and Sun Solaris. The database environment can be run using Microsoft SQL Server, IBM DB2, Oracle, and other systems. It is scalable. The system is normally run on one server, but if necessary, it can be divided into multiple servers and used as a distributed system. From the point of view of interconnectivity with other systems, it may be particularly useful to connect to a personnel database or another company's structure. Another example is the possibility of linking with the existing technology to authenticate access to the system. The users themselves are substantially less demanding, with a standard web browser. In addition, in eDoceo an external application, Creator for Creating Courses, Testing, and Course Conditions is available. It is available in both English and Czech versions. Courses can be created from existing materials and electronic documents. A ready course is exported to eDoceo or to a given computer for individual use. The eDoceo system, except the Tutor module, also includes the Manager module. In similar systems it is customary to have one module of similar character and purpose, here the competencies are divided into two roles. Selected Tutor options include:
– evaluation of test questions,
– answers to students' questions,
– assisting the students in assigned courses using the communication environment,
– creating documents for modifying and changing the courses.

Selected Manager Options are:
– obtaining data and basic information about the courses the student has been assigned,
– obtaining statistical reports on selected users, how quickly the student progresses in the study, how well he completes individual courses,
– information and overview of the groups, which the manager is responsible for,
– information about the students, progress of their studies, the results.

Finally, it should be noticed that the role of a tutor is primarily to create the content and help the students, the role of a manager is to supervise and control whether the student is fulfilling all the tasks. Compared with iTutor, eDoceo is a powerful tool. Both of them are modular systems, characterized by a similar composition. EDoceo supports a larger number of operating and database systems. In contrast, iTutor supports multiple languages. In terms of compactness, they are roughly the same, both supporting the common e-learning standards. They

also have a LMS extension in the form of a training application as the content of the education management system. A noticeable difference is in making tests. In eDoceo, tests are created in the authorized application, in the case of iTutor, their a separate module in the LMS. Overall, both instruments are gaining influential customers, which is probably the best sign of quality and service satisfaction. In the Czech market, eDoceo is one of the strongest competitors for iTutor.

Docebo LMS. It is an open source LMS platform designed for the commercial sphere and higher education. It is available in 12 languages but includes neither Czech nor Slovak. It supports the SCORM standard in version 1.2. It provides educational models with mixed, self-study, group features, and also with chats and forums. It has a user friendly interface with graphically attractive icons. The top menu bar is identical in all three modules - admin, student, lecturer. It contains the following bookmarks: my courses, course catalogue, my area, news, and logout. The list of courses and course catalogue contains just a list of courses with a short description. In addition, the courses catalogue contains a course search box. When opening a course, it is possible to see individual lessons that can be started and studied directly. Furthermore, the left-hand part of the screen displays usable tools, as well as the course statistics, such as access and success rate. The available tools include reports, calendar, forum, video conferencing, chat, and so on. However, not all courses offer all the tools. The suitably chosen colors and graphic elements facilitate orientation and limit the need to consult the user manuals to control the system. From the student's point of view, this seems a big advantage since a simple user interface is important to create a good relationship with the system. Too much complexity often discourages users from using such tools. On the other hand, it should be said that even the admin module is not much more developed than the student module or the lecturer module, which reduces the overall functionality. Another disadvantage is the fact it only supports only the SCORM standard.

3.1. Information technology management

It is very important for the future of managers to have some other skills, especially computer skills. Management today requires detailed measurement of service delivery and subsequent analysis and review of that service. Information technology does not make managers better. IT increases the availability of information. It allows the manager to view information in different ways, and assist in the decision-making process. A manager must learn to deal with information requests so as to address business problems. IT management is the process whereby all resources, related to information technology, are managed according

to the organization's priorities and needs. This includes the tangible resources, such as networking hardware, computers and people, as well as the intangible resources, such as software and data. The main aim of IT management is to generate value through the use of technology. To achieve this, business strategies and technology must be aligned. IT management ensures that all the technology resources and associated employees are utilized properly and in a manner that provides value for the organization. An effective IT management enables the organization to optimize the resources and personnel, improve business processes and communication as well as to enforce best practices. IT management is the distribution, organization and control of technology in business. The technology managed can include budgets, personnel, computers, programs and systems. Information technology management is a fast-growing field. Companies always want to upgrade their technology, and IT managers can help them do it. It is also possible to discover academic and career options in this field. Individuals who can work with computers and communicate with others should be suited to work in IT management.

3.2. ICT education requirements

IT managers will often maintain and administer the database systems, and develop the user standards and procedures to operate them. They may also: evaluate the database server integrity and security, review reports, documentation and other staff-produced materials, oversee the design and maintenance of databases and online communications as well as analyze, plan and manage the projects to upgrade the existing systems or install a new hardware and software. Using their communication, decision-making and leadership skills, IT managers direct and support their teams toward reaching goals. They interact with employees, supervisors and managers, and make decisions and recommendations to promote the organization's sustainability and profitability. To prosper in a competitive global marketplace, employers are likely to seek IT managers with business knowledge and up-to-date technical skills. They typically look for the candidates with the following attributes:

– strong analytical and mathematical skills,
– excellent communication skills,
– ability to identify and solve problems, and to improve performance and efficiency,
– demonstrated leadership ability,
– excellent attention to detail,
– effective organizational skills.

Summary

"The basis for the functioning of each organization is the possession of specific information, which is its intangible resource. Increasingly, we are talking about the organization's information or intellectual capital. Information for management, which is processed in the IT system, is of a special type. The efficient and effective management manifested in making the right decisions is possible only if one has information about the organization and its environment, which should be separated from the entire data set due to the fact that the actions taken can be fully accessed. That is why it is right to say that information for management is of direct and indirect influence on the decision-making process" [Kisielnicki 2006: 10]. It is inevitable that public administration is in transition from a traditional service to an electronic service. Transforming a traditional office into an e-office is a matter of time in public administration in Poland. The assumption of state policy is to eliminate paper documents completely in public administration and replace them with electronic documents. One should expect a greater reduction indirect customer service, in the use of paper documents, and in activities performed by officials in a traditional way [Cichoń, Knop 2017: 149-158].

