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Table of contents

Zeszyty Naukowe Małopolskiej Wyższej Szkoły Ekonomicznej w Tarnowie
The Małopolska School of Economics in Tarnów Research Papers Collection
ISSN 1506-2635, e-ISSN 2658-1817
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Spis treści

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Foreword

This issue of the *Małopolska School of Economics in Tarnów Research Papers Collection* is devoted to important issues in the modern economy and social space. It indicates the need for state institutions and the European Union to take action to support business in the short and long term, as well as the introduction of new principles and aspects of planning, governance and spatial policy—determining real management processes based on resources, rationality and optimality—providing de facto sustainable development. A great deal of space is devoted to new organizational and legal forms of FabLab business incubators, in particular, nonprofit organizations, unions and sporting organizations. The key importance of increasing the efficiency of work management systems, work safety culture and better than ever use of innovative mobile IT technologies by older people, taking into account the principles of ergonomics, are emphasized. The texts on corporate financial management present the results of empirical research on the implementation of new instruments for measuring and recording corporate financial results in practice, and new methods of calculating and maximizing shareholder value.

The articles, which are the result of research conducted as part of basic and implementation, conceptual and empirical research, contain a lot of interesting cognitive and application-related information. The results of these studies can be used by researchers of management and social sciences, as well as by practitioners striving to ensure the development of organizations of which they are part.

The journal is the work of research and teaching staff at our Institution and other schools of higher education in the country, i.e. the Jacob of Paradies University in Gorzów Wielkopolski, the Poznań University of Economics and Business, the Cracow University of Economics, the KEN Pedagogical University of Krakow, the University of Zielona Góra and the University of Szczecin.

On behalf of the Authors, I would like to thank everyone who co-edited this issue of the journal, especially the Editors, and to thank the Reviewers who took the trouble to express their opinions on the submitted articles, and also the Editorial Team and collaborators.

Leszek Kozioł
Editor-in-Chief

ECONOMICS AND FINANCE

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COVID-19: New challenges for the Ukrainian economy

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Abstract: The article analyzes the works of economists who deal with the impact of COVID-19 on the economic development of European countries. The COVID-19 pandemic has already inflicted severe damage on the Ukrainian economy despite relatively mild public health implications so far. The authors analyzed the impact of COVID-19 on the activities of certain sectors of the Ukrainian economy, namely: catering, real estate, the judiciary and more. The direct impact of the pandemic on the economy has been channelled through stopped domestic economic activity in sectors affected by the shutdown, as well as lower demand for Ukrainian exports and lower remittances from abroad. Travel restrictions almost completely stopped local and international tourism. Second round effects stem from reduced household income, redirection of government spending and disruption of investment plans of companies, resulting in lower demand for a wide range of goods and service. For example, reduced electricity demand caused disruptions in energy system balance and lower demand for coal. "Forecast for 2020–2021" has been proposed, developed by experts on the basis of generalized consensus assumptions obtained from the results of the survey. The position of the Union of Ukrainian Entrepreneurs on reducing the tax burden on Ukrainian enterprises during the COVID-19 pandemic and the need to implement radical measures to support business has been revealed. The author has identified short- and medium-term measures that can improve the financial situation of the business after their release from quarantine. Several scenarios for overcoming the post-crisis period for the Ukrainian economy have been proposed.

Keywords: COVID-19, impact on the economic development, Ukrainian economy, sectors of the Ukrainian economy, Union of Ukrainian Entrepreneurs, financial situation

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1. Introduction

To understand how COVID-19 has affected Ukrainian exports and imports, it is necessary to turn to the gravitational model of international trade, which states that trade between two countries is directly proportional to the exporting country's production capacity and market size, and inversely proportional to trade costs necessary for the movement of goods between countries. That is why the COVID-19 pandemic has a negative impact on all three factors.

Production capacity in Ukraine has declined significantly during the quarantine period as people are becoming ill, isolating themselves at home as a precaution or at the government's request to shut down bars, restaurants, theatres, sport and music venues.

It should also be noted that further impacts on production are due to disruptions in global supply chains and shortages of intermediate products from countries affected by the pandemic. For example, between January and March 2020 many manufacturers using components from China in their production chains experienced a shortage of raw materials and supplies due to China's travel restrictions, which significantly reduced production capacity. As a result of the negative shock for supply chains, exports of goods and services are declining.

The size of the market is also affected by negative consumer expectations about future jobs and business income. Consumers are reducing and postponing the purchase of non-essential goods. Demand for luxury goods, cars, and air tickets is declining significantly, which also reduces imports of goods and services.

Trade costs are also changing as governments take measures to restrict the free movement of goods and people, including banning the export of medical equipment and restricting travel (Shepotilo, 2020).

Today, the question of the impact of COVID-19 on the economic development of entrepreneurship in the world, and in Ukraine in particular, is studied by many economists and analysts, including Gene Marx, Nuriel Rubini, Andrei Bezpyatov, Sergei Fursa, Anders Oslund, Yaroslav Zhalilo, Vasily Furman, Anatoly Amelin, and many others. However, this issue requires a comprehensive analysis and daily monitoring of the situation, which determines the relevance of the chosen topic.

For example, the economic and social consequences of COVID-19 are being studied by scientists from various aspects. In particular, R. Maistro and D. Nazarenko paid attention to Ukraine's anti-crisis strategy to overcome the negative economic consequences of quarantine. The authors note the need to develop domestic demand for domestic products, support the real sector of the economy, prevent destabilization in the financial and foreign exchange markets.

A. Oleshko, O. Rovnyagin analyzed the impact of the spread of COVID-19 on the social and economic situation in the world, summarized the measures of anti-crisis policy and provided proposals for state support for business, the population, the financial sector.

O. Moroz, studying the development of investment activity in Ukraine in the economic crisis of 2020, notes that overcoming the global economic crisis in 2020 will be carried out by countries, based on national approaches (own way), with maximum use of available resources, and protectionist and anti-globalization trends will be the opposite of the trends associated with overcoming the economic crises that occurred in previous years.

However, the research conducted by scientists, as well as ours, identifies the first problematic issues that arise in the development of the crisis caused by COVID-19.

The purpose of the research is to comprehensively analyze the sectors of the Ukrainian economy and their impact on the COVID-19; development of recommendations for mitigating the negative impact of the pandemic on economic life and development of the state.

2. Materials and methods

As a result of the coronavirus pandemic and the introduction of quarantine measures, the fall in Ukrainian GDP, according to the Ministry of Economic Development, Trade and Agriculture in the first half of 2020 was 6.5%.

According to the forecast of the National Bank of Ukraine (NBU), the fall in GDP in 2020 may be at least 6%.

At the same time, according to the IMF, the Ukrainian economy will shrink by 8.2% in 2020.

Quarantine has eroded consumer sentiment, almost halting several industries—retail, hotel and restaurant business, air transportation. The number of budget revenues decreased. As a result of the quarantine, Ukrainian companies froze investments and production chains.

Given the above negative trends, we conducted an in-depth study of the impact of COVID-19 on the economic development of Ukraine.

When writing the article, the method of analysis was used to study the impact of COVID-19 on the activities of certain sectors of the Ukrainian economy, namely: catering, the real estate market, the judicial system, etc. This made it possible to comprehensively investigate this issue in all its aspects.

Thus, the use of this method has led to the conclusion that sectors where quarantine restrictions are relaxed and which are related to consumer demand—are recovering rapidly, especially retail and services. The situation is worse with industry and investment demand.

The use of induction and deduction methods made it possible to identify short- and medium-term measures that can improve the financial situation of businesses after their quarantine and restructure, defer debts and loans from partners and financial institutions, transfer the maximum number of employees to a simplified tax system to reduce the tax burden.

The method of generalization gives a clear idea of the directions of probable changes in the development of the domestic economy under the influence of the COVID-19 epidemic. In particular, there is every reason to expect a reduction in spending on both consumption and investment in Ukraine. This will reduce the volume of construction, wholesale and retail trade, catering, passenger air transport, business areas such as tourism, hotel business and, entertainment.

Using the method of research as a synthesis makes it possible to combine the abstract aspects of the subject and reflect it as a concrete whole. In our study, this is done by presenting a forecast for 2020–2021, developed by experts based on generalized consensus assumptions. According to it, the consensus forecast envisages a reduction in consumption by 3%, imports—by 12.2%, exports—by 7.9%, industrial production—by 6.1%, agricultural—by 1.1%.

3. Results and discussion

For young economies such as Ukraine, there are additional challenges posed by financial difficulties in the global market and increased pressure on the Ukrainian hryvnia as global investors withdraw their resources in search of a safe haven. In most cases, these are government bonds of the US government and other developed countries.

It should be mentioned that Ukraine is an exporter of primary goods such as metals, and their price is likely to fall significantly due to falling demand in world markets. During the month of February 2020, the price of copper fell by 16%. Iron and steel prices have the same downward trend.

The crisis of 2009, when the fall in metal prices reached 40%, led to a decrease in Ukraine's GDP by 15%. However, COVID-19 should be expected to have a smaller impact, as lower prices for other commodities, such as food and agricultural products, are expected to be smaller, and a sharp drop in oil prices will have a positive impact on the competitiveness of Ukrainian export.

In our view, it is necessary to consider the impact of falling production and demand by 5–10% in Ukraine and its trading partners, along with an increase in trade costs by 5–10%. According to the gravitational model, this will lead to a fall in exports and imports by 15–25%, which means a decrease in exports by 7.5–12.5 billion US dollars and imports by 9–15 billion US dollars in 2020.

To prevent the negative scenario described above, governments are announcing aid packages to support financial markets, businesses, and individuals. Ukraine should include both monetary and fiscal instruments in the aid package. Unlike most countries, the National Bank of Ukraine has the opportunity to reduce the discount rate, which is currently 10%. The government must support the economy with all its might, even by increasing Ukraine's national debt. The immediate priority, of course, is adequate funding for the health care system to be prepared for this unprecedented challenge. The sooner the virus is overcome, the lesser its impact on the economy will be. The government should also consider financial incentives to support vulnerable people and businesses with temporary financial problems. An obvious source of this kind of incentive is borrowing from international financial institutions.

On the other hand, in times of crisis, international investors are fleeing emerging markets, creating a balance of payments crisis and pressure on the local currency. Ukraine should negotiate further cooperation with the IMF to stabilize its foreign exchange market and create comfortable foreign exchange reserves to be prepared for any emergencies that may arise with the evolving crisis (Shepotilo, 2020).

As noted above, a number of European countries have shown a willingness to support business, as there have long been government programmes in which the employer can save both its own financial resources and jobs by obtaining temporary unemployment funding.

As for Ukraine, in accordance with the decision of the Verkhovna Rada, which adopted the Law on Amendments to Certain Legislative Acts Aimed at Providing Social and Economic Guarantees in Connection with the Spread of Coronavirus Disease (COVID-2019):

- the employer will be paid partial unemployment benefits for workers whose working hours have been reduced as a result of quarantine. The payment provides for compensation two-thirds of the employee's salary in case of reduction or cessation of production. In this case, the amount of such assistance may not exceed the amount of the minimum wage;
- increased annual limits for individual entrepreneurs;
- temporarily, for the period of quarantine (and until the end of the month in which the quarantine ends), VAT transactions are not spread on import, supply to the territory of Ukraine of goods necessary for the implementation of measures aimed at preventing COVID-19 (medicines, medical devices, medical equipment);

– tax rebates have been introduced for some taxpayers.

Also, parliamentarians have amended the Tax Code, according to which:

– penalties are not applied for violations of tax legislation committed in the period from 1 March to 30 April 2020;
– a moratorium on documentary and factual inspections was established from 18 March to 18 May 2020;
– the deadline for submitting the annual declaration of property and income has been extended until 1 July 2020;
– it is not accrued and paid in the period from 1 March to 30 April 2020.

Thus, the Ukrainian government has eased external pressure on business by providing some benefits and discounts, as well as minimum wage compensation for employers, but this will certainly not be enough to support the viability of small and medium-sized businesses in Ukraine.

All these measures should somewhat reduce the burden on Ukrainian business, but, in our opinion, this will not significantly affect the overall decline in business activity and will not compensate for the significant loss of profits.

With the beginning of quarantine, small and medium-sized businesses in Ukraine, especially those involved in services, entertainment, and food, had to close. Some companies have still been able to move to other forms of work, but such restructuring has required significant staff reductions. At the same time, the obligations of companies to employees remain—they are obliged to pay salaries, employees cannot be fired, and it's almost unbearable to afford a vacation at their own expense—many people will live on credits and a month or two without salary may lead to losing property (Table 1).

Table 1. COVID-19 has affected the activities of certain sectors of the Ukrainian economy

Type of business activity	Influence of COVID-19 on activity
Catering	According to Poster Restaurant Automation, 2,500 Ukrainian establishments have stopped working after two weeks of the quarantine. This is 63% of all the company's customers in Ukraine. Thus, we can assume that currently there are about 30,000 such institutions in the country. Sales of catering establishments in Ukraine from March 23 to 29 decreased on average by 73% compared to the same period before quarantine. Sales have fallen sharply not only in the capital (by 78%) but also in all major regional centres. Thus, in Lviv the indicator has fallen on average by 78%, in Kharkiv—73%, in Dnipro—65%, in Odesa—60%. More than 160,000 people lost their jobs in the restaurant business. Poster themselves do not currently have 13,000 employees.
Real estate market	According to the Dobovo daily rental service, real estate rental prices have fallen about three times.
Taxi service	The number of orders for the large Bond taxi service, which operates in Kyiv and Odesa, has dropped almost threefold, according to its founder, Petro Obukhov.
Judiciary	During the quarantine in Ukraine, more than 5,000 courts were transferred. The law providing additional social and economic guarantees in connection with the spread of coronavirus provides for online meetings. However, so far the mechanics of the introduction of this practice hasn't been prescribed in detail. Now part of the court hearings are postponed indefinitely, and some cases are proposed to be considered without the participation of the parties.

S o u r c e: Author's own elaboration based on DTKT official website, 2020.

According to a survey by the Union of Ukrainian Entrepreneurs (SUP), in April 2020 almost 60% of business owners continue to operate during restrictions (mostly large and medium-sized businesses), another 29% have stopped working (typical of micro business). At the same time, 51% of enterprises can last only 1 month, and every fourth business will withstand 2 or 3 months of work in quarantine and not go bankrupt; 6% of entrepreneurs completely closed their business, mainly micro and small businesses fell into this category. Only 3% of respondents indicate that their business will be able to work for a long time under the necessary conditions (rental vacation, remote access for employees, review of the business model).

One-third of business owners (mostly micro) report a 90–100% drop in income since the start of quarantine. The same entrepreneurs have already laid off up to 50% of the staff.

Small and medium-sized business owners say that incomes have decreased by 25–50% compared to the pre-quarantine period and have already laid off 10 to 25% of employees. Losses of profits of large enterprises are 10–25%, there is a reduction in staff by 25% by the end of restrictive measures (Slovoidilo official website, 2020).

Noteworthy is a survey conducted by the European Business Association among small businesses, according to which, due to the economic consequences of the coronavirus pandemic, 18% of entrepreneurs are considering closing their own business. 78% of respondents report losses of up to 75% of income and only 4% confirm an increase in profits.

Due to the pandemic, 31% of enterprises will have to reduce the number of employees, 21% have not yet decided. At the same time, almost half—48% of surveyed entrepreneurs—do not plan any layoffs.

At the same time, if the quarantine is extended indefinitely, 47% will look for new development opportunities. At the same time, 22% of respondents will be forced to close their businesses. However, according to the EBA, due to the unpredictability of the situation in business, everything may still change (Martyniuk, 2020).

In 2020, one of the main factors influencing economic processes was the spread of the COVID-19 pandemic. In response to the COVID-19 pandemic, there have been significant changes in the lives of many countries around the world, including Ukraine.

According to the results of the first quarter, the seasonally adjusted decline in GDP to the previous quarter amounted to 0.7%, and the fall in the quarter to the corresponding quarter—1.3%. But the biggest losses the domestic economy suffered in the second quarter. According to preliminary estimates of the Ministry of Economy, the fall in GDP by the second quarter of 2019 was 11% (against the projected 14%).

According to the NBU, the index of business activity expectations in June 2020 was 45.5 points compared to 29.9 points in April 2020 (a record low) and 45.8 points in March 2020. In May we have a decrease in the depth of decline of most economic activities.

In general, during January–June among the main sectors of the economy, there was an increase in only the volume of retail trade turnover—by 3.0% (an increase of 10.5% in January–June 2019).

At the same time, other types of economic activity showed a decrease: agriculture by 18.7% (an increase of 5.8% in January–June 2019); volume of cargo turnover by 19.6% (increase by 3.4%, respectively), volume of passenger turnover by 55.9% (increase by 3.0%, respectively),

wholesale turnover by 0.5% (decrease by 0.2 %, respectively), industrial production by 8.3% (growth by 1.3%, respectively), construction by 5.5% (an increase of 25.3% in January–June 2019). As a result, the fall in GDP for the first half of the year, according to the Ministry of Economy, is 6.5% (projected at 8.1%).

The dynamics of domestic prices in 2020, despite a period of uncertainty in the mood of business entities related to quarantine, is generally lower than in recent years. Temporary decline in demand due to quarantine restrictions on economic activity (especially in trade) while maintaining the supply potential of goods and services that need relatively rapid sales mainly limited the growth of consumer prices, excluding point positions in food.

Entrepreneurs expect financial support from the state authorities in the first place. 29% of business owners believe that it should be carried out in the form of temporary exemption from taxes or at least in their significant reduction (tax holidays, temporary abolition of single social contributions, personal income tax).

At the same time, the recently adopted "anti-crisis" laws to support the economy no. 3275 and the signed no. 533-IX did not take into account the relevant business proposals.

The Union of Ukrainian Entrepreneurs called on the authorities to exempt from paying SSC and PIT by the end of the year all businesses that do not reduce staff in terms of downtime. The purpose of this initiative is not to save on the payroll, but to enable employers to keep jobs during the current crisis.

According to the survey results, Ukrainian entrepreneurs find themselves in difficult living conditions—the multiplier effect of the spread of the virus in the country under different scenarios will lead to a 4–9% drop in GDP this year due to business closures and significant staff reductions.

In this regard, in addition to the temporary abolition of SSC and PIT, the Union continues to emphasize the need for radical measures to support business:

First, it is necessary to exempt from income tax the most affected areas: cultural institutions (cinemas, etc.), tourism enterprises.

Secondly, it is necessary to allow all employers to receive partial assistance for their employees, if their time and workload are reduced, in order to prevent the spread of the pandemic.

Third, a moratorium should be introduced on all business inspections until the end of the year, so that entrepreneurs have the opportunity to recover economically from the crisis, rather than to administer (Epravda official website, 2020).

It should be noted that any crisis is an opportunity for business transformation and development. During the crisis, consumer preferences and demand will change and new niches for business will emerge. It is important not to miss such opportunities for Ukrainian entrepreneurs.

Therefore, the reaction and actions of business during the crisis must be rapid. Any plans and strategies should be constantly reviewed depending on changes in the situation. Such actions must be coordinated through the leadership of the owners or managers of the companies.

In our opinion, it is necessary to identify short- and medium-term measures that can improve the financial situation of the business after their release from quarantine.

Thus, short-term measures should include:
– reviewing the terms of payment of real estate rent by asking for a significant discount or deferral;
– reducing or sending on unpaid temporary leave non-critical staff, but at the same time guaranteeing the company's critical staff that they will be protected during the crisis. Instead of downsizing, if possible, staff can be transferred to other types of work (for example, developing new services and products in demand during the crisis or planning and preparing for the resumption of the company after the crisis) or even temporarily lending to other companies, even at a discount;
– limiting the hiring of new staff. Soon market salaries for certain professions will likely fall and many free professionals will appear on the market (SME official website, 2020);
– compensating for the cost of work of consultants who help the company to find a new business model and not to close;
– supporting for businesses that have gone online (benefits, direct assistance).

The medium-term should include the following:
– restructuring and deferring debts and loans from partners and financial institutions;
– transferring the maximum number of employees to a simplified taxation system to reduce the tax burden;
– stimulating the national localization of public procurement by making appropriate amendments to the Law of the country "On Public Procurement";
– viewing the list of objects of large and medium privatization. In times of crisis, the state does not receive an attractive price for them, it is better to repurpose them or raise funds through a concession;
– business incentives cannot be transferred exclusively to local budgets (abolition of local taxes, the abolition of excise revenues from fuel at 13.44%, etc.);
– providing a system of state guarantees for a part of the loan amount (about 80%) on loans to enterprises, limiting the concentration in "one hand" by groups;
– introducing tax holidays for small businesses to pay a single tax of 6 months;
– strengthening the control of antitrust authorities to reduce energy prices (fuel) in connection with the global fall in prices;
– stimulating the creation of industrial parks by identifying promising areas in each region and providing suitable infrastructure for state and municipal funds;
– temporarily reducing the rates of customs duties on goods that are not produced in Ukraine with an increase in real control at customs. We have to receive revenue from customs while encouraging our entrepreneurs to replace certain groups of goods;
– stimulating the transition from the export of raw materials to the export of goods with high added value—increasing foreign exchange earnings and jobs. Such measures can be implemented through tax holidays for new processing plants and government guarantees for lending to such projects;
– reducing port dues by at least 25%, open inland waterways (without additional charges) to reduce the cost of export logistics and focus on the development of logistics infrastructure;
– preserving the structure of the current state budget as much as possible and not to completely cancel development expenditures (infrastructure, entrepreneurship, etc.). In

case of the introduction of manual "stabilization" funds, their funding should be minimal. Situational use of the budget will lead to unpredictable consequences, both in terms of economic effect and in terms of corruption risks (Pavlychenko, 2020).

It should be noted that Ukrainian entrepreneurs offer their recovery strategy and "survival" tactics for small and medium-sized businesses, which includes:

– total cost optimization in everything;
– negotiations on withdrawal/ reduction of rent, deferral of loans for the quarantine period;
– retaining key employees/ teams through business reorientation and grants from one's own pockets;
– only forced partial dismissal or salary reduction;
– reorientation/ adaptation of business in new conditions (for example, catering establishments for delivery and self-pickup; event industry—online events);
– transfer of a business to online formats: management, communication with clients, advertising (Shtogrin, 2020).

Thus, it should be noted that the consequences of the coronavirus pandemic will significantly affect the economic development of the country, because the slowdown in the world economy may lead to the decline of business activity in Ukraine, which will automatically mean rising unemployment.

Among the long-term effects of the crisis on the Ukrainian economy, the National Bank of Ukraine calls for reduction in exports and reduction in the attractiveness of government debt securities. Besides, the situation will worsen with debt obligations. And in the complex—all these factors will definitely affect the depreciation of the hryvnia. The exact depth of the devaluation of the national currency can not be predicted, however, obviously, another devaluation will cause prices to rise.

The rating agency S&P Global Ratings has already reacted to the events and lowered the forecast of Ukraine's GDP growth in 2020 from 3 to 2.5%. Bank of America believes that the economy of our country in 2020 will grow by no more than 1.2%. Although in the previous forecast of BofA there was a figure of 3.5% (Ukrinform official website, 2020).

The World Bank has announced its vision of Ukraine's economic development prospects for 2020. In particular, according to his forecast, in the spring of 2020, dedicated to the coronavirus pandemic in the world, Ukraine's GDP is expected to fall by 3.5% this year. Also, World Bank experts predict an increase in inflation in Ukraine this year to 8.9% with a state budget deficit of 4.9% of GDP, a current account deficit of 2.7% of GDP, and an increase in public debt to 59% of GDP, while in 2019 this figure was 51% of GDP. These World Bank estimates are based on assumptions that the coronavirus pandemic will decline in the second half of 2020 (Kulitsky, 2020).

In turn, the IMF submits its disappointing forecasts for Ukraine, namely: in 2020, the economy is projected to fall by 7.7%. The inflation rate in 2020 in Ukraine is projected at 4.5%—with further growth to 7.2% in 2021 (Lazur, 2020).

Small and medium-sized businesses suffer large losses. First of all, the tourism industry, services, and transportation will suffer. Besides, the government has already recorded a shortfall for February–March 2020, about 20% of the planned funds from customs.

In our opinion, the most realistic forecast for the development of the Ukrainian economy is submitted by the Ministry of Economic Development, which has drawn up its consensus forecast.

It is calculated on the basis of materials provided by experts from the Ministry of Economy, NBU, institutes of NASU, Derzhzovnishinform, International Center for Policy Studies, Dragon Capital, ICU, VoxUkraine, Ukrsibbank, and others.

Experts predict that Ukraine's GDP will fall more sharply than the world—by 4.2%. At the same time, the spread of estimates is very large—from a decline of 6.6% to an increase of 1.4%. But in 2021 a gradual recovery will begin. The median forecast of experts is 2.4% (spread from 1.5% to 4.4%).

The consensus forecast envisages a reduction in consumption by 3%, imports—by 12.2%, exports—by 7.9%, industrial production—by 6.1%, agricultural—by 1.1%.

Experts forecast inflation at 7% in 2020 and 5.9% in 2021.

The average annual exchange rate is projected at 28.85 UAH vs 1 USD in 2020 and 30.00 UAH vs 1 USD in 2021 (Table 2) (LB official website, 2020).

Table 2. Forecast for 2020–2021, developed by experts on the basis of generalized consensus assumptions obtained from the results of the survey

Period / Indicator	Questionnaire (1)		Consensus forecast (2)		Government forecast (3)		IMF forecast (4)	
	2020	2021	2020	2021	2020	2021	2020	2021
GDP% real change	–4.4	2.3	–4.2	2.4	–4.8	x	–7.7	3.6
Consumer price index	–	-						
Average per year	107.1	108.6	105.8	107.7	106.8	x	104.5	107.2
December to December of previous year	110.0	107.5	107.0	105.9	111.6	x	107.7	105.9
Average exchange rate, UAH vs USD								
Average	28.5	29.0	28.85	30.0	30.0	x	x	x
At the end of the period	30.0	30.0	29.5	30.75	29.5	x	x	x
Unemployment level in % related to workforce aged 15–70	9.7	9.1	9.4	9.1	9.4	x	10.1	9.3

1—the average value of several key forecast indicators estimated by experts based on common assumptions and a single consensus scenario of economic development
2—the average value of the main forecast indicators of economic development of Ukraine, which are calculated as the median based on their assumptions and their scenario of economic development provided by respondents
3—indicators are given in the resolution of the Cabinet of Ministers of Ukraine dated by 29 March 2020 no. 253
4—https://www.imf.org/en/Publications/WEO/issues/2020/04/14/weo-april-2020

S o u r c e: LB official website, 2020.

Many other experts are pessimistic about the long-term dynamics of the Ukrainian economy. A. Ivanets, director of marketing and communications at Kreston GCG, Bank of America, said that this year's fall in Ukraine's GDP, according to his estimates, is expected at 5.6%. Analysts of Ukrainian banks are also confident that we will feel the fall in GDP in the first quarter. And although all forecasts differ from each other, in the most pessimistic scenario they come to one mark—"minus" 10% on an annualized basis. According to the American Chamber of Commerce and Industry's Economic Impact of COVID-19 on Ukraine, 65% of Ukrainian companies will not be able to meet their annual business plans (Kulitsky, 2020).

However, it is worth noting the optimistic forecast of Anders Oslund, a senior researcher at the Atlantic Council in the United States, who notes that Ukraine will be easier than most other countries to get out of the crisis. In particular, because agriculture suffers the least, and it is the main export product. Like iron ore, it sells well, but steel sells poorly. These are the three main products that Ukraine exports. Tourism in the world has stopped, but for Ukraine it is not the main thing. Ukraine quickly and early began to take measures against the spread of coronavirus—and rightly so. The country had to be closed and the situation taken under control. But there is a downside. This is finance. Ukraine is very much dependent on international funding. IMF financing is particularly important. And now, probably, there will be a cooperation agreement with the IMF, because the Verkhovna Rada has passed a "banking" law. This will mean that it will be easier for Ukraine to get out of the crisis (Lazur, 2020).

We share the opinion of Serhiy Fursa, an investment banker, a specialist in Dragon Capital's debt securities sales department, regarding two possible scenarios: an optimistic and a pessimistic one. The optimistic one implies cooperation with the IMF, however, the pessimistic says that it will not happen. These are the key differences on which everything depends. The optimistic scenario also assumes a downturn in the economy, but moderate inflation. At the same time, this scenario assumes that the economy will begin a rapid recovery in the fall. When quarantine is lifted, both the world economy and the Ukrainian economy can begin to recover in September. As a result, we get a fall in the economy somewhere at 4.5% and the hryvnia exchange rate somewhere around 30 UAH for 1 USD at the end of the year and next year, then the economy will return to growth.

If we consider the scenario without cooperation with the IMF, it assumes a much deeper economic downturn, which will not provide for recovery in the fall. Refusal to cooperate with the IMF means either default, or the same consequences as default, without the word "default", implies a deep devaluation, panic among the population, outflow of investment and very cautious attitude of all economic agents to Ukraine's prospects in the next few years (Lazur, 2020).

4. Conclusions

Thus, the presented marketing research in combination with the above information gives a clear idea of the directions of probable changes in this year's development of the domestic economy under the influence of the epidemic COVID-19.

In particular, there is every reason to expect a reduction in spending on both consumption and investment in Ukraine. This will reduce the volume of construction, wholesale and retail trade, catering, passenger air transport, business areas such as tourism, hotel business, and entertainment. Moreover, the mentioned reduction of consumer and industrial consumption will negatively affect not only the production of goods and services in Ukraine but also lead to a reduction in imports of goods and services to Ukraine, which, incidentally, is reflected in the above-mentioned government macroeconomic forecast changes to the State Budget for 2020 (Kulitsky, 2020; Ukrinform official website, 2020).

So, summarizing the information above, it should be noted that the main task of any domestic enterprise is to ensure effective and efficient management decisions and delegation of authority remotely. And in this context, a business with a strong online component will benefit those who are conservative and used to working offline.

So, today's situation, caused by the COVID-19 pandemic, is the time for a turnaround that will not only survive the crisis but also gain an advantage over competitors in the long run.

5. Limitations and suggestions for future research

In our opinion, the most realistic forecast for the development of the Ukrainian economy was voiced by the participants of the online round table in Ukrinform "Economic impact of the COVID-19 pandemic on Ukraine", based on a study by the Institute for Economic Research and Policy Consulting in cooperation with the German Economic Team, that took place on 28 May 2020. They developed three baseline scenarios of coronavirus exposure: optimistic—with a 6% drop in the economy, baseline—7%, and pessimistic—11%. Vitaliy Kravchuk, a senior fellow at the Institute for Economic Research and Policy Consulting, said that given the timely lifting of quarantine restrictions, the forecast is moving closer to an optimistic fall scenario. According to him, the biggest losses were in the transport, retail, and industry, while agriculture suffered the least.

