



LEVEL OF SPECIALIZATION AND MANAGEMENT METHODS IN SMALL AND MEDIUM ENTERPRISES OF THE GAS INDUSTRY

Daria Motała¹, Alexander Y. Bystryakov², Vladimir M. Pizengolts²

¹ Poznan University of Technology, Faculty of Engineering Management, Poland

² RUDN University, Russia

Corresponding author:

Daria Motala

Poznan University of Technology

Faculty of Engineering Management

Strzelecka 11, 61-845 Poznań, Poland

phone: (+48) 61 665 33 87

e-mail: daria.motala@put.poznan.pl

Received: 24 January 2018

Accepted: 12 June 2018

ABSTRACT

In small and medium-sized enterprises (SMEs), the ways of operating are dependent on the specific nature of their business activity, while management methods are often used intuitively. The paper shows that specialization, defined as offering products to companies from one or from two to four industries, is of great importance among SMEs in the gas sector. The analysis of the applied management methods allows us to conclude that the most important ones are those related to human capital.

KEYWORDS

small and medium enterprises, specialization, management methods.

Introduction – the selection of management methods for the study

The reality in which modern companies operate is highly dynamic and heterogeneous. Unpredictable changes occurring in the business environment make it difficult for companies to gain and maintain their desired market position. This is why they first of all need to focus on the resources they actually have or which are available to them. As a result, companies are increasingly interested in resource management methods, which encompass appropriate concepts, methods and tools of management. It should be pointed out that, depending on managers' perception, management having the same name is treated as a concept, method or even a tool. In this paper, the term of "method" would be applied, while realizing that it is not always in line with the taxonomy adopted by some authors.

Researchers into the field of management do not seem to pay much attention to the issue of the application of popular management methods (used extensively by large corporations) by small and medium enterprises. SMEs often use management methods

in an intuitive way rather than drawing on scientific theories. However, some of them do apply a number of tools which are part of management methods. Thus, it is worth examining which methods from the adopted catalogue and to what extent companies use.

The selection of methods analyzed in this paper was based on the taxonomies concerning small and medium-sized enterprises described in the literature. A lot of the methods discussed are aimed at utilizing available resources, which are often characteristic of the industry, which may reflect a trend towards the specialization of companies. When selecting management methods for the study, the findings of the analyses and taxonomies provided by Bolden's team [1], presented in 1997, and of Trzcieliński's set of methods, which followed Bolden's model [2–4] were used. The reason behind such a choice is the fact that they are consistent with the classifications used by other management specialists [5–9]. The following methods were taken into consideration in the study:

- Total Quality Management (TQM);
- Benchmarking (BEN);
- Continuous Improvement (CI);

- Concurrent Engineering (CE);
- Supply-Chain Partnering (SCP);
- Just In Time (JIT);
- Outsourcing (OS);
- Team-Based Working (TBW);
- Manufacturing Cells (MC);
- Total Productive Maintenance (TPM);
- Empowerment (EMP);
- Integrated Computer Technologies (ICT);
- Business Process Reengineering (BPR);
- Learning Culture (LC).

Interesting research on the effectiveness of small and medium-sized enterprises from the gas sector was conducted in Africa. They showed a completely different approach to achieving high competitiveness than in the following article. It mainly concerned the links between various entities related to the gas sector [10].

The selection of enterprises for the study

The study that served as the basis for formulating conclusions consisted of two stages. In both of them, the analyzed enterprises were selected following certain criteria. It was assumed that they should be related to the gas sector. At the first stage, they included gas component manufacturers and firms providing services to the gas industry. At the second stage, companies dealing with the production of components for gas networks were examined. The selection of the gas industry made it easier to compare the scope of the application of management methods through the unification of firms' operational conditions.

Only small and medium sized enterprises were taken into consideration – ignoring small entrepreneurs and large corporations – because of the number of entities of this size in the Polish market and of the origin of gas companies. Small and medium enterprises represent approximately 99% of all companies registered in the Polish market, and they employ more than 70% of all workers. Accounting for 58% of total national production, they generate almost 58% of the state revenue [11]. The presented data (Fig. 1) confirm the importance of small and medium-sized companies in the economy, thus they have become the subject of my interest.