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E-learning ako nástroj na šírenie poznatkov v riadení organizácie

Abstraktné. *Vďaka e-learningu sa zamestnanci organizácie učia, čo potrebujú v danom okamihu, čo potrebujú na to, aby sa naučili na určitom mieste a v čase, vlastným tempom a preferovaným spôsobom. E-learning poskytuje štandardizáciu poznatkov, uľahčuje kontakt so životným prostredím, uľahčuje výcvik, poskytuje koncepčnosť, multithreading a individualizáciu školení a je interaktívnou a pútavou formou školenia. E-vzdelávanie je nástroj, ktorý by sa mal v budúcnosti rozšíriť v šírení poznatkov, a to aj v oblasti financií a účtovníctva, a jeho efektívne využívanie si vyžaduje širšiu integráciu medzinárodných odborníkov do rozvoja vzdelávacích programov a workshopov. Cieľom článku je prediskutovať e-learning ako nástroj riadenia, charakterizujúci systém manažmentu vzdelávania a efektívne riadenie informačných technológií v organizáciách vrátane verejných.*

Kľúčové slová: *e-learning, vedomosti, manažment*

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E-learning as a Professional Tool in the Higher Education of University Students Preparing for the Role of Managers in Public Organizations

Abstract. *Modern information society is a society of creative, innovation-oriented, enterprising people, open to information from many sources and from the media. Access to reliable and professional knowledge is very valuable and pays off in the future. It is essential that this knowledge be systematized, selected, specialized, transferred in an attractive form, condensed, transparent and adapted to the recipient. E-learning is becoming a very attractive tool, whose usefulness is appreciated by organizations, including public ones, and by individual people. Functioning in an information, knowledge-oriented society requires constant training, further practice and continuous improvement of qualifications. In this context, universities need to adapt their educational offering to the constantly changing environment in order to meet market expectations. The aim of the paper is to explain the use of e-learning in the era of innovation and computerization, to determine the impact of the use of e-learning on the higher education of students and in their further professional development as managers of public organizations.*

Keywords: *e-learning, university, management, public organization, student*

Introduction

The interchangeably used terms, such as e-education, computer distance learning, e-learning, computer-assisted teaching, non-traditional trainings, refer to

a number of new methods using computer tools for training, which holds promise for creating a new quality of education, also in higher education. Educational platforms are the most popular and the most effective method used in acquiring and managing knowledge. They are designed for self-study and for supervised learning. A well-prepared and efficiently conducted e-learning course using the latest advances in distance learning, with the possibility of interaction through voice and image, can compete with the traditional methods of running classes and can often be much more effective.

The aim of the article is to explain the use of e-learning in the era of innovation and computerization, to determine the impact of the use of e-learning on the higher education of students and in their further professional development as managers of public organizations.

1. Definition of e-learning

A number of definitions of the e-learning concept have been proposed at different times, and they often differ a lot given the continuous dynamic development of e-learning itself and related information and communication technologies. Here are some of the most common ones. E-learning is studying using computer technology and the Internet. E-learning is basically any use of an electronic material and didactic means to effectively achieve an educational goal, being implemented in particular, but not only, through computer networks. In the Czech environment, it is mainly associated with a controlled study within the learning management system (LMS) [Kopecký 2006]. E-learning is a learning process using information and communication technology to create courses, distribute learning content, communicate between students and educators, and to manage the study [Wagner, Bukó 2005]. It is a type of learning in which the acquisition and use of knowledge is distributed and facilitated by electronic devices [Průcha 2006]. E-learning encompasses both theory and research, as well as any educational process (with varying degrees of intent), in which information and communication technologies (ICT) working with data in an electronic form are used in accordance with the ethical principles. The way ICT is used and the availability of learning materials depends primarily on the educational objectives and content, the nature of the educational environment, the needs and possibilities of all actors in the learning process [Zounek 2006]. Higher education was among the first to discover the benefits of new media and technologies. By the mid-1990s, university e-mail systems had become a standard of communication, particularly in traditionally technologi-

cally advanced countries such as Japan or the USA. Faculties and individual students started using the Internet and the World Wide Web (www or web) as a source of information, communication and entertainment. In particular, younger students created chat rooms and on-line chat rooms where they could communicate in real-time about everything from fashion to politics and search for new friends. Development at universities continued to move forward. Syllabuses, library resources, lecture contents were moved from classrooms to multi-media resources and to the local networks. Private companies began to explore the possibilities of the commercial use of e-learning [Stříteská, Svoboda 2007]. Virtual universities were created in the web and offered all their courses and certificates via the Internet. In the late 1990s, e-learning tools enabled online real-time testing, real-time games, and tools to identify the strengths and weaknesses of each student. The student could obtain a university degree without being physically present in class, and fully employed adults could study at a college at their own pace without having to solve the problems associated with their physical presence at school.

E-learning can be divided into two basic forms, from the point of view of the accessibility of resources necessary for the execution of the study:

– off-line learning,

– on-line learning.

For off-line learning, the computer does not need to be connected to the Internet, and learning content is presented from pre-stored information on the storage medium. Thus, in this case, the educational content is not provided by the LMS but is located directly on the computer on which the study is conducted. Students only depend on the information contained in the study material, which very often does not allow the use of all the textbook advantages and degrades the conditions under which the study is carried out. For these reasons, this form of e-learning is already on the decline. The same concerns the correspondence and multimedia form of distance learning. On-line learning ("on-line" indicates the state of the Internet connection) requires networking and can be synchronized or asynchronous. Due to the fact that the educational content and other necessary information is placed in the LMS system, there can be a timely evaluation of the course and, if necessary, the student can immediately correct his/her task, for example after failing to pass the final test, the student can rely on appropriate passages or information sources where the subject is presented. This gives immediate feedback to the LMS system, and through it, to the educational organization and the tutor. Another way of using on-line forms is to use video conferencing, discussion forums, or virtual classes. The most sophisticated of the methods is a virtual class simulating the common environment of an educational institution. To extend distance learning through virtual classes, it is necessary

to further extend the availability of high-quality, high-speed Internet access to the general public. As already mentioned, the on-line form of e-learning is implemented in two ways:

– asynchronous form,
– synchronous form.

The asynchronous form of e-learning is characterized as a way of studying during which the student spends most of the time self-teaching. The student independently enters the prepared educational program and has much more control over the learning process. This form is based on the assumption that students learn at different times and in different places. However, the mode of group collaboration is very limited and the student is not motivated by other students to gain new knowledge. Also, the student is not involved in direct competition with other students to achieve better educational outcomes. For this reason, as with off-line forms of e-learning, stronger motivation is needed on the part of the learner. The benefit of this form of courses is that the student is able to work during the course at any point in time, not being bound to follow a particular study schedule. Another advantage is that this form of study can function either with a relatively slow network connection (on-line form) or can even be pursued off-line. The synchronous form of e-learning takes place via virtual classes, videoconferences or discussion forums. The common feature of all these three communication tools is that all participants attend the course at the same time but in different places. For example, there is a possibility of group collaboration, involving mutual communication among the participants, who can cooperate, create projects together, and motivate one other in further study. Although this form of e-learning is developing today, it is necessary to point out that it places relatively high demands on the performance of the computer hardware and the data network capacity. On the basis of the above, three levels of e-learning can be distinguished, which correspond not only to the technical maturity but also to the level of pedagogical mastery [Lowenthal et al. 2009]: CBT – Computer-Based Training. This level is regarded as off-line education, where all the educational content is transferred to a data carrier, for example, CD-ROM, and the communication and management component is too limited to be used for the whole education process.