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COVID-19: nowe wyzwania dla ukraińskiej gospodarki

Abstrakt: Artykuł analizuje prace ekonomistów zajmujących się wpływem COVID-19 na rozwój gospodarczy krajów europejskich. Pandemia COVID-19 już wyrządziła poważne szkody ukraińskiej gospodarce, pomimo stosunkowo łagodnych skutków dla zdrowia publicznego. Autorzy przeanalizowali wpływ COVID-19 na działalność niektórych sektorów ukraińskiej gospodarki, a mianowicie: gastronomii, nieruchomości, sądownictwa i innych. Bezpośredni wpływ pandemii na gospodarkę miał miejsce poprzez wstrzymanie krajowej aktywności gospodarczej w sektorach dotkniętych zamknięciem, a także niższy popyt na ukraiński eksport i niższe przekazy z zagranicy. Ograniczenia w podróżowaniu prawie całkowicie zatrzymały turystykę lokalną i międzynarodową. Efekty drugiej rundy wynikają z obniżenia dochodów gospodarstw domowych, przekierowania wydatków rządowych i zakłócenia planów inwestycyjnych przedsiębiorstw, co skutkuje niższym popytem na szeroką gamę towarów i usług. Na przykład zmniejszone zapotrzebowanie na energię elektryczną spowodowało zakłócenia w bilansie systemu energetycznego i mniejsze zapotrzebowanie na węgiel. Zaproponowano „Prognozę na lata 2020–2021", opracowaną przez ekspertów na podstawie uogólnionych zgodnych założeń uzyskanych po wypełnieniu ankiety. Ujawniono stanowisko Związku Ukraińskich Przedsiębiorców w sprawie zmniejszenia obciążeń podatkowych ukraińskich przedsiębiorstw w czasie pandemii COVID-19 i konieczności podjęcia radykalnych działań wspierających biznes. Autorzy zidentyfikowali krótko- i średnioterminowe działania, które mogą poprawić sytuację finansową firmy po zwolnieniu z kwarantanny. Zaproponowano kilka scenariuszy wyjścia z okresu pokryzysowego dla ukraińskiej gospodarki.

Słowa kluczowe: COVID-19, wpływ na rozwój gospodarczy, gospodarka Ukrainy, sektory gospodarki ukraińskiej, Związek Ukraińskich Przedsiębiorców, sytuacja finansowa

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Beta and sigma convergence of incomes of municipalities in Lubusz Voivodeship between 1999 and 2019

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Abstract: In studies on regional and local development, the subject of interest are disproportions between territorial units constituting a given municipality. Changes in these categories over time are an important quality, too. This leads to the formulation of the concepts of convergence and divergence processes in the economic development of the studied units. The object of this paper is the analysis of the occurrence of real economic convergence at the level of municipalities using the example of Lubusz Voivodeship, in which study two measures relating to their income have been applied. The one is the municipality's own income as a measure of economic activity in its area. The other one is personal income of the population as a measure of the level of its wealth. Using the Theil index and regression models, the occurrence of beta and sigma convergence phenomena in both income categories in municipalities were investigated. The analysis was conducted on the basis of data derived from the Local Data Bank of the Central Statistical Office, covering the 1999–2019 period. The results indicate that both the beta and sigma convergence phenomena do take place in the development of municipalities' own income in the analyzed period. The above regularities, due to the volatility of tendencies, cannot be stated in the case of the personal income of the population.

Keywords: local development, economic convergence, own income of municipalities, personal income of municipality population

1. Introduction

In theoretical works on the diversification of the economy in spatial terms, the concepts of regional and local development are formulated. According to Andrzej Potoczek (2003, p. 14), the term *regional economic development* is generally understood as the process that involves any change in the region. Its main expression is economic growth, i.e. increase in the production of goods and services as a result of the use of production factors (material and personal) becoming greater, and an improvement in their efficiency. In practice, quantita-

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tive changes in production in a region are often accompanied by qualitative and structural changes. The increase in the quantity and improvement in the quality of goods and services produced in the region's economy is the basis for changes in the way, level and quality of life of the population living there. Thus, economic growth influences changes in the social sphere in the region.

Jerzy J. Parysek (2001, p. 22) defines the concept of *local development* as a complex of transformations of a given area with respect to the conditions that economic entities operate in its territory and the standard of living of its inhabitants. The core issues related to the development on a local scale include: maximization of the income of the local government and its population, an increase in consumption of material goods, provisions for satisfaction of social needs of residents, improved access to service facilities of various types and an improved quality of the natural environment. The following factors of local development are brought up: the structure of economic entities, local market and internal markets, labour resources, investment opportunities, advancements of science, technology and culture, condition of municipal ownership, creativity and entrepreneurship of inhabitants, natural resources, features of the natural environment, relations between local authorities and community (Pasieczny 2008, p. 105). In Poland, it is assumed that the regional level refers to voivodeships, and the local level refers to districts and municipalities (Jankowski, 2013, p. 231).

Local and regional development are complex categories, therefore their measurement requires the use of a wide set of features—symptoms of this phenomenon—to allow for quantitative assessments of the studied areas (Grzebyk, 2017, p. 45). In comparisons of economic development across voivodeships, the gross domestic product per capita is usually used as one of the most important measures (Korenik, 2003, p. 74). Other measures of voivodeship development taken into account in the analyses are: the level of population income, unemployment rate, size of production fixed assets, indicators describing the employment structure by sectors of the economy, population density, migration balance, percentage of urban and rural population, birth rate, life expectancy, the amount of municipal, state and private investment outlays.[1]

However, in the case of municipalities, a direct use of the same set of indicators that are used to study voivodeship development is not possible (see Śleszyński, 2017). Due to the lack of data, there are no ready-made measures for the level of production, the value of fixed assets and income of the population at their level. A certain indirect solution, as assumed by Janusz Hryniewicz (1998, p. 58), is the use of the amount of their income as the core measure of the economic development of municipalities. Among their various categories, a particular attention is paid to the municipalities' own income. Pursuant to the Act on the Income of Local Government Units (Journal of Laws, 2003, no. 203, item 1966), they include: income from municipality own property, income from share in personal income tax (PIT) and legal income tax (CIT) that all constitute state revenues, income from property taxes, agricultural taxes, means of transport and other local taxes and fees. It is also assumed that the higher

[1] The GDP per capita indicator is a measure relating to the economic growth of voivodeships. Other indicators will testify to economic development in a broader sense when they illustrate—apart from an increase in the value of goods produced and services provided—favourable qualitative changes in the economy and social sphere in the individual voivodeships, too (see Parysek, 2018, p. 42).

value of municipalities' own income per capita is an indicator of greater economic activity in a given municipality.

On the other hand, Bartłomiej Kołsut and Artur Bajerski (2013) propose that as an indicator of personal income of the population there should be used wealth of municipality inhabitants. This indicator is calculated on the basis of a per capita averaged sum of two components. The first component is the revenues obtained by municipalities from the participation in personal income tax, which determine the level of income of non-agricultural population (inter alia from business activity, employment, pensions and disability pensions). The other component is the revenues to the municipality budgets from agricultural tax. Since this tax is charged depending on the acreage, type and class of agricultural land, it is assumed that it may provide grounds for estimation of income derived from agricultural activities.

Considering the fact that municipalities are diversified with respect to their development, significant disproportions in the level of income between municipalities depending on their size, administrative status or geographical location are pointed out (see Jarosiński, 2013). An important feature is also changes in the level of their differentiation over time. This leads to the formulation of the concept of municipal income convergence. In the studies concerning this issue, the term *convergence* in real (material) and nominal (financial) sense is used. The first type of convergence relates to real economic processes and means reduction in differences between the analyzed economies (Kusideł, 2013, p. 15). The other type applies to fulfilment by individual European Union countries of the conditions for joining the Euro area, defined in the Maastricht Treaty. Krzysztof Beck and Maciej Grodzicki (2014, p. 9) generally define real convergence as individuals becoming similar in terms of a given measure of economic development. Convergence in the sense of an economic phenomenon is described by him as one taking place when the differentiation in its level decreases over time. The very term of *divergence* (disparity, polarization) is an opposite phenomenon, i.e. an increase in the differentiation of the phenomenon. In line with this definition, one can also understand the convergence of income of municipalities.

More than once the phenomenon of economic convergence in real and financial terms has been studied at the level of OECD countries or regions, the European Union and Poland (Malaga, 2004; Łaźniewska, Górecki and Chmielewski, 2011; Kusideł, 2013; Beck and Grodzicki, 2014). The objective of this paper is to analyze the occurrence of the phenomenon of economic convergence in real terms at the level of municipalities, after an example of Lubusz Voivodeship, using two measures relating to their income. The first one is the municipalities' own income, which is a measure of economic activity in their area, the other is the personal income of the population, which is a measure of its wealth. Using the Theil index and regression models, the occurrence of beta and sigma convergence phenomena in both income categories in municipalities was investigated. The analysis was carried out on the basis of data obtained from the Local Data Bank of the Central Statistical Office, covering the period 1999–2019.

2. Methods of convergence research

In the literature, the methods of convergence research were presented by Robert Barro and Xavier Sala-i-Martín (1992, 1996). They distinguish between beta (β) convergence and sigma (σ) convergence. *Beta convergence* refers to a process in which areas (regions, municipalities) characterized by a lower level (in terms of GDP per capita) grow faster than rich ones. The pace of per capita income growth is inversely proportional to its initial level. This phenomenon is called a catch-up (convergence) effect. The occurrence of divergence is related to the growing divergence between these areas.

In the classical approach, the model describing the phenomenon of beta convergence of income per capita is (Łaźniewska et al., 2011, p. 69):

$$\ln\left(\frac{y_{iT}}{y_{i0}}\right) = \alpha + \beta\ln(y_{i0}) + \varepsilon_i, \tag{1}$$

where:

α, β—model parameters
y_{i0}—per capita income in the base period
y_{iT}—per capita income over the period T
ε_i—random component.

The model parameters are estimated using the method of least squares (LSM), known in econometrics. The value of the directional parameter $\beta < 0$ means the presence of convergence of the studied phenomenon. Otherwise, it is divergence that takes place.

Knowing the parameter β, the convergence coefficient λ can be determined, given as:

$$\lambda = -\frac{\ln(1+\beta)}{T}. \tag{2}$$

The λ coefficient allows to determine the speed of convergence.

The above model (1) shows a phenomenon of beta convergence of municipalities' income in the so-called absolute terms. The only variable explaining the growth rate of income per capita is its initial level. In the conditional beta convergence model, the dynamics of income growth in the analyzed areas depends, apart from their initial level, also on other socio-economic variables (Malaga, 2004, p. 26).

The concept of *sigma convergence* means that the dispersion of the analyzed indicator (income per capita) for the studied group of areas (regions, municipalities) decreases over time (see Sala-i-Martín, 1996, p. 1020). To determine whether such a tendency occurs, the standard deviation of their income in a given period is calculated (Łaźniewska et al., 2011):

$$\sigma_t = \sqrt{\frac{1}{N-1}\sum_{i=1}^{N}(y_{it} - \bar{y}_t)^2}, \tag{3}$$

where:

$\bar{y}_t$—arithmetic mean of income per capita in the period t.

In practice, the classical or weighted coefficient of variation is also used to test sigma convergence (Kusideł, 2013, p. 54). Another interesting measure of differentiation is the Henri Theil index. When the income of municipalities is considered, it is expressed as follows:

$$T_t = \sum_{i=1}^{N} \frac{y_{it}}{Y_t} \ln \left(\frac{\frac{y_{it}}{Y_t}}{\frac{p_{it}}{P_t}} \right), \tag{4}$$

where:

y_{it}/Y_t—share of the municipality's income i in the value of the region Y's income over the period t
p_{it}/P_t—share of the municipality's population i in the total population P of the region over the period t.

The Theil index is a normalized measure with values in the range [0; +∞). The value of zero means no differentiation of the examined feature (uniform distribution). Higher index values mean higher levels of inequality between objects.[2]

The sigma convergence analysis can be supplemented with the determination of the trend function determining the continuity of changes in the applied measure of income dispersion over time (Kusideł, 2013, p. 63). With this function, conclusion can be drawn up whether the decline in the differentiation is systematic or not over the period considered. The basis for inference was the negative and statistically significant value of the trend direction parameter.

It is also pointed out that there are specific relationships between both types of convergence (Sala-i-Martín, 1996). Beta convergence is necessary but not sufficient for sigma convergence to occur. This means that beta convergence can occur without sigma convergence, i.e. if income differentiation is kept constant. In some cases, it may even be accompanied by sigma divergence, manifested by an increase in their diversity. Such a situation may take place when initially the "worse-off" economy will show a "so fast" rate of income growth compared to the "better-off" economy that it will overtake it "that much" that the existing difference between them will increase.

3. Convergence of municipalities' own income in the region

Lubusz Voivodeship is one of the smallest voivodeships in Poland, if both territory and population size are taken into account. The area of the region located at the western border of the country is 13,988 square kilometres. According to the 2019 data, the voivodeship is inhabited by 1,011,592 people (GUS, 2020). Out of the total population, 64.9% are urban while the remaining 35.1% are rural. The value of the gross domestic product generated in the region amounts to PLN 49,071 million, which constitutes 2.1% of Poland's GDP. Calculated per capita, it gives 48.44 thousand PLN and the 9th place out of all 16 Poland's voivodeships.

The region has two capitals, Zielona Góra (the seat of the voivodeship diet) and Gorzów Wielkopolski (the seat of the voivodeship governor). The territorial division of the region includes: 12 districts, 2 cities with district rights (its capitals) and 82 municipalities. The total number of municipalities in the region consists of: 9 urban municipalities, 34 urban-rural municipalities and 39 rural municipalities. The least populated municipality in the region is Wymiarki (rural), with 2263 inhabitants. The municipality of Zielona Góra is the most populous with 141,222 inhabitants.

There is a significant diversification among the municipalities' own income, the level of which can be treated as a measure of economic activity in their area. Their amount per capita in nominal terms for the years 1999 and 2019 is presented in Table 1.[3]

[2] The Theil index, for example, is used by the OECD to study inequality across countries (see OECD, 2018).

[3] In the years 1999–2014, 83 municipalities functioned within the administrative division of Lubusz Voivodeship. However, since 2015, the voivodeship has counted 82 municipalities. The change in the number

Table 1. Own income per capita in Lubusz Voivodeship municipalities in 1999 and 2019

1999			2019		
Pos.	Municipality	Own income (in PLN)	Pos.	Municipality	Own income (in PLN)
1.	Łęknica	3876.55	1.	Łęknica	3895.93
2.	Lubniewice	1710.10	2.	Zielona Góra	3834.01
3.	Słubice	1144.62	3.	Bobrowice	3669.35
4.	Przewóz	1003.21	4.	Kostrzyn nad Odrą	3486.87
5.	Zielona Góra (urban)	920.16	5.	Słubice	3445.17
83.	Bytom Odrzański	327.71	82.	Siedlisko	1307.53

S o u r c e: Author's own elaboration based on GUS, 2020.

Both the data for 1999 and 2019 indicate that the municipality of Łęknica (urban) is the wealthiest municipality in terms of its own income in the region. The income of this municipality per capita in 2019 amounted to PLN 3895.93. The poorest municipality in this respect is the municipality of Siedlisko (rural). The level of own income in this municipality is only PLN 1307.53. The dynamics of changes in municipalities' own income between 1999 and 2019 was different. They grew fastest in the Trzebiechów (rural) municipality. Own income per capita in this municipality increased on average by 11.1% annually. The lowest dynamics is observed in the Łęknica municipality, where the growth rate of own income did not exceed 0.025%. Hence, in 2019 the disproportions in the level of this income category between it and other municipalities, including urban-rural and rural ones, showing a higher growth rate than it, decreased.

The Theil index was used to assess the sigma convergence of municipalities' own income in 1999–2019. Changes in the index value are illustrated in Figure 1.

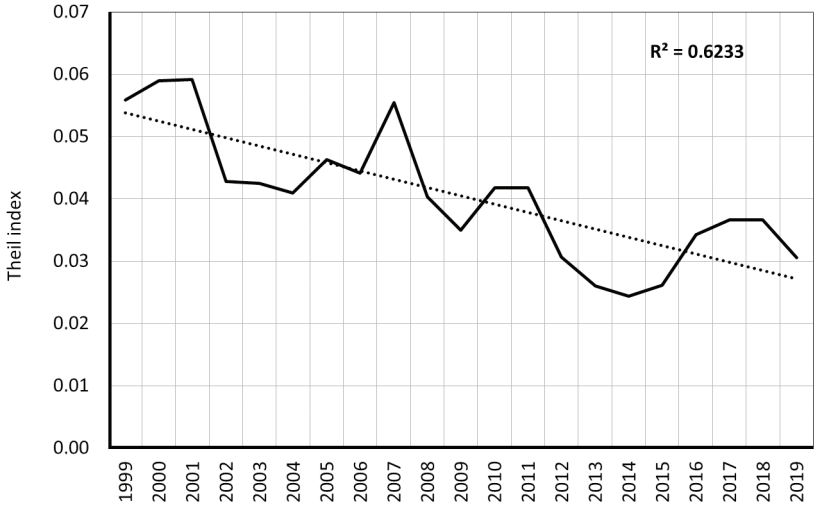

Figure 1. Sigma convergence of own income in Lubusz Voivodeship municipalities between 1999 and 2019

S o u r c e: Author's own elaboration.

of municipalities in the region is connected with the decision by the Council of Ministers of 29 July 2014 which merged the city of Zielona Góra and the surrounding rural municipality of Zielona Góra.

Although there were some fluctuations in the level of the Theil index in the analyzed period, it can be noticed that its values generally show a downward trend. The index value decreased from 0.0559 in 1999 to 0.0306 in 2019. The estimated trend function of the Theil index takes the form:

$$\hat{T}_t = 0.0551 - 0.0013 \cdot t\,, R^2 = 0.6233.$$

A negative value of the trend directional parameter indicates the presence of sigma convergence of municipalities' own income. The Theil index is decreasing by an average of 0.0013 per year. This conclusion is confirmed by the value of t-Student statistic. It amounted to –5.60, which proves the significance of that parameter defining this tendency.[4] The above function explains 62.33% of the development of the applied income inequality measure in the analyzed period.

The phenomenon of beta convergence of municipalities' own income per capita in the region is also visible. This phenomenon is illustrated in Figure 2.

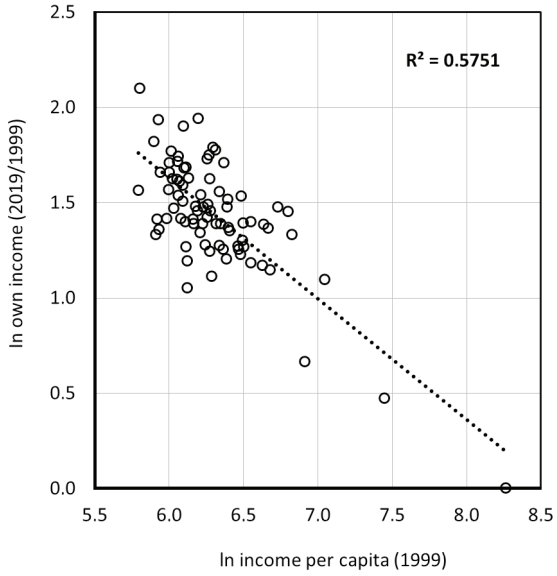

Figure 2. Beta convergence of own income in Lubusz Voivodeship municipalities between 1999 and 2019

S o u r c e: Author's own elaboration.

The chart shows a negative correlation between the initial level of municipalities own income in 1999 and their growth rate in 1999–2019. The regression function that describes this is as follows:

[4] The formally verified hypothesis has the form of $\beta = 0$, while the opposite hypothesis being its negation is formulated as $\beta \neq 0$. That the parameter is significant, is confirmed once the calculated value of the t-Student statistics has been compared with the critical value obtained from the distribution table for a given significance level and n-2 degrees of freedom. In practical terms, a given parameter is assumed to be significant, if the absolute value of the test statistic is greater than 2 (see Hozer [ed.], 1997, p. 168).

$$\ln\left(\frac{\hat{y}_{iT}}{y_{i0}}\right) = 5.434 - 0.634 \cdot \ln(y_{i0}), R^2 = 0.5751.$$

This function turns out to be fairly well fitted to the empirical data. The measure of fit R^2 takes the value of 57.51%. The β directional parameter is important in light of the t-Student statistic, which amounted to –10.41. After appropriate calculations, the coefficient λ takes the value of 0.0478. This means that the differences in municipalities' own income decrease at an average rate of 4.78% annually. Therefore, it can be estimated that the time needed to reduce the distance between them by half is about 14.5 years.[5]

4. Convergence of personal income of the population of municipalities in the region

The other category describing the diversification of the economic situation in the municipalities of the region is the personal income of the population. This indicator was determined as the sum of the municipalities' income per capita from their share in the income tax on natural persons and from the agricultural tax. Data on their value in nominal terms in 1999 and 2019 are presented in Table 2.

Table 2. Personal income per capita in Lubusz Voivodeship municipalities in 1999 and 2019

1999			2019		
Pos.	Municipality	Personal income (in PLN)	Pos.	Municipality	Personal income (in PLN)
1.	Zielona Góra (urban)	298.76	1.	Zielona Góra	1972.88
2.	Szczaniec	271.96	2.	Kłodawa	1842.47
3.	Brody	259.65	3.	Świdnica	1435.74
4.	Gorzów Wlkp.	252.70	4.	Gorzów Wlkp.	1337.87
5.	Świebodzin	245.66	5.	Kostrzyn nad Odrą	1175.05
83.	Łęknica	135.83	82.	Kolsko	516.04

S o u r c e: Author's own elaboration based on BDL GUS, 2020.

If both years are juxtaposed, the highest value of personal income of the population is characteristic of the Zielona Góra municipality. In 2019, the rate in this municipality reached 1972.88 PLN per capita. The rural municipality of Kolsko is the poorest in terms of income of residents. The value of personal income per capita in this municipality is 516.04 PLN. At the same time, the growth rate of the population's income was different in individual municipalities in the analyzed period. Their greatest dynamics is recorded in the Kłodawa (rural) municipality. The average annual growth rate of the analyzed income category in nominal terms in this municipality amounted to 11.6%. The personal income of the population in another rural municipality—Brody—was growing most slowly. Their average growth rate was only 5.53%. Hence, the municipality fell from the 3rd place in 1999 to the 51st place in 2019. In turn, in some municipalities there is a situation of low growth dynamics with a simultaneous low level of income of the population. This

[5] This time is determined by the so-called half-life factor. There is a relation between the speed of convergence and this coefficient: $hl = \ln 2/\lambda$ (see Łaźniewska et al., 2011, p. 70).

concerns such urban-rural and rural municipalities as: Trzebiel (5.80%), Kolsko (6.31%), Iłowa (6.66%), Małomice (6.66%), Krzeszyce (6.79%) and Bojadła (6.93%).

Changes in the inequality of personal income of the population of municipalities measured with the Theil index in 1999–2019 are presented in Figure 3.

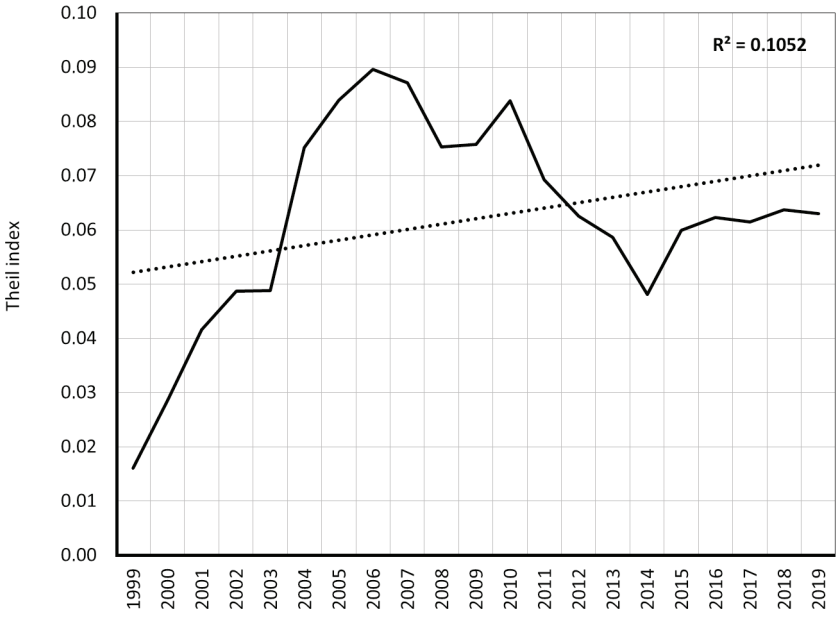

Figure 3. Sigma convergence of population income in Lubusz Voivodeship municipalities between 1999 and 2019

S o u r c e: Author's own elaboration.

The course of the Theil index value does not indicate a clear trend of changes in the differentiation of personal income of the population in the region. It should be stated that although the value of the index increased from 0.0161 in 1999 to 0.0630 in 2019, the current trend is non-linear. In this case, the use of a linear function does not give satisfactory results.[6] Therefore, for the purposes of further analysis, more homogeneous sub-periods in the development of the phenomenon were distinguished. Based on the chart observations, the division into three sub-periods was adopted, i.e. the years 1999–2005, 2006–2012 and 2013–2019.

The trend functions for particular years take the form:

– 1999–2005: $\hat{T}_t = 0.0056 + 0.0108 \cdot t\,, R^2 = 0.9534$
– 2006–2012: $\hat{T}_t = 0.0931 - 0.0039 \cdot t\,, R^2 = 0.7251$
– 2013–2019: $\hat{T}_t = 0.0536 + 0.0015 \cdot t\,, R^2 = 0.3789$.

The results show a high variability of trends in the shaping of the differentiation of personal income of the population in particular sub-periods. In the years 1999–2005 the phenomenon of sigma divergence was visible, which meant an increase in the differentiation of personal income of the population of municipalities. In 2006–2012, the trend is opposite. There is

[6] The directional parameter of the trend was 0.0009 with the t-Student statistic of 1.42. The measure of fit R^2 was only 0.1052.

sigma convergence, i.e. a decrease in the differentiation of this income category across municipalities. The value of the directional parameter –0.0039 indicates, however, that the decline in the index level was slower in this case than its previous increase, reaching an average of 0.0108 per year in the first period. The above conclusions can be confirmed by testing both directional parameters of the trend. The t-Student statistics for them are 10.11 and –3.64, respectively. For the 2013–2019 sub-period, this statistic, assuming the value of 1.74, is in turn irrelevant. Thus, despite the fact that the directional parameter is 0.0015, it means that there is no significant tendency in the shaping of the analyzed category in the last period.

The occurrence of beta convergence of personal income of the population in the three distinguished sub-periods was also analyzed.[7] An illustration of the obtained results is shown in Figure 4.

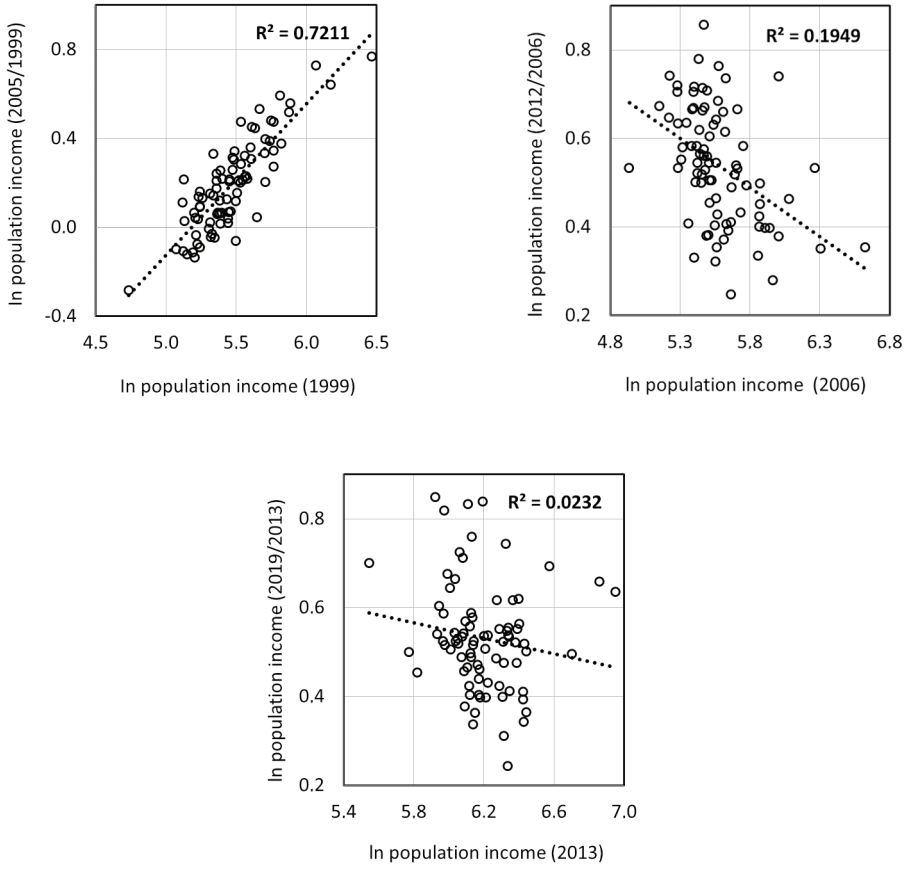

Figure 4. Beta convergence of population income in municipalities between 1999 and 2005, 2006 and 2012, 2013 and 2019

S o u r c e: Author's own elaboration.

[7] There were also no statistically significant results that could confirm the beta convergence of this income category for the entire 1999–2019 period.

As it can be seen in the scatter diagrams of dependencies, each of the sub-periods is different. The regression function estimates for each of them are as follows:

– 1999–2005: $\ln\left(\frac{\hat{y}_{iT}}{y_{i0}}\right) = -3.539 + 0.683 \cdot \ln(y_{i0}), R^2 = 0.7211$

– 2006–2012: $\ln\left(\frac{\hat{y}_{iT}}{y_{i0}}\right) = 1.777 - 0.222 \cdot \ln(y_{i0}), R^2 = 0.1949$

– 2013–2019: $\ln\left(\frac{\hat{y}_{iT}}{y_{i0}}\right) = 1.068 - 0.087 \cdot \ln(y_{i0}), R^2 = 0.0232.$

In the years 1999–2005 the phenomenon of beta divergence of personal income of the population of municipalities takes place. The directional parameter β for this sub-period is 0.683 and the t-Student statistic calculated for it is 14.47. The λ coefficient indicates that the pace of changes is negative, reaching an annual average of 7.44%. This means that inequality is increasing at this pace. In the years 2006–2012 the tendency is opposite, there is a beta convergence of personal income in municipalities. The directional parameter β is –0.222 and the value of the test statistic is –4.43. This phenomenon can therefore also be statistically confirmed. The average annual speed of convergence λ for this sub-period is positive and amounts to 3.59%. In the next sub-period, although there is also a negative value of the β parameter, it is –0.087 and the speed of convergence λ reaches 1.30%, which could indicate a continuation of the phenomenon, it turns out to be statistically insignificant, though. In this case, the value of the t-statistic is only –1.38. Much better for the first two sub-periods is also the fit of the estimated regression functions to the empirical data. For them it amounts to 72.11% and 19.49%, respectively, while for the third one it is only 2.32%.

It seems that the occurring variability of beta and sigma convergences of income of the population of municipalities in the region could have been influenced by many factors. Changes in employment in agriculture in rural and urban-rural municipalities could also be significant. Another factor could be that economic zones set up in some urban and urban-rural municipalities needed commuting to and fro. Residential migration of the population from urban municipalities to the surrounding rural municipalities could also likewise be attributable. Each of these factors could bring about changes in the dynamics of the income growth of the population of the surveyed municipalities in particular sub-periods.

5. Conclusion

The conducted analysis allows for the formulation of several conclusions concerning the shaping of the inequality of two important categories of the development of municipalities in Lubusz Voivodeship. The first is the municipalities' own income per capita, which is a measure of economic activity in their area. The results in that aspect indicate that in the years 1999–2019 there is both beta and sigma convergence of this income category. To put it another way, "better-off" municipalities are being caught up by "worse-off" ones in terms of their own income, and, mutatis mutandis, the general level of disproportions between them is decreasing.