What should also be emphasized is the unique origin of the companies in this sector. After the transformation, when the free market economy was introduced, large state-owned enterprises were reformed by being split into smaller entities, which were put in private hands. What is more, people with expertise in

the gas market, who had worked as managers in state monopolies, founded their own companies and dealt with the area they had experience in. As a result, there are a number of new small and medium-sized enterprises, which have operated without any significant changes regarding their size and type activity.

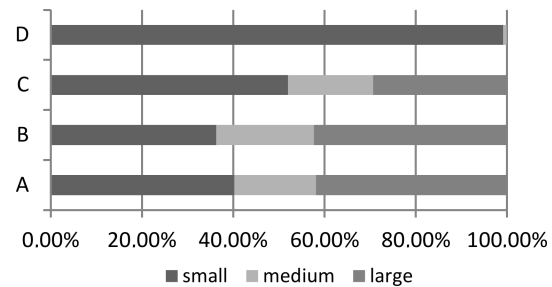


Fig. 1. The role of small and medium enterprises in the Polish economy [11].

Research implementation

The study of the application of management methods by the small and medium-sized enterprises of the gas sector was conducted in two stages. The preliminary study involved exclusively companies from the Wielkopolska region, performing contracts for the local branch of Polish Oil and Gas Company (PGNiG). They include manufacturers and service providers in the gas industry. The reason behind this choice was first of all the accessibility of these entities and the availability of data. The second stage involved companies from the whole country and the study was limited to manufacturing enterprises, which supplied components for the broadly defined gas distribution network.

In order to obtain information on the applied management methods, an oral interview, which was structured, open and individual was used. The survey questions were formulated in a way that would make it possible to compare the examined enterprises. Most of the questions were closed, with the others being semi-closed. The goal of the second stage of the research was to check the scope of the use of the previously analysed management methods and changes in the area of application. Special attention was paid to the methods which previous studies revealed as those widely used and focused on the rationalization of resource use.

The scope of the application of methods was determined by distinguishing symptoms characteristic of each management concept and method [12]. Consequently, a set of symptoms was used in the study of enterprises. This set served as the basis for the identification of the use of the examined management

methods. This led to an increase in the objectivity of the study because the respondents' statements concerning the use of a given method were not taken into account which could be motivated by their willingness to make an impression with a multitude of solutions they used. The actual scale of the application of a specific method was estimated on the basis of the occurrence of characteristic symptoms the significance of which was ranked according to weights.

The specialization of the small and medium-sized enterprises of the gas sector

When carrying the pilot study, the level of specialization was observed as that what distinguished small and medium gas enterprises. That is why paying special attention to it in the nationwide research was decided. Analysis has shown that almost half of the companies involved in the regional study and one third of the enterprises covered by the nationwide research have a high degree of specialization. Almost a quarter of the entities from the pilot study and more than a half of the enterprises examined at the second stage of research show a moderate degree of specialization, which means performing contracts for from two to four industries (Fig. 2).

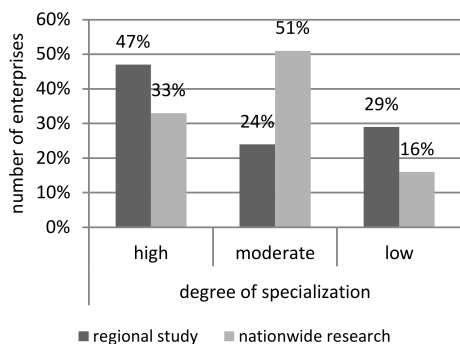


Fig. 2. The degree of specialization of the companies from the regional and nationwide research [own study].