WBT – WEB-Based Training. It is an on-line form of education where the educational content is transmitted over the network. However, this issue does not address the problem of appropriate management of student activity, and for this reason, this component is sometimes suppressed; LMS – Learning Management System. The most advanced level. In addition to the computer and network, it features special software to create, manage, and distribute the educational con-

tent, to communicate between learners and tutors, to manage the entire learning process, and evaluate learning outcomes.

The different levels of e-learning include some key concepts that need to be implemented and are very important for the whole distance learning process in the form of e-learning. There are three basic components that are required for effective study and that must be provided by an effective LMS system: educational content, the distribution of educational content, and the management of education, which includes communication and evaluation elements. These components constitute the educational system itself and are essential for its effective functioning. Only if the three components have been successfully implemented, is a distance learning system complete [Barešová 2003]. The first component of e-learning is educational content, containing complete training courses (e-courses), which can be quite large. At a lower level, educational content may consist of individual training modules that can be combined into full training courses. In addition to the exposition of theoretical knowledge, e-courses also include numerous practical exercises used to understand the materials better and to understand their practical effect. Most such courses consist of multimedia features that make them understandable and user-friendly. The exposition of textbook content is complemented by audio and video recordings, interactive animations, and sometimes even virtual reality activities. The course content typically includes test modules, which provide students with feedback that allows them to check the effect of their studies.

The last element of the education process is education management. One can designate a management process to manage e-courses and students, including tracking the results of their studies. This process is provided by an educational institution and is managed mainly by education managers. It gives them a comprehensive overview of the progress of individual learners or study groups and evaluates e-courses. This makes it possible to accurately monitor the course efficiency and the quality of each course module. The main indicator is the success rate of the students in the tests after completing the modules and in the final test. On the basis of this information, some modules can be modified or completely removed from the course and replaced by other modules. Obviously, it is also possible to communicate with the human resource management system, which provides accurate information about the results of individual students and their abilities [Barešová 2003]. E-learning, if it is to be a truly effective learning tool for distance learning, must be based on the appropriate technological basis, which LMS systems provide in this case. In the next part of the article, these systems will be described in more detail, with their functions in the education process and their relation to the individual components of distance learning conducted in the form of e-learning.

2. Students and their future profession

There are many reasons for going to university, including – naturally – a love of the subject to be studied, and the opportunity to experience a different way of life. Higher education is much more than a production line of graduates ready to work. The Department of Informatics FEM SUA in Nitra conducted a study about the future of graduates of managerial and economic programs. The main emphasis of the study was to assess the current level of education in IT within the selected economic and managerial programs and to propose the optimum development of IT competencies for future graduates in accordance with the requirements of the current practice and the labour market. Data were collected by means of a questionnaire, which was specially developed for the purpose of the study and tested in terms of reliability. Each ordinal item was rated by respondents on a five-point Likert scale, i.e. with scores ranging from 1 to 5, where the middle value corresponded to a neutral, emotionally indifferent assessment. Lower values represented a higher degree of disagreement with each statement (1 denotes complete disagreement). Higher values represented a higher degree of agreement with the statement (5 denotes full agreement). In the section entitled 'My future profession', students were asked to indicate to what extent they agreed or disagreed with the statements regarding the choice and decision-making regarding their professional orientation. The questions were designed to determine to the importance of specific factors for the respondents.

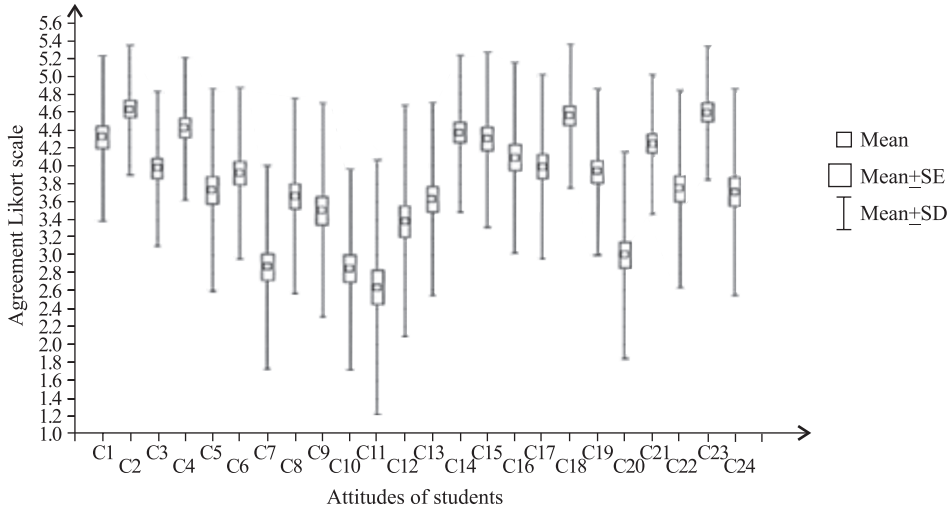

Figure 1. The results of student's survey

Source: own materials

There were 24 items (C1 – C24) for which respondents had to indicate the degree of agreement on a five-point Likert scale (5 – strongly agree, 4 – rather agree, 3 – neither agree nor disagree, 2 – rather disagree, 1 – strongly disagree). Figure 1 presents a chart with boxplots showing the results for each questionnaire item, showing the mean, and two measures of variation: standard error and standard deviation. The questionnaire included the following items: C1 – work on things which are in agreement with my attitudes and values, C2 – work on things which are considered to be interesting and meaningful, C3 – work independently from others, C4 – use my talents and skills, C5 – work with people rather than with things, C6 – help others, C7 – work with animals, C8 – work in the area of modern technologies, C9 – do simple, undemanding work, C10 – work with machines or tools, C12 – create, propose or discover something new, C13 – propose new ideas, notions, C14 – make my own decisions, C15 – have a lot of time for my family and friends, C16 – work in the area which involves a lot of travel, C17 – work in a place where something new and exciting often happens, C18 – earn a lot of money, C19 – manage other people, C20 – become famous, C21 – have a lot of time for interesting activities, hobbies and pursuits, C22 – become the "boss" in the workplace, C23 – develop and improve my knowledge and skills, and C24 – work as part of a large group could be gratifying.

On average, students indicated that in their future profession they would like to work on things they considered to be interesting and meaningful and wanted to develop and improve their knowledge and skills, which today is a necessary condition of achieving success at work. They expressed a need to use their talent and skills, make their own decisions, and work on things, which were in agreement with their opinions and attitudes. On the other hand, they did not want to sacrifice everything for their work and wanted to have a lot of time for their family and friends as well. It is natural that they wanted to be adequately rewarded for their work, i.e. they wanted to earn a lot of money, also by increasing their knowledge and skills, which is one of the significant findings.

3. Education of managers

Education of people is among the key objectives and consequences of modern society. It is conditioned by the current demanding and turbulent environment, requiring people to constantly improve, adapt and develop their educational achievements. It means that education needs to be continuous and should reflect all the current needs brought about by the reality of changes. Employee education

can be characterized as a continuous process in which the adaptation and change of working behavior, the level of knowledge, skills and motivation of employees takes place on the grounds of learning based on different methods. This process helps to decrease the gap between employees' present competences and the changing requirements they have to meet.

