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Innovation in coal mining management as an intelligent specialization

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Abstract

In Poland, one of the industries that has to take action to increase innovation is mining, as it is still a strategic branch of the Polish industry. The analysis of the structure of expenditure on mining innovation shows that there are innovations in the product sphere and solutions related to mechanical coal mining, while the sphere of widely understood management is omitted and expenditure on this field is negligible. Bearing in mind, among other things, the above challenges facing the Polish economy in the near future and in particular Polish coal industry, the author of the article attempted to analyse the most important challenges facing the mining industry in Poland. This article will attempt to answer the question in which direction innovative measures should be taken in Polish hard coal mining industry to allow for the development of this industry.

1. Introduction

Bearing in mind intelligent specializations implementing an innovation policy based on the effective and synergistic use of public support for enhancing innovation capacity of a given region, it can be stated that for Upper Silesia hard coal mining is such an intelligent specialization. It is now assumed that regions, in order to use effectively funds invested in science, research and development, should seek positioning in the regional „market” rather than to fragment their investments in areas where they will still remain just catching up regions. In addition, EU Member States for the coming years have set the course of action in economy, that is innovations that underpin technical progress, including the social, economic, political, spiritual, health, consumption and knowledge spheres.

Innovative activities should lead to the modernization of industry both in the manufacturing phase through increasingly effective production, aiming at:

- minimizing production costs,
- improving quality of the final product,
- increasing the company's income,

but also in the organizational sphere, occupational safety, environmental protection and shaping (ZIOŁO Z. 2009).

In Poland, the need to undertake innovative activities should also be addressed to mining companies, as hard coal mining is

still a strategic branch of the Polish industry. In terms of coal mining, Poland ranks 10th in the world rankings and 1th in the European Union. For Poland, coal is a guarantee of energy security, being the primary source of electricity generation (DUBIŃSKI J., TUREK M. 2012).

2. Poland's innovation on the background of the European Union

Innovative activities of industrial enterprises are perceived as a total of scientific, technical, financial and organizational activities which, as a consequence, should lead to the implementation of innovations that bring about economic effect. The measures taken in this regard are related to the overall technical and organizational progress that is, in addition to capital and human labour, one of the most important factors in achieving the economic results. From the previous observations it is clear that the innovativeness of Polish enterprises is significantly different from the levels recorded in most EU countries (FRANIK T. 2015, POMYKALSKI P. 2015, MIDOR K. 2015). Innovation results in the EU are improving year by year, but the innovation gap between EU Member States is steadily increasing. This applies not only to product and pro-

cess innovations, but also to organizational and marketing innovations, whose relevance in today's world is constantly growing.

The European Commission has published another report for 2016 specifying the level of innovation in Europe. The report analyses the situation of EU Member States and other European countries, including Serbia, the Former Yugoslav Republic of Macedonia, Turkey, Iceland, Switzerland, Norway, Ukraine and Israel. Three main groups were taken into account for calculating the level of innovation: Potential, Business Activity and Economic Impact. Each group has detailed indicators (a total of 25) that differentiate all countries and place them at the right place in the European Innovation Index.

Due to the results obtained, the studied countries were divided into four groups: innovation leaders, strong innovators, moderate innovators and modest innovators. Starting with the top of the ranking, Switzerland, Sweden, Denmark, Finland, Germany and the Netherlands belonged to the group of European innovation leaders. In this group each country's result was significantly above the EU average. A group of strong innovators is the second group where Ireland, Belgium, Great Britain, Luxembourg, Austria, Israel, Iceland, France and Slovenia have their place. Moderate innovators are by far the most numerous group, in which its place has also Poland. In addition, we will find here Norway, Cyprus, Estonia, Malta, Czech Republic, Italy, Portugal, Greece, Spain, Hungary, Slovakia, Serbia, Lithuania, Croatia and Turkey. The list is closed by countries that have been identified as modest innovators, which include Bulgaria, the Former Yugoslav Republic of Macedonia, Romania and Ukraine.