As the analysis proves the significance of specialization, which is characteristic (to a high or moderate degree) of most enterprises (Fig. 2), this parameter was compared with the data concerning companies' size and with the length of time they had operated in the market. In the regional study, the longest period taken into consideration was 11 or more years. This is not consistent with the longest period in the nationwide research (more than 15 years). Such an approach was adopted because there is a few years gap between the implementation of both research stages and it was assumed that it would adequately reflect

the expression "long market presence" for both studies at the same time. The data presented in Fig. 3 imply that almost 60% of the companies in the pilot study had been present in the market for over 11 years at the time of the study, and almost a half of them showed a high degree of specialization (fulfilling contracts for the customers from a single industry) and were of the medium size (employing 50 – 249 people).

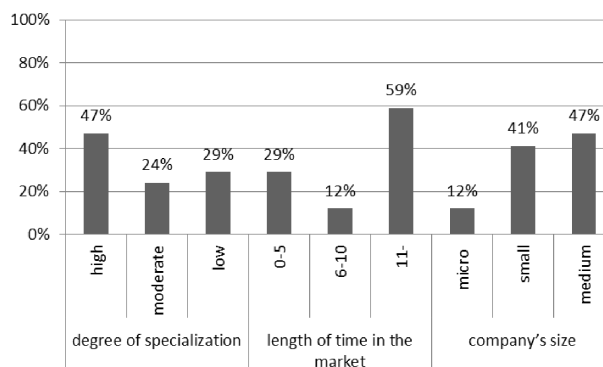


Fig. 3. The degree of specialization, length of time in the market, and size of the companies in the light of the regional study results [own study].

The detailed research results show that 80% of the enterprises established 11 or more years ago offer products to one or from two to four industries. They are usually industries related to the gas-sector, such as plumbing or air-conditioning. The findings of the regional study indicate that half of the incumbent companies employ 50 or more people. It means that entrepreneurs – their owners – set up small businesses and do not usually expand their activity.

However, one can observe a trend towards extending specialization among the small companies with the longest market presence – only one of them still offers only gas related products. In the group of firms that have operated in the market for six to 10 years and have grown to become medium-sized – there are five such companies, and three of them show a high degree of specialization.

The examined enterprises usually choose one of two development paths. Some of them focus on exploiting a specific market niche and develop their business within its confines by increasing employment. The other solution is to look for industries which are similar in terms of product range. In the literature, both models are defined as the possible development patterns for small, highly specialized companies [13].

The basic difference between the results of the regional and nationwide studies is the level of specialization of the analyzed enterprises (Fig. 4). Mod-

erately specialized firms account for the majority of companies from the whole country (51%), which means that they offer their products to customers from two to four sectors, while highly specialized firms turned out to be dominant among the entities examined in the first study (47%). This is probably due to the changes that occurred in the period between the two studies. That time was not favorable to the development of the gas distribution network, which is reflected, among others, in the difference between the actual consumption of gas and the expectations for given periods (Fig. 5).

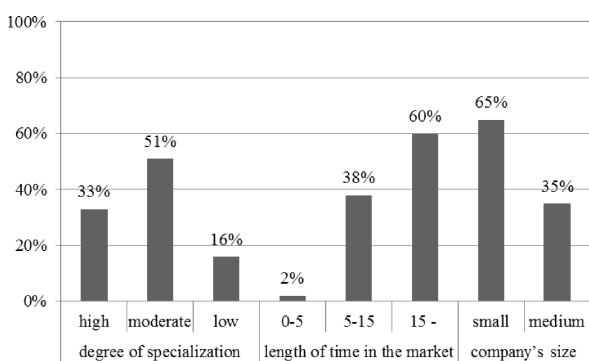


Fig. 4. The degree of specialization, length of time in the market, and size of the companies in the light of the nationwide research results [own study].

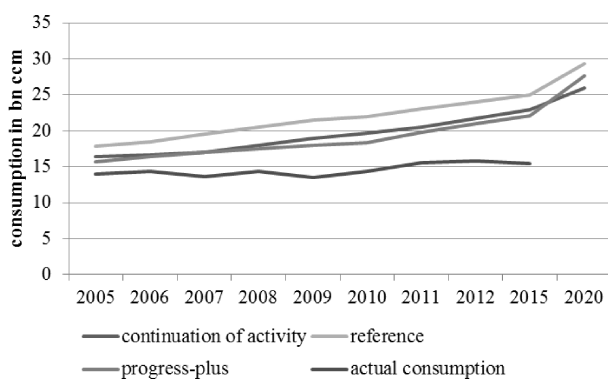


Fig. 5. The comparison between the anticipated and actual gas consumption in the years 2005–2020 [own study based on [14–17]].