Continuous education and development of managers increase the quality of obtained education, skills and abilities. The basic qualities currently expected of employees are flexibility, adaptability and proactivity. Training and development prepares staff to cope with new tasks and challenges better, as employees should be prepared to cope with new demands from their superiors, but also should be ready to change their job position in the organization. The aim of education is to enable students to:

– acquire competencies, especially communication skills, oral and written skills, the ability to use information and communication technologies in the national language, mother tongue and foreign languages, mathematical literacy and competencies in the field of science and technology, lifelong learning, social skills and civil competencies, entrepreneurial skills and cultural competencies;

– learn and use at least two foreign languages,

– learn how to identify and analyze problems, propose solutions and know how to solve them,

– develop manual skills, creativity and artistic psychomotor skills,

– learn how to develop and cultivate their personality and lifelong learning, to work in a team and accept responsibilities.

Within an organization, training activities are carried out by human resource management. It creates opportunities to raise the qualifications of staff and to form human capital in the organization. Employee education can be characterized as a continuous process, in which the adjustment and changes in working behavior, level of knowledge, and motivation of the company's employees are increased by learning through various methods. The outcome of education is a reduction of the gap between the current workers' skills and requirements that are imposed on them. A person's basic and general knowledge as well as their skills are shaped by education, which provides a general foundation, on which it is possible to build training. The concept of education (training) itself allows the organization to make systematic, planned efforts aimed at providing the employees with a possibility to learn competencies needed for their work. The purpose of education is that the employees acquire skills and knowledge and subsequently use them at work. It is not a preparation for future jobs, but it is aimed at improving the current job performance. Organizations should strive to achieve a state in which their employees share their new knowledge with colleagues and can instruct their co-workers [Brdička 2003a]. Personal development of managers

should be different from the education of other employees. The reason is the nature of their work, which is hardly predictable and measurable, which also affects the choice of education methods. Many authors describe it as an attempt to improve the efficiency of managers through the process of education. Personal development of managers is a continuous process that includes a wide range of opportunities and activities. The process of their personal development is related to the implementation of organizations' objectives and strategies. It is based on the understanding of business objectives and specific organization requirements. The development of the total professional potential of managers, such as talent, skills and perspective ensures the success of the organization in the future too. The success of personal development of managers requires an understanding of the nature of the development of managers and all processes related to it, the creation of favorable conditions for this development and last, but not least, the implementation of this development in connection with the various aspects of managerial work that make up the concept of the development of managers [Jašek, Rosman 2006]. Modern managers need creativity and innovative thinking, particularly due to the rapidly and unpredictably changing world, intensifying competition and new technologies. The range of competencies necessary to serve responsible roles in the management of companies/organizations is becoming wider. One of the important skills of the modern manager is creativity, ability to solve problems and thinking "outside the box". These aspects should be necessarily reflected in the education of future managers, who should not only be able to "manage" the creativity of employees, but also be creative and innovative and thus be prepared for sudden changes in the business environment as well as within the organization. According to Chittaro [Chittaro, Ranon 2007], managers often face a situation in which strategic questions, leadership issues and complex organizational situations cannot be managed in a routine manner but call for creative solutions. The more unusual the situation (meaning that managers cannot rely on their experience or established routines), the more creativity is required to solve it. In that sense, creativity is seen almost as a prerequisite for a change and renewal, it is a key skill for leaders and organizations, not only in order to adapt to the change, but also to proactively shape industries and markets. The qualities that effective managers should have include [Horton, Horton 2003]:

– motivation – a good manager has the ability to inspire every employee to perform to their highest standards through a thought-out leadership and action,

– assertive – a good manager should have the ability to achieve results despite any obstacles,

– accountable – good managers not only hold themselves and other employees responsible for their work, but they foster an atmosphere of accountability,

– personable – a manager cannot lead the team if the employees do not trust him. Therefore, a good manager has to create a culture of transparent dialogue and open trust,

– decisive – good managers make decisions based on productivity not bureaucracy behind the projects, and on performance.

Formal management education programs typically emphasize the development of problem-solving and decision-making skills, for instance. However, they give little attention to the development of skills required to find problems that need to be solved, to planning for the achievement of desired results, or to carrying out operating plans once they are shaped. Success in real life depends on how well a person is able to find and exploit opportunities that are available, and, at the same time, discover and deal with potential serious problems before they become critical.

Managers need to be able not only to analyze data from the financial statements and written reports, but also to scan the business environment for less concrete clues that a problem exists. They must be able to give meaning to changes in the methods of doing business and in the actions of the customers and competitors, which may not show up in the operating statements for months or even for years.

Summary

In the field of higher education in the era of global economy and supranational concerns, an international cooperation in the field of education is becoming more and more important. Knowledge orientation in the multinational groups is now becoming a trend. The virtual network environment becomes a place of cooperation for students of various universities as well as for employees of many organizations with offices around the world. Collaboration with others, regardless of the physical distance and learning environment, also requires the acquisition of the ability to recognize own individual characteristics and skills to deal with issues, including overcoming weaknesses that may hinder group learning and cooperation. On the one hand, e-learning makes it possible to enrich and diversify traditional activities, and on the other hand, helps to eliminate factors that limit educational possibilities of some participants. It should not be treated as an alternative to the current education, but as a tool that is able to improve and facilitate the work of both, lecturers and students, and in the long-term, for example for employees of public organizations, including managers of these institutions.

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E-learning ako profesionálny nástroj vo vysokoškolskom vzdelávaní vysokoškolských študentov, ktorí sa pripravujú na úlohu manažérov vo verejných organizáciách

Abstraktné. *Moderná informačná spoločnosť je spoločnosť tvorivých, inovatívnych, podnikavých ľudí, otvorených pre informácie z mnohých zdrojov a médií. Prístup k spoľahlivým a profesionálnym poznatkom je veľmi cenný a v budúcnosti sa vyplatí. Je nevyhnutné, aby sa tieto znalosti systematizovali, vybrali, špecializovali, preniesli v atraktívnej podobe, kondenzovali a transparentne sa prispôsobili príjemcovi. E-learning sa stáva veľmi atraktívnym nástrojom, ktorého užitočnosť oceňujú organizácie, vrátane verejných a jednotlivých ľudí. Fungovanie v informačnej spoločnosti založenej na znalostiach si vyžaduje stálu odbornú prípravu, ďalšie postupy a neustále zvyšovanie kvalifikácie. V tejto súvislosti musia univerzity prispôsobiť svoju ponuku vzdelávania neustále sa meniacemu životnému prostrediu s cieľom splniť očakávania trhu. Cieľom práce je vysvetliť využitie e-learningu v dobe inovácie a informatizácie, určiť vplyv využívania e-learningu na vysokoškolské vzdelávanie študentov a ich ďalší profesionálny rozvoj ako manažérov verejných organizácií.*