However, the above effects cannot be come across in the case of changes in the differentiation of personal income of the population of municipalities. Generally, in the entire analyzed period, changes in the inequality of distribution of this income category are of a non-linear nature, and they take on different courses in individual sub-periods. Between 1999 and 2005, there is beta and sigma divergence in this income category, signifying an increasing level of inequal-

ity. In the 2006–2012 sub-period, their beta and sigma convergence takes place, i.e. a decrease in the level of inequality. In 2013–2019, the results indicate no significant trends in changes in the level of inequality in this income category in municipalities. In the context of the regional policy pursued in the voivodeship governorship, it would be recommended that the reasons for this state of affairs be considered. In this case, factors that could stimulate the process of personal income growth of the population of poorer municipalities should be subject to scouting out. These issues, however, require separate and more in-depth research going beyond the scope of this paper.

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Konwergencja typu beta i sigma dochodów gmin województwa lubuskiego w latach 1999–2019

Abstrakt: W studiach nad rozwojem regionalnym i lokalnym przedmiotem zainteresowania są dysproporcje między tworzącymi daną zbiorowość jednostkami terytorialnymi. Ważną cechą są również zachodzące zmiany tych kategorii w czasie. Prowadzi to do sformułowania pojęć procesów konwergencji i dywergencji rozwoju gospodarczego badanych jednostek. Celem artykułu jest dokonanie na przykładzie województwa lubuskiego analizy występowania realnej konwergencji gospodarczej na poziomie gmin z wykorzystaniem dwóch mierników odnoszących się do ich dochodów. Pierwszym są dochody własne gmin, jako miernik aktywności gospodarczej na ich obszarze. Drugim – dochody osobiste ludności, jako miernik poziomu jej zamożności. Przy użyciu indeksu Theila i modeli regresji zbadano występowanie zjawisk konwergencji typu beta i sigma obu kategorii dochodów w gminach. Analizę przeprowadzono na podstawie danych z Banku Danych Lokalnych GUS, obejmując nią okres 1999–2019. Wyniki wskazują, że w zakresie kształtowania się dochodów własnych gmin w badanym okresie ma miejsce zarówno zjawisko konwergencji typu beta, jak i sigma. Powyższych prawidłowości, ze względu na zmienność tendencji, nie można jednak stwierdzić w przypadku kształtowania się dochodów osobistych ludności.

Słowa kluczowe: rozwój lokalny, konwergencja gospodarcza, dochody własne gmin, dochody osobiste ludności gmin

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Relationship between sport and financial performance in top European football clubs

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Abstract: The Champions League has been the most elite football competition in Europe for several decades. Achieving sports successes makes it much easier for football clubs participating in the Champions League games to have very good financial results, which allow them to spend significant amounts on the purchase of players and their salaries. The total market value of the players in some teams exceeded 1 billion EUR in the 2018/2019 season. In the article the relationship between financial results and sports results in national and international competitions in the seasons 2014/2015–2018/2019 is verified. The efficiency of the football clubs under investigation is verified using a model developed by the author of the article. In addition, dynamics of changes in profits, expenditure on salaries and operating activities as well as the market value of selected European football clubs is presented. The results of the analysis allow to identify football clubs whose activities are characterized by the highest efficiency. Both the market value of the players and the expenses on their salaries have a significant, positive impact on sports performance. However, among the leading European football clubs one can distinguish those that functioned much more effectively than their competitors. Sports successes contribute to increasing the market value of players, but also involve the need to allocate larger amounts to players' wages.

Keywords: financial result, operating costs, market value, wages costs, sport results

1. Introduction

International football competitions have taken place in Europe for several decades. Participants of the competitions have been the best teams representing national football leagues. In the recent years, teams from Spain, the UK, Italy and Germany have had the strongest position on the European market. Representatives of these countries have dominated the games of the Champions League and the European League—two currently played international football competitions in Europe. Along with the growing popularity of the games, many scientific studies have been carried out regarding leading European football clubs.

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The article aims to determine the mutual relations between investment expenditure and financial and sports results in football clubs, to prioritize the factors that determine the sports and financial result, and to indicate football clubs with the best relationship between investment outlays and outcomes.

The research has allowed to determine which clubs made the best use of these resources compared to competitors with similar financial possibilities. Based on the analysis of the cited literature on financial and sports performance, the following hypotheses were formulated:

H1: Increase in investment outlays contributes to the improvement of sports results in national and international competitions.

H2: Football clubs that achieve the best sports results are also characterized by the highest effectiveness (the best ability to transform investment outlays into financial and sports results).

H3: Greater financial possibilities of some football clubs may be offset by better use of available resources and application of the appropriate business model by their market competitors.

2. Literature review

The most common method for analyzing data related to the functioning of football clubs is Data Envelopment Analysis (DEA). DEA is a non-parametric method. It enables to test the effectiveness of results depending on incurred inputs. In other words, it measures the effectiveness of converting inputs into results. In DEA, efficiency is defined as the quotient of the sum of weighted effects and the sum of weighted inputs. It is based on linear programming and used to measure the relative effectiveness of the tested objects in a situation where, due to the existence of many inputs and many effects, the measurement of effectiveness is difficult. The comparative measure in this method is the difference in effectiveness, because measuring effectiveness consists in determining the distance between given points and the borderline productivity.

Other methods used in the analysis of this topic include linear regression analysis, factor analysis, logistic regression, and stochastic methods. Most of the analyses cover one of the markets representing the leading European football leagues. Examples of the use of these methods will be presented in more detail in this article. Below there is a review of studies on the relationship between sports and financial results in football and business strategies adopted by football clubs.

Based on DEA, Kulikova and Goshunova (2013) showed that the sports performance of English football clubs mainly depended on the skills of players and coaches and their wages. The efficiency of the French league football clubs, in turn, was verified by Jardin (2009), who, using DEA, examined the dynamics of changes in the effectiveness of clubs playing in Ligue 1. In his analysis, the clubs that had scored the most points in league games or generated the highest income were not recognized as most effective due to overinvestment. The analysis showed that generally, clubs in the French league should be considered effective, but at the same time indicated deterioration in the external conditions in which they had to operate. Halkos and Tzeremes (2013) took into account the number of cups won by clubs to measure their sports efficiency. They used DEA to analyze 25 European 2008–2011 taking revenues, operating costs and the share of loans in the club's total liabilities as input vari-

ables. Their analysis shows that the effectiveness of sports results is not the outcome of high revenues or the value of other financial indicators. García-Sanchez (2007) analyzed clubs from the Spanish league using DEA, thus verifying the effectiveness of the clubs appearing in La Liga in the 2004/2005 season. According to this study, getting a high number of points was largely dependent on the defense and attack performance, which in turn depended on the value of the players and size of the team squad.

A statistically significant relation between sports results, players' salary costs and their value was demonstrated by Carmichael, McHale and Dennis (2011), who created a unique indicator of sports efficiency. The indicator was based on the share of points obtained by the team in league games in the total number of points scored by all teams that participated in the competition. The purpose of their research was to reflect the club's competitive advantage as participation in sporting successes. The DEA method used to analyze the efficiency of English clubs brought two different results in the studies of Guzmon and Morrow (2009) and Haas (2003). Both works used the same variables—the cost of wages for footballers and coaches. In the former study, a 20% reduction in wage expenditure led to an increase in sports efficiency. The latter study indicated that an improvement in sports efficiency required not only a reduction in the salaries for players and coaches, but also an increase in the number of points scored in league games. Solberg and Haugen (2009) analyzed the reasons for the low profits made by football clubs despite high revenues: they concluded that in the fight for talented young players European clubs should adopt a more aggressive strategy and spend more money on buying them than clubs on other continents. Advancing to European cups or struggling to avoid a decline led to a push-out effect. Using game theory, they illustrated the mechanisms that led European clubs to spend more money than their budgets allowed.

The DEA model was further developed by Pyatunin et al. (2016) in their article "The economic efficiency of European football clubs—Data Envelopment Analysis (DEA) approach". The authors added two additional models: DEA super efficiency and DEA cross efficiency. The authors took into account clubs from the leading leagues and analyzed both the factors influencing sports and financial efficiency. The results of the research carried out on 48 European clubs showed that both methods can be successfully used to measure the effectiveness of football clubs and to verify what factors affect their effectiveness. Clubs that were among the leading sports clubs were characterized by lower effectiveness due to the large difference in expenditure between them and other clubs. In order to be effective, clubs must combine good financial results with successes in national and international competitions.

The relationship between profitability and football results of European clubs was also investigated by Sánchez, Barajas and Sánchez-Fernánadez (2020). The authors note the emergence of a group of investors who allocate assets both in America and Europe. In previous studies, profitability was not considered the goal of operating in European clubs, but only in American clubs. The article found a negative correlation between financial and sports performance and no impact of sports performance on profitability. So club owners do not have to focus on sports performance and instead pay more attention to maximizing financial performance. Moreover, the authors note that ownership concentration has a negative impact on both sports and financial performance.

There are also studies in the literature on the impact of stock exchange on the finances of football clubs. Thus, Baur and McKeating (2009) analyze the financial results of football clubs that were going through the first public offer. The conclusions of the study were similar to most literature on corporate finance, which indicates that the price of their shares is lower than that for similar companies in the medium term. Football clubs usually had worse financial results after the commencement of trading on the stock exchange. Tiscini and Dello-Strologo (2016) pointed out that the value of a football club could not be estimated on the basis of expected financial results alone. It was necessary to take into account also the general benefits for shareholders represented by private control benefits and socio-emotional benefits.

Conclusions about the relationship between the costs of wages for players and coaches and the revenues and sports successes of football clubs were also drawn by Kern and Süssmuth (2009), who verified the relationship between financial and sports results in German clubs. The Bundesliga was also a source of effectiveness research for Beck and Meyer (2012), who used the difference between goals scored by the home team and goals scored by the guests. Based on over 3,000 matches played in Germany, the authors showed that the ability to achieve satisfactory sport results depended mainly on the individual skills of players, their nationality, age and experience. Frick and Simmons (2007), based on the analysis of the number of points scored by 39 Bundesliga clubs in 1981–2003, showed that trainers' salary influenced the sports results achieved by football clubs. According to these authors, the footballing skills of the players in the team were crucial for the success of German clubs, both sports and financial. Different conclusions were reached by McNamara, Peck and Sasson (2011): based on the example of testing English clubs over a 12-year period, they determined that the managers' ability to assess the potential of players and create a well-functioning team is very important. However, it is also important to remember the importance of the sports potential of players whose skills play a vital role in the manager's work to improve the team's performance.

Barajas, Fernández-Jardón and Crolley (2007) created a composite index (IND), which reflected the structure of revenues of Spanish football clubs on the basis of results in various sports competitions. The authors proved a high correlation between sports revenues and salary costs in Spanish clubs in 1998–2002. In the period they analyzed, salary costs increased up to 70% of the club's total revenues, making Spanish football clubs' profits relatively low. In general, they recognized that financial results did not have a significant impact on sports performance.

DEA was also used to estimate the efficiency of football clubs from other parts of the world. Thus, Soleimani-Damaneh, Hamidi and Sajadi (2011) verified the efficiency of football clubs in Iran. They showed a significant positive correlation between sports performance and the salaries of players and coaches. However, too high salary increases contributed to a reduction of clubs' efficiency.

Previous studies used other methods to analyze the effectiveness of football clubs. McNamara et al. (2011), using the linear regression model, analyzed the clubs' sports results depending on the adopted business model. They noticed that personal stabilization translated into better financial results. Barajas, Fernández-Jardón and Crolley (2007), thanks to the use of linear regression, noticed a high correlation between revenues and sports results of Spanish clubs. Sánchez, Barajas and Sánchez-Fernández (2020), based on linear regression analysis, noticed

that financial results had a negative impact on the sports performance of clubs, while sports performance did not harm profitability. Also, ownership concentration had a negative influence on financial and sports performance. These findings showed that the pursuit of sports success might not affect the profitability and sustainability of clubs. Therefore, investors could focus less on sports performance and more on maximizing financial return on investment. Samagaio, Couto and Caiado (2009) used factor analysis to study the financial situation of English clubs. They noted that a strong correlation between financial and sports performance made managers strive to maximize sports performance at the expense of financial performance, regardless of the ownership structure in the club. On top of this, financial and sports performance correlated with returns on equity but not with risk. Barajas and Rodríguez (2010) used logistic regression to study the financial situation of Spanish clubs. A large part of the analyzed clubs recorded operating losses and the debt exceeded revenues in most cases. The clubs were characterized by low debt repayment capacity and by ineffectiveness in terms of spending on the purchase of new players. An important factor to avoid insolvency is to stay in the top division. Frick and Simmons (2007) used stochastic methods to analyze German clubs and showed that the coaches' salaries affected the sports performance of football clubs. The football skills of players were key to the success of German clubs, both in terms of sports and finance.

The above studies mainly analyzed the relationship between sports results of football clubs and various factors that may influence them. An important goal of football clubs, however, is also to maximize the market value of players and optimize the cost of their wages in relation to their sports achievements. Obviously, the hierarchy of importance of individual goals varies depending on the financial and sports position of a given club. For some clubs analyzed below, player sales are only a tool to achieve the goal of meeting financial fair play requirements. In many cases, the sale of players is dictated only by sports reasons, such as the inability to play in the first team. On the other hand, most of the clubs in the less prosperous leagues sell the best players, hoping to achieve high profits that are necessary for their continued functioning. The negative effects of the arms race of the best football clubs, based on the example of Spanish teams, were presented by Barajas and Rodríguez (2010), who pointed out that in 2009, 9 teams were technically insolvent and were under the supervision of the league, which was due to their excessive spending allocated to new players.

In most cases, the market value of players is correlated with their wages. Acquiring a highly valued player involves both the need to pay a high amount for the transfer of a player and a high salary. The club therefore incurs two types of expenses: the cost of buying a player and his earnings. In some cases, however, clubs acquire a player for free, despite the fact that he presents a very good sports level, e.g. in the case of a short contract with another club, or pay a low amount, e.g. in the case of an advanced age of the player.

Based on the analysis of the literature and knowledge about the functioning of football clubs, 4 variables have been selected as inputs and 4 variables that characterize the effects of the activities of a football club have been identified as results. Thus, the inputs include:

- expenses on players' salaries;
- expenses on club operating activities (operating costs);
- expenses on transfers (net);
- market value of footballers.

The results include:
– weighted number of points scored in league games;
– club market value;
– financial profit generated by the football club in a given season;
– number of points scored in the UEFA ranking.

3. Research procedure

The sources of data subjected of the analysis are as follows: the specialized football portal www.transfermarkt.de, industry rankings provided by professional audit companies: Deloitte and KPMG, and the official website of the European football federation www.uefa.com. The analysis covers 20 clubs that achieved the highest revenues in the 2018/2019 season.

The analysis includes the following stages:
– presentation of financial and sport results of football clubs;
– calculation of performance indicators;
– determining a collective efficiency indicator for each of the analyzed clubs;
– developing a ranking based on the value of the performance indicator.

The basis for the assessment of each club will be the efficiency coefficient, which consists of the values of financial and sports variables in the analyzed period. The efficiency coefficient was calculated for each of the analyzed clubs.

Formula 1. The efficiency coefficient of the football club

$$w_e = \sum_{i=1}^{n} y_i - \sum_{i=1}^{n} x_i$$

where:
$\sum_{i=1}^{n} xi$—total standardized inputs: wages costs (*x1*), operation costs (*x2*), expenses for transfers (*x3*) and market value of players (*x4*)
$\sum_{i=1}^{n} yi$—total standardized effects: points in domestic leagues (*y1*), market value (*y2*), operation profit (*y3*) points scored in UEFA ranking (*y4*).

Weights of individual inputs are consistent with the share of individual categories of expenses in the total amount of club expenses. They are based on the summed values of the variables for all clubs included in the analysis. The higher the value of the above indicator, the greater the club's ability to transform outlays into effects, and therefore the more effective is the club's functioning. Thus, the significance of individual financial categories for the results of the conducted analysis is similar to the significance of these factors for the overall financial situation of a football club. The effects weights are the same for all variables. The target values of the efficiency indicator were determined on the basis of standardized variables. It enables to compare variables that are not expressed in the same units, including league points and UEFA rankings and financial profit expressed in millions of euros. Due to the short period of analysis and the relative stability of money in the analyzed period, the research results were presented in current prices. Standardized values of variables were determined on the basis of the following formula:

$$Z_i = \frac{x_i - \overline{x_n}}{Sx_n}$$

where:
Z_i—standardized value of variable
x_i—the value of the variable for a club
$\overline{x_n}$—average value of the variable for all analyzed clubs
Sx_n—standard deviation of the variable for all analyzed clubs.

Stage 1: input variables

Table 1 presents expenditure on wages in leading European football clubs in the 2014/2015–2018/2019 seasons, expressed in millions of euros. Expenses allocated for this purpose regularly increased—in the 2014/2015 season the average among the analyzed clubs was 177.57 million EUR, and in the 2018/2019 season as much as 234.85 million EUR. In each of the analyzed seasons, FC Barcelona allocated the largest amount to players' salaries.

Table 1. Wages costs in European football clubs (*x1*) from season 2014/2015 to 2018/2019 (in millions of euros)

Team/ year	2014/2015	2015/2016	2016/2017	2017/2018	2018/2019
Real Madrid	254	271	321	344	327
Atletico Madrid	72	84	134	174	176
Bayern Munich	264	287	289	296	324
FC Barcelona	304	320	339	394	421
Juventus Turin	198.4	221.5	261.8	259	327.8
Tottenham	141.23	139.83	147.84	166.55	186.32
PSG	212	224	216	247	264
Manchester City	255.04	264.16	307.21	292.97	304.68
Arsenal London	252.99	261.23	231.92	270.89	225.12
Borussia Dortmund	147	158	174	178	194
Liverpool	219.21	279.42	242.25	297.47	316.45
Manchester United	268.17	321.78	306.43	333.94	354.42
Chelsea London	285.63	310.15	256.98	277.25	291.49
Inter Milan	116.5	124.2	151.3	156	192.6
AS Roma	136.1	155	145	158.8	184.1
Schalke 04	124	122	132	138	154
Bayer Leverkusen	108	116	134	132	146
Sevilla	51	63	73	87	84
Napoli	85.2	85.2	101.6	118.2	138.1
Monaco	57	54	58	74	86

S o u r c e: Author's own elaboration based on Footballbenchmark, 2021.

Table 2 presents expenses which the clubs spent to cover operating costs in the analyzed period. These include expenses related to the organization of football matches, travel, expenses for marketing and training of young players. In most clubs the expenses for operating costs were lower than the amounts allocated for players wages and they increased regularly every season, just like the wages. In the 2014/2015 season, the average operating expenses were 103.82 million EUR, and in the 2018/2019 season—166.82 million EUR. Real Madrid and FC Barcelona allocated the highest amounts for operating activities.

Table 2. Expenses for operating costs in top European football clubs (*x2*) from season 2014/2015 to 2018/2019 (in millions of euros)

Team/ year	2014/2015	2015/2016	2016/2017	2017/2018	2018/2019
Real Madrid	219.4	209.9	284.9	329.6	322.8
Atletico Madrid	75	96.1	117.4	155.4	159.6
Bayern Munich	158.3	207.4	210.8	231.9	224
FC Barcelona	197.8	219.1	220.4	346.2	373.3
Juventus Turin	66.8	78.5	99.7	117.9	142.6
Tottenham	69.57	85.67	115.76	95.55	161.68
PSG	166.6	210	178.8	228.7	234
Manchester City	110.36	131.14	139.69	148.73	187.32
Arsenal London	116.01	115.77	113.18	119.91	157.18
Borussia Dortmund	84.6	93.5	126.2	139.1	164.5
Liverpool	93.29	110.18	110.75	125.43	197.95
Manchester United	109.13	135.02	149.77	145.66	185.78
Chelsea London	140.37	134.35	151.32	167.25	226.51
Inter Milan	117.7	72.8	70.4	74	116.2
AS Roma	60.7	66.6	66.9	69.9	81.2
Schalke 04	86.5	78.3	82.5	101.5	114
Bayer Leverkusen	76	80	87	96	98
Sevilla	45.7	50.9	57.3	64.9	58.8
Napoli	28.2	23.3	28.5	34.4	30
Monaco	54.4	55.5	70.2	88.9	101

S o u r c e: Author's own elaboration based on Footballbenchmark, 2021.

Table 3 presents net expenditure on the purchase of new players. In each of the analyzed seasons, the clubs spent a greater amount on the purchase of players than they earned from the sale of players. The average amount of expenditure on transfers ranged from 17.38 to 49.9 million euros.

Table 3. Net expenses for new players purchasing in top European football clubs (*x3*) from season 2014/2015 to 2018/2019 (in millions of euros)

Team/ year	2014/2015	2015/2016	2016/2017	2017/2018	2018/2019
Real Madrid	13.3	69.35	–7.5	–88	28.65
Atletico Madrid	53.65	–20.79	35.3	18.5	95.6
Bayern Munich	4.7	56	17.7	84.25	–74
FC Barcelona	84.92	12.7	90.95	142	–4.95
Juventus Turin	35.69	75.37	18.92	18.7	149
Tottenham	4.33	–16.58	31.2	17.7	–5.35
PSG	47.3	93.2	74.7	139.6	113
Manchester City	72.27	140.76	178.15	226.15	24.49
Arsenal London	91.18	24	102.69	–5.15	72.5
Borussia Dortmund	60.4	–22.55	10.1	–151.11	–23.7
Liverpool	52.16	35.95	94.52	–20.62	141.1
Manchester United	146.09	53.93	137.75	152.9	52.15
Chelsea London	–7.11	3.01	24.4	59.9	137.05
Inter Milan	–6.55	–13.07	141.05	58.31	15.5
AS Roma	56.91	–42.17	27.17	–58.85	0.64
Schalke 04	–4.2	–20.1	–16.5	42.2	15.55
Bayer Leverkusen	18.71	–5.25	33.4	–35.9	–13.5
Sevilla	–29.6	–16.45	–9.75	–3.95	–12.2
Napoli	14.35	24.41	–18.12	49.55	–32.3
Monaco	–49.37	–84.09	32.05	–77.1	–181.4

S o u r c e: Author's own elaboration based on Transfermarkt, 1.04.2021.

Table 4 presents the market value of players of the analyzed teams based on the valuation carried out by www.trasfermarkt.de. The presented amounts do not include the market values of players bought and sold within a given season.

Table 4. Market value of players in top European football clubs (*x4*) from season 2014/2015 to 2018/2019 (in millions of euros)

Team/ year	2014/2015	2015/2016	2016/2017	2017/2018	2018/2019
Real Madrid	634.35	631.15	750.6	804.2	1056.65
Atletico Madrid	235.35	356.79	421.6	566.5	776.65
Bayern Munich	559.48	552.5	575.01	526	909.9
FC Barcelona	513.83	605.8	696.25	630.5	1167.5
Juventus Turin	322.01	318.97	403.09	521.83	724.78
Tottenham	294.37	270.33	354.3	517.65	824.95
PSG	338.7	340.1	427.35	441.5	729.4

Manchester City	405.73	311.99	443.25	390.2	1029.76
Arsenal London	313.17	384.6	420.06	639.05	520.8
Borussia Dortmund	269.4	334.15	310.95	600.34	400.5
Liverpool	232.84	289.05	299.63	515.72	759
Manchester United	105.66	225.82	143.5	65.2	222.85
Chelsea London	533.21	712.5	578.65	589.75	909.2
Inter Milan	318.26	310.97	177.8	289.12	570.39
AS Roma	203.6	361.26	258.27	387.14	434.55
Schalke 04	217.58	229.45	255.25	163	228.35
Bayer Leverkusen	147.84	206	211.23	261.3	372.85
Sevilla	152.45	202.95	246.15	273.4	280.7
Napoli	268.58	244.54	322.03	323.09	552.97
Monaco	244.12	236.84	158.4	369.1	567.06

S o u r c e: Author's own elaboration based on Transfermarkt, 2021.

Stage 2: output variables

Table 5 presents UEFA's coefficients, which determine the strength of the football league based on the achievements of its representatives in European competitions.

Table 5. UEFA coefficient in seasons 2014/2015–2018/2019

Team/ season	2014/2015	2015/2016	2016/2017	2017/2018	2018/2019
Premier League	13.571	14.25	14.928	20.071	22.642
German League	15.857	16.428	14.571	9.857	15.214
Spanish League	20.214	23.928	20.142	19.714	19.571
Italian League	19	11.5	14.25	17.333	12.642
French League	10.916	11.083	14.416	11.5	10.583

S o u r c e: Author's own elaboration based on UEFA, 2021.

Table 6 presents the number of points scored in league competitions by leading European teams multiplied by UEFA coefficients for each of the leagues: English, Spanish, German, Italian and French. For example, 68 points Real Madrid scored in the 2018/2019 season multiplied by the UEFA coefficient of 19.571 from Table 5 resulted in 1331 points. Due to the very strong position of the Spanish league on the European market, among the leading teams we will find 3 teams representing La Liga: Real Madrid, Atletico Madrid and FC Barcelona. The English Premier League, on the other hand, includes a rather high number of first-rate teams. Therefore, the English clubs had more difficulty in scoring a high number of points than teams from the Italian, French, German or Spanish leagues. There are more high-level clubs in the Premier League and even lower-ranked clubs have high budgets and excellent players.

Table 6. Weighted number of points (*y1*) in national league from season 2014/2015 to 2018/2019

Team/ year	2014/2015	2015/2016	2016/2017	2017/2018	2018/2019
Real Madrid	1859.69	2153.52	1873.21	1498.26	1330.83
Atletico Madrid	1576.69	2105.66	1571.08	1557.41	1487.40
Bayern Munich	1252.70	1445.66	1194.82	827.99	1186.69
FC Barcelona	1900.12	2177.45	1812.78	1833.40	1702.68
Juventus Turin	1653.00	1046.50	1296.75	1646.64	1137.78
Tottenham	868.54	997.50	1283.81	1545.47	1607.58
PSG	906.03	1063.97	1254.19	1069.50	963.05
Manchester City	1072.11	940.50	1164.38	2007.10	2218.92
Arsenal London	1017.83	1011.75	1119.60	1264.47	1584.94
Borussia Dortmund	729.42	1281.38	932.54	542.14	1156.26
Liverpool	841.40	855.00	1134.53	1505.33	2196.27
Manchester United	949.97	940.50	1030.03	1625.75	1539.66
Chelsea London	1180.68	855.00	1388.30	1404.97	1630.22
Inter Milan	1045.00	770.50	883.50	1247.98	872.30
AS Roma	1330.00	920.00	1239.75	1334.64	834.37
Schalke 04	761.14	854.26	626.55	620.99	502.06
Bayer Leverkusen	967.28	985.68	597.41	542.14	882.41
Sevilla	1536.26	1244.26	1450.22	1143.41	1154.69
Napoli	1197.00	943.00	1225.50	1577.30	998.72
Monaco	775.04	720.40	1369.52	920.00	380.99

S o u r c e: Author's own elaboration based on Transfermarkt, 2021.

Table 7 below presents the market value of leading European clubs according to the methods adopted in the report "The European elite" developed by the consulting company KPMG. From the 2014/2015 season to 2018/2019, there was a regular increase in the value of the clubs analyzed. In the 2016/2017 season, Manchester United was the first club to exceed the value of 3 billion euros, and in the 2018/2019 season Real Madrid was the second club to exceed this value. Both clubs competed in the entire period for the title of the highest-rated football team in the world. The exceptionally high value of the two clubs is the outcome of both their superb sports achievements and huge recognition around the world. However, it is worth noting that often football clubs that otherwise achieved very good sports results were of lower value than clubs that won the national championship or won the Champions League.

Table 7. Market value of European football clubs (*y2*) in years 2014/2015–2018/2019 (in millions of euros)

Team/ year	2014/2015	2015/2016	2016/2017	2017/2018	2018/2019
Real Madrid	2894	2905	2976	2920	3224
Atletico Madrid	548	592	793	900	1004
Bayern Munich	2138	2153	2445	2552	2696

FC Barcelona	2742	2758	2765	2783	2676
Juventus Turin	956	983	1218	1302	1548
Tottenham	748	801	1011	1286	1679
PSG	788	843	998	1142	1315
Manchester City	1541	1620	1979	2160	2460
Arsenal London	1598	1663	1956	2102	2008
Borussia Dortmund	795	830	971	1060	1085
Liverpool	1249	1273	1330	1580	2095
Manchester United	2884	2905	3095	3255	3207
Chelsea London	1418	1453	1599	1765	2227
Inter Milan	378	399	429	491	692
AS Roma	347	358	453	455	516
Schalke 04	603	624	691	673	765
Bayer Leverkusen	548	571	584	624	658
Sevilla	173	181	261	316	352
Napoli	381	394	409	518	569
Monaco	174	195	218	259	255

S o u r c e: Author's own elaboration based on Footballbenchmark, 2021.

Figure 1 presents the dependence between weighted number of points in national leagues and the market value of European football clubs. In most cases there is a positive correlation between these variables. The Spearman correlation coefficient is 0.58.

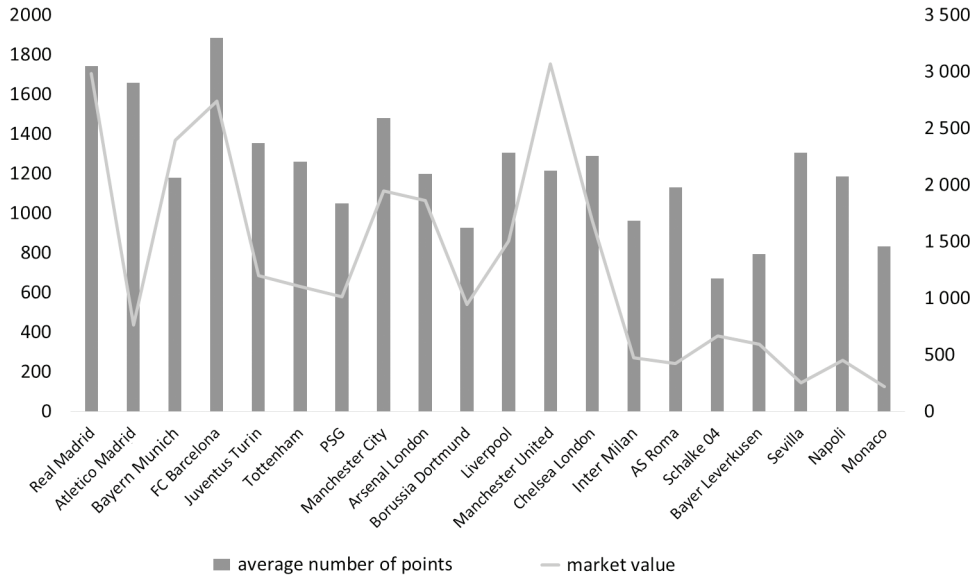

Figure 1. Average weighted number of points in domestic leagues vs market value of teams (in millions of euros) in years 2014/2015–2018/2019

S o u r c e: Author's own elaboration.

Table 8 presents financial profits achieved by leading European clubs expressed in millions of euros. The total financial profit of all the analyzed clubs increased from 811.92 million EUR in the 2014/2015 season to 959.95 million EUR in the 2018/2019 season. The best, however, was the 2016/2017 season in which the total profit of the analyzed clubs amounted to 1253.63 million EUR. This gives us the average profit of 62.68 million EUR. Manchester United was the top club in terms of financial gain in 2014–2019.