The observed differences were predominantly caused by the following factors [16]:

- the central, administrative regulation of gas prices combined with the insufficiently liberalized gas market,
- consumers' high price sensitivity,
- the relatively lower price of coal in comparison to gas,
- the depreciated assets of fossil fuel power stations,
- the low severity of penalties for damage to the natural environment.

Representatives of the gas industry hope that the gas sector will develop at a much faster pace thanks to the high share of imports in the national balance of this fuel and to the liberalization of trade exchange with foreign countries. They reckon that a gas stock system will have to be developed. This will entail, in turn, the extension of underground natural gas storage areas. According to the statistics from 2016, there are seven underground gas storage facilities in Poland and two of them are still being extended [18], which requires the involvement of local companies dealing with the production of gas storage and transmission components and using them for building infrastructure. As regards pipelines, there are also not enough of them and their quality should be improved. Thus, in 2017, the PGNiG planned to spend 1,237 million zloty on the extension and modernization of pipelines, which may improve the condition of enterprises performing contracts for the construction and maintenance of transmission networks.

In order to stay afloat in this difficult time in the market, companies in the gas sector adjusted their offer to meet the needs of related markets, usually the plumbing one. It should be stressed that, despite this fact, only a few of the examined firms (16%) operated in several markets at the same time.

In the nationwide study, the aspect of the specialization of small and medium-sized gas enterprises was considered in two ways. The first of them referred to the number of industries that companies work for. These results are presented in Fig. 4. At the same time, the findings of the nationwide study let to identify the level of specialization in terms of specific products offered by enterprises. In this context, the following models have been distinguished (Fig. 6):

- a single product offered in a single market,
- a lot of products offered in a single market,
- a single product offered in a few markets,
- a lot of products offered in a few markets.

Having considered the above options, one can observe that almost 80% of all the examined companies exhibit specialization in one of the above forms. Most of them (60%) focus on a single market, i.e. they operate in one selected industry and offer diverse products adapted to its needs. This approach is also in line with the concepts of the functioning of small enterprises. Their owners, who are managers at the same time, concentrate on the area that they have good knowledge of. The products they offer are diverse to a limited degree as they are targeted at specific audience. This operational model is thus the same as the exploitation of a selected market niche,

which is seen as characteristic of small enterprises in the literature [10].

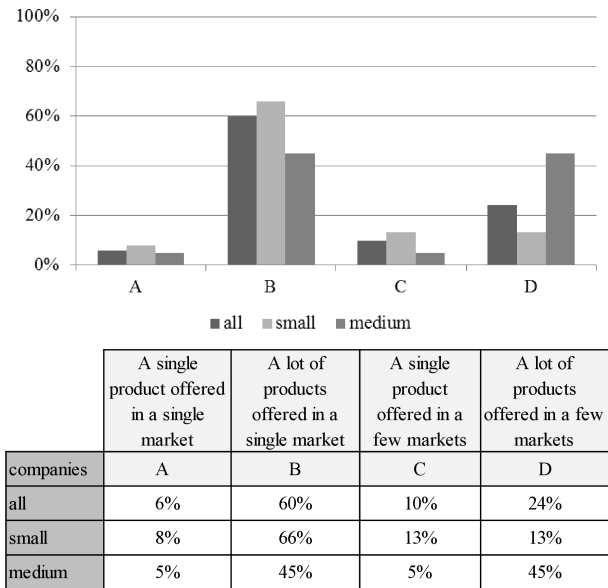


Fig. 6. Specialization of enterprises – nationwide research results [own study].

The nationwide study also shows that small and medium-sized gas enterprises have a relatively shorter lifecycle. Most of them (60%) have been present in the market for over 15 years, and they employ less than 49 people. What is more, their managers claim that their size has changed, on average, by no more than 30% since the firm was founded. The most numerous group includes the companies which have increased their staff size by approximately 16–20% throughout the whole period of their activity (Fig. 7).