Kľúčové slová: *e-learning, univerzita, manažment, verejná organizácia, študent*

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Economic Conditions of Restructuring of Medical Entitie

Abstract. *a significant number of public hospitals in Poland systematically show losses on the basic medical activities. This is the reason for the growing debts in these hospitals. Their current level is estimated at approx. PLN 15 billion. It is not possible to reduce this indebtedness if these hospitals do not cover the costs of basic operating activity with the revenues achieved. To achieve such a state, it is necessary to carry out a deep restructuring in most of them. Its goal should be, on the one hand, to adapt the service potential to demand, and on the other hand, to create conditions for an ongoing cost control. The aim of the article is to assess the financial situation of one of the hospitals in Eastern Poland and to indicate changes in the management system, enabling the rationalization of operating costs.*

Key words: *financial situation of medical entities, costs, restructuring, financial controlling.*

Introduction

Public health care facilities are not commercial entities. Their task is not to generate profit. However, they operate on a self-financing basis, which means that their revenues should at least cover the costs they generate. The revised rules for financing hospital services provided by the so called "hospital network" do not change this general requirement. In order to achieve a zero financial result in many hospitals, not only an appropriate increase in revenues is necessary, but

also changes in the level and structure of costs are desirable. Many costs incurred by hospitals do not result directly from the size and structure of medical services provided. However, it is related to the service potential (property, employment of medical, auxiliary and administrative personnel) and its use. The consequence of the potential is fixed costs related to its maintenance. The unused potential generates costs without contributing to any revenues.

The ballast for many hospitals and the source of additional costs is the high level of indebtedness. Currently, it is estimated that the debts of public hospitals can amount to as much as PLN 15 billion [Karolewska 2017]. This is often a consequence of many years of neglect in restructuring the potential and cost rationalization. An additional problem that may affect the deterioration of the current financial situation of many hospitals is the pay rise expected by medical workers and the need to adapt to the end of the current year. hospital rooms to current sanitary requirements. (the need to incur additional expenses for adapting many old hospital buildings). The improvement of the efficiency of public hospitals and the positive solution to the problems facing them is not possible without multidirectional restructuring.

The aim of the article is to assess the financial situation of one of the poviat hospitals located in Eastern Poland. His main idea is the hypothesis that changing the method of financing health services alone is not enough to improve the financial condition of the hospital. Far-reaching restructuring changes are necessary and, in many cases, recapitalization from the founding bodies. The assessment was based on the analysis of the hospital's financial statements for the period 2009-2016.

1. External and internal conditions for the functioning of hospitals

The functioning of the health care system, and therefore also the financial condition of hospitals, is a resultant of the impact of both, exogenous and endogenous factors. The endogenous (internal) determinants can be largely shaped by the managers of health facilities. In this group of factors one can find a management system, organizational structure, internal communication system, quality of services, internal financial and accounting system, marketing and PR strategies, etc.

The exogenous (external) determinants are independent (possibly with a very low degree of dependence) from the decisions made by the Board or Chief. These include legal regulations at the national and regional level, socio-economic

system of the country, local government policy, economic situation, health and nutrition awareness of citizens, public education in the field of maintaining good health, monetary policy of the central bank, fiscal and state policy, situation on the labor market, accessibility of communication, etc.

The structure of the financing sources is a key element of the stability of health care system. It affects the size and continuance of available resources as well as the scope of tax burdens paid by the citizens. There are various systems in different EU countries, and hence different financing structures for the health care system. This is because the individual member states are characterized by varying degrees of economic development and often a different system of social participation. However, in almost all EU countries, in the recent years, there has been a trend of revenues achievement from the health insurance premiums and other fiscal policy tools of the state. Money supply for the health care system in these countries comes from general and purpose taxes, both at the national or local level; from social security contributions or contributions from the citizens participating in the compulsory health insurance.

Other sources of funding for health facilities are strictly or quasi-commercial sources. These include commercial loans, preferential loans, subsidies, credit, leasing, etc. In many EU Member States the private sources account for over 30% of the current expenditure on healthcare (see Figure 1).

In addition, many systems may include multiple sources of financial support that provide an additional revenue. These benefits can be implemented, among others, through co-payments or other direct forms such as, for example, private health insurance or special accounts (savings accounts). Any way in which the revenues are obtained through these available tools generates the different distribution effects.

The structure of financing sources has a direct impact on the financial situation and development opportunities of health facilities. It shapes the average levels of the cost of capital, which directly affects the value of the enterprise. However, this is not the only factor affecting the economic efficiency and health security of citizens. It also influences the level of availability of medical services for the society. Accessibility can also be considered in a spatial context. The studies carried out at the request of the European Commission show that, apart from the waiting list and costs of medical services, the availability of benefits is also affected by a geographical distance [Joint Report on Health… 2016].

Apart from the aforementioned determinants, the level of satisfying the health needs is also influenced by other ones that can be classified as intangible, covering the cultural and socio-economic barriers of access. For example, the specific socio-economic and cultural groups may have less chance of getting

medical help or registering with a family doctor. This is evidenced by the results of studies on the life expectancy of Poles, which shows that the longest-lived citizens of our country are the inhabitants of Krakow,[1] which is one of the largest air pollutants in Poland[2] and even in Europe.[3] These barriers often go hand in hand with the determinants of geographical distance. This means that these determinants cannot be analyzed individually, but the interrelationships between them should be taken into account.

from one other. This is important especially in the context of alternative possibilities of cooperation among the doctors and nurses with other hospitals and clinics. This form of employment in many workplaces is financially beneficial for medical personnel. In addition, thanks to the absorption of knowledge and the analysis of scientifically interesting cases from different places, it enables the doctors and nurses to learn faster, and thus improve their professional skills. However, it should be emphasized that cooperation with other centers often results in shortening the working time in the mother unit, and the load of duties in the long-term may cause fatigue and greater risk of error. For the director of the hospital, the geographical distance between the competing health facilities is very important, in particular when negotiating payroll and implementing the strategy of forming an image of the facility.