Figure 1 graphically shows the above data. In the figure on the x-axis symbols of the states are presented, while on the y-axis – the coefficient of innovation.

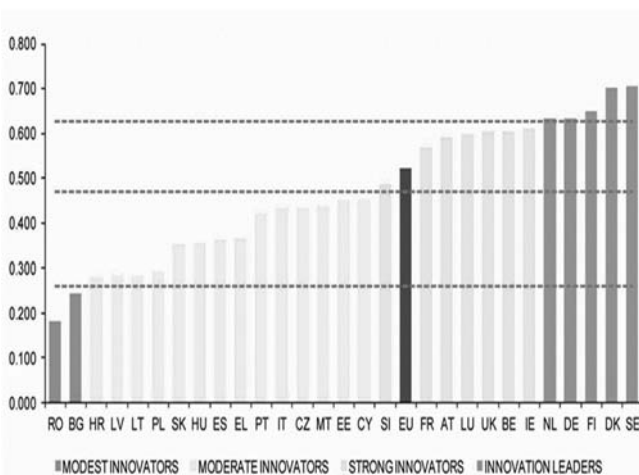


Fig. 1. European Innovation Scoreboard 2016 (EUROPA 2017)

After analysing the last year's results, it appears that the composition of all groups compared to the previous year remained virtually unchanged. Only Latvia was promoted to the group of moderate innovators, while the Netherlands joined the group of innovation leaders. Poland ranked 29th in the overall ranking and 22nd in the European Union ranking, with

a score of 0.29175 (the EU average is 0.52149). Compared to last year, this is one place up. Analysis of Poland's situation shows that in each of the factors taken into account, Poland is below the EU average. The Commission's experts note, among others, a relatively strong decrease in innovative cooperation of small and medium-sized enterprises with others (-12%) and in the number of SMEs with organizational or marketing innovations (-9.7%) (JAZLOWIECKA 2017).

Bearing in mind the topic of the article, it is important to analyse the results obtained by Poland in areas such as the introduction of product or process innovation and marketing/organizational innovations by companies. Indicators illustrating these areas were calculated in terms of: companies performing the given innovation to the total number of enterprises and expressed as a percentage.

Figure 2 shows how innovations in Polish companies in the field of process or product innovation in the years 2008-2015 have taken shape against the European Union.

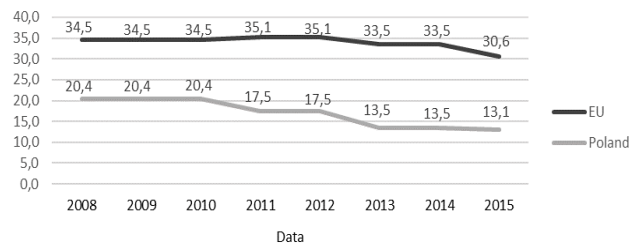


Fig. 2. SMEs introducing product or process innovations as % of SMEs (EUROPA 2017)

The analysis of Figure 2 clearly indicates that in Poland since 2010 there has been a downward trend, significantly stronger than in the EU. The same statement can be applied to marketing/organizational innovation, as shown in Figure 3.

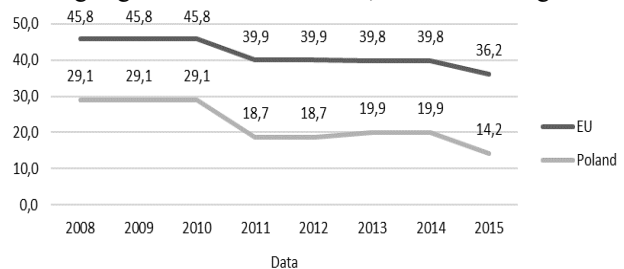


Fig. 3. SMEs introducing marketing or organizational innovations as % of SMEs (EUROPA 2017)

3. Innovation and hard coal mines

Hard coal mining is a branch of the traditional industry, whose peak period of development in Poland took place in a centrally controlled economy. With economic growth, the importance of traditional industry branches is declining and the importance of high technology industries is rising. Traditional industry is characterized by weak market dynamism, which results in small extent of innovation in the industry, reflecting, inter alia, the fact that the mining industry has been struggling with difficult economic situation for many years.