Table 8. Operational profit of European football clubs (*y3*) in years 2014/2015–2018/2019 (in millions of euros)

Team/ year	2014/2015	2015/2016	2016/2017	2017/2018	2018/2019
Real Madrid	101.7	138.5	65.2	69	90.5
Atletico Madrid	28.1	49	43	–18	35.7
Bayern Munich	51.8	51.7	97.6	88.1	101.3
FC Barcelona	58.9	76.9	83.1	–51.1	45.1
Juventus Turin	26.9	59.2	38.7	49.7	23.1
Tottenham	44.71	59.78	102.48	162.55	29.06
PSG	98.6	93.3	89.9	60.1	69.4
Manchester City	98.16	129.11	107.16	127.14	64.47
Arsenal London	66.81	92.13	143.18	49.42	55.22
Borussia Dortmund	38.6	49	33.2	32.5	0.1
Liverpool	81.66	17.88	74.53	94.13	60.21
Manchester United	143.14	231.91	220.54	187.58	128.19
Chelsea London	–5.76	4.43	21.24	65.08	45.1
Inter Milan	–66	–14.4	41.1	50.7	57.3
AS Roma	–29	–16.1	–2.2	–36.9	22.2
Schalke 04	27.1	8.6	18.4	16.9	69
Bayer Leverkusen	18.4	14.9	15.8	12.8	27.4
Sevilla	–8.2	5.5	10.3	13.3	–3.5
Napoli	31	12.5	34.7	71	30.3
Monaco	5.3	–32.3	15.7	–39.3	9.8

S o u r c e: Author's own elaboration based on Footballbenchmark, 2021.

Table 9 illustrates the number of points scored by leading European clubs in the 2014/2015–2018/2019 seasons in the UEFA ranking. The ranking confirms the dominance of Spanish clubs that had won the Champions League four times and the European League three times. Real Madrid was the best club in terms of sports results during this period. The club collected a total of 146 points, winning the title of the best team in Europe 3 times. The next places in the ranking were won by FC Barcelona, Bayern Munich and Atletico Madrid.

Table 9. Points obtained in UEFA rank (*y4*) from season 2014/2015 to 2018/2019

Team/ year	2014/2015	2015/2016	2016/2017	2017/2018	2018/2019
Real Madrid	29	33	33	32	19
Atletico Madrid	22	28	29	28	20
Bayern Munich	28	29	22	29	20
FC Barcelona	34	26	23	25	30
Juventus Turin	29	18	33	23	21
Tottenham	9	12	10	21	26
PSG	21	24	20	19	19
Manchester City	15	26	18	22	25
Arsenal London	20	15	19	21	26
Borussia Dortmund	18	17	22	10	18
Liverpool	10	22	0	30	29
Manchester United	0	13	26	20	19
Chelsea London	21	18	0	18	30
Inter Milan	12	0	4	0	15
AS Roma	12	14	13	25	17
Schalke 04	17	18	11	0	17
Bayer Leverkusen	18	14	18	0	11
Sevilla	28	23	19	21	13
Napoli	22	13	17	10	18
Monaco	21	5	25	6	5

S o u r c e: Author's own elaboration based on UEFA, 2021.

Figure 2 presents the dependence between the average cost of wages (presented in Table 1) and the average number of points in UEFA rank from season 2014/2015 to 2018/2019. As a rule, clubs that spent more money on salaries obtained better results in international competitions. The Spearman correlation coefficient is 0.56.

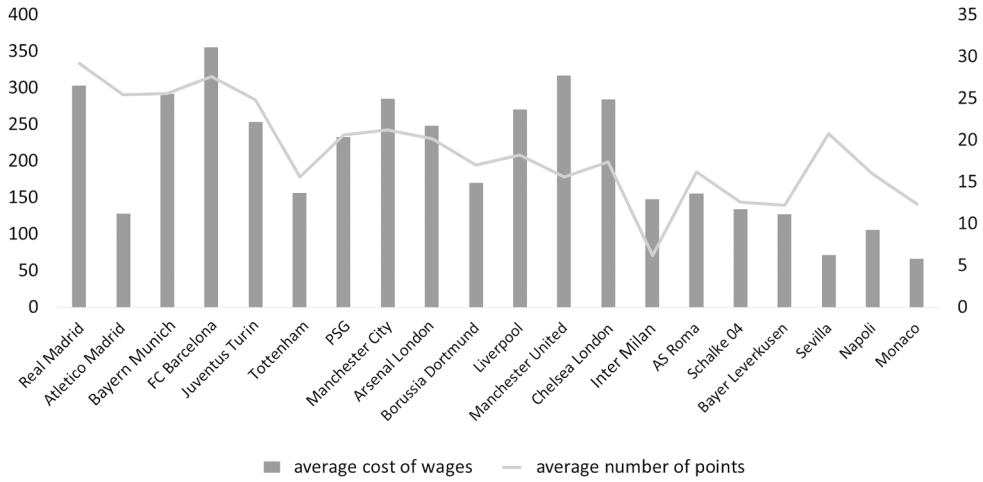

Figure 2. Average costs of wages (in millions of euros) and average number of points in UEFA rank in seasons 2014/2015–2018/2019

S o u r c e: Author's own elaboration.

Stage 3

In the next stage, the efficiency coefficient was calculated for each of the analyzed clubs in accordance to the previously presented Formula 1.

$$w_e = \sum_{i=1}^{n} y_i - \sum_{i=1}^{n} x_i$$

The results are presented in Table 10 below.

Table 10. The values of the efficiency coefficients of football clubs in the 2014/2015–2018/2019 seasons

Team/ year	2014/2015	2015/2016	2016/2017	2017/2018	2018/2019
Real Madrid	–0.15	0.15	–0.48	–0.81	–0.63
Atletico Madrid	0.84	0.42	0.43	–0.25	–0.26
Bayern Munich	–0.63	–0.35	–0.50	–0.21	–0.18
FC Barcelona	0.01	–0.40	–0.60	–1.04	–1.03
Juventus Turin	0.53	0.05	0.14	0.02	–0.57
Tottenham	–0.27	0.15	0.20	0.68	0.06
PSG	–0.36	–0.02	–0.26	–0.42	–0.48
Manchester City	–0.44	0.53	–0.39	0.90	0.03
Arsenal London	–0.18	–0.05	0.22	–0.41	0.88
Borussia Dortmund	–0.16	0.05	–0.04	–1.06	0.04
Liverpool	–0.12	–0.02	–0.41	0.27	0.55
Manchester United	0.53	1.01	1.44	2.02	1.73

Chelsea London	–1.29	–1.37	–1.27	–0.43	–0.10
Inter Milan	–0.86	–0.67	–0.21	0.06	–0.18
AS Roma	–0.05	–0.43	0.03	0.13	–0.05
Schalke 04	0.05	0.25	–0.27	–0.02	0.64
Bayer Leverkusen	0.46	0.20	–0.10	–0.33	0.01
Sevilla	1.25	0.53	0.69	0.61	0.34
Napoli	0.58	0.19	0.39	0.69	0.11
Monaco	0.24	–0.22	1.01	–0.38	–0.95

S o u r c e: Author's own elaboration.

Stage 4

The last stage of the analysis consisted in the creation of a ranking of clubs in accordance with the performance indicator. The total performance indicator is the sum of the club's performance indicators in specific seasons. Manchester United reached the highest rate as its performance in the analyzed period was excellent in financial terms. The club maintained its position as one of the highest-rated football clubs in the world, and regularly obtained high financial profit. Despite the lack of sports successes comparable to those achieved many years ago, the club is still one of the richest in the world. Sevilla came the second in the ranking, mainly due to very good sports results achieved at relatively low expenditure. The club had won the European League twice in the analyzed period, despite competing with clubs with more valuable players and higher revenues. The top three is supplemented by Napoli, which did not achieve significant sports successes, but compared to other analyzed clubs had players with lower market value and spent less on players' salaries and operational activities. FC Barcelona was among the teams with the worst performance indicator, mainly due to very high salary costs and lower than expected results in the Champions League. The club that stood out due to poor sports performance in relation to outlays was Inter Milan, which was promoted to the Champions League only in the 2018/2019 season. The lack of international success also translated into the low position of PSG, whose greatest success in the analyzed period was only the Champions League quarter-final. It is worth noting that the club has invested a very high amount to buy new players. The lowest efficiency index was achieved by Chelsea, which presented an irregular sports shape and had poor financial results in the analyzed period.

It should be noted that the results obtained concern only the leading European clubs and in a relatively short period. In further research, it is advisable to take into account a longer time range and other variables that indicate the financial situation of the club, e.g. revenues and market value of players. Moreover, it is advisable to research more clubs and compare the situation of clubs in different European markets.

Table 11. Performance indicator of top European football clubs

Position	Football club	Total performance indicator
1	Manchester United	6,73
2	Sevilla	3,41
3	Napoli	1,96
4	Atletico Madrid	1,18
5	Tottenham	0,82
6	Schalke 04	0,64
7	Manchester City	0,63
8	Arsenal London	0,46
9	Liverpool	0,27
10	Bayer Leverkusen	0,25
11	Juventus Turin	0,17
12	Monaco	–0,30
13	AS Roma	–0,36
14	Borussia Dortmund	–1,17
15	PSG	–1,54
16	Inter Milan	–1,85
17	Bayern Munich	–1,87
18	Real Madrid	–1,91
19	FC Barcelona	–3,06
20	Chelsea London	–4,45

S o u r c e: Author's own elaboration.

4. Conclusion

Effective use of resources is very important for football clubs competing at the highest level. Most football games have been dominated in recent years by clubs with the highest budgets and those with the highest-rated players. In some cases, clubs with higher budgets and players with higher market value lost in competition with clubs with less financial and sports resources. Among the leading football clubs one can distinguish both those that did better in sports competition, and those that outperformed their competitors with greater financial results. You can also point to clubs in which investments in the development of the football team did not contribute to the expected sports successes. Based on the performed calculations, it should be stated that Hypothesis 1 has been positively verified. Football clubs that spent relatively more on footballers' salaries and operational activities were more successful than their competitors in national and international competitions. Hypothesis 2 has been falsified—clubs with a strong international position such as Real Madrid, FC Barcelona, and Bayern Munich took a low position in the efficiency ranking. Hypothesis 3 has also been falsified. The sports and financial results of

some clubs, such as Sevilla, Atletico Madrid and Napoli, confirm that good resource management allows for effective competition with clubs with greater financial possibilities.

Constant investment in team development is an easiest way to maintain a competitive advantage and successfully compete for sporting successes on the domestic and international markets. Furthermore, some examples indicate that human resources, effective management and know-how allow to overcome financial disadvantage.

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Związek między sportem a wynikami finansowymi w czołowych europejskich klubach piłkarskich

Abstrakt: Liga Mistrzów to od kilkudziesięciu lat najbardziej elitarne rozgrywki piłkarskie w Europie. Osiąganie sukcesów sportowych znacznie ułatwiają klubom piłkarskim uczestniczącym w rozgrywkach Ligi Mistrzów bardzo dobre wyniki finansowe, które pozwalają przeznaczać niemałe kwoty na zakup piłkarzy i na ich wynagrodzenia. Łączna wartość rynkowa piłkarzy znajdujących się w składzie niektórych drużyn przekroczyła w sezonie 2018/2019 1 miliard euro. W artykule został zweryfikowany związek między wynikami finansowymi a wynikami sportowymi w rozgrywkach krajowych i międzynarodowych w sezonach 2014/2015–2018/2019. Za pomocą opracowanego przez autora modelu została zweryfikowana efektywność klubów piłkarskich będących przedmiotem badania. Ponadto przedstawiona została dynamika zmian zysków, wydatków na wynagrodzenia i działalność operacyjną, a także wartości rynkowej wybranych europejskich klubów piłkarskich. Wyniki analizy pozwoliły na wskazanie klubów piłkarskich, których działalność charakteryzuje się najwyższą efektywnością. Na podstawie przeprowadzonej analizy należy stwierdzić, że zarówno wartość rynkowa piłkarzy, jak i wydatki na ich wynagrodzenia miały znaczący, pozytywny wpływ na wyniki sportowe. Wśród czołowych europejskich klubów piłkarskich można jednak wyróżnić takie, które funkcjonowały zdecydowanie skuteczniej niż ich rynkowi konkurenci. Sukcesy sportowe przyczyniają się do zwiększenia wartości rynkowej piłkarzy, ale wiążą się także z koniecznością przeznaczenia większych kwot na wynagrodzenia zawodników.

Słowa kluczowe: wynik finansowy, koszty operacyjne, wartość rynkowa, koszty wynagrodzeń, wynik sportowy

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Market Value Added (MVA) and Total Shareholder Return (TSR) among IT and video game companies listed in Warsaw Stock Exchange

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Abstract: Nowadays, the measurement of a company's performance seems to be complex. There are many classical accrual indicators of profitability, like ROA, ROE and EPS. However, the concept of focusing on maximization value for owners has its influence on the main aim of the functioning of business entities. Because of it, and of disadvantages of previously mentioned measures, new ones, referred to value added for shareholders, have been created. Indicators like EVA, MVA and TSR led to the estimation of value created by the company. The aim of this paper is to analyze the added value created by chosen listed companies. The empirical research was focused on comparing added value for shareholders with risk and accrual indicators by using descriptive statistics and correlation. The level of risk among analyzed companies (from IT and video game sector, listed on Warsaw Stock Exchange) was different—quite high for entities, which activity is connected with the video games industry, and lower for IT companies. In general, MVAs and TSRs were characterized by the high volatility of their values. What is more, the higher risk was not related to higher rates of return (measured by TSR). Moreover, there were no significant relationships between accrual indicators and value added measures. What is worth mentioning, the result of the analysis differs from the studies mentioned in the paper. It might be caused by specific sample selection.

Keywords: effectiveness indicators, rates of return, accrual indicators, correlation, profitability

1. Introduction

In the assessment of the economic condition of enterprises, there are some quite popular ways to measure their profitability. Financial ratios like Return On Assets, Sales or Equity (in sequence: ROA, ROS, ROE) are commonly known. The main advantage of using them is the possibility to measure the ability to generate profit according to almost all types of business entities. On the other hand, in the case of public limited companies, there is another eventuality—taking advan-

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tage of measures connected with return on equity (related to stock prices). This possibility is giving an insight into the creation of added value for shareholders. For this reason, it seems that these measures make sense and might be a source of valuable information not only for investors, but also for the market outside. Hence, the aim of the paper is to analyze the added value created by listed companies. The study was based on data from companies from the IT and video games industries, due to their popularity and growth even in the pandemic period. A novelty is the market added value study based on a set of Polish companies from these sectors. In addition, the years included in the analysis are the present period, which affects the timeliness of this analysis.

As a part of this paper, the focus was on measuring Market Value Added (MVA) and Total Shareholder Return (TSR), which present cash benefits which might be achieved by investors. Moreover, connections between these measures and risk and also accrual financial data were taken into account in further analysis. Companies chosen for this purpose come from IT and video game sectors. The first part of the paper refers to the theoretical view on creating added value for capital market entrants. It consists of literature review focused on returns for shareholders as well as studies linked with a subject. The next fragment shows briefly formulas applied for calculating MVA and TSR and the rationale for their use. The last section embraces computed measures and a trial for estimating their connections with classical financial ratios and economic categories.

2. Literature review

Nowadays, measures based on the accrual approach to profitability are still commonly used, as several dozen years ago. There are existing some advantages of applying them, which determine their usefulness, like the simplicity of calculating and quite high comparability among companies functioning in different fields of economy. However, it is worth emphasizing the defects of their using, too. Among them might be mentioned for instance:

– accrual financial result includes balance sheet structure and tax strategy, therefore it might not reflect well results generated by activities in industry;
– accrual measures are expressed in cash values, they are size-dependent of a company;
– cash flows and the cost of capital are not taken into account when calculating financial results based on the classic approach (Szczukiewicz, 2003).

Disadvantages of accrual indicators led to research for other measures, which are able to take into account the creation of value added for shareholders. It is connected with the purposes of the functioning of business entities, too—generating profits used to be known as the main aim, while nowadays maximizing value for owners is considered as a better one (Damodaran, 2014). Moreover, recently interest in Value Based Management (VBM), a concept linked with focusing on value creation, has been increased—it is actually one of the most commonly used strategies of company management. One of the main premises of using VBM in business entity management is to reduce the difference between the potential and present market value of a company (Jóźwiak, 2020).

Regarding the VBM concept, different value drivers are distinguished in the literature of the subject. Fulfilling them should ensure an increase in added value of the company. They include for instance:

– increase in net sales revenues;
– cash margin of operating profit;
– cash tax rate;
– the level of working capital;
– investments in tangible fixed assets;
– WACC (Weighted Average Cost of Capital);
– average duration of the increase in value (Rappaport, 1986).

All of the categories presented above are differently perceived by the market. An increase in net sales allows the expansion of the activities of a company. Margin changes allow for optimization of the added value generated from 1 product. The cash tax rate is a relevant factor of company policy. Working capital is the means necessary for the proper functioning of the company. Investments in tangible fixed assets allow the company's development in the long term. WACC is the benchmark for assessing the profitability of investment projects, and it reflects opportunity cost in the context of running a business. The duration of the increase in value is the period in which investment returns exceeded the WACC. All of these quantities determine the increase in value added for a company.

Taking everything into account, it can be stated that as a result of weaknesses of accrual measures and focus on maximizing value for shareholders (also included in the VBM concept) there was a need to look for new measures of company performance. There arose many commonly used measures of benefits for shareholders, however it is unclear, which of them is the most suitable one. The most frequently used can be divided into 2 groups:

1) created value indicators:
   – Economic Value Added (EVA);
   – Market Value Added (MVA);
   – Shareholder Value Added (SVA);

2) total return indicators:
   – Total Shareholder Return (TSR);
   – Total Business Return (TBR).

The first of them, highly likely the most commonly known, is EVA. This concept was created by Stern Stewart & Co., it gained popularity in the 1990s. The formula of Economic Value Added include operating profit, income tax and cost of capital. Another concept is MVA. It might be considered as a present value of discounted EVAs until the end of the business (Kacprzyk, Rychter and Wolski, 2009). For listed companies, it may be computed in a quite simple way, using share prices. MVA shows a shift in shareholders' wealth between the moment when the capital was invested and the time of measurement. It is worth underlining that EVA is conditioned by the internal situation of the company, where MVA is determined by external factors, connected with assessment of the entity by the market (Mikołajek-Gocejna, 2010).

The second group of effectiveness indicators of value added are focused on measuring return for investors as a relative quantity. TSR indirectly includes fundamental parts of the company's functioning—the result of operating activity, changes in the capital market, finan-

cial leverage. It is used as a long-term indicator of a company's success achieved by creating value for shareholders (Shah and Sengupta, 2015). Beyond the presented division, there is also another one—there are internal (e.g. EVA) and external (e.g. MVA, TSR) measures of value added for shareholders. The empirical part of this paper is focused on the external ones.

In general, there are many reasons for using measures based on creating value added for shareholders. Pressure from investors, understanding the concept of created value among managers, other circumstances, for instance referred to behavioural aspects—the sense of comfort as a result of using commonly approved measures—there are just some of them, in relation to shareholders (Szczukiewicz, 2003). The concepts like EVA, MVA or TSR can provide a better view of the company's current situation and the perspective of the future. Traditional measures, like ROI or EPS, take into account only costs connected with capital, they overlook many essential areas (Shah and Sengupta, 2015). Further, it is pointed out that comparing the economic return with the cost of capital is relevant. The company might be considered as a profitable one, when after covering costs of activities it is providing firm returns for owners. Moreover, these earnings should not be lower than the cost of equity (Nowicki, 2018). Such an approach is able to provide measures based on the creation of added value. On the whole, measures of a company's performance, which are using market values, might be considered as valuable instruments to estimate, how the present situation of the company and its forecasts are perceived by the external entities and investors.

In the literature of the subject, there can be found some examples of analyses focused on the dependence between value creation measures and random variables. Cucari, Mazza, Constantini and Sancetta (2016) analyzed relationships between CEO (Chief Executive Officer) Pay and TSR. They considered 40 companies listed on Milan Stock Exchange in the period 2008–2014. Eventually, their study did not confirm the correlation between CEO Pay and TSR. However, the results of the analysis performed on the example of entities listed on the Johannesburg Securities Exchange, in the years 2006–2010, were different. There was pointed out the existence of a significant relationship between the executive compensation and measures of financial performance (not only ROA or ROE, but also EVA and MVA). Especially, for companies generating a high level of EVA there were observable stronger relationships between executive compensation and MVA (De Wet, 2012). Another study was focused on the competitiveness of the companies and their interdependence with value added. The author stated that the company's stakeholders are the beneficiaries of its value. For this reason, it is required to enable reconciliation of needs of different groups (shareholders, managers, employees, clients, suppliers, etc.). Companies included in the study come from the construction sector of the Warsaw Stock Exchange (WSE), data was collected for 2012. As a part of that work, it was indicated that there is existing dependence between market share in sales (as a measure of competitiveness) and value added (Grabowska and Otola, 2013). In research on measures of added value, analyses based on data from listed companies with low capitalization can also be extracted. An example is research of companies with capitalization not higher than 100 million PLN listed on Main Market of WSE in the period 2011–2012. The study found an average negative level of profit and EVA. The author explained it with a bad situation of the Polish economy after the crisis, which had started in 2008 (Wypych, 2013). Another analysis, focused on smaller listed companies too, was conducted on the ex-

ample of 6 companies with the lowest capitalization on WSE. The period taken into account is 1999–2009. Attention has particularly been paid to low market efficiency in relation to entities taken into account, for instance due to a small number of free float shares and, in effect, to low interest from institutional investors. The result of that study showed that MVA does not explain the changes in share prices better than the net profit (Kicia, 2010). The next research took into account 20 companies from the Indian Cement Industry, in the period 2005–2015. The study was focused on correlations between EVA, MVA and rates of return. The authors showed the existence of a relationship between the mentioned measures (Kiran Kumar and Subramanyam, 2017). Another research, conducted on a sample of 22 companies listed on Bombai Stock Exchange in the period 2009–2014, took into account relationships between MVA and accounting indicators (EPS, ROA, ROE, ROS). The authors found significant correlations between MVA and EVA, also between MVA and EPS (Rajan, Ravi and Ashafaque, 2015).

Overall, there are many studies that try to link measures such as MVA or TSR to financial indicators and other economic variables. Depending on the research sample, their results often differ. Therefore, it can be said that there are needed further research taking relationships between value added measures and previously indicated variables into account in various aspects.

Considering the presented outline of theory and the examples of research, the aim of this study was formulated. This purpose is to check whether there is any dependence between these measures and risk and accrual indexes, among the IT and video games industry. The following hypotheses were put forward:

1) the level of risk of IT and video game companies is, on average, higher than for benchmark;
2) value added measures are characterized by the occurrence of high volatility among companies from IT and video game industries;
3) higher risk, measured by the beta coefficient, is connected with higher rates of return;
4) there are positive dependencies between values of accrual indicators and value added measures.

3. Analysis methods and sample

The measures related to the company's performance used in this study are MVA and TSR (with its variants ETSR and RTSR). The formula of Market Value Added, for listed companies, is as follows (Kacprzyk, Rychter and Wolski, 2009):

$$\text{MVA} = \text{number of shares} * \text{market value of shares} - \text{book value of equity} \quad (1)$$

MVA could be considered as the hypothetical difference between the sale value of all shares at a current moment and the invested capital (Mikołajek-Gocejna, 2010).

The next measure taken into account is Total Shareholder Return. It is calculated in that way (Comporek, 2018):

$$\text{TSR} = \frac{P_c - P_s + \text{DPS}}{P_s} \quad (2)$$

where:
P_c—current price
P_s—starting price
DPS—dividend per share.

In relation to this indicator, it is worth pointing out that TSR is commonly used among companies listed on S&P1500—almost 50% of them are taking advantage of it (Cucari et al., 2016).

Excess Total Shareholder Return (ETSR), apart from TSR, includes also an opportunity cost, for instance cost of equity The formula for its computing is (Comporek, 2018):

$$ETSR = TSR - K_e \tag{3}$$

where:
K_e—the cost of equity (computed on the basis of CAPM model):

$$K_e = r_f + \beta * rp \tag{4}$$

where:
r_f—risk-free rate (10-year treasury bond yield, calculated at the beginning of a year taken into account)
β—stock price sensitivity factor to changes in the benchmark
rp—risk premium, considered as Country Risk Premium, according to Damodaran (2020).

Relative Total Shareholder Return (RTSR) is calculated among a group of companies and led to extract business entities, which are characterized by achieving above-average rates of return. It is calculating as follows (Comporek, 2018):

$$RTSR = TSR - \overline{TSR} \tag{5}$$

This measure allows highlighting entities performing better than the market or the analyzed group.

The companies taken into account were chosen because of the availability of stock quotes for not less than 5 quarters (to the date of 30 October 2020). The beta coefficient has been determined on the basis of closing prices of individual companies, WIG (Warsaw Stock Exchange Index) and NCIndex (NewConnect Index). The period included in calculations is 2 January 2019–30 October 2020. The group of analyzed companies includes entities operating in IT (26 from WSE Main Market and 3 from NewConnect) and the video game sector (in sequence: 9 and 16). The first reason for choosing this group of entities was connected with their popularity and development in recent years, especially reflected in considerable fluctuations, usually increases, of stock prices. Another one has a source in COVID-19 pandemic—these economic areas were not strongly affected by this random event, so they can be considered as operating under normal market conditions. The data was obtained from the Biznesradar website (https://www.biznesradar.pl/).

4. Empirical analysis of TSR and MVA

It is worth noting that wherever 17 appears in the name of the indicator, it means 2017, and the same is true for 18 (2018), 19 (2019) and 20 (2020—the period between 2 January and 30 October). Initially, it is worth presenting beta coefficients for analyzed companies. It is shown in Table 1.

Table 1. Beta coefficients[1]

Company	Beta	B-k	Company	Beta	B-k
Ailleron (AIL)	1.29	WIG	Bit Evil (BIT)	0.71	NCIndex
Asseco Business Solutions (ABS)	0.51	WIG	Blackpoint (BLP)	0.60	NCIndex
Asseco Poland (ASP)	0.42	WIG	Xplus (XPL)	0.49	NCIndex
Asseco South Eastern Europe (ASE)	0.62	WIG	7Levels (7LV)	0.82	NCIndex
Atende (ATE)	0.55	WIG	Bloober Team (BLT)	1.35	NCIndex
Betacom (BET)	0.66	WIG	Creativeforge Games (CRE)	1.31	NCIndex
Comarch (CCH)	0.49	WIG	Creepy Jar (CRJ)	1.01	NCIndex
Comp (COM)	0.14	WIG	Draw Distance (DDI)	0.90	NCIndex
Datawalk (DAT)	1.24	WIG	Prime Bit Studios (PBT)	0.94	NCIndex
Digitree (DIG)	0.72	WIG	The Dust (TDU)	0.71	NCIndex
Ifirma (IFI)	0.56	WIG	Cherrypick Games (CHG)	0.41	NCIndex
K2 Internet (K2I)	0.52	WIG	Forever Entertainment (FRE)	1.11	NCIndex
Livechat (LIV)	0.52	WIG	Jujubee (JUJ)	0.88	NCIndex
LSI Software (LSI)	0.67	WIG	No Gravity Games (NGG)	1.42	NCIndex
NTT System (NTT)	0.20	WIG	One More Level (OML)	1.56	NCIndex
Opteam (OPT)	0.05	WIG	Qubic Games (QUB)	1.19	NCIndex
PGS Software (PGS)	0.94	WIG	The Farm 51 Group (F51)	1.18	NCIndex
Procad (PRO)	0.03	WIG	Varsav Game Studios (VGS)	1.26	NCIndex
Quantum Software (QUA)	-0.01	WIG	Neurone Studio (NEU)	1.21	NCIndex
Silvair (SIL)	0.29	WIG			
Simple (SIM)	0.41	WIG			
Sygnity (SYG)	1.00	WIG			
Talex (TAL)	0.44	WIG			
Unima 2000 (U2K)	0.44	WIG			
Wasko (WAS)	0.55	WIG			
Elzab (ELZ)	0.63	WIG			
CD Projekt (CDP)	0.85	WIG			
11 Bit Studios (11B)	0.85	WIG			
Artifex Mundi (ART)	1.09	WIG			
CI Games (CIG)	1.45	WIG			
PlayWay (PLW)	1.29	WIG			
T-Bull (TBL)	1.43	WIG			
Ultimate Games (ULT)	1.52	WIG			

[1] B-k—benchmark.

Company	Beta	B-k	Company	Beta	B-k
Ten Square Games (TSG)	1.08	WIG			
Vivid Games (VIV)	1.00	WIG			

S o u r c e: Biznesradar, 2020.

Quite surprising were observations for Sygnity and Vivid Games, where beta coefficients took values very close to 1, which does not happen often. It indicates that share prices of these companies fluctuated on average as much as on the market. In general, most companies' beta was below 1 (63% entities). It means that fluctuations of stock prices of these enterprises were not as strong as for benchmark (WIG or NCIndex). Theoretically, these companies were characterized by a lower level of risk than the average on the market. However, it is necessary to pay attention to the distribution of coefficients by industries, as shown in Table 2.

Table 2. Distribution of beta coefficients by industries

	WIG			NCIndex		
Industry	**β>1**	**β≈1**	**β<1**	**β>1**	**β≈1**	**β<1**
IT	2	1	23	–	–	3
Video games	6	1	2	10	–	6

S o u r c e: Author's own elaboration.

In the case of the IT industry, almost 90% of companies were characterized by the volatility of share prices at a lower level than for the market. For entities, which activity is focused on video games, there were observable different situations—values of beta coefficients for most of them (64%) were above 1. Overall, it can be said that on average the analyzed IT companies are characterized by lower risk than the market, while for entities active in the video games industry occurred higher risk. Therefore, the first hypothesis was only partially confirmed—in relation to the gaming industry.

The next part of the analysis embraced calculations of MVA, TSR, ETSR and RTSR. MVAs are estimated for values observed at the end of the year (2018 or 2019). TSR and its variants are stream variables: "2019" means that there were computed quantities for 30 December 2019, in relation to 2 January 2019. The period called "2020" is the time between 2 January 2020 and 30 October 2020, due to the time of writing this paper.