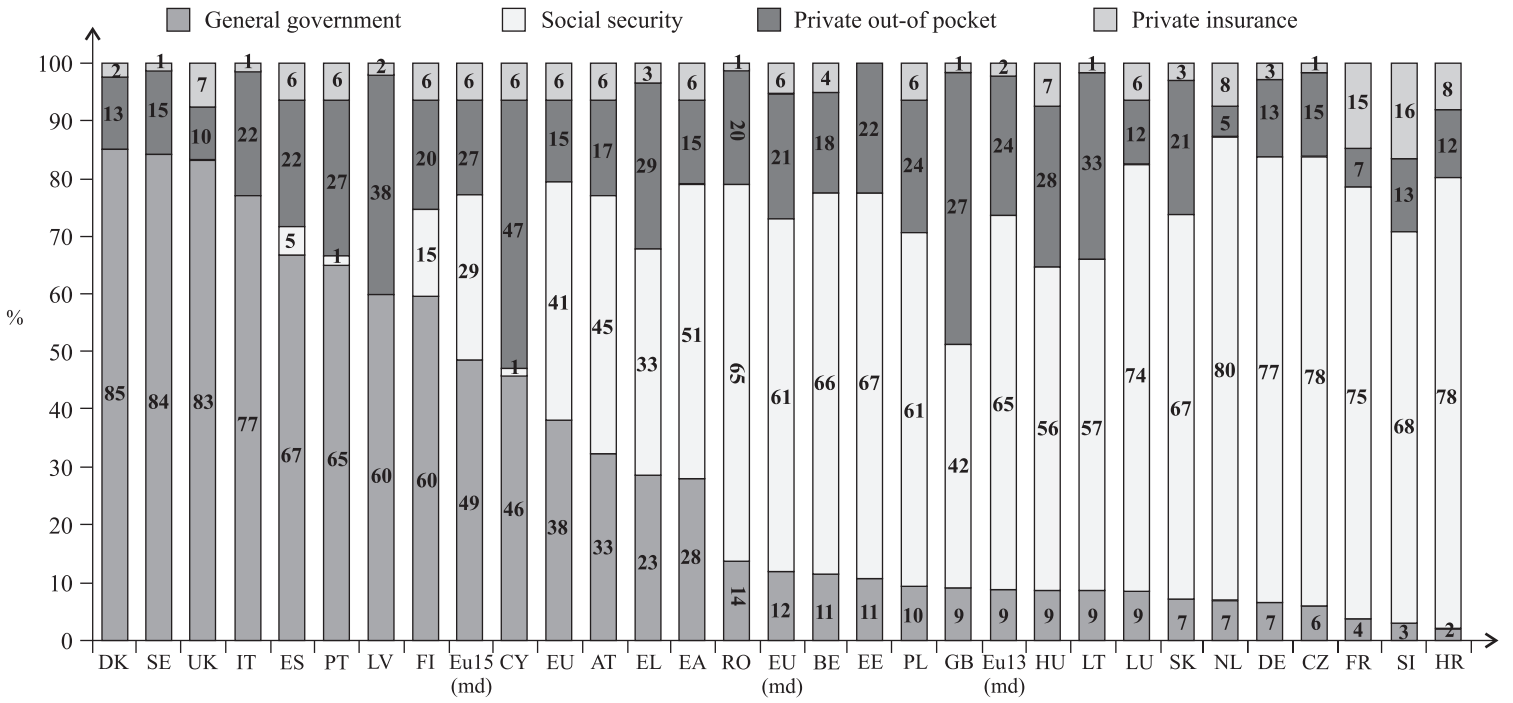
The aforementioned conditions of functioning of health facilities are of great importance in shaping the remedial programs and development projects. Not all management's intentions can be implemented as a part of the entire socio-political and economic system. This does not mean that the hospital directors do not have any tools to influence the financial situation of the facilities they manage. They can successfully implement changes of organizational, technical, technological, financial character. However, one should not forget about the barriers created by the system in which they must operate.

Spatial analysis of the functioning of health facilities should cover not only their distance from households, or jobs of current and potential patients. It should also take into account the spatial distribution of the individual health facilities Despite these limitations, many hospitals in Poland are successfully implementing the restructuring processes, as a result of which favorable changes occur, affecting the economic and financial situation and providing development opportunities, as well as positively affecting the availability and quality of the medical services

[1] https://zdrowie.radiozet.pl/Choroby/Raport-W-ktorych-polskich-miastach-i-dzielnicach-zyje-sie-najdluzej-00001280 [accessed: 22.05.2018].

[2] http://wiadomosci.gazeta.pl/wiadomosci/7,114883,20072482,33-z-50-miast-ue-z-najgorszym-powietrzem-jest-w-polsce-na-pierwszym.html [accessed: 22.05.2018].

[3] www.gazetaprawna.pl/galerie/739525,duze-zdjecie,8,ranking-10-najbardziej-zanieczyszczonych-miast-w-europie-6-jest-w-polsce.html [accessed: 22.05.2018].



1) Current health expediture including long-term care, SHA category HC.3)
2) Figures have been rescaled when the sum of original figures exceeded 100% (UK)
3) Data for IE and MT missing

Figure 1. Sources of spending on health care in EU countries in 2013

Source: https://ec.europa.eu/info/sites/info/files/file_import/ip037_vol1_en_2.pdf [accessed: 21.05.2018].

provided. These changes require the involvement of many employees at various levels, and sometimes also the engagement of specialized companies supporting the hospital in the restructuring processes.

2. The essence, goals and scope of restructuring

Restructuring means defined changes in tasks, potential and organization aimed at better adjustment of an economic entity to changes taking place in its environment and thus improvement of the efficiency of its operations. It is a process that can cover all aspects of the unit's operation, that is, technology, organization of services, legal and organizational status as well as changes in the capital-structure structure [Sapijaszka 1997: 28-30]. Restructuring is a change that is to improve the functioning of the hospital and create the opportunity to achieve higher effects from the service potential. Depending on the situation, this potential may be subject to multi-directional changes. There are basically three main methods for changing the potential:

– internal changes in possessed potential related to the structure of technical equipment, employment, organization and/or capital structure,

– division of the hospital into smaller organizational units, which may receive the status of independent therapeutic entities or which may be included in other entities (through sale or by in-kind contribution to the company),

– connection of the hospital with other or other hospitals organizational units on the basis of mergers or acquisitions.

In the first and part two of the method, changes are aimed at releasing internal efficiency reserves, while in the third method – to achieve an additional effect in the form of synergy. Internal changes are often a derivative of the division or connection of medical entities. Their goal should be to streamline their management processes. It is all about improving the quality of medical services and increasing the added value for patients and other stakeholders (eg medical staff) [Swayne, Duncan, Ginter 2012: 179]. External factors of restructuring include changes in the system of financing medical entities, changing their organizational and legal forms, changing sanitary requirements in the scope of conducting medical activities, new technologies and medical procedures, growing competition from private healthcare entities, etc.

The management of many hospitals and middle management staff lacks new ideas for their further functioning and development. The initiative lost for many years has lost the "self-preservation instinct". They still expected help from the founding organs (state and local governments). Due to the above, the restructuring

processes were often undertaken with considerable delay, and their effects proved to be lower than expected or possible.