Therefore, measures should be taken to allow the mining industry to become economically viable in order to prolong the viability of the extractive industries in Poland, since it is in the socio-economic interest of the country. Innovations are a tool for increasing the competitiveness of the mining industry (MIDOR K., BIAŁY W. 2016).

Certainly understanding of the word „innovation” is often different. The author of the article assumes that innovation does not necessarily mean „developing” something completely new. Innovation can also mean a new way to use something we already have, but in another area, in another industry.

The pressure of innovation is on all types of companies in different industries and includes such elements as new products, technologies, organization, relationships with partners, etc. The effectiveness of this depends largely on the competence and management skills and strategies adopted in the companies. The environment in which the companies operate is of great importance, as well as support for policies and initiatives by public authorities creating favourable conditions for the emergence of an innovative climate (ŚWIĘCICKA Z. 2012, OKSANYCHO O. 2015).

Literature divides innovation into different types. The article uses the international standards for definition and measurement of innovation as set out in the Oslo Manual 2005 (GŁÓWNY URZĄD STATYSTYCZNY). This manual highlights product, process, organizational and marketing innovations. Product innovation is any kind of change in products or services that involves refining or extending with a new product or service range. It involves the use of new technologies, new uses of existing technologies or the use of new knowledge. Process innovation is a change in the manufacturing methods used, as well as in the ways of reaching consumers with a product or service. The purpose of innovation within the process is to reduce the unit cost of production or delivery, improvement of the quality of products. They may involve significant hardware and software changes or changes to the procedures or techniques used to provide a service. Organizational innovations are activities in enterprises that involve introduction of a new organizational method into the organization's operating principles, which have not been applied in the enterprise yet. These are innovations that support product and process innovation and have a significant impact on efficiency of the business. Organizational innovation can contribute to improving the quality and productivity of work or increasing the ability of a business to learn.

As defined in the Oslo Manual, marketing innovation is the implementation of a new marketing method that involves significant changes in product design/construction or packaging, distribution, promotion or pricing strategies. The aim of marketing innovation is to better meet the needs of customers, to open new markets, or to position products on the market in a new way. Marketing innovations are distinguished by the fact that they consist in implementing a marketing method not used by a given company before.

In accordance with the definition adopted by the European Union and the OECD, innovation will only occur when a new or significantly improved product is launched and new pro-

cesses, organizational methods or marketing methods are currently used in the business. It is the word „currently” that the author of the article would like to draw special attention to.

By analysing the innovative activity of industrial enterprises in the Coal and Lignite Mining sector according to the Polish classification of economic activities (PKD) in 2008-2014, which is presented in Figure 4, it can be seen that the innovative activity of the mining companies in the analysed period was around 45%, which means that every other company did not introduce any innovative change in the area of product, process, organization or marketing. It is a very unfavourable situation for the industry struggling with low profitability. Figure 4 also shows that among the innovative companies, this activity was most closely linked to process innovations, including the implementation of new improved production methods. The remaining groups of innovations were implemented in a small percentage by companies from the mining industry.