Table 3. Calculated MVA, TSR, ETSR and RTSR 2018–2020

	MVA 18	**MVA 19**	**TSR 19**	**TSR 20**	**ETSR 19**	**ETSR 20**	**RTSR 19**	**RTSR 20**
AIL	4.300E+07	1.560E+07	–23.15%	–30.11%	–35.20%	–33.30%	–123.68%	–52.98%
ABS	5.439E+08	5.853E+08	10.56%	39.88%	4.08%	37.35%	–53.69%	–19.27%
ASP	–2.266E+09	–6.966E+08	52.93%	18.71%	47.10%	16.25%	–74.86%	23.10%
ASE	–1.954E+08	4.658E+08	123.37%	90.97%	116.11%	88.34%	–2.60%	93.54%

	MVA 18	MVA 19	TSR 19	TSR 20	ETSR 19	ETSR 20	RTSR 19	RTSR 20
ATE	5.509E+07	4.461E+07	4.42%	–3.42%	–2.34%	–5.99%	–96.99%	–25.41%
BET	6.609E+06	–1.866E+06	–34.05%	19.57%	–41.60%	16.90%	–74.00%	–63.88%
CCH	3.627E+08	5.618E+08	26.68%	11.59%	20.34%	9.08%	–81.98%	–3.15%
COM	–1.995E+08	–1.059E+08	41.63%	–4.09%	37.79%	–6.31%	–97.66%	11.80%
DAT	1.101E+07	–1.152E+07	–51.90%	74.60%	–59.88%	71.89%	–18.97%	–81.73%
DIG	1.159E+07	3.395E+07	76.81%	–27.88%	69.18%	–30.55%	–121.45%	46.97%
IFI	2.774E+07	6.388E+07	93.20%	166.67%	90.01%	164.52%	73.10%	63.37%
K2I	–1.236E+07	–1.446E+07	–45.75%	71.43%	–48.80%	69.30%	–22.14%	–75.58%
LIV	–3.714E+07	–5.896E+07	20.16%	–2.50%	17.39%	–4.60%	–96.07%	–9.67%
LSI	1.617E+08	6.603E+07	–47.02%	–10.05%	–51.93%	–12.40%	–103.62%	–76.85%
NTT	–1.032E+08	–1.092E+08	–1.12%	88.41%	–6.88%	85.96%	–5.16%	–30.95%
OPT	–2.333E+07	–2.491E+07	0.52%	50.84%	–5.46%	48.36%	–42.73%	–29.31%
PGS	4.736E+07	1.741E+08	114.90%	243.75%	103.21%	240.60%	150.18%	85.07%
PRO	–6.572E+06	4.099E+06	75.81%	29.49%	68.97%	26.91%	–64.08%	45.98%
QUA	1.446E+07	9.783E+06	–11.50%	73.63%	–18.05%	71.08%	–19.94%	–41.33%
SIL	5.658E+08	1.063E+09	92.87%	121.75%	86.32%	119.20%	28.18%	63.04%
SIM	1.386E+07	1.054E+07	3.13%	29.74%	–1.14%	27.46%	–63.83%	–26.70%
SYG	2.139E+08	2.334E+08	21.11%	21.84%	11.56%	18.94%	–71.73%	–8.72%
TAL	6.999E+06	4.060E+06	–7.64%	195.38%	–17.62%	192.44%	101.81%	–37.47%
U2K	1.780E+07	2.341E+07	35.99%	–3.03%	30.01%	–5.50%	–96.60%	6.16%
WAS	–1.021E+08	–1.224E+08	–12.23%	13.62%	–18.99%	11.05%	–79.95%	–42.06%
ELZ	–1.965E+07	–3.658E+07	–29.52%	36.91%	–36.86%	34.28%	–56.66%	–59.36%
BIT	3.536E+06	6.196E+06	66.34%	47.30%	59.22%	44.69%	–46.27%	36.51%
BLP	–3.168E+06	1.449E+07	107.24%	171.81%	100.90%	169.29%	78.24%	77.41%
XPL	–6.590E+06	–1.020E+07	–46.80%	154.36%	–54.71%	151.65%	60.79%	–76.63%
CDP	1.293E+10	2.576E+10	86.68%	45.89%	77.78%	43.06%	–47.68%	56.85%
11B	4.682E+08	7.951E+08	57.48%	19.48%	48.57%	16.65%	–74.09%	27.65%
ART	1.511E+07	1.382E+07	–26.32%	191.18%	–36.94%	188.15%	97.61%	–56.15%
CIG	5.710E+07	6.646E+07	–1.29%	79.27%	–14.49%	75.94%	–14.30%	–31.13%
PLW	7.648E+08	1.372E+09	74.84%	133.72%	62.80%	130.53%	40.15%	45.01%
TBL	1.884E+07	–2.660E+05	–50.00%	45.58%	–63.05%	42.27%	–47.99%	–79.83%
ULT	5.441E+07	9.256E+07	62.55%	50.58%	48.86%	47.20%	–42.99%	32.72%
TSG	5.188E+08	1.330E+09	164.28%	182.44%	153.73%	179.42%	88.87%	134.45%
VIV	2.077E+07	1.861E+07	–8.30%	64.00%	–18.28%	61.05%	–29.57%	–38.13%
7LV	9.951E+06	1.080E+07	–2.56%	62.50%	–11.26%	59.70%	–31.07%	–32.40%
BLT	4.458E+07	7.865E+07	54.30%	192.83%	41.82%	189.59%	99.26%	24.47%

	MVA 18	MVA 19	TSR 19	TSR 20	ETSR 19	ETSR 20	RTSR 19	RTSR 20
CRE	2.462E+07	2.740E+07	3.93%	125.93%	–8.26%	122.72%	32.36%	–25.90%
DDI	1.434E+07	1.687E+07	13.85%	17.97%	4.58%	15.10%	–75.60%	–15.99%
TDU	2.634E+06	1.552E+07	258.19%	201.95%	250.28%	199.24%	108.38%	228.36%
CHG	7.777E+07	1.298E+07	–67.15%	61.15%	–72.92%	58.70%	–32.42%	–96.99%
FRE	3.775E+07	1.099E+08	131.34%	129.02%	120.58%	125.98%	35.45%	101.51%
JUJ	9.169E+06	2.236E+07	87.78%	22.88%	78.66%	20.04%	–70.69%	57.95%
NGG	1.227E+07	1.912E+07	15.38%	110.34%	2.41%	107.05%	16.77%	–14.45%
OML	4.880E+07	3.817E+07	–3.88%	841.86%	–17.85%	838.44%	748.29%	–33.71%
QUB	7.185E+06	2.005E+07	119.23%	143.26%	107.90%	140.16%	49.69%	89.40%
F51	1.060E+08	1.373E+08	14.38%	–8.46%	3.12%	–11.56%	–102.03%	–15.45%
VGS	5.092E+07	4.308E+07	–7.72%	–12.11%	–19.55%	–15.27%	–105.68%	–37.55%
NEU	3.107E+06	–1.003E+06	–53.95%	170.00%	–65.43%	166.88%	76.43%	–83.78%
CRJ	8.913E+07	1.153E+08	20.82%	432.62%	10.77%	429.66%	339.05%	–9.01%
PBT	3.433E+06	4.291E+06	10.00%	57.78%	0.45%	54.88%	–35.79%	–19.83%

S o u r c e: Author's own elaboration based on financial data of the analyzed companies.

A wide range of data differentiation draws attention. Because of it, it is quite difficult to extract their essence. To get a better insight into already presented data, descriptive statistics were computed for MVAs and TSRs. It has been shown in Table 4.

Table 4. Descriptive statistics for MVAs and TSRs[2]

	MVA 18	MVA 19	TSR 19	TSR 20	ETSR 19	ETSR 20	RTSR 19	RTSR 20
MEAN	2.69E+08	5.98E+08	29.83%	93.57%	21.24%	90.79%	–	–
MED	1.38E+07	1.89E+07	14.12%	59.47%	3.60%	56.79%	–34.10%	–15.72%
SD	1.79E+09	3.51E+09	63.38%	133.96%	63.35%	133.83%	133.96%	63.38%
CV	666.83%	585.87%	212.46%	143.16%	298.24%	147.41%	–	–
MIN	–2.27E+09	–6.97E+08	–67.15%	–30.11%	–72.92%	–33.30%	–123.68%	–96.99%
MAX	1.29E+10	2.58E+10	258.19%	841.86%	250.28%	838.44%	748.29%	228.36%

S o u r c e: Author's own elaboration.

Taking into account measures of volatility, particularly coefficient of variation, there are noticeable their very high values, especially for MVAs. For Market Value Added it is caused by characteristics of its value—as absolute terms. However, for TSRs there was also considerable variability. It indicates that the group is heterogeneous in terms of the achieved rates of return. Mean and median are significantly in plus, which means that most entities achieved

[2] MED—median, SD—standard deviation, CV—coefficient of variation.

positive added value during the considered period. The highest observable values were startlingly high—the maximum value of TSR exceeded 840%, while the minimum was below –65%. Thereby, the second hypothesis—about the high volatility of the analyzed measures—might be considered as a confirmed one.

As the next part of the analysis, dependencies between beta, a measure of risk, and TSRs were computed. Results are shown in Table 5.

Table 5. Correlation between β and TSRs[3]

	TSR 19	TSR 20	ETSR 19	ETSR 20	RTSR 19	RTSR 20
Beta	–0.04327	0.32049*	–0.0122	0.36604*	0.36828*	0.03424

S o u r c e: Author's own elaboration.

Significant dependencies between beta and TSRs could be expected, according to the potentially positive relationship between the rates of return and risk. However, the results of this part of the study are different. While there was an observable significant correlation between beta and TSR in 2020, in 2019—not, the same was true for ETSR. Based on the theoretical interpretation, it can be concluded that in a group of entities taken into account, the higher risk was not associated with higher rates of return in 2019. Therefore, the third hypothesis could not be absolutely confirmed, but only in reference to 2020, when higher rates of return were achieved by companies with higher beta. What is more, rates of return above the average were achieved by more risky companies, in terms of market fluctuations in share prices, in 2019, while in 2020 there was no significant correlation between these variables. MVA was omitted in this part of the analysis, because it is expressed in absolute terms, while TSRs—in relative values, such as beta.

The following fragment of the analysis is focused on the comparison of accrual indicators and MVA and TSR. For this purpose, correlations between measures based on accrual principle and concept of value creation for shareholders were computed. They are presented in Table 6.

Table 6. Correlations between EPS, ROA, ROE, ROIC and MVA, TSR, ETSR, RTSR

	MVA 18	MVA 19	TSR 19	TSR 20	ETSR 19	ETSR 20	RTSR 19	RTSR 20
EPS 18	–0.00789	0.03307	0.19206	–0.06373	0.19752	–0.06349	–0.06373	0.19206
EPS 19	0.03197	0.07594	0.24728	–0.07559	0.24803	–0.07563	–0.07559	0.24728
ROA 18	0.04589	0.05192	0.25756	0.02807	0.26693	0.02861	0.02807	0.25756
ROA 19	0.05415	0.05964	0.06382	0.00373	0.06523	0.00381	0.00373	0.06382
ROE 18	0.03865	0.04633	0.24108	0.03107	0.25132	0.03167	0.03107	0.24108
ROE 19	0.04082	0.04670	–0.01002	0.03132	–0.00841	0.03144	0.03132	–0.01002
ROIC 18	0.03769	0.04370	0.22223	0.01605	0.23256	0.01664	0.01605	0.22223
ROIC 19	0.05049	0.05719	0.02354	0.02104	0.02714	0.02126	0.02104	0.02354

S o u r c e: Author's own elaboration based on financial data of the analyzed companies.

[3] *—significant correlation ($p<0.05$).

It is worth underlining that in the case of comparing ROA, ROE, ROIC, EPS and TSRs, there is an existing time shift. Accrual indicators were computed on the basis of financial data from 30 December, and these results influence company's performance in the next year, too (for instance financial statements for the previous year are published in the first or the second quarter of the following year and at the time of publication it influences current stock prices). Therefore, the comparison for example ROA 18 with TSR 19 seems to be a sensible procedure.

Despite the expected dependencies, there are no significant correlations ($p<0.05$) between ROA, ROE, ROIC, EPS and TSR, MVA. It is a quite surprising result, which means that return on assets, equity or invested capital has no similar influence, among an analyzed group of companies, on MVA and TSR neither in the same year, nor in the following one; the same is true for EPS and MVA and TSR. It indicates that measures of value added are not consistent with accrual indicators—both groups are providing different information about the company's performance, therefore the fourth hypothesis might be considered as a rejected one. Hence, it may be useful to use not only ROA, ROE or EPS, but also measures like MVA and TSR, especially its modifications (ETSR, RTSR) during the assessment of the company's profitability in different approaches.

5. Conclusion

Taking everything into consideration, it can be said that IT and video games industry companies are characterized by high volatility of rates of return, according to TSRs. Moreover, a higher risk is only partially associated with higher returns (that is true for 2019 and not for 2020). Further, the level of risk, measured by the beta coefficient, was higher for entities from the gaming industry than for IT companies. What is more, significant correlations between accrual indexes and value added measures were not observable. The obtained results indicate that the economic theories (for example regarding the positive dependence between risk and rates of return and the positive relationship between value added and accrual measures) are only partially confirmed in the actual situation on the IT and video games markets. Generally, the results of previously pointed out studies are significantly different from this one, based on IT and video game companies. It may be caused especially by the selection of the analyzed group of entities, whose area of operating activity is significantly different from classical companies. That difference may be an incentive for further, in-depth research in this area.

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Rynkowa wartość dodana (MVA) i całkowity zwrot dla akcjonariuszy (TSR) wśród firm z branży IT i gier wideo notowanych na Giełdzie Papierów Wartościowych w Warszawie

Abstrakt: Współcześnie pomiar wyników przedsiębiorstwa wydaje się złożony. Jest wiele klasycznych, memoriałowych wskaźników rentowności, takich jak ROA, ROE i EPS. Jednakże koncepcja skupienia się na maksymalizacji wartości dla właścicieli ma wpływ na główny cel funkcjonowania podmiotów gospodarczych. Z tego powodu, a także z uwagi na wady wcześniej wymienionych indeksów, stworzono nowe, odwołujące się do wartości dodanej dla akcjonariuszy. Wskaźniki takie jak EVA, MVA czy TSR pozwalają na oszacowanie wartości kreowanej przez firmę. Celem artykułu jest analiza wartości dodanej kreowanej przez wybrane spółki giełdowe. Badanie empiryczne skupione była na porównaniu wartości dodanej dla akcjonariuszy z ryzykiem i ze wskaźnikami memoriałowymi, przy użyciu statystyk opisowych, korelacji i regresji. Poziom ryzyka wśród analizowanych przedsiębiorstw (z branży IT i gier wideo, notowanych na Giełdzie Pa-

pierów Wartościowych w Warszawie) różnił się – był dość wysoki dla jednostek, których działalność związana jest z branżą gier wideo, niższy zaś dla przedsiębiorstw z branży IT. Ogólnie wartości MVA i TSR cechowały się dużą zmiennością. Co więcej, wyższe ryzyko nie było związane z wyższymi stopami zwrotu (mierzonymi TSR). Ponadto nie wykazano istotnej zależności pomiędzy wskaźnikami memoriałowymi a miernikami wartości dodanej. Warto wspomnieć, że wynik analizy różni się od rezultatów prac wymienionych w artykule. Może być to spowodowane specyficznym doborem próby badawczej.

Słowa kluczowe: wskaźniki efektywności, stopy zwrotu, wskaźniki memoriałowe, korelacja, rentowność

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FabLabs as local business incubators on the example of Krakow

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Abstract: Entrepreneurship is an important element of the modern market economy. The characteristic features that describe modern entrepreneurship are expansiveness and innovation. Expansiveness defines the willingness to catch up with the best and setting ambitious goals. Innovation means a constant search for novelties and constant improvement. The functioning of modern places such as FabLabs fits in with the characteristic features of modern entrepreneurship. The scientific goal of this publication is to present the FabLabs institutions as innovative organizations that catalyze entrepreneurship on a local scale. The article presents a detailed analysis of the Krakow community of the FabLabs. The research methods used in the article are: analysis of existing data and telephone interview. The article was created using compact book materials, magazines, as well as netographic information and telephone contacts with representatives of Krakow's FabLabs. The article describes the concept of FabLabs, its roots and development in the world and in Poland. The functioning and role of the FabLabs as local entrepreneurship centres in Poland were discussed. The activities of the FabLabs in Krakow were thoroughly analyzed. The thesis put forward in the publication is that FabLabs play an important role in supporting local entrepreneurship. The research results positively verify the thesis. Based on the collected data and the information obtained, it is clear that the functioning of the FabLabs in the city of Krakow significantly favours local development of entrepreneurial attitudes.

Keywords: expansiveness, innovation, creativity, society, local systems

1. Introduction

Entrepreneurship is now a lever of the modern economy. It enables constant development and achieving a competitive advantage. Expansiveness and innovation are characteristic adjectives that describe contemporary entrepreneurship.

Among the many places for the development of entrepreneurship, FabLabs deserve attention in the form of publications. These relatively new places for the development of ideas in Poland are becoming more and more popular.

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The scientific aim of the article is to present the FabLabs institutions as innovative organizations that catalyze entrepreneurship in local systems. The publication devotes special attention to the Krakow community of FabLabs.

The research methods used in the article are: analysis of existing data and telephone interview in the form of open questions. The publication was created thanks to the use of a compact book monograph, magazines, as well as netographic information and telephone contacts with managers, founders and employees of the Krakow FabLabs.

The thesis put forward in the publication is that FabLabs play an important role in supporting local entrepreneurship.

Based on the results of the research, it is clear that the functioning of FabLabs in the city of Krakow significantly fosters the development of entrepreneurial attitudes, fosters the creation of innovation, while playing a pro-social role.

2. The concept and development of FabLabs in the world

The term FabLab (also Fab Lab, Fab lab) comes from Fabrication Laboratory and means a type of workshop or a small laboratory that allows willing people to implement their own ideas, passions or projects. Sometimes a FabLab is defined as a small workshop that offers digital modelling and manufacturing capabilities (Gershenfeld, 2005).

The concept of FabLab is synonymous with such concepts as:

– Makerspace;
– Hackerspace (Haklab) (https://hackerspaces.org, 2020).

FabLabs are publicly available institutions that offer at least some of their services or workshops for free. Each FabLab must contain, inter alia, a 3D printer, an electronics zone with available microcontrollers, a carpentry shop or a CNC plotter. The scope of the equipment is precisely defined by FabFoundation (http://www.fabfoundation.org, 2020).

Makerspace can be defined as a physical space equipped with work tools. Unlike the FabLabs, there are no rules that define how large a space is and what specific tools must be in it (http://wojciechkarcz.pl/makerspace/, 2020).

Hackerspace is a grassroots form of Makerspace, usually focused on programming and electronics. Like Makerspaces, Hackerspaces usually live off contributions and have little formal rules. They often host parties, focusing on building a community of hackers and electronics to create new projects together (https://startup.pfr.pl/pl/aktualnosci/makerspace-co-jest/, 2020).

The world's first FabLab was established in 2001 in the USA. Its founder was Professor Neil Gershenfeld, director of the Center for Bits and Atoms at Media Lab, scientifically associated with the Massachusetts Institute of Technology (MIT) in Cambridge, USA (Markoff, 2011). As a physicist, computer scientist and DIY enthusiast, he initiated the creation of the first FabLab in the world. In 2001, Gershenfeld came to the conclusion that the world is full of people with different ideas, but who lack a place to work and implement ideas in practice. According to Gershenfeld, people who want to create something or improve an already functioning product should be given a chance (Mikhak et al., 2002).

The first FabLab was the result of a collaboration between the Grassroots Invention Group and the Media Lab Center for Bits and Atoms at the Massachusetts Institute of Technology (MIT) under a grant from the National Science Foundation in Washington. The key objective of establishing the first FabLab was an attempt to examine the degree of the ability to implement the possessed information and knowledge in practice and the suitability of high technology for the needs of local communities. The pioneering FabLab, in contrast to the majority of those currently operating, was a typical university unit (Fab Central—Fab Lab—IaaC. Archived from the original on 10 February 2014).

Another FabLab was created on the Asian continent. The Indian Institute of Education (Vigyan Ashram) with capital backing from the National Science Foundation created the first FabLab outside the US in India in 2002 (http://vigyanashram.com/Default.aspx, 2020).

Until 2008, the number of FabLabs remained low (Osunyomi et al., 2016). In the following years, the idea of FabLabs began to spread rapidly around the world. Studios began to appear on almost every continent. In 2009, at the initiative of Gershenfeld and as part of MIT, the FabFundation was established. The Foundation coordinates the opening and operation of FabLabs around the globe. The organization has also developed its own logo (Figure 1) and specific guidelines for the necessary FabLab equipment that is necessary to use this name (http://www.fabfoundation.org/index.php/about-fab-foundation/index.html 2020).

Figure 1. Logo of the FabLabs

S o u r c e: https://en.wikipedia.org/wiki/Fab_lab, 2020.

Contributing to the expansion of the FabLabs around the world is the fact that the foundation does not charge any license fees from its followers. Moreover, it does not impose any additional restrictions as to the conditions of functioning on a given market. The project logo can also be used at no cost. According to the Małopolska Regional Development Agency (MAAR) estimates, more than 1000 FabLabs currently operate on the markets of 100 countries (https://www.marr.pl/news/fablab-malopolska-wkrotce-w-krakowie/, 2020). Most of them, however, no longer have much in common with university units. The locations of FabLabs in the world in 2018 are shown in Figure 2.

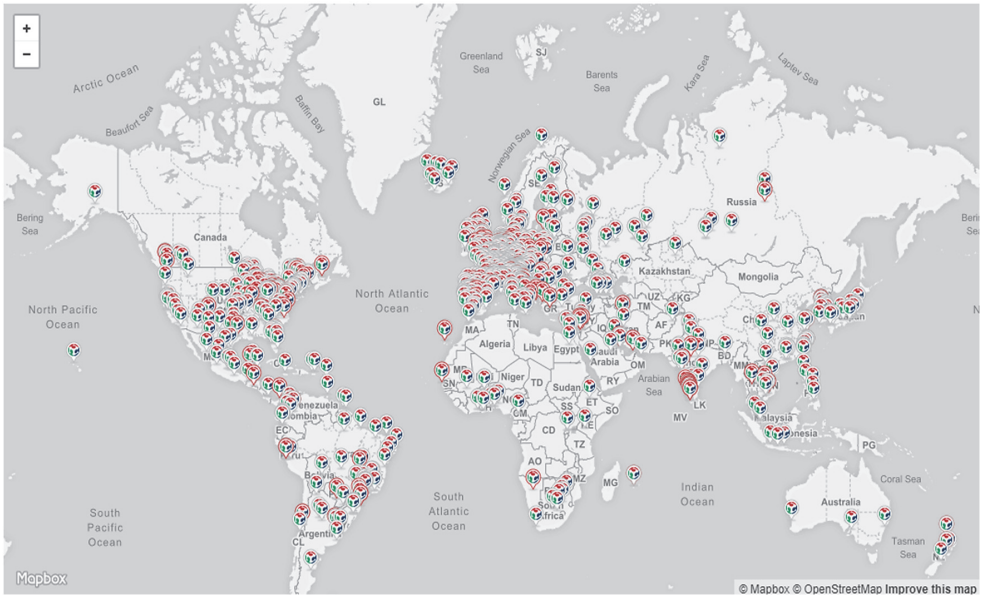

Figure 2. Map of the FabLabs around the world

S o u r c e: https://www.dobreprogramy.pl/cyryllo/FabLab-miec-swoje-miejsce-na-hobby,86498.html, 2020.

The data in Figure 2 clearly show the dominance of the location of the FabLabs in Western Europe as well as in the USA.

FabLabs allows realize passions, interests or dreams. Thanks to their help, it is possible to produce many interesting products or inventions. An important aspect of the FabLabs' activity is mutual assistance, cooperation between members and supporting creativity. FabLabs also focus on group work, which triggers synergistic effects (Gershenfeld, 2005).

The FabLabs' offer is addressed to wide social groups, including in particular young people who do not have their own technical background, workplace, tools, and the necessary technical knowledge. This mainly applies to young city dwellers, schoolchildren and students who have limited financial resources (Tokushima, 2016).

FabLabs, thanks to their equipment, give the opportunity to implement their passions in practice without falling into costs. They operate in an open hardware environment and take the digital revolution to a new level, for example with self-replicating 3D printers. As workshops for creative work, FabLabs usually have:

– computers;
– devices for digital production and fabrication (3D printers, 3D scanners, CNC machine tools, plotters) thanks to which it is possible to create virtually any object or device;
– cutters for sheet metal processing: laser cutter, plasma cutter, water jet cutter, knife cutter;
– carpentry tools;
– design stations, both assembly and testing (Verbelen et al., 2013).

FabLabs care about safety and compliance with health and safety rules. Each person who wants to use the collected equipment must undergo appropriate workplace and health and safety training. What's more, beginner DIY enthusiasts can count on the support and advice of trainers. In addition to access to devices, each FabLab user has the opportunity to establish contacts with other people, share knowledge and ideas. Moreover, on the premises of the FabLabs, workshops and practical classes by people prepared for this are conducted. As part of the lablabs, there are also associations of DIY enthusiasts, modellers, architects, artists and engineers (Walter-Herrmann and Bueching, 2013).

3. The beginnings and development of the FabLabs in Poland

The FabLab market in Poland is under development. Compared to the USA or Germany, FabLabs, Makerspaces and Hackerspaces appeared in Poland relatively late, just a few years ago. The location of FabLabs, Makerspaces and Hackerspaces in Poland at the end of 2017 is shown in Figure 3.

Figure 3. Location of FabLabs, Makerspaces and Hackerspaces in Poland in September 2017

S o u r c e: https://www.dobreprogramy.pl/cyryllo/FabLab-miec-swoje-miejsce-na-hobby,86498.html, 2020.

The data in Figure 3 shows that FabLabs and its related Makerspaces and Hackerspaces are unevenly distributed. At the end of 2017, there were 21 active FabLabs in Poland. Most of them operated in the Greater Poland Voivodeship (5) and Silesian Voivodeship (4). Including the Makerspaces and Hackerspaces, which often later turn into FabLabs, the regions with the

highest saturation should include the Masovian and Lower Silesian voivodeships. In total, out of 16 regions in Poland, 11 can boast of having active FabLabs in their area. The fewest FabLabs, Makerspaces and Hackerspaces are located in the eastern part of Poland, i.e. in the least developed and least enterprising regions of the country.

The first FabLabs in Poland appeared in large urban centres. Gdynia, Lodz, Poznań, Krakow and Warsaw are among the cities that can be considered pioneers of FabLabs, Makerspaces and Hackerspaces in Poland. The list of the first FabLabs in Poland is presented in Table 1.

Table 1. The first FabLabs in Poland

Name	Town	Date of establishing
FabLab Lodz	Lodz	2013
FabLab Tri-City	Gdynia	2013
FabLab Lublin	Lublin	2013
Wytwórnia (Plant)	Krakow	2013
FabLab Kielce	Kielce	2013
Zakład (Plant) Makerspace	Poznań	2014
FabLab Poznań	Poznań	2014
Hackerspace Kraków	Krakow	2014
FabLab	Bielsko-Biała	2014
Off Marina	Szczecin	2014
FabLab24	Bielsko-Biała	2014
Fab Lab Twarda powered by Orange	Warsaw	2017
FabLab Gdansk powered by Orange	Gdańsk	2017

S o u r c e: Author's own elaboration.

One of the first Polish FabLabs was FabLab Lodz, opened in 2013. FabLab Tri-City is also one of the pioneers in this field. The oldest are FabLabs in Lublin and Kielce, too. In Poland, the presence of the FabLabs is not only the domain of large cities. The presence of the studio can be noted in smaller towns such as Wisła, Września, Sokołowsko, Niechanowo. In this respect, the Greater Poland Voivodeship is in the lead (http://fab-lab.pl/, 2018).

Polish FabLabs are often made in unusual places. Krakow's Wytwórnia (Plant) operates in the last remaining building of the former Telpod factory in the industrial district of Zabłocie (https://wytworniakrakow.pl/, 2020). Szczecin's Off Marina was established on the site of a nineteenth-century restaurant enriched with concert halls and a theatre, transformed into a furniture factory after the war (http://off-marina.pl/, 2020). In turn, the Poznań Makerspace Plant is located in the premises of the former graphic factory in the Jeżyce district (http://zaklad.org/, 2018).

Polish FabLabs often produce unique and innovative items, e.g. in Off Marina individually ordered guitars, in FabLab Małopolska accessories for Star Wars Armada or patchwork products. FabLab Lublin can boast of building houses using the straw bale method, ecological energy generators or compost toilets, and FabLab Krakow—weather stations with air purity sensors.

Polish FabLabs are not a monolith. Some of them focus on developing traditional professions based on the use of new technologies, while others are only based on electronics, IT or high technologies.

Polish FabLabs function as social nonprofit organizations. Most often they have the status of an association or foundation. In most cases, they are started by a group of enthusiasts, students. Some are created with the support of external entities, such as FabLab24 (http://www.fablab24.pl 2020). Most of them operate independently, in some cases as school organizations. Such an example is FabLab Wisła Czarne (http://fablab.wisla.pl/ 2020).

4. Krakow's FabLabs as local business incubators

The Krakow's FabLabs market is one of the most dynamic in Poland. The first Hackerspace in Krakow, later transformed into FabLab, was established in 2012. In the following years, more studios began to appear. In 2020, there were four FabLabs in Krakow. The characteristics of the Krakow's FabLabs are presented in Table 2.

Table 2. FabLabs in Krakow in 2020

Name	Date of establishing	Number of members	Specialization
Hackerspace Kraków	2012 (2014)	30	Modern technologies, electronics, IT
Wytwórnia (Plant)	2013	50	Creative workshop, handicraft
FabLab Krakow	2017	15	Modern technologies, electronics, IT
FabLab Małopolska	2018	10	Modern technologies, electronics

S o u r c e: Author's own elaboration.

The first three FabLabs were created thanks to the initiative and financial resources invested by young people interested in creating a creative space. These people then involved other volunteers in the activities. On the other hand, the newest Krakow's FabLab was created on the initiative and with the support of a non-governmental organization and the Marshal's Office.

The first FabLab in Krakow, which from the very beginning met the requirements set by the FabFundation, inaugurated its activity on 11 May 2013. On the initiative of two students, Kajetan Jasztal and Maciej Chart-Olasiński, FabLab was launched under the name Wytwórnia (Plant) at 9 Ślusarska Street in Krakow's Zabłocie district. At the beginning, the studio operated as a sole proprietorship. However, from 2016 it obtained the status of an association (https://wytworniakrakow.pl/, 2020).

The business premises were renovated and equipped thanks to the efforts and financial resources of the founders and a group of supporters. Currently, it has about 350 square metres of usable space, divided into such parts as:

– Fine picking zone;
– Carpentry workshop;
– Zone of embracing and organization;
– Heavy works zone;
– Quiet work zone;

– Chillout zone;
  – Co-work;
  – Ideationroom;
  – Photo darkroom.

The facility was designed as a studio, workshop and prototyping room. The main profile of the activity of the discussed FabLab are traditional professions and activities such as tailoring, renovation of old furniture, making musical instruments, carpentry and screen printing. The facility, which was initially intended to be a meeting place for a narrow group of friends, began to expand its group of members over time. Currently, their number can be estimated at about 50 people.

The label is financed through monthly fees charged to its members. Their amount varies depending on the status and frequency of appearances in FabLab. As part of a coworking workshop, monthly fees range from 80 PLN to 350 PLN, and in the case of a coworking office, from 250 PLN to 450 PLN. In addition, the additional financial support comes from voluntary donations from donors from various sources. For some time, the Wytwórnia (Plant) was also living off fees for renting rooms for various types of training or events.

According to Katarzyna Dulińska-Bohonko, the person responsible for marketing and PR at the Wytwórnia (Plant), the profile of its supporters is varied. The members of the label are students, working people, as well as entrepreneurs, designers and freelancers. Each member undergoes mandatory health and safety training or on-the-job training necessary to work with a given device.

Some people treat activity in FabLab as a typical hobby or a way of spending free time. The results of their work often become the furnishings of their homes. However, for some members of the discussed studio, the products of their work constitute the basic or additional source of income.

Some of the members of the Wytwórnia (Plant) are also involved in coaching activities. Trainers represent various fields and disciplines of knowledge and craftsmanship. During regular training, they help and support new members. They also organize trainings and shows for external entities.

Among the most visible activities of the organization in question in stimulating local entrepreneurship, it was necessary to conduct a free creative workshop in November 2018 called "Discover the designer in yourself". The workshops were intended for all eager and broad age groups. The activities covered 11 thematic areas, including ceramics, portrait photography, book illustrations and sieve-sewing. In addition, the Studio can boast of organizing a number of other events. These were, among others workshops on building 3D printers organized by Materialination, programming workshops: WebMuses and OpenProgramming, Christmas decorations factory, MediaLabs, as well as numerous film evenings, joint breakfasts and design sessions.