Restructuring is not an end in itself [Swayne, Duncan, Ginter 2012: 43]. Its result should be improvement of management results and increase of competitiveness [Suszyński 2003: 53]. It should be a well-thought-out and related process with the previously prepared strategy for the development of a medical entity. It is one of the ways to implement the development strategy through the emergence of a new quality of activities. Detailed tasks faced in the restructuring of healthcare entities can be summarized as follows:

1) decentralization of the management structure by transferring decision-making powers and responsibilities to individual organizational units,

2) identification of sources and level of costs for individual organizational units,

3) removing obstacles that hinder independence, entrepreneurship and flexibility in lower-level cells,

4) spreading the risk of economic activity on a larger number of entities,

5) obtaining by the healthcare entity a permanent self-financing ability,

6) introduction of modern medical technologies,

7) increasing the quality and competitiveness of the services provided

8) obtaining capital necessary to modernize and develop the service potential.

Restructuring activities must be based on a reliable diagnosis of the internal and external situation of the company and their impact on the existing value gap. Diagnosis is associated with the need to obtain comprehensive information about the therapeutic entity and its environment. It is necessary to correctly identify the causes of the existing unfavorable financial situation and to determine ways of its liquidation.

A frequent cause of the gap in low financial efficiency is excessive operating costs of medical activity. Therefore, the internal causes of disability are first sought for and taken to remove them (e.g. increase in work efficiency, elimination of unproductive units, increase in independence of internal organizational units (eg. hospital wards) and their responsibility for achieved economic results).

Improvement of efficiency often requires restructuring of assets (sale of non-productive assets, purchase of new assets, launching new business lines, etc.). For this purpose, a detailed analysis of the external situation of the treatment entity is necessary (its market position, current situation and potential competitors, consideration of investment opportunities). Systematic control and verification must be subject to the financial policy of the medical entity. The structure of capital is an important factor its financial security. The idea is to shape the structure of the company's financing sources so that the average weighted cost of capital is as low as possible. Comprehensive analysis of the financial situation gives the

basis for a possible verification of the strategy implemented by the entity and subordination of its planned restructuring activities.

3. Financial situation of the examined hospital

In the years 2009-2016 there was a clear, 150-percent increase in sales revenues. At the same time, operating expenses increased by 84%. This increase can be considered as significant, because at the same time the minimum wage in Poland increased by 45.0% (www.infor.pl), and the average remuneration in the Polish economy increased by 48.3% (https://wynagrodzenia.pl), whereas the capitalized inflation rate in the analyzed years was only 14.2% (www.nbp.pl). The analysis of changes in particular items of the profit and loss account is presented in Table 1.

Table 1. Analysis of changes in the profit and loss account items related to the operational activity of the hospital X

No.	Specification	2009	2016	Change [PLN]	Change [%]
A	**Sales**	**20 814 414.69**	**52 064 480.55**	**31 250 065.86**	**150.14**
B	**Operating costs**	**28 301 499.24**	**52 197 888.71**	**23 896 389.47**	**84.44**
I	Depreciation and amortization	6 217 840.48	5 300 581.04	–917 259.44	–14.75
II	Materials and energy	5 911 763.83	13 632 551.47	7 720 787.64	130.60
III	External services	7 637 708.84	16 687 403.58	9 049 694.74	118.49
IV	Taxes and fees	148 405.45	154 311.43	5 905.98	3.98
V	Remuneration	6 576 099.68	13 072 818.14	6 496 718.46	98.79
VI	Social insurance	1 296 657.71	2 687 177.11	1 390 519.40	107.24
VII	Other costs	513 023.25	663 045.94	150 022.69	29.24
C	**Profit (Loss) on Sales**	**–7 487 084.55**	**–133 408.16**	**7 353 676.39**	**–98.22**

Source: own analysis based on the financial statements of the hospital X.

The data presented in Table 1 shows that the significant reduction in the deficit that occurred over the analyzed period was the effect of much higher sales dynamics than the dynamics of operating costs. The reasons for this state should be seen in the lower dynamics of many significant cost items in relation to revenues:

– costs of materials and energy consumption, the vast majority of which in medical institutions constitute variable costs, increased by 20 pp. less than sales revenue,

– increase in the cost of salaries, social security and other benefits was about 50 p.p. lower than revenues, which indicates a rational personnel policy conducted in the analyzed unit,

– higher than wages, but clearly lower than revenues from sales, the pace of changes in the cost of external services (change by approx. 118%), which was the result of personnel outsourcing in the form of changing employment conditions of some medical workers from a contract of employment,

– a negligible, compared to revenues, increase in other types of costs, which is a sign of the Director's determination to keep them as low as possible, especially in relation to items not strictly related to medical activities.

In the years 2009-2016, positive changes in property management also occurred in the audited entity. The value of assets in this period decreased by PLN 25.358 million, ie by over 23% (see Table 2). This change is interesting in the context of the dynamic growth in sales value observed in the analyzed years (see Table 1).

Table 2. Analysis of changes in the asset position of hospital X

No.	Specification	2009	2016	Change [PLN]	Change [%]
A	**Non-current assets**	**108 923 057.32**	**83 565 379.13**	**–25 357 678.19**	**–23.28**
I	Intangible assets	2 883.03	10 100.49	7 217.46	250.34
II	Real assets	108 875 099.42	83 555 278.64	–25 319 820.78	–23.26
III	Long-term receivables	0.00	0.00	0.00	–
IV	Long-term investments	0.00	0.00	0.00	–
V	Deferred tax assets	45 074.87	0.00	–45 074.87	–100.00
B	**Current assets**	**3 320 579.22**	**14 252 388.45**	**10 931 809.23**	**329.21**
I	Inventories	229 990.62	461 220.20	231 229.58	100.54
II	Short-term receivables	2 478 995.84	6 745 938.54	4 266 942.70	172.12
III	Short-term investments	574 647.42	7 041 806.22	6 467 158.80	1125.41
IV	Other assets	36 945.34	3 423.49	–33 521.85	–90.73

Source: own analysis based on the financial statements of the hospital X.

A characteristic result of these changes was the improvement of net financial results, which in 2015 after many years reached a positive value. a positive level of the result was also achieved in 2016. It stopped the decrease in equity. It should be emphasized, however, that the changes have not yet led to a lasting improvement in the financial result on sales, i.e. the result achieved on core operating activities. The level of indebtedness decreased, which dropped by slightly over 30% in the period under consideration. The result was a significant drop in financial costs.

Table 3. Analysis of changes in the liability position of the hospital X

No.	Specification	2009	2016	Change [PLN]	Change [%]
A	**Equity**	**99 040 919.89**	**88 646 864.08**	**–10 394 055.81**	**89.51**
I	Share capital	109 419 394.81	105 816 049.04	0.00	100.00
II	Profit (Loss) from the previous years	–2 662 993.30	–18 323 310.65	–15 660 317.35	–688.07
III	Profit (Loss) from the current year	–7 715 481.62	1 154 125.69	8 869 607.31	–
B	**Liabilities**	**13 202 716.65**	**9 170 903.50**	**–4 031 813.15**	**69.46**
I	Long-term liabilities	7 613 463.14	–	–7 613 463.14	–100.00
II	Short-term liabilities	5 589 253.51	5 588 615.02	–638.49	99.99
III	Accruals	–	3 582 290.48	3 582 290.48	100.00

Source: own analysis based on the financial statements of the hospital X.