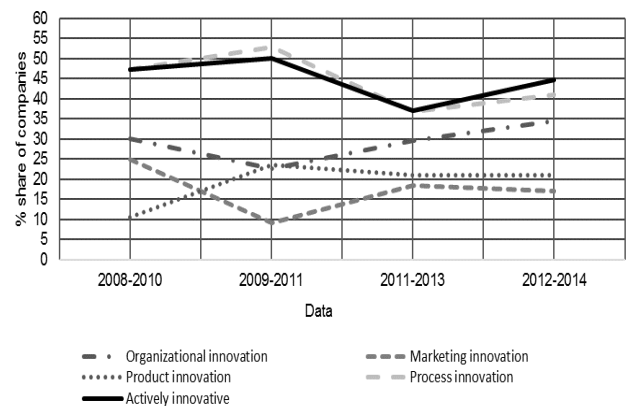


Fig. 4. Innovative activities of enterprises in the PKD section of the whole enterprise (MIDOR K., BIAŁY W. 2016)

Based on results of the survey on the innovative activity carried out in 2012 among mining companies (ŚWIĘCICKA Z. 2012) it was clear that among the process innovations most frequently mentioned by the respondents was the implementation of new software supporting the purchase of electricity and a new seismic monitoring system followed by the purchase of new machines and devices. On the other hand, the introduction of innovative products was to a lesser degree. Such a state of affairs is natural given the homogeneity of the manufactured product, which is coal. Examples of innovative products introduced by the mines are ecological certified fuels.

By analysing the number of enterprises of mining industry that have implemented organizational innovation (Figure 4), it can be seen that these innovations are relatively rare, with the largest activity in this area manifested in 2012-2014, with activity at 34.5 %, which, according to the Central Statistical Office analyses of enterprise innovation activity, means that the highest percentage of companies introducing organizational innovations in Poland are entities from the division of Hard Coal and Lignite Mining. It is a significant increase in compar-

ison to 2011-2013, when 29.6% of mining companies introduced organizational innovation. Referring to the results of the aforementioned survey (MIDOR K. 2015), the organizational innovations introduced in hard coal mines consisted mainly in introduction of a new method of undertaking projects, establishment of complex mines and introduction of quality management and environmental management. Looking at the percentage of mining companies that introduced marketing innovations in 2012-2014, it can be seen that only 17.2% implemented such innovations when 18.5% were between 2011 and 2013. As for the examples of marketing innovations reported by the respondents in the survey mentioned above, e-shop and dealer network sales introduction were stated.

To sum up, the above considerations it can be clearly stated that mining companies are innovatively active primarily in the process area, while in other areas this activity is at a low level.

4. Summary and conclusion

The economy of our country is currently in a specific moment of development. Previous competitive advantages based e.g. on a monopoly, are clearly losing their importance. It is, therefore, necessary to build new advantages based on knowledge and innovation, which are the basic factor of long-term economic development. It is important from this point of view to develop innovative activity of enterprises, including research and development, as the most important factors of competitiveness. These demands largely concern the mining industry, particularly hard coal mining, whose main goal is to ensure the country's energy security while at the same time achieving high efficiency in the difficult primary fuel market.

At the European Economic Congress held on 20-22 April 2015 in Katowice, during the panel of inventions in the Polish mining and power industries there was a clear defence of coal. Scientists, experts, politicians and manufacturers provided examples of innovative solutions and ongoing research and development. It was emphasized that Poland could stand for world innovations in mining and power industries. However, all these examples concerned innovation in the sphere of product and coal production technology, there were no ideas for innovation in the sphere of management, which, according to

the author of the article, is the key to the success of the mining industry in Poland.

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煤矿管理创新作为智能化专业化

关键词

革新
采煤
智能化专业化
管理化

抽象

在波兰，必须采取行动来增加创新的行业之一是采矿业，因为它仍然是波兰工业的战略部门。对采矿创新支出结构的分析表明，在机械采煤业的产品领域和解决方案方面存在创新，省略了广泛理解的管理领域，这一领域的支出可以忽略不计。考虑到波兰经济在不久的将来面临的上述挑战，特别是波兰煤炭行业，该文章的作者试图分析波兰采矿业面临的最重大挑战。本文将尝试回答波兰硬煤采矿业应采取创新措施的方向，以促进该行业的发展。