In 2012, Hackerspace Kraków started its activity. In 2014, it was renamed FabLab. The organization was established by two students: Maria Skrzypek and Mirosław Woźniak. Hackerspace Kraków has been operating as a foundation since 2014 and is located at 5 Zacisze Street in the very centre of the city (https://hackerspace-krk.pl/, 2020).

Hackerspace Kraków gathers mainly lovers of small electronics, modern 3D technologies and programming microcontrollers. According to Jakub Kramarz, a board member of the Hackerspace Kraków Foundation, its members are students, high school students, retirees, pensioners, as well as families with children. Financing the activities of the FabLab in question is carried out through membership fees, which amount to 50 PLN per month and donations. The organization specializes in conducting courses, presentations and workshops.

The most important achievements of the Hackerspace Kraków Foundation in stimulating local entrepreneurship include the annual organization of amateur radio courses enabling the acquisition of amateur radio licenses. These are the only courses of this type in the region. In addition, the cyclical Nighthacks that integrate young people to work on joint projects deserve attention.

On 11 October 2017 Robert Gryń, the owner of the Krakow-based Codewise company, decided to open his FabLab (https://innpoland.pl/147267,fab-lab-krakow-inicjatywa-roberta-gryna-o-ktorej-nikt-nie-slyszal, 2020). FabLab Krakow is located at 8 Czysta Street in Krakow and functions as an association. The studio, in addition to 3D printers, provides the possibility of using a laser cutter, CNC milling machine, prototyping electronic devices or using sewing machines. FabLab Krakow offers also workshops on ceramics, vegan felting, the production of natural cosmetics, small electronics, screen printing, creating moss pictures and a worldpress course. According to Przemysław Baranowski, the guardian of FabLab Krakow, working at FabLab Krakow gives the opportunity to experiment on your product and correct its mistakes. One of the designers, while working at FabLab Krakow, created original shoes with a wooden sole—Skleyaki. They use the technology of alternating cutting in wooden alder plywood. The author of the idea won them in the Young Design 2018 competition (https://www.iwp.com.pl/young_design, 2020).

The offer of FabLab Krakow is addressed to a wide range of interested people, regardless of age, gender or profession. The free thematic workshops for people with disabilities are worth mentioning. The organization applies preferential fees to students. The cost of monthly access without any time limits at FabLab Krakow is 150 PLN (100 PLN for students). The price includes access to all devices without exception, basic materials and the ability to store your unfinished projects. There is also a single entry fee of 30 PLN (20 PLN for students). Every Thursday from 4:00 pm to 9:00 pm FabLab Krakow offers free tours (https://fablab-krakow.pl 2020).

On 17 October 2018, at the initiative of the Małopolska Regional Development Agency represented by Jakub Hołysz and the Marshal's Office, the youngest FabLab in Krakow was established (https://www.marr.pl/ 2020). FabLab Małopolska was located at 65A Królewska Street. The organization in question offers access to 6 laboratories:

- tailoring;
- modelling;
- design;
- electronics;
- 3D printing;
- product photography.

The youngest FabLab in Krakow is currently in the embryonic stage. Its launch and financing currently comes mainly from subsidies from Małopolska Regional Development Agency and membership fees in the amount of 80 PLN introduced from January 2019 (https://www.fablabmalopolska.pl/, 2020).

According to Malwina Wójcik, the coordinator of FabLab Małopolska, FabLab's members are mainly students of various faculties, especially arts. There are also people representing the older generation of FabLab's enthusiasts, as well as families with children. For seniors, a visit to FabLabs is a return to childhood memories related to attending classes in modelling shops.

FabLab Małopolska supports local entrepreneurship by organizing a number of free events. On the one hand, these are trainings, courses, meetings addressed to various groups of recipients (mainly students, young entrepreneurs, families with children). FabLab organizes contests in which you can win subscriptions that give you the opportunity to work individually in this creative space. Particularly noteworthy is the rich offer of thematic family (family) or children's workshops.

The organization of projects supporting young business is one of the most important achievements of the organization in question. The businessmaker project teaches the basics of business and running your own business. On the other hand, the innomaker project introduces the principles of design thinking—designing and commercializing everyday products. Some of the manufactured products are sold, which constitutes income for their creators, and some become a permanent element of the organization.

Despite the fact that there are several FabLabs in Krakow, there is no competition among them. It can rather be said about creative inspiration and exchange of mutual experiences.

The future of FabLabs in the Małopolska Voivodeship is promising. It is planned to open more studios, located not only in Krakow, but also in smaller towns of the region. In addition, it is also planned to launch a mobile FabLab, located in a truck, which would reach remote corners of the region (http://innowacyjnystart.pl/index.php/miejsca-i-spolecznosci/152-fab-lab-malopolska, 2020).

5. Summary

The activity of FabLabs, as well as related Makerspaces or Hackerspaces in Poland and in the world, is difficult to overestimate. Enabling young people, and not only, access to space, equipment or technology provides a simple way to shape creativity and stimulate innovation. Many people have their own ideas, but it is not possible to implement them in practice. The idea of FabLabs meets these types of problems and acts as local business incubators.

In the case of countries such as Poland, the activity of the FabLabs is particularly valuable. For years, Poland has been one of the last places in Europe in terms of the level of innovation. Many ideas are unlikely to be implemented due to the lack of technical or financial resources of the creators. The spread of places of creativity seems to be a valuable remedy for improving the disadvantage.

Due to the growing interest in the FabLabs' offer in Poland, their further development can be expected. It would be especially valuable to develop FabLabs in small towns and villages, where access to modern technology is the most limited.

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FabLabs jako lokalne inkubatory przedsiębiorczości na przykładzie Krakowa

Abstrakt: Przedsiębiorczość stanowi istotny element współczesnej gospodarki rynkowej. Charakterystycznymi cechami opisującymi nowoczesną przedsiębiorczość są ekspansywność oraz innowacyjność. Ekspansywność określa chęć dorównania najlepszym i stawianie sobie ambitnych celów. Innowacyjność zaś to ciągłe poszukiwanie nowinek i nieustanne udoskonalanie. Funkcjonowanie nowoczesnych miejsc takich jak FabLaby wpisuje się w charakterystykę współczesnej przedsiębiorczości. Celem naukowym niniejszej publikacji jest przedstawienie instytucji FabLabów jako społecznych i jednocześnie innowacyjnych organizacji katalizujących przedsiębiorczość w obszarach miejskich. W artykule poddano szczegółowej analizie krakowskie środowisko FabLabów. Metody badawcze zastosowane w artykule to: krytyka piśmiennicza, analiza danych zastanych i wywiad telefoniczny. Artykuł powstał dzięki wykorzystaniu zwartych materiałów książkowych, czasopism, jak również informacji netograficznych i kontaktów osobistych z przedstawicielami krakowskich FabLabów. W artykule dokonano charakterystyki pojęcia FabLab, jego korzeni oraz rozwoju na świecie i w Polsce. Omówiono funkcjonowanie i rolę FabLabów jako ośrodków przedsiębiorczości na terenie Polski. Dogłębnej analizie poddano działalność FabLabów na terenie Krakowa. Teza, jaką postawiono w publikacji, to stwierdzenie, że FabLaby odgrywają istotną rolę społeczno-innowacyjną w kreowaniu zachowań przedsiębiorczych. Wyniki badań pozytywnie weryfikują postawioną tezę. Na podstawie zgromadzonych danych i uzyskanych informacji wynika jasno, że funkcjonowanie FabLabów na obszarze Krakowa w istotny sposób sprzyja rozwojowi postaw przedsiębiorczych oraz kreowaniu innowacyjności, przy realizowanej jednocześnie funkcji prospołecznej.

Słowa kluczowe: ekspansywność, innowacyjność, kreatywność, społeczeństwo, układy lokalne

MANAGEMENT AND QUALITY

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"The loneliness" of the nonprofit leader: Comparison with for-profit and public organizations

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Abstract: Leaders in nonprofit organizations face challenges related to assignment and enforcement of tasks. Their influence on employees, who are mostly volunteers, remains largely limited. The purpose of the article is to answer the following research questions: Do leaders in Polish nonprofits feel alone in making decisions and carrying out tasks? Are there any differences between nonprofit, for-profit and public organizations in terms of who is responsible for decision-making? Are there any differences between nonprofit, for-profit, and public organizations in terms of who is responsible for carrying out tasks? A total of 315 non-randomly selected respondents participated in the study: 105 leaders and 210 employees not holding managerial positions (35 and 70, respectively, from each type of organization). The article shares the findings of the analysis of leaders' statements. The Kruskal-Wallis test was used to identify possible cross-sectoral differences. The results prompt a conclusion that a significant part of leaders in Polish nonprofits experience "loneliness" and a sense of being left alone with problems related to the functioning of the organization. To a large extent, they have to make decisions and carry out tasks on their own, as they receive little to no support from employees. The comparative analysis showed that this problem is more prevalent in nonprofits than it is in for-profit or public organizations.

Keywords: leaders, nonprofits, decision-making, task realization, cross-sectoral differences

1. Introduction

Managing nonprofit organizations (NPOs) is a case apart because of the structural and personal characteristics of these organizations. Polish experience shows that leaders[1] of nonprofit organizations face challenges related to assigning tasks and enforcing their realization, while having a limited ability to influence employees who are mostly volunteers. Every third Polish NPO (36%) relies on social work only, while

[1] NPOs in Poland are small and non-formalized and therefore the term *leader* is applied to persons responsible for managing such entities.

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every fourth (27%) offers irregular income (Charycka et al., 2020). Available reports on the activities of the Polish third sector point to the existence of what can be described as "loneliness" experienced by nonprofit leaders. In a 2015 study, more than half of participating nonprofit representatives (55%) admitted that most of the work and responsibilities is passed on to leaders (Adamiak et al., 2016). A similar pattern was observed for responsibility, which rested solely on management staff in almost half of the cases (48%). This, of course, entails emotional and health consequences for managerial staff. Research by Cypryańska-Nezlek (2020) found that problems commonly found in NPOs involve: fatigue, stress, pressure to work more, feeling of powerlessness related to external difficulties in accomplishing goals and missions. Are leaders in nonprofits "on their own" and do they bear the burden of decision-making and task realization by themselves? This is where it may be worth comparing nonprofits with for-profit and public organizations, as only that context can shed proper light on the extent to which this is a typical problem for NPOs while also expanding the knowledge of existing cross-sectoral differences.

The purpose of the article is to answer the following research questions:[2]

Q_1: Do leaders in Polish nonprofits feel alone in making decisions and carrying out tasks?

Q_2: Are there any differences between nonprofit, for-profit and public organizations in terms of who is responsible for decision-making?

Q_3: Are there any differences between nonprofit, for-profit, and public organizations in terms of who is responsible for carrying out tasks?

The article is divided into sections, which are as follows: introduction, literature review, methods, results, and conclusions.

2. Leadership in nonprofit organizations

The literature points to differences in institutional requirements for leaders at organizations representing the three main sectors of the economy (cf. Mirabella and Wish, 2000; Tschirhart et al., 2008; Suarez, 2009). Differences in approaching leadership are emphasized in particular between for-profit and nonprofit entities (De Hoogh et al., 2005; Egri and Herman, 2000; Rierson and Miller, 2006; Rowold et al., 2014; Saxton, 2005; cf. Rowe, 2014).

Disparities in the work of profit, nonprofit and public managers result from the organizational context. What makes nonprofits stand out is that their human resources are drawn chiefly from volunteer work (Anheier, 2005; Salamon and Anheier, 1997). Participation is therefore voluntary, meaning also that activities take place without a clear division of responsibilities (Frumkin, 2002). Nonprofit leaders do not have strong authority over their employees and have limited opportunities to impose their plans and decisions (Neck et al., 1998; Rierson and Miller, 2006; Jager et al., 2009). Nonprofit organizations often lack a formal hierarchy and management is democratized, which in turn may turn them into a de facto coalition of individuals.

Nonprofit leaders "have people who work with them, and not for them" (Rierson and Miller, 2006). Farmer and Fedor (1999) draw attention to the differences in psychological contracts in nonprofit and for-profit organizations. In the former, participation is symbolic,

[2] These questions are based on the literature review.

therefore the expected terminology is also symbolic. Volunteers bring onboard their convictions and beliefs, which are a manifestation of their ethical attitude towards the world (Rothschild and Milofsky, 2006; cf. Stukas et al., 2016). Motives of volunteers' involvement in nonprofit work can be both altruistic and instrumental (Briggs et al., 2010; Clary et al., 1998; Horton-Smith, 1981; Pearce, 1993; Shye, 2010; Sokolowski, 1996; Stukas et al., 2016).

Nonprofit leaders have limited opportunities to apply formal tools for enforcing orders and shaping the preferred behaviour of employees. This can be balanced out by greater involvement from volunteer staff. Pearce (1993; Liao-Troth, 2003) identified reliability as the central distinguishing feature between volunteers and paid workers. Volunteer workers exhibited lower levels of both job withdrawal and work withdrawal than paid employees, and higher levels of organizational commitment than paid employees. Volunteers were more likely to participate in organizational citizenship behaviours (Laczo and Hanisch, 1999). Overall, nonprofit employees are more willing to "donate" work and stay loyal to the organization than employees in other sectors (Almond and Kendall, 2000; cf. Borzaga and Tortia, 2006). Having said that, research by Goulet and Frank (2002; cf. Lyons et al., 2006) challenged that view by arguing that organizational commitment runs highest among employees working in enterprises, followed by nonprofits, and public organizations coming last.

3. Methods

The cross-sectoral study was conducted in 2019, in Poland's Lubusz Voivodeship. It concerned differences in the management of: nonprofit, for-profit, and public entities. One of the research areas was related to the "loneliness" of nonprofit leaders as well as to the problem of decision-making and task realization in three types of organizations. A total of 315 non-randomly selected[3] respondents participated in the study: 105 leaders and 210 employees not holding managerial positions (35 and 70, respectively, from each type of organization). This article shares the findings of the analysis of leaders' statements.

The questionnaire, in the part relating to the issues analyzed in this article, consisted of 2 semi-closed questions concerning persons responsible in their entities for the tasks realization and decision-making, which were addressed to managerial staff of all three types of organizations. Nonprofit leaders, through three closed questions, were additionally asked about their sense of loneliness in the entities they lead, about people who can replace them in their role as leaders, and about the percentage of employees engaged in the activities of the organization.

The research process consisted of the following stages: literature analysis, research gap identification, formulation of research questions and hypotheses, sample selection and development of adequate research tools, data collection and analysis, formulation of conclusions, indication of research limitations and future directions.

[3] The sample was selected non-randomly. No list is available of leaders working in organizations in Lubusz Voivodeship, nor there is any such list of employees, members or volunteers working in Polish nonprofit organizations.

The following hypotheses were formulated:

H_1: The majority[4] of the leaders in Polish nonprofits feel lonely in making decisions and carrying out tasks.

H_2: There are differences between nonprofit, for-profit, and public organizations in terms of who is responsible for decision-making.

H_3: There are differences between nonprofit, for-profit and public organizations in terms of who is responsible for task realization.

To test these hypotheses, surveys and statistical analyses were conducted. The questionnaires were sent out to different respondents (representatives of one of the three types of organizations: nonprofit, for-profit, and public) whose participation in the study was voluntary.

Among the leaders who participated in the study, there were more men (52.38%) than women. The average age of respondents in the study was 35.8. Most of them worked in small organizations (46,67%), the third part (31.42%)—in micro, and the fifth part (21.90%)—in medium-sized or large.

Nonprofit employees more often represented associations (74.3%) than foundations (25.7%). Every third (30.48%) worked for an entity with fewer than 10 permanent employees (paid, non-paid, members). Almost half (47.62%) were involved with organizations employing 11–50 people, while the rest (11.90%) worked for larger organizations. They represented entities operating in various areas but mostly: social and humanitarian aid (37.14%), education and research (35.24%), culture and recreation (24.76 %) or development and housing (22.86%). More than half of the surveyed NPO employees (62.82%) were members of the organization, the fifth part (19.23%) were volunteers, and the remaining part (17.95%) were paid employees.

Public team members most often worked in medium-sized (50–249 employees; 35.14%) or large entities (over 250 employees; 35.24%), while other members mostly worked in small or micro entities (up to 50 employees; 27.62% in total). Those were mostly: offices (42.86%), army and police and prison (18.09%), educational institutions (15.24%), hospitals (13.33%).

Every fifth (19.05%) for-profit respondent worked in a company with fewer than 10 employees, while every fourth (25.71%)—in a small, every third (30.48%)—in a medium-sized, and every fourth (24.76%)—in a large enterprise. The predominant industries were wholesale and retail trade (23.81%) and manufacturing (22.86%).

Statistical analyses were carried out using Microsoft Excel and Statistica software. A non-parametric test was performed (the Kruskal-Wallis test), which was preceded by examining the normality of the distribution of individual research groups—using to this end the Kolmogorov-Smirnov test with the Lillefors correction (the results obtained justified using the non-parametric test).

4. Results

The research showed that more than every third (37.14%) of the surveyed NPO leaders felt lonely, in the sense of being left alone with problems related to the functioning of the organization, while every second (51.43%) expressed the opposite opinion. The obtained results were the basis for rejecting the H_1 hypothesis, although they also showed that the scale of the discussed problem is significant, which can be considered a worrying indicator for the functioning of Polish nonprofit entities.

[4] According to the *Wielki słownik języka polskiego* (Greater dictionary of Polish language, Żmigrodzki, https://wsjp.pl/index.php?id_hasla=35345), *the majority* is "the number of objects that account for more than half the total".

An interesting question is whether the "loneliness" experienced by some of the NPO leaders was a matter of choice or perhaps stemmed from employees' passive attitude to work (cf. Stankiewicz et al., 2018). To this end, leaders were asked to indicate what percentage of their employees were involved in the functioning of the organization. Responses showed that in every tenth (11.43%) entity only 10% of employees were actually involved in the activities of the organization. No more than half of the employees were involved in the functioning of most NPOs (65.71%), while only in every third (34.29%) the percentage of engaged employees was higher (Figure 1).

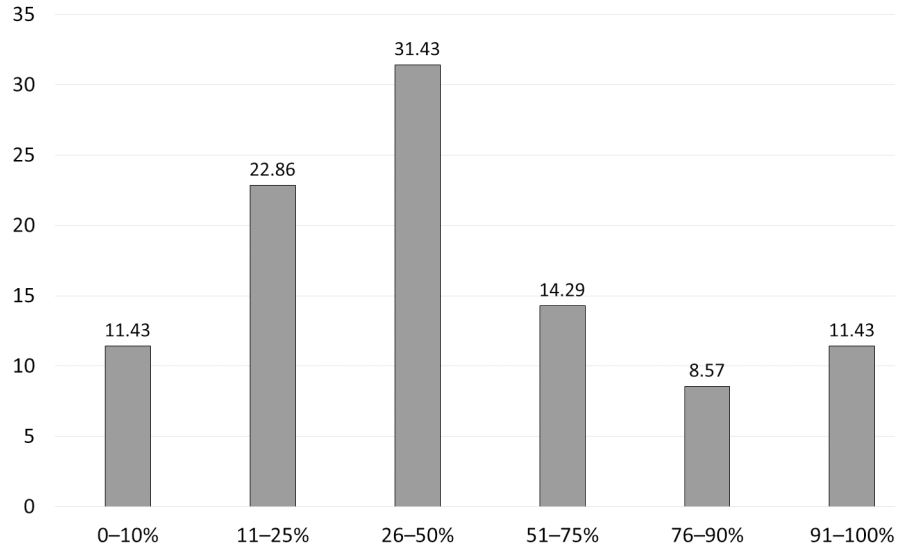

Figure 1. Percentage share of nonprofit employees engaged in the functioning of their organization

S o u r c e: Authors' own elaboration.

Some light on the problem of "loneliness" among nonprofit leaders has already been shed by research intending to find out which people could effectively replace NPO leaders in the case the latter quit. According to more than half of the surveyed managers (60%), there are employees who could become their successors, while over a fifth of respondents (22.86%) expressed the opposite opinion. 17.14% of the leaders found it difficult to answer that question. In other words, one in five NPOs would be at risk if their leader chose to step down.

The leader's sense of "loneliness" in the organization may also spring from the fact that he/she does not receive support from employees, e.g. in the decision-making process (not only for everyday but also strategic decisions) and/ or during the implementation of tasks.

In the course of the research, the decision-making patterns in NPOs were analyzed and compared with those collected in for-profit and public organizations. The Kruskal-Wallis test was performed to determine whether the responses given by leaders differentiate the type of organization.[5] There were no grounds to reject the null hypothesis about the uni-

[5] The null hypothesis (about uniform distribution) is rejected when H value is larger than the Chi^2 distribution (Ostertagová et al., 2014).

form distribution of the assessment of decision-making in nonprofit, for-profit and public organizations (H=0.19229, Chi^2=3.565170; H<Chi^2). However, cases where leaders would make decisions on their own due to lack of support from employees were observed in nearly every fifth NPO (17.14%), while this correlation was either non-existent (0%) in public or sporadic (2.86%) in for-profit organizations. It was also found that leaders are more likely to consult employees for decision-making regarding the functioning of the organization in for-profit and public entities (54.29% each) than they are in nonprofit entities (31.43%). Joint decision-making involving all staff was most prevalent in NPOs (28.57%, compared to 17.14% in public and 14.29% in for-profit) (Table 1).

Table 1. People who are responsible for decision-making in nonprofit, for-profit and public organizations

People who are responsible for decision-making in organization N=105 (35/35/35)	**Total**	**Nonprofit**	**For- profit**	**Public**
	[%]			
1. Leader makes decisions on his/ her own, he/ she is not interested in hearing the opinions of other employees.	5.71	8.57	5.71	2.86
2. Leader makes decisions on his/ her own because there is no such support coming from employees.	6.67	17.14	2.86	0.00
3. Leader makes decisions on his/ her own taking into account the opinions of a few trusted employees.	20.00	11.43	22.86	25.71
4. Leader makes decisions on his/ her own listening to the opinions of all staff.	46.67	31.43	54.29	54.29
5. All staff make decisions together.	20.00	28.57	14.29	17.14
6. Management board makes decisions through majority voting.	0.95	2.86	0.00	0.00

S o u r c e: Authors' own elaboration.

The questionnaire also addressed the issue of task realization in nonprofit, for-profit and public organizations. The Kruskal-Wallis test was performed to determine whether the responses given by leaders differentiate the type of organization. Grounds were found for rejecting the null hypothesis about the uniform distribution of the assessment of task realization in nonprofit, for-profit and public organizations (H=8.217809, Chi^2=1.06006; H>Chi^2).

Table 2. People who are responsible for carrying out tasks in nonprofit, for-profit and public organizations

People who are responsible for carrying out tasks in organization N=105 (35/35/35)	**Total**	**Nonprofit**	**For- profit**	**Public**
	[%]			
1. Leader carries out tasks on his/ her own, not wanting help from others.	0.95	0	2.86	0
2. Leader carries out tasks on his/ her own because there is no such support coming from employees.	4.76	11.43	0	2.86
3. Tasks are carried out by a small percentage of employees.	26.67	37.14	22.86	20.00
4. Tasks are carried out together by all staff.	60.95	45.71	68.57	68.57
5. Others.	6.67	5.71	5.72	8.58

S o u r c e: Authors' own elaboration.

Carrying out tasks together by all staff was more prevalent in for-profit and public organizations (68.57%, each) than in NPOs (45.71%) (Table 2). In NPOs, however, it was more common for a small percentage of employees to show commitment (37.14% compared to 22.86% in for-profit and 20.00% in public). Let us note that in every tenth nonprofit entity (11.43%) the leader carried out tasks on his/ her own, as no other employees wanted to support him/ her in this area.

5. Conclusions

The results prompt a conclusion that a significant part of nonprofit leaders in Poland experience "loneliness" and a sense of being left alone with problems related to the functioning of the organization. They largely have to make decisions and carry out tasks on their own, as they receive little to no support from employees. The comparative analysis showed that this problem is more prevalent in NPOs than it is in for-profit or public organizations.

While this may be explained by the limited possibilities of using formal tools of influencing nonprofit employees, a question should also be asked about the psychological variable which is the assertiveness of nonprofit leaders but also their management skills expressed e.g. in the ability to divide responsibilities and manage human resources. Let us also note that NPO leaders are not normally subject to complex substantive verification of their fitness for leadership. As a rule, those who are socially accepted and willing to act get the job, which means they are often left alone to bear organizational burden. This is further complicated by the fact that some nonprofit leaders lack any management background whatsoever, which can make them not as well-equipped to deal with employees, including through the use of HRM methods and techniques adapted to the needs of nonprofit organizations. While these solutions are encouraged by some of the authors dealing with the problems of the third sector (e.g. Baluch, 2012; Bogacz-Wojtanowska, 2009; Burke and Cooper, 2012; Hudson, 1999; Pynes, 2013)[6], available studies show that management of human resources, including non-wage motivation, is largely underestimated among Polish NPO leaders (Charycka et al., 2020). This, in turn, may have a negative impact on employee commitment and favour employees' reluctance to engage in decision-making and task realization.

To what extent is the problem discussed in this article caused by structural, and to what extent—by personal and competence-related conditions? Further research is needed to answer this question. Any such studies should be in-depth and use techniques based on direct contact, interviews, observation, case study, etc. which would help better understand the analyzed problem. Finally, let us point out some limitations of this research. The sample was selected non-randomly, which means the findings cannot be generalized, and the study involved only Polish organizations, meaning it was embedded in a specific cultural context that should be accounted for when formulating conclusions.

[6] It is often highlighted in the literature that motivating third-sector employees should be based on: mission of the organization, wise leadership, mutual trust, reaching to the source of problems, two-way sensitivity, personal discipline, and teamwork (Drucker, 1990; cf. Schepers et al., 2005; Stankiewicz, Seiler and Bortnowska, 2017).

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„Osamotnienie" lidera organizacji nonprofit: porównanie z organizacjami nastawionymi na zysk i z organizacjami publicznymi

Abstrakt: Liderzy organizacji non profit stają w obliczu problemów związanych z delegowaniem zadań i egzekwowaniem ich wykonania. Mają oni ograniczone możliwości wpływania na pracowników, którzy przeważnie są wolontariuszami. Celem artykułu jest udzielenie odpowiedzi na następujące pytania badawcze: Czy liderzy polskich nonprofitów czują się osamotnieni w podejmowaniu decyzji i realizacji zadań? Czy istnieją różnice między organizacjami non profit, for-profit i publicznymi w zakresie tego, kto podejmuje w nich decyzje? Czy istnieją różnice między organizacjami non profit, for-profit i publicznymi w zakresie tego, kto realizuje w nich zadania? W badaniach ankietowych wzięło udział łącznie 315 celowo dobranych respondentów: 105 liderów oraz 210 pracowników niepełniących funkcji kierowniczych (odpowiednio: po 35 oraz po 70 z każdego typu organizacji). W artykule zaprezentowano wyniki analizy wypowiedzi liderów. Zastosowano test Kruskala-Wallisa celem identyfikacji ewentualnych różnic międzysektorowych. Wyniki przeprowadzonych badań upoważniają do wniosku, że w polskich organizacjach non profit istotna część liderów czuje się osamotniona i pozostawiona sama z problemami dotyczącymi funkcjonowania organizacji. Muszą oni w znacznym stopniu samodzielnie podejmować decyzje i wykonywać zadania, ponieważ nikt z personelu ich w tym nie wspiera lub czynią to nieliczni. Analiza porównawcza wykazała, że w przypadku organizacji non profit problem ten jest powszechniejszy niż w organizacjach for-profit i publicznych.

Słowa kluczowe: liderzy, organizacje non profit, podejmowanie decyzji, realizacja zadań, różnice międzysektorowe

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Disclosure of information on increasing and decreasing the balance of reserves in financial statements by companies listed on the Warsaw Stock Exchange

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Abstract: The purpose of this paper is to verify whether companies listed on the Warsaw Stock Exchange disclose less information about reserves in their financial statements in case of a reduction in reserves than in case of an increase in reserves. It has been hypothesized that in the case of a reduction in reserves balance, disclosures are less detailed than in the case of an increase in them. This hypothesis was verified through an analysis of information reported in the financial statements of 148 companies listed on the Warsaw Stock Exchange for the years 2007–2014: in total, the analyzed data comes from 1184 financial statements. Within the research, a three-step index of disclosures detail of the two leading reserve categories is constructed and followed with a comparison of the values of disclosure indexes and the fact that reserves were reduced and increased. The research methodology included literature studies and empirical studies using the author's index of disclosure detail and statistical testing. The conducted research extends the cognitive legacy of mainstream research into the quality of financial statements disclosures and in the principal-agent problem.

Keywords: reserves, disclosure of information, financial reporting, financial result, earnings management

1. Introduction

Information provided by accounting is an important determinant of investor decisions. Nonetheless, incorrect or unclear information provided by the accounting system can lead to inefficient resource placement (Bleck and Liu, 2007). As many authors have demonstrated (Ascioglu et al., 2012), the quality of financial statements depends on the liquidity and stability of financial markets, whereas securities prices react strongly to information about financial results that is provided by the accounting system.

Meanwhile, there is a danger that false information will be delivered to the financial market. This is because financial statements may be subject to manipulation. The final ac-

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counting product—financial statements—is one of the most important elements of ownership supervision and the main source of information regarding the financial situation of a company. Unfortunately, the quality assessment of reporting information is exceedingly difficult to conduct, as information is only an "abstract model of reality" (however, it can be assumed that high-quality information shall be equal to the reliable reflection of economic reality (Jurewicz and Walińska, 2008, p. 107).

Meeting the overarching objective of accounting, i.e. quantification of the economic life and portrayal of entity's activities in the most faithful way, requires accounting to be based on general principles and an area of freedom (Staszel, 2019), which enable the choice of the solution closest to economic reality, rather than one that is based on strict regulations, orders and prohibitions. Unfortunately, this area of freedom in accounting that accountants are awarded to capture the economic reality—in a manner tailored to each entity—as accurately as possible in the financial statements, may be used for the wrong purpose, i.e. to manipulate the reporting data and thus the decisions of the users of said data. Research carried out by many authors (Pfaff, 2007) indicates that the areas most prone to errors and irregularities in listed companies are issues connected, e.g. with employee benefits and reserves. Other studies (Andrzejewski and Mazurczak, 2011, p. 244) showed that the most common related reasons for financial statements being revised include the lack of reserves for retirement benefits. E. Peek (2004) also points out that reserves are a key item of the financial statements and should be carefully reviewed by auditors. Micherda (2009, p. 138) highlights that in terms of value measurement in accounting, special attention should be paid to two areas, one of which is the creation and release of reserves.

The subject of the research work, partially described in this paper, are reserves that belong to a category in which, according to numerous authors, the risk of lack of credibility is high. Valuation procedures of both reserves and impairment write-offs permit subjective parameters, so that the picture of an entity, as concluded from the financial statement, can be largely different from reality.

The effects of increasing or reducing reserves, with only a few exceptions, directly change an entity's financial result, and as most of the reserves are treated as estimates, this is a category that can be successfully used for discretionary profit management. Taking that into account, the decision was made to investigate whether or not the entities restrict the disclosure in financial statements (i.e. because the reserves balance is reduced, they provide fewer data in the supplementary information and explanations than in the case of increasing the reserves balance) when those entities reduce reserves balance (perhaps intentionally to increase the reported financial result). If the hypothesis is confirmed that the disclosure contains less detail (as measured by the disclosures' detail index) in the case of decreasing reserves balance, then this would imply that entities purposefully "conceal" the data in the case of decreasing reserves balance. This could indicate a discretionary and intentional reduction of the reserves balance.