The financial situation of a healthcare facility is mainly the result of skillful management of human resources. The measurable result is proper analysis and management of labor costs. In hospitals on the so-called total labor costs consist of the costs of salaries, social security and other benefits as well as most of the costs of external services (contracts).

In 2009, the total cost of labor (CKP) was PLN 15.5 million, in 2016 the level of this cost group fluctuated around PLN 32.45 million. Over the analyzed years, it was therefore an increase of PLN 16.94 million, ie by 109.2%. The increase in the share of KCP in operating costs may seem seemingly worrying. Over the analyzed period, this share increased from 54.8% to 62.2%. The assessment of this change changes after analyzing the dynamics of sales value, whose value in 2009-2016 increased by 150.1%. As a result, the relation of total labor costs to sales revenues decreased from 74.5% to 62.3%. This is a confirmation of the Directorate's proper, responsible personnel strategy.

The improvement of the financial situation of the analyzed hospital also resulted to some extent from the change of the seat which took place in 2009. Thanks to this, it was possible to reduce the costs of internal logistics and shorten communication time between employees of individual hospital departments.

The transfer of the hospital to the new headquarters also enabled a clear reduction of investment expenditures for the reconstruction of owned fixed assets. An additional factor enabling the generation of beneficial cash flows from investing and financing activities (reduction of financial costs) was also the active participation of the analyzed entity in acquiring EU funds. The funds obtained from the European Neighborhood and Partnership Instrument as part of the Poland-Belarus-Ukraine 2007-2013 Cross-Border Cooperation Program were

earmarked, among others, e.g. the purchase of medical equipment and devices. They allowed to improve the quality and effectiveness of deep burns treatment. Savings due to the relocation of the seat and as a result of rational policy of human and material resources management enabled the hospital to clearly reduce the loss on sales and even earn over PLN 1.4 million in sales profit in 2015. However, this profitability decreased in 2016, mainly as a result of a 2% drop in sales revenues and an increase in wage pressure of employees, which resulted in a 7% increase in wage costs. On this basis, it can be stated that employee participation in positive changes that occur in the enterprise as a result of restructuring activities should be implemented in a thoughtful manner, taking into account different variants of future developments.

Despite a small loss from sales generated in 2016, the hospital managed to reduce financial costs, which in just one year decreased from around PLN 275,000. to PLN 111,000. In the entire analyzed period (2009-2016) their level decreased by 73%. Thanks to positive changes in the area of operating activities and reduction of financial costs, as well as due to the settlement of EU subsidies through other operating revenues, the net financial result of the hospital increased from PLN –72.72 million to PLN 1.15 million. Thanks to this and as a result of a high positive equity value, the hospital will not have problems with obtaining external sources of debt financing in the future, which is particularly important in the perspective of reducing the possibilities of non-returnable EU subsidies in the next few years.

Summary

Despite the favorable changes introduced in the examined hospital, as well as other healthcare entities in Poland, the financial situation of many medical entities is still difficult. The changes introduced in many of them are insufficient. Sometimes, after a periodic elimination of the deficit on basic medical activity, the healthcare entity starts to generate a loss again. This is usually due to the lack of ongoing control over the generated costs. Therefore, it is not enough to carry out a one-time restructuring. It is also necessary to introduce changes in the field of operational management.

The restructuring process of a healthcare facility in a modern economy, characterized by a high volatility of political, legislative and financial conditions, cannot be a one-off activity. It is a kind of sequence of changes that enable the implementation of a bunch of operational, tactical and strategic objectives, consistent with the mission of the hospital. Therefore, apart from the achievement or

increase of the operational, investment and financial efficiency, the restructuring of medical facilities should also take into account the human aspect in the form of benefits for patients as well as medical and administrative employees. The restructuring plan should therefore take into account not only the tangible effects in the form of financial indicators, but also the human element, which may be the main accelerator or destabilizer of changes in the organization [Elarabi, Johari 2014: 18-21].

Proper coordination of activities in the personnel, financial, organizational, technical and technological areas is a guarantee of effective implementation of change strategies in the organization. Maintaining positive results of these changes enables programming and implementing in the hospital a financial controlling system that enables the transformation of basic and auxiliary activity cells as well as administrative cells into separate centers of financial responsibility. In this process, the point is that internal units performing their tasks independently do not act against the principle of self-financing of the hospital as a whole.

Internal organizational units in hospitals are divided into: primary activity cells (admission rooms, hospital wards, counseling centers, operating units, diagnostic laboratories), centers of auxiliary medical activity (e.g. sterilization, hospital pharmacy, oxygen plant, etc.), cells of non-medical auxiliary activities (e.g. laundry, maintenance and repair brigade, transport, etc.) and board cells. Many of them (branches in hospitals, clinics in academic hospitals, hospital clinics, etc.) have a large autonomy [Sobkowski, Opala 2009: 239]. Each of the listed units can be a separate center of financial responsibility. The scope of this responsibility may vary in individual centers. The point is, however, that internal units that perform their tasks independently do not act against the principle of self-financing of the plant as a whole. It is a difficult task because there is a divergence in the goals of medical activity with the economic goals that determine its development. Economic entities providing health services should at least balance the costs of revenues and not generate debt [Hass-Symoniuk (ed.) 2008: 56]. Achieving compliance between the mentioned goals is fostered, among others, by budgeting tasks for internal units of organizations providing medical services.

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Ekonomiczne uwarunkowania restrukturyzacji podmiotów leczniczych

Streszczenie. *Znacząca liczba szpitali publicznych w Polsce systematycznie wykazuje straty na podstawowej działalności leczniczej. Jest to przyczyną rosnących długów w tych szpitalach. Obecny ich poziom szacuje się na ok. miliard złotych. Redukcja tego zadłużenia nie będzie możliwa, jeżeli szpitale te nie będą pokrywały kosztów podstawowej działalności operacyjnej uzyskiwanymi przychodami. Dla osiągniecia takiego stanu konieczne jest przeprowadzenie w większości z nich głębokiej restrukturyzacji. Jej celem powinno być z jednej strony przystosowanie potencjału usługowego do zapotrzebowania, z drugiej zaś stworzenie warunków do bieżącej kontroli kosztów. Celem artykułu była ocena sytuacji finansowej jednego ze szpitali powiatowych w Polsce Wschodniej oraz wskazanie zmian w systemie zarządzania, które umożliwią racjonalizację kosztów operacyjnych.*

Słowa kluczowe: *sytuacja finansowa podmiotów leczniczych, koszty, restrukturyzacja, controlling finansowy*

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  Dyrektywa Rady 2004/67/WE z dnia 26 kwietnia 2004 r. dotycząca środków zapewniających bezpieczeństwo dostaw gazu ziemnego, Dz. Urz. UE L 127 z 29.04.2004.

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