The research aimed to verify if the quality of disclosed information depends on whether entities reduce or increase reserves. Two hypotheses were formulated: Hypothesis 1: when the size of the retirement reserve is reduced, the detail of disclosure measured in terms of the detail of the disclosure index is lower than in the event of an increase in the size of the reserves. Hypothesis 2: when other reserves are reduced, the detail of disclosure of these reserves is lower than in the event of an increase in the size of reserves.

The hypotheses were verified through an analysis of information retrieved from 1184 financial statements of 148 companies listed on the Warsaw Stock Exchange covering 2007–2014. The research method involved literature review and empirical studies employing the author's proprietary disclosure detail index and statistical testing: use was made of the T-test for the mean.

2. Literature review

The research into reserves focuses primarily on the ability to discretionarily shape financial result through this category. It is worth noting that procedures such as income smoothing, big bath or cookie jar reserves are based on appropriate manipulation of the size of reserves, as the effects of increasing or decreasing the reserves balance, with a few exceptions only, directly change the entity's financial result, and as most of the reserves are treated as estimates, this is a category that can be successfully used for discretionary profit management.

The analysis carried out by many Polish authors demonstrates that the share of reserves in the total balance sheet of the analyzed business entities does not exceed 5%, yet this practice provides an effective tool used for manipulating the financial result. The authors found a correlation between the creation/ release of reserves and the financial result/ financial ratios, including ROE. Research conducted by Polish authors also shows that entities are prone to creating excessive reserves which are later used (released) to create a financial result that is higher than it actually is. A summary statement of the main research on reserves conducted by Polish authors is presented in Table 1.

Table 1. The summary of the results of the research on the reserves' category conducted in Poland

Authors of the research and research sample	Main findings of the research
Chraścina, 2015, 263 companies listed on the Warsaw Stock Exchange, 2010–2013	– The level of reserves disclosed in the financial statement depends, among other factors, on audit quality. – Reserves provide a tool for shaping financial results (*earnings management*) in order to smoothen the financial result, apply "big bath" strategies, avoid reporting on a decline in the financial result and avoid reporting on a small loss.
Duraj, 2005, 237 companies listed on the WSA	The research found no link between the increase in dividend payments and the reduction in reserves for long-term liabilities.
Walińska, Bęk-Gaik, 2012, 14 companies with the WIG 20, 2007–2010	– Reserves can provide a tool for discretionary creation of the financial result.

S o u r c e: Author's own elaboration based on the literature cited in the table.

Many Polish authors that used the reserve category as the subject of their research were interested in its possible use for discretionary profit management. In most cases, the hypothesis that reserves provide a profit management tool has been confirmed. Little of the research focused on the quality (detail) aspect of the information disclosed in financial statements.

Abroad, research into reserve categories is conducted on a large scale, which also includes the aspect of the ability to shape financial results through reserves. Table 2 consists of aggregate information about the main global research into reserves.

Table 2. The summary of the results of global research into reserves

Researcher and subject of the research	Conclusions and observations drawn by the research authors
Peek, 2004, Financial statements of Dutch companies for the years 1989–2000	– Reserves are used to shape profits. – Entities report large reserves to smoothen current profits.
Cohen, Darrough, Huang, Zach, 2011, Reserves for warranty repairs were examined in a group of 800 companies	– Reserves for warranty repair can serve managers as a tool shaping financial results.
Abou-El-Sood, 2012, The research covered statements of 878 U.S. commercial banks for the years 2001 to 2009	– Loss reserves provide a tool used for smoothing banks' financial results. – During the crisis, banks lowered the reserves level to report a higher financial result.

S o u r c e: Author's own elaboration based on the literature cited in the table.

Research conducted in Poland, as well as worldwide, shows that companies can shape the image of the financial and economic situation using reserves which are an estimative category (Poniatowska, 2013). Reserves can be successfully used for shaping the financial result to smoothen it, apply a "big bath" strategy, avoid reporting on a small loss, avoid reporting on a decline in the financial result (Chraścina, 2015). Manipulating financial reporting by means of reserves is possible because their value is determined by estimation and they directly affect the financial result. Manipulating financial results is possible by the following means: avoiding creating or undervaluing reserves, creation of excessive or overvalued reserves, concealment of real reserves under the category of contingent liabilities, or even release of reserves despite the absence of circumstances that could justify such a release, etc. For instance, research conducted by Hołda and Staszel (2019) shows that even a small change of only 1% in the assumptions used to estimate the discount rate (estimated with the use of the CAPM or WACC model) results in a 1% change in the discount rate. The research also found that a change of merely 1% in the discount could result in a significant change in the reserves balance, i.e. it may distort the reporting information.

The latest international research indicates that reserves are one of the most frequently manipulated areas of financial reporting. Summary results of the latest research are presented below and include the following finding:

1) In the USA, the factors behind the decision to engage in manipulation and the related consequential appointments of the CEO were analyzed by Cheng, Cummins and Lin (2021).
2) Factors which underlie the creation of too low reserves and the consequential disclosure of inflated profit are of social and psychological character, e.g. chairpersons' overconfidence (Berry-Stölzle, Eastman and Xu, 2018).

3) It was pointed out that the implementation of the Sarbanes–Oxley (SOX) Act in 2002 did not contribute to the reduction of risk of erroneous estimation of reserves (Ma and Pope, 2020).
4) In Poland multiple studies confirmed profit manipulation involving reserves and accruals (Comporek, 2018).

The above studies indicate that this area and research into it play an important role in today's economy and processes taking place in it. The research focused on the impact of manipulation, e.g. in the field of reserves on the decisions of users of financial statements. However, the author did not come across research that would analyze the quality of disclosures regarding reserves, which makes the research presented in this paper highly original. As indicated by Schilit (2018), it is enhanced data transparency and a better quality of disclosures that may be a useful tool to use to reveal and prevent manipulation. It was also proved (Sangyong, Gene and Chia-Ling, 2018) that enhanced transparency is linked with a more cautious estimation of reserves, and enhanced transparency, in turn, is mandated by external regulations as entities are reluctant to disclose data on e.g. reserves of their own will.

The research is based on a detailed analysis of financial statements of selected companies whose shares are or were listed on the Warsaw Stock Exchange (the WSE). Due to its time-consuming nature, the empirical research of financial statements ran from January 2013 to March 2017, while the research sample was determined in June 2014. After the initial analysis of the financial statements of companies listed on the WSE, the companies were selected for further research as follow: all entities listed on WIG30 (30 companies in total), mMWIG40 (30 companies, the remaining 10 companies are also listed on WIG 30), SWIG80 and 160 companies that were randomly chosen and do not figure in WIG30, mMWIG40, SWIG80. The research period covers years from 2007 to 2014, i.e. eight years in total.

Of the initially selected pool of 300 companies, 152 could not be included in the research: for objective reasons. During the collection of empirical material in the form of financial statements of listed companies, it was noted that companies often did not file their financial statements for the year in which the basis for the preparation of financial statements changed from standards of the Accounting Act to IAS.

Ultimately, only those companies that made their full financial statements available on the Internet (i.e., with additional information) for all years from 2008 to 2014 were included in the sample. To collect data and initially process it an Excel spreadsheet was used. Statistical analysis was done in Statistica version 13.1. In conclusion, 148 companies were included in the research sample.

3. Results

Construction of the disclosures' detail index and disclosures' detail regarding reserves in the financial statements of the examined entities has been presented below.

Within the framework of research into the detail with which companies disclosed information on remaining reserves, a three-level scale of disclosure details was applied to the remaining reserves of this group:

Level (1):
- if an entity discloses the overall amount of remaining reserves on its balance sheet but does not present any additional notes specifying the reserve position;
- if the explanatory note to the liabilities indicates an entity holds remaining reserves among its liabilities but does not specify what those reserves relate to;
- if there is an explanatory note to the "remaining reserves" item, however, it contains information only on the value of the released or newly created reserves: the entity discloses the initial state of the total remaining reserves, any prospective decreases or increases and the final state, however, it does not disclose exactly what the remaining reserves relate to and for what purpose they were created;

Level (2):
- if there is an explanatory note in which the entity details what the remaining reserves relate to, e.g. states that the remaining reserves group relates to reserves for warranty repairs, employee leave and litigation. At this level of disclosure, an entity lists what is included in the remaining reserves category but does not specify the exact amounts of each reserves category or provide detailed amounts of each type of the remaining reserves, however, at the same level, it does not provide any information on changes in reserves (what part of reserves was released, used, created);
- if the entity indicates the exact reserves categories that are included in the remaining reserve categories and specifies in the total amount the initial reserves balance, its increase and decrease (incl. a break-down of reserves into released and used) as well as the final balance of the total remaining reserves, however, it does not specify which increases and decreases related to which reserve categories;

Level (3):
- if the entity indicates for each reserves type held (e.g. for warranty repairs, leaves, compensations), their initial amount, increase, decrease and final state.

Table 3 provides the results of the analysis of the disclosed information details regarding the remaining reserves in the companies that had disclosed remaining reserves in a given year.

Table 3. Disclosure detail in the remaining reserve categories in each of the researched periods (percentage of statements with a given disclosure level)

Data/ year	The average for 2007 to 2014
The number of companies that show the remaining reserves (out of 148 examined)	On average, 117 companies disclosed the remaining reserves
Disclosure detail—Level (1)	11.9%
Disclosure detail—Level (2)	31.5%
Disclosure detail—Level (3)	56.6%

S o u r c e: Author's own elaboration based on the research data.

Analysis of the disclosed information detail regarding reserves compiled in Table 3 justifies the conclusion that the quality of disclosed information on the remaining reserves is satisfactory—on average, in more than half of the examined entities (56.6%), the detail of disclosed information on the remaining reserves reached the highest level: Level (3) (according

to the proposed scale of the disclosure level). 31.5% of companies achieved disclosure level (2). In total, more than 88% of the examined entities disclosed detailed information about the type of reserves they held and how these reserves developed during the financial year—how much of the reserves was used, released and created. It was also confirmed that in 97% of the examined statements, the entities provided an additional note that explains the category of remaining reserves (with only a few cases where the explanatory note was merely a repetition of the total of the remaining reserves contained in the balance sheet).

Within the framework of research into the detail of the disclosed information on reserves held for retirement benefits by the examined companies, a six-step scale of disclosures' detail was applied in relation to these reserves:

Level (1):

- if an entity discloses the overall amount of remaining reserves on its balance sheet but does not present any additional note specifying the reserve position;
- if within the explanatory note to the liabilities item the entity reports among liabilities or even accruals the possession of the reserve for retirement, but does not, however, disclose any additional information on this reserve;

Level (2):

- if there is an explanatory note explaining the position of reserves for retirement benefits, however, it only contains information on the value of the released or newly created reserves: the entity presents the initial amount of these reserves, any prospective decreases or increases and the final state, however, it does not disclose exactly the purpose of reserve (severance pay, leaves, bonuses or others) or provides no assumptions used during the creation of the reserve;
- if there is an explanatory note in which the entity details what the reserves held for retirement benefits relate to (e.g. severance pay of various types, leaves, bonuses, allowances in kind, employee allowances for purchase of benefits and others). At this level of disclosure, an entity lists what is included in the reserves for retirement benefits category without providing the amounts of each of those categories, or specifying the amounts of each type of the remaining reserves, however, at this level, the entity does not provide any information on changes in reserves (what part of reserves was released, used, created);
- if an entity indicates the exact reserves categories that are included in the retirement benefits categories and provides in the total amount the initial reserves balance, its increase and decrease (including the division of reserves into released and used) as well as the final balance of the total remaining reserves, however, it does not specify which increases and decreases related to which reserve categories;

Level (3):

- if for each possessed type of reserves (e.g. for warranty repairs, leaves, compensations) the entity indicates its initial amount, increase, decrease and the final state, and it provides additional actuarial assumptions about the created reserves (e.g. the ratio of employees who decide to leave the company, mortality rate, discount rate, and other assumptions).

Table 4 provides the results of the analysis of the disclosures detail regarding retirement benefits in companies that indicated the possession of reserves for retirement benefits in

a given year (not necessarily itemized as the reserves for retirement benefits, but also as accruals or remaining reserves).

Table 4. Disclosure of information detail regarding reserves for retirement benefits

Levels of the value of the disclosure index	The percent of companies that report reserves for retirement benefits (out of 148 examined). The average from 2007 to 2014
Disclosure detail—Level (1)	3%
Disclosure detail—Level (2)	47%
Disclosure detail—Level (3)	51%

S o u r c e: Author's own elaboration based on the research data.

A detailed analysis for 2007–2014 showed that level (2) disclosure detail decreased in subsequent years due to an increase in the number of level (3) disclosures, which may have been caused by the increasing number of statements compiled in accordance with IAS. The disclosure detail is high: half of the examined financial statements contained level (3) disclosures, i.e. the highest level.

Within the research, the main hypothesis states that in the case of a decrease in the reserves balance (resulting in an increase in the financial result due to the release of reserves), the disclosure detail is lower (measured by the index of disclosure detail) than in the case of an increase in the reserve balance. Partial hypotheses are concerned with the verification of two separate reserve categories: reserves for retirement benefits and remaining reserves.

The first hypothesis examines the reserves for retirement benefits. Table 5 compares the average values of the disclosure detail index (1, 2 or 3) depending on how the change in the reserve balance is being handled (taking into account situations where the reserve balance increases or decreases, excluding the very few situations where the reserve balance remains the same).

Table 5. Average levels of the value of the disclosure index in statements due to a decrease or increase in the reserve balance

Year	Change in the reserve balance	
	Decrease in the reserve balance	Increase in the reserve balance
2008	2.222222	2.197368
2009	2.246377	2.214286
2010	2.170732	2.304878
2011	2.250000	2.274725
2012	2.212766	2.367089
2013	2.285714	2.363636
2014	2.307692	2.352941

S o u r c e: Author's own elaboration based on the research data.

Table 5 shows that a higher value of disclosure index (higher disclosure detail) is more common in companies that increased their reserve balance in 2010–2014. In contrast, in the first two years covered by the research (2008–2009), a higher disclosure index occurred in

the case of entities whose reserve balance for retirement benefits was reduced. Whether the observed differences between averages are statistically significant, can be determined through the T-test for independent samples. The author examined whether the average values of the disclosed reserve detail indexes for retirement benefits differ depending on whether a decrease or an increase in a particular reserve occurred (see the results in Table 6). The group of statements in which a decrease in reserve balance occurred is designated as Group I, whereas the group in which an increase in reserve balance was ascertained is designated as Group II.

Table 6. T-test results for the reserve disclosure indexes for retirement benefits according to whether an increase (Group II) or a decrease (Group I) of the reserve occurred

	Average for Group I	Average for Group II	t	f	p	N Valid for Group I	N Valid for Group II	std dev. Group I	std dev. Group II	Quotient F Variance	P Variance
Decrease in reserve balance (Group I) vs increase in reserve balance (Group II)	2.197411	2.182948	0.381750	870	0.702740	309	563	0.499863	0.553469	1.225982	0.045536

S o u r c e: Author's own elaboration based on the research data.

The relationship in Table 6 shows that the variants for handling the change in the reserve balance (decrease or increase in reserve balance) do not appear to be a relevant differentiating factor of the disclosure quality index, i.e. the average levels of the disclosure index did not differ significantly regardless of whether the entities increased or decreased reserves' balance.

Subsequently, it was decided to perform the same separate test for statements prepared in accordance with the Accounting Act and IAS. The results are presented in Tables 7 and 8, respectively.

Table 7. T-test results for the reserve disclosure indexes for retirement benefits for an increase and decrease in the reserve disclosed in statements prepared in accordance with the Accounting Act (decrease in Group I, increase in Group II)

	Average for Group II	Average for Group I	t	f	p	N Valid for Group II	N Valid for Group I	std dev. Group II	std dev. Group I	Quotient F Variance	P Variance
Decrease in reserve balance (Group I) vs increase in reserve balance (Group II)	2.013423	2.092308	-0.914317	212	0.361589	149	65	0.614977	0.491270	1.567031	0.043167

S o u r c e: Author's own elaboration based on the research data.

Table 8. T-test results for the reserve disclosure indexes for retirement benefits for an increase and decrease in the reserve disclosed in statements prepared in accordance with IAS (decrease Group I, increase Group II)

	Average for Group I	Average for Group II	t	f	p	N Valid for Group I	N Valid for Group II	std dev. Group I	std dev. Group II	Quotient F Variance	P Variance
Decrease in reserve balance (Group I) vs increase in reserve balance (Group II)	2.243961	2.225410	0.450260	656	0.652672	414	244	0.516929	0.499392	1.071463	0.554190

S o u r c e: Author's own elaboration based on the research data.

The tests show that for statements prepared both in accordance with the Accounting Act and IAS, the disclosure detail regarding reserves for retirement benefits does not depend on whether the entities increase or decrease reserves.

Another partial hypothesis is concerned with the following: in the case of a decrease in the remaining reserve balance, the disclosure detail for these reserves is lower. Table 9 compares the average values of the disclosure index in accordance with how the change in reserves is handled. Table 10 shows the T-test results for average indexes of the disclosure level in the case of the increase and decrease in the remaining reserve balance.

Table 9. Average levels of the value of the remaining reserves disclosure index regarding the change in the remaining reserve balance

Year	Change in the reserves' balance	
	Decrease	Increase
2008	2.441860	2.453333
2009	2.567164	2.377358
2010	2.436364	2.476923
2011	2.584906	2.454545
2012	2.466667	2.466667
2013	2.393443	2.456140
2014	2.408163	2.468750

S o u r c e: Author's own elaboration based on the research data.

Whether the observed differences between the averages are statistically significant can be determined on the basis of the T-test for means.

Table 10. T-test results for the disclosure indexes of the remaining reserves according to whether an increase or decrease in reserves occurs (decrease in Group I, increase in Group II)

	Average for Group II	Average for Group I	t	f	p	N Valid for Group II	N Valid for Group I	std dev. Group II	std dev. Group I	Quotient F Variance	P Variance
Decrease in reserve balance (Group I) vs increase in reserve balance (Group II)	2.384615	2.383378	0.024614	826	0.980369	455	373	0.723568	0.715002	1.024105	0.812414

S o u r c e: Author's own elaboration based on the research data.

The relationship in Table 10 shows that the variants for handling the remaining reserves (increase or decrease in their balance) do not appear to be a relevant differentiating factor of the disclosure quality index, i.e. the average levels of the disclosure index did not differ significantly regardless of whether the entities increased or decreased the remaining reserve balance. Tables 11 and 12 show the test results for statements which are divided into two groups: statements prepared in accordance with the Accounting Act and statements prepared in accordance with IAS.

Table 11. T-test results for the disclosure indexes of the remaining reserves according to whether an increase or decrease occurred in the reserve in statements prepared in accordance with IAS (decrease in Group I, increase in Group II)

	Average for Group II	Average for Group I	t	f	p	N Valid for Group II	N Valid for Group I	std dev. Group II	std dev. Group I	Quotient F Variance	P Variance
Decrease in reserve balance (Group I) vs increase in reserve balance (Group II)	2.398281	2.393220	0.089787	642	0.928485	349	295	0.714463	0.710434	1.011375	0.922150

S o u r c e: Author's own elaboration based on the research data.

Table 12. T-test results for the disclosure indexes of the remaining reserves according to whether an increase or decrease occurred in the reserve statements prepared in accordance with the Accounting Act (decrease in Group I, increase in Group II)

	Average for Group II	Average for Group I	t	f	p	N Valid for Group II	N Valid for Group I	std dev. Group II	std dev. Group I	Quotient F Variance	P Variance
Decrease in reserve balance (Group I) vs increase in reserve balance (Group II)	2.339623	2.346154	–0.058647	182	0.953298	106	78	0.754501	0.735499	1.052339	0.819227

S o u r c e: Author's own elaboration based on the research data.

4. Discussion

In summary, although the disclosure quality differs between entities that prepare statements in accordance with the Accounting Act and IAS, statistical tests have shown that a decrease or increase in the reserve, whether it is the remaining reserve or the reserve for retirement benefits, is not a factor that differentiates the disclosure detail index: the quality of the disclosed information in regard to reserves does not depend on whether an entity creates reserves or releases/ uses them, either in statements that were prepared in accordance with the Accounting Act or in accordance with IAS. Thus, the hypothesis whereby entities decreasing their reserve balance reveal less information regarding these reserves has not been confirmed.

Author's analysis of the disclosure detail regarding created and released reserves or even of the disclosure of actuarial assumptions used for the estimation of reserve amounts leads to the conclusion that the detail of the disclosed data is statistically significant when it comes to the differences between the entities which prepare statements in accordance with IAS and the Accounting Act. However, despite those substantial differences in the levels of reporting (reporting detail), it was impossible to confirm the hypothesis that where the reserve balance is decreased (which affects the recognition of income) an entity discloses fewer data about reserves (in other words: less disclosure detail). This hypothesis has not been confirmed either in relation to the financial statements prepared in accordance with the Accounting Act or IAS, although, as indicated by other research carried out by A. Staszel (2020), the financial statements prepared in accordance with IAS reveal statistical correlations indicating that the decisions on changes in reserves' balance were discretionary.

5. Conclusion

The purpose of the research was to verify whether the detail of the disclosed information on reserves is conditioned by an entity decreasing or increasing the reserve balance. The obtained results are as follows:

Hypothesis: in the case of a reduction in the reserve balance for retirement benefits, the disclosure detail is lower (as measured by the disclosure detail index) than in the case of an increase in the reserve balance—it has not been confirmed in the group of statements prepared in accordance with the Accounting Act or those prepared in accordance with the IAS.

Hypothesis: in the case of a reduction in the remaining reserve balance, the disclosure detail regarding these reserves is lower—it has not been confirmed in the group of statements prepared in accordance with the Accounting Act or those prepared in accordance with the IAS.

Analysis of the obtained results shows that, although reserves provide a tool that could be used for manipulating financial reporting, the economic entities always disclose the same amount of reserve-related data, regardless of whether they decrease or increase the reserve balance or even potentially manipulate the size of the reserves. This fact may mean that the disclosures regarding reserves in the financial statements are insufficient to assess the reliability and credibility of the reporting information regarding reserves. Once more, the role of reliable and independent auditing needs to be emphasized: it is auditing that allows the attestation of the accounting system's data and seems to be the primary guarantor of the reliability of the reporting data (Staszel, 2020).

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Ujawnianie informacji o zwiększaniu i zmniejszaniu stanu rezerw w sprawozdaniach finansowych przez spółki notowane na Giełdzie Papierów Wartościowych w Warszawie

Abstrakt: Celem artykułu jest zweryfikowanie, czy spółki notowane na GPW w Warszawie w przypadku zmniejszania stanu rezerw ujawniają mniej informacji o rezerwach w swoich sprawozdaniach finansowych niż w przypadku zwiększania stanu rezerw. Sformułowano hipotezę, że w przypadku zmniejszeń stanu rezerw szczegółowość ujawnień jest niższa niż w przypadku zwiększania stanu rezerw. Hipoteza została zweryfikowana za pomocą analizy danych zawartych w sprawozdaniach finansowych 148 spółek notowanych na GPW w Warszawie za lata 2007–2014: łącznie przeanalizowano dane zawarte w 1184 sprawozdaniach finansowych. W ramach prowadzonych badań skonstruowano trójstopniowy wskaźnik szczegółowości ujawnień dwóch wiodących kategorii rezerw, a następnie porównano wartości wskaźników ujawnień z faktem zmniejszania i zwiększania rezerw. Metodologia badań obejmowała studia literaturowe oraz badania empiryczne z wykorzystaniem autorskiego wskaźnika szczegółowości ujawnień i testowania statystycznego. Przeprowadzone badania poszerzają dorobek poznawczy nurtu badań nad jakością ujawnień w sprawozdaniach finansowych oraz teorii agencji.

Słowa kluczowe: rezerwy, ujawnianie informacji, sprawozdawczość finansowa, wynik finansowy, zarządzanie zyskami

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The concept of a safety culture management system in a company

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Abstract: The aim of the article is to present the concept of safety culture management systems in an enterprise and to indicate the directions of their improvement. In the course of two-stage empirical research, elements of the management system that highly determine the development of occupational safety culture were identified and described. This applies in particular to: technical and managerial competences of the management staff, modernity of IT technology, work organization techniques, cooperation, values professed in the company. These factors were found to be important criteria for assessing the effectiveness of systems for managing work safety culture. The concept of work safety culture and proposals of the authors of management systems related to work safety culture were characterized. The article concludes with general recommendations and methodological guidelines for enterprises interested in the effectiveness of occupational safety culture management systems in the context of company performance.

Keywords: occupational safety culture, occupational safety culture management systems, efficiency of management systems, fundamental company values

1. Introduction

For the last two decades an increase in interest in occupational health and safety and ergonomics has been observed. However, despite the development of technology, the information technology in particular, and taking into consideration the dissemination of methods and principles of systemic management, adaptation of Polish law to European standards, implementation of prevention programmes in organizations, expansion of the system of state and social supervision over occupational health and safety or growing popularity of initiatives aimed at building safety culture—the level of safety in Polish organizations, measured by accident rates, does not undergo significant changes (Roszko-Wójtowicz, 2015, p. 89; Kozioł, Muszyński and Kulwicki, 2018; Olszewski, 1997). The introduction of a differentiated insurance premium, the

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amount of which depended on the size of the total company risk, did not give much in this regard, i.e. improvement of work safety (Sobolak and Konodyba-Szymańska, 2004; Kozioł, Siewiora and Korbelak, 2020). These failures are mainly attributed to the low level of safety culture. The lower level of safety culture among Poles in comparison to, for instance, the British, is caused primarily by low awareness of threats that almost every job carries and inappropriate attitudes of employees and lack of genuine organizational commitment on their part (Studenski, 1996). Moreover, which is worth emphasizing, the lower level of culture results from such premises as assigning primacy to the implementation of production tasks before occupational health and safety tasks, employees' habituation to specific working conditions and underestimation of threats, or even not realizing the existence of irregularities in the area of working conditions and organizational solutions (Olszewski, 1997, p. 230).

More recent studies carried out in various coal sector mines indicate that occupational safety is low on the workers' value hierarchy, lower than earnings, work organization, interpersonal relations or job security. It has been found that more than 50% of blue-collar workers do not see a link between accidents at work and compliance with occupational health and safety standards (Stach, 2020, p. 8).

The aim of the article is to present the concept of work safety culture management system in an enterprise and to show the results of empirical research. The elements of occupational safety culture management system were adopted as the subject of the research, while the reference is OSH and the results of the enterprise.

The thesis that the organization and functioning of work safety culture management systems fundamentally determine the use and development of work safety principles and tools in an enterprise was accepted. This concerns in particular: managerial competence, modernity of infrastructure, organization of work and cooperation, values carried out by the enterprise. The effectiveness of occupational safety culture management systems also depends on the development strategy, level of innovation and performance of the enterprise.

The realization of the research objective was based on the analysis of tangible and intangible elements of occupational safety culture and in this context the study of the efficiency of occupational safety culture management systems was set.

Another, no less important, issue of analysis is the determination of the importance of occupational safety culture in enhancing the well-being of employees, considered in the context of the functioning and development of the company.

The following research methods were used to achieve the objectives of the study and to verify the theses such as: results of predecessor studies, analysis of impact factors, questionnaire method, expert research and case study method.

2. The concept of a safety culture management system in a company

Concepts of workplace safety culture date back to the mid-twentieth century. Earlier, in the early years of the century, it was observed that employees had formed their own norms, views, values and ways of behaviour within the workplace. Consequently, many industries, large corporations began to take an interest in workplace safety culture with a view to using it to prevent major accidents and the numerous accidents associated with routine work. In

the relatively few, piecemeal studies on these topics, evidence of this phenomenon are given. A. Studenski defines the culture of work safety as a set of psychological, social and organizational factors initiating or supporting activities protecting life and health both at work and in non-occupational activities (Studenski, 2000). Work safety culture is defined differently by L. Sobolak and B. Konodyba-Szymańska. They stress that it is a part of the organizational culture and in its essence refers to the behaviour of all personnel, the way of performing work and the ability to use equipment and organizational conditions that affect health and safety at work. The strengthening of occupational safety culture is strongly influenced by the information system that promotes occupational protection activities (Sobolak and Konodyba-Szymańska, 2012, p. 261).

According to A. Lipińska-Grobelny and W. Michałowska, the key issue for the interpretation of work safety culture is the interaction between the elements of culture creating work environment and individual needs, aspirations, abilities and expectations of employees. Although the elements of job safety culture influence attitudes towards work, individually perceived quality of work environment, conditions and rules in force constitute reference point for the employee's situation and if it does not promote development (well-being), no other factors will be effective (Lipińska-Grobelny and Michałowska, 2018, p. 35). In turn, the aspects of safety culture assessment given by M. Milczarek such as safety values, employee relations and belonging to the company, responsibility and awareness of OSH, safe behaviour, management commitment and employee participation as well as OSH training and accident analysis can also be considered as nodal task areas of occupational safety culture (Milczarek, 2002).

The analysis shows that occupational safety culture consists of different matters such as: material elements related to the area of technology and techniques, work organization and management, information flow and the level of innovation, occupational safety instructions, ergonomic principles and indications, appropriate use of personal protective equipment, cost analyses of occupational safety and health and the results of the company's activities, and others such as: attitudes of management and employees towards occupational safety and health and ergonomics, individually perceived quality of work environment, conditions and rules in force and, most importantly, interaction between cultural elements creating work environment and individual needs and expectations of employees.

Recording costs on particular type accounts, apart from accounting standards, makes it possible to gain knowledge about their size and it allows to relate them (costs) to the study of effectiveness of activities implemented in the field of OSH. For example, the examination of created relation between the costs of preventive activities (e.g. by recording costs by type of OSH) and the costs of accident insurance tells us about the effectiveness of undertaken activities and management decisions in the field of occupational safety (Stach, 2020, p. 10 and p. 12).

Some researchers emphasize and recognize intangible elements of workplace safety culture. They believe that this culture establishes rules of conduct and values recognized by members of a given group, and determines what people's attitude to risk and safety is. It also perceives the values, visions, work style, beliefs and performance of the organization (Kopczewski, Pączek and Tobolski, 2012, pp. 923–929; Glinka and Kostera, 2012; Ejdys, 2010; Bitsani, 2013, p. 50; Wudarzewski, p. 59). With this approach to the study of occupational safety culture, the relationship between culture and organizational climate can be indicated.

This is because organizational climate expresses employees' feelings and evaluations relating to selected elements of culture and organizational factors (Bitsani, 2013, p. 50; Wudarzewski, 2013, p. 59). This stream also includes intangible elements such as: attitudes of management and employees towards health and safety and ergonomics issues, individually perceived quality of work environment, conditions and rules in place, and the most important interaction between the elements of culture that create work environment and individual needs and expectations of employees.

This review of selected literature alone indicates that the analysis of elements or aspects of workplace safety culture is still a poorly recognized and acknowledged issue of enterprise analysis.

3. Safety culture management system concept Selection of assessment criteria

The concepts of occupational safety culture management system or, more broadly, occupational health and safety management system have so far not met with a precise definition. From the context in which the term has been used, it can be assumed that the management of the two mentioned areas is a process that constitutes normative conduct and dispositional influence on the executive sphere (cf. Smoliński and Solecki, 2015; Kozioł, Muszyński and Kulwicki, 2008; Glinka and Kostera, 2012; Berkowska, Drzewiecka and Mrugalska, 2014; Sobolak and Konodyba-Szymańska, 2012; Beasley, 2013; Cascio and Boudreau, 2011, p. 88; Striker, 2013).

In a broader sense, the notion of management system can be defined, following A. Stabryła, as a complex, which is determined by the following (Stabryła, 2011, p. 18): objective, subjective, structural, functional and instrumental aspects. A developed interpretation of this term, capturing the size of its partial forms, was presented by this author as follows (Stabryła, 2011, pp. 7–8):

- It is a set of multiple economic and non-economic objectives;
- In the organizational sense, it is a structure that determines (as a static system) the functioning of an enterprise (institution);
- There are institutional pragmatics and pragmatics of management processes;
- The management process is determined by the following functions: deciding, identifying, planning, organizing, motivating and controlling;
- The management process is captured in different organizational forms such as: management decision systems, management process support systems, functional systems, integrated systems;
- Is a set of rules for the management of resources;
- Is an instrument for stimulating innovation processes.

For the purposes of further analysis, occupational safety culture management system can be presented as follows: work safety culture management system is a stimulating-regulating system and a mechanism for shaping work safety culture and efficient functioning of the organization; determined mainly by the following aspects: subjective, functional and instrumental.

Referring to the concept of J. M. Kobi and H. Wurtchitz[1], the reference system in the research was also the so-called fundamental orientations of occupational safety culture, such as the company's development strategy, elements of structure and power and the values valued by the company, especially those that fall in the area of cooperation with customers and employees.

In the area of customer cooperation, the company is guided by its values:
– treating customers with respect;
– ensuring the security of personal data;
– counselling, joint search for a solution to the problem;
– providing assistance in difficult financial situations.

In the area of cooperation with employees, attention is paid in particular to:
– care for the company's reputation;
– ensuring good relations within the company;
– mutual assistance;
– tolerance;
– mutual respect and partnership based on relationships;
– continuous improvement of qualifications.

During the two-phase research it was possible to extract the set of features of occupational safety culture management performance evaluation model. In the first phase, those features that reflect the functions of the model of assessment of the management efficiency of occupational safety culture, main and partial, were identified and selected from the many variables of the organization's resources by means of the influence factors analysis. In the identification process several sources of information were used, e.g. research reports, expert opinions, management and OSH specialists. In the first stage of the analysis, 5 main criteria and 13 sub-criteria were identified.

In the second phase, an analysis of the safety culture management evaluation system relevance criteria was made. Interviews were conducted among 14 respondents selected from the management of companies in the area of operational management and specialists in ergonomics and OSH. Finally, 5 main criteria and 10 sub-criteria were adopted. The survey was conducted in 2020. A summary of the criteria for assessing the efficiency of safety culture management is given in Table 1.

[1] Among the "fundamental cultural orientations of the enterprise", the authors included: customers, associates, performance, innovation, costs, communication, identification with the enterprise, and technology (cited after: Marcinkowski and Sobczak, 2000, p. 7).

Table 1. Performance evaluation system of the management system of safety culture in the enterprise

Main criteria	Sub-criteria	Evaluation of the efficiency of the management system	
		Pt	Specification
Managerial competences	Training time for technical and managerial competences	1	The number of training days per employee per year does not exceed 5 days
		2	The number of training days per employee per year is between 5 and 10 days
		3	The number of training courses per employee exceeds 10 days
	Knowledge of the operation of modern technologies used in the organization	1	Low familiarity: 30% of the total workforce
		2	To a limited extent: 60% of total employees
		3	Full-time: 90% of all employees
Modernity of infrastructure	Information system layout	1	Distributed
		2	Mixed
		3	Integrated
	Types of information systems	1	Lack of systems supporting knowledge and innovation management
		2	There are systems in place for capturing, collecting and processing information useful for knowledge development and innovation
		3	Expert systems are used to generate ideas and support teamwork
Organization of work	Infrastructure supporting the internal communication process	1	Lack of an IT system to support the internal communication process
		2	The company has an internal IT network to support communication
		3	The internal network uses IT communication systems and databases exist
	Forms of organization of work	1	Team forms of work organization and team problem solving are not used
		2	There is teamwork, employee participation, quality agenda
		3	Methods to promote teamwork are used, e.g. case study, brainstorming, idea fairs, expert networks, intellectual property support systems
Cooperation. External competences	Cooperation with other entities	1	The company does not maintain knowledge contacts with customers, suppliers, co-operators
		2	The company cooperates with customers, suppliers and co-operators
		3	The company enters into “knowledge alliances” and creates shared databases with selected stakeholders
	Source of knowledge on company development	1	Lack of a formalized system for obtaining information and knowledge on OSH and safety culture
		2	There is a system for collecting internal and external information, the company participates in exhibitions, fairs, seminars, conferences, etc.
		3	The company obtains knowledge from universities, research institutions, R & D units and others

Value system	Cooperation with clients	1	Customers are treated with respect
		2	Ensuring data security, consulting
		3	Provision of financial assistance
	Employee relations	1	Lack of formalized system, rules of cooperation
		2	Caring for the company's reputation and good relations within the company, tolerance
		3	Mutual assistance, continuous improvement of qualifications

S o u r c e: Authors' own elaboration.

4. Assessing the performance of a workplace safety culture management system—a case study

A study on the effectiveness of systems for managing the culture of work safety was carried out in a service company operating in the financial sector, which invests in and manages customer receivables. Among others, it deals with legal services for business entities, economic information, and conducts lending activities for clients. The company is a joint stock company with share capital of 20 million PLN—it operates in Poland and abroad. Employees of the company perform office work with the use of computer and other IT tools, moreover, they participate in negotiations, meetings, seminars, conferences. The work is carried out in comfortable physical conditions (it concerns the material working environment), it is characterized by high complexity and responsibility, generates stress, especially in the process of negotiations and talks with clients, contractors and when making difficult financial decisions. In the last two years there have been no accidents at work during work and commuting.

The evaluation of the management system of work safety culture efficiency in the examined enterprise is presented in Table 2. In the light of the adopted criteria, 3 features of the management system were rated high: training, cooperation with other entities and relations between employees, the remaining ones weaker (on average).

Table 2. Company safety culture management system performance evaluation sheet

Symbol	Criterion	Evaluation
ABCDEFGHIK	Training time for technical and managerial competences	3
	Knowledge of the use of modern technology	2
	Information system layout	2
	Types of information systems	2
	Infrastructure supporting the communication process	2
	Forms of organization of work	2
	Cooperation with other entities	3
	Sources of knowledge regarding company development	2
	Cooperation with clients	2
	Employee relations	3
	OSZ = 2,3	23

Rating: 1—low level; 2—medium level; 3—high level

S o u r c e: Authors' own elaboration.

The measurement of the effectiveness of the work safety culture management system assessment in the examined company can be presented in an aggregate form. The aggregate assessment consists in combining into one whole the individual assessment criteria. The overall index of evaluation of the management of the culture efficiency of work safety system of the company on a scale of 1–3 can be calculated from the formula:

$$\text{OSZ} = \frac{A + B + C + D + E + F + G + H + I + K}{10}$$

where:

OSZ—is the value of the index of safety culture management system efficiency in the company;
A…K—criteria symbols.

Table 3. Hierarchical ranges of the safety culture management system performance index in the company

Category	Scoring	
A	2,50–3,00	Benchmark value
B	2,00–2,49	High suitability status
C	1,50–1,99	Usable condition
D	1,00–1,49	Unusable condition

S o u r c e: Authors' own elaboration.

The useful state is such a degree of function fulfilment which is greater than or equal to the conventionally accepted sufficient degree of the innovation project function fulfilment.

The state of high usefulness, goodness, is the right quality of the innovation project function.

The evaluation index value of the innovation project in the hierarchical range is category B of the score of 2.30, i.e. the state of high usefulness.

5. Concluding remarks and conclusions

Among the important conclusions that arise from the conducted analyses, the most important one seems to be the one that says that it is the development of resources that constitutes the basic determinant and criterion for assessing the efficiency of work safety culture management systems in an enterprise. In particular, the great importance of managerial competence, the degree of development (modernity) of IT technology, work organization and cooperation, as well as the values recognized by the company, enshrined in the strategy, is emphasized.

The dominant aspects are the subjective, instrumental and functional aspects of the safety culture management system, i.e. the aforementioned competences of the organizational participants, IT instruments and management techniques.

As it has been mentioned, an important distinguishing mark of the efficiency of the system of management of safety culture is technical and managerial competence in the field of diagnostic research methodology and methodology of designing new solutions in the sphere of basic research and in the sphere of implementation in particular. The developed managerial (employee) competences constitute a buckle linking diagnostic research with designing,

thus fulfilling the diagnostic and developmental function of the system of work safety culture management in the enterprise.

The system of values and norms, unwritten rules of conduct and implicit assumptions (i.e. the de facto organizational climate) are an important complement, support for the safety management system.

Work safety culture and its management should also be considered (studied) in terms of a subjective perspective, directly related to the individual interpretation of the work situation, strategy, structure, motivation and action, with the development of resources, especially the company's development resources, being of key importance. In conclusion, it should be added that, due to the limited framework of the article, it does not present a broad discussion on the essence and scope of occupational safety culture management system. It presents a frame presentation of the mentioned concept together with a methodology for measuring this phenomenon, which is the culture of occupational safety.

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Koncepcja systemu zarządzania kulturą bezpieczeństwa pracy w przedsiębiorstwie

Abstrakt: Celem artykułu jest przedstawienie koncepcji systemów zarządzania kulturą bezpieczeństwa pracy w przedsiębiorstwie oraz wskazanie kierunków ich doskonalenia. W trakcie dwustopniowych badań empirycznych zidentyfikowano i opisano elementy systemu zarządzania, które w wysokim stopniu determinują rozwój kultury bezpieczeństwa pracy. Dotyczy to w szczególności: kompetencji technicznych i menedżerskich kadry kierowniczej, nowoczesności technologii IT, technik organizacji pracy, kooperacji, wartości wyznawanych w przedsiębiorstwie. Czynniki te uznano za istotne kryteria oceny sprawności systemów zarządzania kulturą bezpieczeństwa pracy. Scharakteryzowano pojęcie kultury bezpieczeństwa pracy oraz propozycje autorów systemów zarządzania odnoszących się do kultury bezpieczeństwa pracy. W zakończeniu artykułu podano ogólne rekomendacje merytoryczne oraz wskazania metodyczne dla przedsiębiorstw zainteresowanych sprawnością systemów zarządzania kulturą bezpieczeństwa pracy rozpatrywaną w kontekście wyników przedsiębiorstwa.

Słowa kluczowe: kultura bezpieczeństwa pracy, systemy zarządzania kulturą bezpieczeństwa pracy, sprawność systemów zarządzania, fundamentalne wartości przedsiębiorstwa

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The use of mobile technologies by the elderly as challenges for innovative companies

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Abstract: Dynamic changes that are taking place in contemporary companies and their environment, development of information and communications technologies (ICT) create new human expectations and needs. Due to the global ageing of societies, increasingly more companies are treating the elderly as a key factor of their success, looking at innovation from the perspective of customer value and improvement of internal processes. The purpose of the article is to formulate the challenges faced by companies in the context of older people, and an attempt to define the attitudes of seniors towards innovation in the area of mobile technologies. The study is cross-sectional and can be used to create marketing strategies for managers of innovative companies operating on the silver consumer market.

Keywords: innovations, company innovations, the elderly, silver market, mobile technologies

1. Introduction

It is expected that in 2050 the number of elderly people aged 65 and over will double and reach 1.5 billion. The global share of seniors above 65 years old increased from 6% in 1990 to 9% in 2019, and the percentage of elderly people aged 65 and over will reach up to 16% in 2050. This means that one in six people in the world will be aged 65 or over (World Population Ageing, 2019). In the light of the above-mentioned demographic processes of ageing societies, it is worth drawing companies' attention to broadening their offers in terms of the silvery economy. The basis for creating such a marketing strategy is to learn the needs and understand the behaviours of older people, because the behaviours of contemporary elderly differ vastly from those from years ago. Given that modern society is developing with participation from the elderly, innovative businesses should take into account the real needs of this social group and undertake ap-

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propriate actions together. Offers targeted at older people should result in their acceptance. Demographic criteria do not exhaust the topic of profiling offers for seniors, so it is worth building a more complete picture of an elderly person based on the way they spend free time, their interests, personality types, and even more detailed aspects, such as attitude to new technologies. Consumer attractiveness among the elderly is very diversified; however, it is worth noting that many people who are currently 60–65 years old earn more now than they did in the last dozen or so years of their life (Żurawski, 2015, pp. 6–8). One of the reasons for this is being released from credit obligations. An analysis of elderly consumers in the United States in 2000 showed that most of them felt 10–12 years younger than their chronological age (Szmigin and Carrigan, 2000, pp. 505–527). Similar studies on cognitive age—which is the age that older people specify and the age they feel they are—were conducted in 2013 in Great Britain. In this research, seniors perceived themselves as up to 20 years younger than their chronological age indicated (Lewis, 2012–2013, pp. 344–348). These studies may suggest that seniors prefer not to realise how old they actually are and that the older the respondent, the less likely they are to "feel their age". That is why, contrary to myths suggesting that the elderly, having more time (for example, after retiring), do not make the most of their opportunities contributing to their own progress and development, the inclusion of older people in contemporary social and economic processes related to meeting their needs should be much smoother than it once was. In the context of the changing demographic structure and the development of modern mobile technologies, the purpose of the article is to define the challenges faced by companies, and to attempt to delineate the specifics of the behaviours of the elderly in this process.

2. Key terms and definitions

The ongoing process of ageing societies concerns practically every country in the world and is a part of the human life cycle. Quoting a definition of old age according to E. Trafiałek, one should see "old age as a natural phase of life after youth and maturity, crowning the dynamic ageing process. Old age is referred to as the final third of life, is associated with a decrease in the body's efficiency, loss of mobility, weakening of immune forces (biological and physiological old age), decreased adaptability to change, and in the socioeconomic context, often pauperization, loneliness (mental old age), the need to use the help of others (economic old age) and being marginalized (social old age)" (Trafiałek, 2006, p. 269). The period of old age is very extended in time, and according to various sources, it begins between the age of 55 (old age in marketing terms) and 65, and lasts until death. According to the World Health Organization (WHO), the age of 60 is considered the beginning of old age, and three main stages can be distinguished in its course (WHO, 2020):

– 60–75 years—young old (early old age);
– 75–90 years—middle old (late old age);
– 90 years and above—old old (longevity).

The basic features characterizing old age include a significant decline in human adaptive abilities in the biological and psychosocial context, the progressive limitation of independence in life, and the gradual increase in dependence on the environment. The term *innovation* (Latin *in-*

novatio—innovare) means renewal, changing for the better what already exists, and is an introduction to a better solution to satisfy the new needs of recipients by way of improved products, processes or services. Although innovation is usually associated with technological change, according to P. Drucker, it is also an economic and social category (Drucker, 1992, p. 36). In many definitions, innovations are identified with novelty, and the creator of this theory is considered to be J. A. Schumpeter, who understood innovation as the introduction into production of new products or improved existing products (Schumpeter, 1960, p. 104). J. A. Schumpeter highlighted five cases of innovation (Wiśniewska, 2013, p. 10):

– creation of a new product;
– use of a new technology, production method;
– creation of a market;
– acquisition of raw materials that were previously unknown;
– reorganization of a specific sector of the industry.

Innovation can also mean the first practical application of a process, system, device or product. Three basic types of innovation are outlined (Niedzielski and Rychlik, 2006, pp. 23–24):

– product innovations related to changes involving the introduction of new products or the improvement of existing products;
– process innovations involving the introduction of new production processes or the improvement of existing production processes;
– service innovations related to the introduction of new services or the improvement of existing services as a result of, first and foremost, the increase of their role in contemporary economy.

Innovative activities require the ability to carefully observe the environment, and multidisciplinary knowledge in order for recipients to understand and accept the proposed solutions. Companies that are innovative are those that are able to continuously seek, implement and promote innovation (Golińska-Pieszyńska, 2011, p. 75) and are focused on development and continually strengthening their position on the market (Jelonek, 2014, p. 319). In the innovation process of companies, it is important to eliminate stereotypical thinking about elderly people, who usually hear that they do not keep up, that they are not familiar with mobile technologies, and that they are not a good match for young teams because they are not very easy-going and are unable to communicate in the language of generations Y and Z. In addition, there is also a belief that the elderly segment is characterized by low purchasing power, and so they are not worth marketers' time. Seniors, as people who are losing strength and ambition, are often thought of as lacking clear requirements for goods and services and satisfied with an offer that meets only the most-basic needs (Lewis, 2012–2013, p. 345). Often, elderly consumers are described as invisible buyers—market laggards lacking cognitive skills and extensive finances. The ageism present in the general awareness of companies should not be a reason for generalization and stereotypical thinking, because increasingly more research results are showing that contemporary seniors differ significantly from the old picture embedded in the broader awareness (Bondos, 2013, pp. 31–36; Badowska and Rogala, 2015, pp. 11–23). More and more frequently, innovative companies, when employing older people, are aware of their potential and ability to create new ideas or a new view of existing ideas. The elderly have exactly the same needs as youth, but a different qualitative and quantitative

dimension: they need more time, patience and understanding, are more likely to focus on the quality rather than the quantity of contacts, are slower to learn, but perform their tasks more accurately. In a way, it can be said that the use of sources of wisdom and experience of seniors in collaboration with younger generations is an innovative solution in the development of the silver economy.

A trend that should be discussed in the context of these deliberations refers to the education of the elderly and the need for lifelong learning, because in the era of technological progress, the period of practical knowledge once acquired is increasingly shorter. Problems with understanding mobile technologies, adaptation of innovative solutions, incorrect ergonomics of smartphones, music players or notebooks can all contribute to the social exclusion and marginalization of the significance of seniors in professional and social life. Wanting to create value that will be gradually promoted by older people, modern companies should know that the essence of educating seniors is independence and an individual's agency enabling them to make individual decisions. Skilful use of mobile technologies enables holistic learning and activation of all senses; it also brings joy from operating a device without assistance, and strengthens the feeling of own value because of the opportunity to correct mistakes. In the process of cooperation, it is important for the employer to be able to take into account changes typical of a given age, and individual factors arising from the psychophysical capabilities, temperament, professional experience and lifestyle of buyers.

The potential of innovations related to mobile technologies has contributed to the creation of communication platforms and mobile applications that enable the provision of services via multi-channel media without losing content quality. Companies with innovative technologies have very advanced adaptation abilities, which are key for the sudden market changes that have been clear during the time of the pandemic. Creating strategies using mobile technologies as a way of running a business can be thought of as a technological and social trend or era of mobility involving the transfer of activities that to date have been performed on stationary devices to mobile devices (Sznajder, 2014, p. 20). Communication and acquisition of information while performing various tasks in a company enables greater multitasking. Most tasks today revolve around the Internet, are unlimited in space and time, and their main tool is a smartphone, which, as J. Kall describes, combines the capabilities of a personal computer with mobility, which revolutionized behaviour, interactions, consumption styles and lifestyle. Modern consumers do not have to wait for the transmission of information mainly from the television or radio (Kall, 2015, p. 10). Mobile devices have an unprecedented impact on shaping the behaviour and attitudes of modern society, and their main benefits include (Łysik and Kutera, 2013, p. 2):

- the portable nature of the devices, their weight and small size;
- simple and intuitive operation;
- the personal nature of the smartphone, personalized applications that draw a lot of attention in observing and analyzing the behaviour of other users;
- multifunctionality—the smartphone is not only a phone, but one can also play music on it, it has a camera, a Bluetooth function for connecting with other modules, and GPS;
- interactivity, which allows you to quickly find what you need and make a booking or purchase of selected products or services.

3. The main barriers to the use of mobile technologies by the elderly

The degree to which a social group shows interest in innovative mobile technology solutions depends primarily on existing needs, the level of compatibility with their values, and previous experience. According to A. Parasuraman, technological readiness refers to an individual's acceptance of modern technologies in the context of achieving their professional and private goals. This is a multi-faceted design that includes four dimensions (Parasuraman, 2000, pp. 307–320):

1) optimism—a positive view of technology and a belief that it offers people increased control, flexibility, and efficiency in their lives;
2) innovativeness—a tendency to be a technology pioneer;
3) discomfort—a perceived lack of control over technology and a feeling of being overwhelmed by it;
4) insecurity—distrust of technology and scepticism about its ability to work properly.

Optimism and innovativeness are key factors that encourage people to use new technologies, while discomfort and insecurity build consumers' reluctance to adopt new solutions in the field of modern technologies, causing feelings of anxiety, insecurity and discomfort (Parasuraman, 2000, p. 314). Although health-related mobile platforms and applications are perceived as promising technologies that can promote health behaviour, the readiness of older people to use mobile technologies can be problematic. The exclusion of the elderly caused by modern technology must be considered from the point of view of the behaviour and attitudes of seniors themselves, and the behaviour of those who offer goods and services (Frąckiewicz, 2019, pp. 50–52). Knowledge about how older people perceive mobile technology is the key aspect that should be taken into account by government institutions and innovative companies rendering services both by and for seniors. Older people are a social group that is prevented from using new technologies by a lack of knowledge about how to use them, a sense of loss of control over information about themselves, a fear of the device breaking, and therefore the high costs of repair. Given the sensory changes that occur in a person's life, such as poorer visual acuity and deteriorating hearing, mobile technologies should be adapted to seniors at a level of difficulty that will not be an obstacle to their use. With age, sensory hypersensitivity changes, and this means that older people start reacting excessively to stimuli, including touch, sound, sight and smell. Hypersensitivity to environmental stimuli makes seniors experience the world differently to younger people, and describe their everyday sensations as irritating, overwhelming, disrupting and distracting. These experiences mean that the elderly need more time to be able to deal with their responses to environmental stimuli, which often leads to a feeling of exhaustion, and even isolation (Kinnealey, Oliver and Wilbarger, 1995). Seniors are more likely to have incorrect colour perception, reduced sensitivity, and poorer resistance to glare. They are slower than young people at processing and recognizing patterns. Ageing people need better lighting to read properly, and with age, correct assessment of the localization of objects decreases. Although these limitations are present in up to 15–20% of the adult population, it is hearing loss that is the most common chronic condition reported by the elderly. Approximately 30–35% of people over the age of 65 have this type of ailment. Hearing impairment is associated with poorer hearing, and a lack of proper perception and lo-

calization of sounds; therefore, when designing an interface or website for seniors, the sound should fall within a certain frequency range. Table 1 shows the progression of the sense of sight and hearing during an individual's lifespan between 35 and 70 years old.

Table 1. Progression of sensory sensitivities across lifespan

Progression of sensory sensitivities across lifespan		Age at which the sensory ability starts to change
Sight	Enhanced need for light	35
	Decreasing accommodation width	40
	Increased glare sensitivity	40
	Reduced depth perception	40
	Reduced eyesight	50
	Reduced adaptation to darkness	55
	Restricted visual field	55
	Diminished colour perception	70
Hearing	Diminished hearing	35
	Distraction by background noises	45
	Diminished localization of sound	70
	Hearing loss of higher frequencies	70

S o u r c e: Author's own elaboration based on American Academy of Neurology, 2012.

4. The role of innovative companies in creating value in the field of mobile technologies

The role of innovative companies is to adapt their activities to the changes occurring in their market. The process of adopting technological innovations is different for each enterprise, and so companies considering selling on the silver market should take into account the fact that older people need more time to learn all of the applications of a device. The acceptance process described by K. Renaud and J. van Biljon is divided into five stages (Renaud, van Biljon, 2008, p. 215):

1. Knowledge stage—the individual gets to know the product.
2. Persuasion stage—the individual becomes persuaded of a need for the product.
3. Decision stage—leads to purchase.
4. Implementation stage—at this time, the product is used by the consumer.
5. Confirmation stage—the user decides whether the choice of device was appropriate or unnecessary.

Knowledge of seniors' preferences in the design of mobile devices is very important and, as highlighted by J. Wakefield, when focusing on the elderly, it is necessary to bridge the gap between the way technological innovations work and the skills of older people. For ex-

ample, the response time of an icon on an Apple device is 0.7 seconds, and the response time of a person over 65 years of age is approximately one second (Wakefield, 2015). Although existing touch screens in smartphones have the ability to set the degree of the screen's touch sensitivity, this is still insufficient for a person who has involuntary hand tremors when performing heavier touches. In such a situation, the mobile device will read it as a wave of the finger rather than touch. The presented problem related to the use of technology by elderly people should be solved so that the senior feels satisfaction from using a specific device or application. A good mobile application is one whose design will be based on the needs of a specific target group and takes its preferences into account. For an application to be considered attractive and interesting, it must be clear and convenient, and operation should be intuitive. Deeming the senior segment to be attractive and lucrative is one thing, but equally important is the preparation of marketing programmes in forms that relate to the modification of existing products to increase their usefulness and thinking about potential customers not only in terms of physical people, but also groups and organizations (Szukalski, 2012, pp. 6–11). K. Janasz and J. Wiśniewska write that a managerial challenge in the twenty-first century is the promotion of changes understood as an opportunity instead of a threat, following novelty and innovation, meaning their rational and effective use both inside and outside the organization (Janasz and Wiśniewska, 2014, p. 187). Therefore, companies operating on the silver market must be aware of the need to correctly overcome limitations that are related to the following barriers:

- psychological—relating to the sceptical approach to life and the environment, traditionalism, aversion to novelty, which can be questioned using the appropriate communications activities;
- medical—referring to the loss of physical ability, decreased cognitive skills (sight, sound, touch, taste);
- social—decreasing the social and professional role, weaker relations with people and family;
- economic—manifested by reduced income or changes in the structure of expenses.

It should be assumed that each company should be aware of the complexity of the innovation process, its costs and risks associated with the possibility of project failure. An important risk factor is the time taken to implement a project, because in the information and communications technologies sector change occurs rapidly. The conditions for the success of innovation have been well defined and presented in three points by P. Drucker (Drucker, 1992, p. 152):

- innovation is work that requires knowledge and often huge resourcefulness;
- wanting to achieve success, innovators must use their strength and be emotionally tuned in to innovation;
- innovation must always be close to the market, focused on the market and be inspired by the market.

The role of innovative companies is to create advanced mobile technologies that can improve quality of life for seniors. Examples of such devices include modern homes equipped with smart lighting systems, smart kitchens (systems that detect the failure of kitchen equipment) and automatic security systems. Human-device interaction (and even human-robot interaction) can be beneficial in extreme situations where immediate third-party help is needed.

An example of such a response is when an elderly person falls and as a result is unable to respond and ask for help. A smart home equipped with technological solutions can recognize the occurrence and inform the relevant services that first aid is required (Cesta et al., 2007, p. 230). An example of a social robot that facilitates relationships and evokes emotions among both children and older people is the Aibo dog, which was made in Japan in 1999 (first version). In addition to a set of sensors such as a camera, stereo sound, infrared and touch sensor, the robot is able to communicate and record video using mobile applications. Aibo moves based on 22 axes, and also has a pair of OLED eyes that are supposed to express its emotions. Artificial intelligence built into the robot enables it to recognize emotions and learn new tricks. For the 2018 version of the robot, Sony recommends additional applications for owners, allowing users to add games, take photos with a camera mounted on the robot, and an "aibone"—an electronic bone for Aibo (Sony-Aibo ERS-7, 2018).

5. Elderly people and innovations

The success of developing innovative products and services for older people is largely determined by their approach to innovation. For seniors, innovations are often associated with the use of the latest technologies, and their promotion requires the overcoming of barriers faced by the elderly. The author carried out a diagnosis of the state of knowledge on the topic of innovative solutions for seniors by referring to the results of studies conducted using the focus method by A. Barska and J. Śnihur on a sample of people 55 years old and over from the Lubusz region in 2017. The questionnaire comprised 15 closed-ended single and multiple choice questions. Before commencing the actual research, a pilot survey was conducted aimed at eliminating any irregularities. Cronbach's alpha test was used to assess the reliability of scales, assuming a value above 0.72 (Hinton et al., 2004), which indicates the correct reliability of the test results. From among 350 questionnaires, 345 correctly completed ones were chosen. The study group included 197 women, and one in three respondents lived in a rural area. The research results showed that only 7% of respondents stated that they do not buy any new products, and none of these were men. The seniors studied in the research demonstrated an openness to innovations, and in particular, those related to the market of food products. Seventy-two per cent of respondents focused on products with low sugar content that decrease the level of cholesterol in the body. The study showed that in making the right decisions, older people place particular value on informal sources of information (46.5%), while 30.2% accept formal sources. Informal sources include suggestions made by family and loved ones who have bought the given product or service before, as well as browsing information on online forums. Only 16.3% of respondents (of which 85% were women) expressed an emotional approach to shopping. Almost one-quarter boasted good knowledge of new products on the market (23%), while 41% were poorly informed in this regard and 36% were unable to answer the question. Table 2 presents the areas for development of innovative solutions that older people are most likely to use (Barska and Śnihur, 2017).

Table 2. Expected areas for development of innovative solutions for seniors

Expected areas for development of innovative solutions for older people	Percentage of respondents
Tourism and leisure	44%
Insurance services	33%
Clothing and footwear	30%
Food products	28%
Educational services (language courses, using a computer)	28%
Dietary supplements	23%
Bank services	16%
Household appliances	14%
Home electronics	12%
Telecommunications	2%

S o u r c e: Author's own elaboration based on Barska and Śnihur, 2017.

6. Summary

The presented research results indicate that older people participating in the study adopt new solutions rather positively, although successful implementation requires effective systems of communication, often also education and help from loved ones. Innovative companies should thoroughly examine communication barriers that exist with seniors to be able to get to know their needs and expectations even better. The results also showed that the elderly expect, first and foremost, innovative solutions related to tourism and leisure, as well as insurance services. The study did not list innovative solutions in the area of disease prevention, which is about the arrival of new ways of taking care of better well-being and, consequently, also health. The said research is preliminary and is the basis for further studies on, at least, the determinants of the diffusion of mobile technology innovations among the elderly. In the author's opinion, even though there is increasingly more development and implementation of innovative processes to consolidate correct habits of a healthy lifestyle and disease prevention, scientific studies assessing these solutions in the context of older people are still at the early stages. Undoubtedly, modern mobile technologies help the elderly remain in contact with their loved ones; enrich personal development without the need to leave the home; simplify health care; generate greater access to information, knowledge, culture, and entertainment; and increase social interaction, self-esteem and overall satisfaction with life (Gamberini et al., 2006). Thanks to their use of innovative solutions, seniors are able to be more independent and socially involved, which should be seen as an indispensable element of life that significantly revolutionizes their everyday being. In summary of the article and given the context of an ageing population, heterogeneity of the group and age-related health problems, the most important thing seems to be that for older people to be able to adapt to life in an innovative society, society must adapt to living with an increasing number of seniors.

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Wykorzystywanie technologii mobilnych przez osoby starsze jako wyzwania dla innowacyjnych przedsiębiorstw

Abstrakt: Dynamiczne zmiany, jakie zachodzą we współczesnych przedsiębiorstwach i w ich otoczeniu, oraz rozwój technologii informacyjno-komunikacyjnych (ICT) kreują nowe oczekiwania i potrzeby człowieka. W związku z globalnym procesem starzenia się społeczeństw coraz więcej przedsiębiorstw traktuje osoby starsze jako kluczowy czynnik swojego sukcesu, patrząc na innowacje z perspektywy wartości dla klienta oraz doskonalenia wewnętrznych procesów. Celem artykułu jest sformułowanie wyzwań stających przed firmami w kontekście osób starszych oraz próba określenia postaw seniorów wobec innowacji z obszaru technologii mobilnych. Opracowanie ma charakter przekrojowy i może służyć do formułowania strategii marketingowych dla managerów innowacyjnych przedsiębiorstw działających na rynku srebrnych konsumentów.

Słowa kluczowe: innowacje, innowacje przedsiębiorstw, osoby starsze, srebrny rynek, technologie mobilne

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