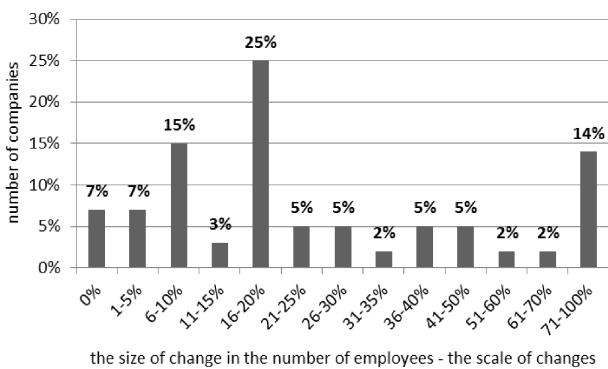


Fig. 7. Changes in employment size in enterprises – nationwide research results [own study].

Thus, changes in employment size were not significant, considering the length of time most of the examined companies have been present in the market. Enterprises generally employ the same number

of employees as they did when they began business activity. Hence, the companies which were small at the beginning tend to develop by improving their product range – by diversifying and extending their portfolio or by becoming specialized in offering specific products rather than expanding their size.

The application of the selected management methods

All of the concepts and methods under analysis have been at least partly applied in the examined enterprises (Figs. 8, 9). However, the difference between partial and significant use is quite big. It shows that the managers of small and medium-sized gas companies have superficial or no knowledge of modern management concepts and methods and that these methods are implemented in an intuitive and random way.

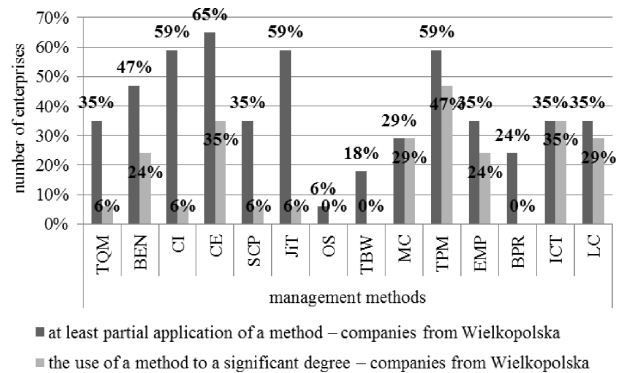


Fig. 8. The scope of the application of modern management concepts and methods in the examined gas enterprises from Wielkopolska region [own study].

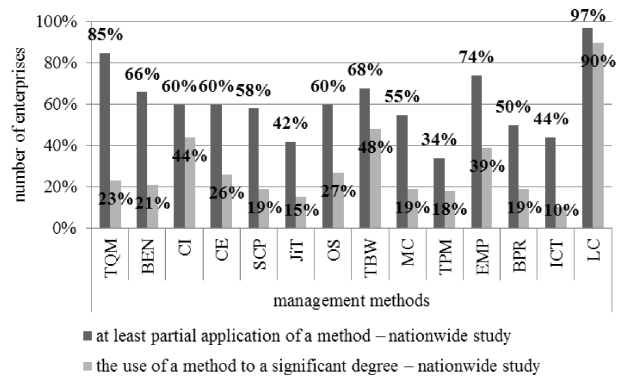


Fig. 9. The scope of the application of modern management concepts and methods in the examined gas enterprises in nationwide study [own study].

Significant differences in the results obtained in the regional study (conducted exclusively in the Wielkopolska region) and the nationwide research

results were observed. They are particularly evident when it comes to the use of such methods as: Continuous Improvement (CI), Team-Based Working (TBW) and Empowerment (EMP), as the result of which the following methods are also widely used: Total Quality Management (TQM), Supply-Chain Partnering (SCP), Outsourcing (OS), and Business Process Reengineering (BPR). What is the most striking difference, however, is the disparity between the implementation of the assumptions of Learning Culture (LC) in the regional study of companies and in the nationwide research. This disparity might be to a certain degree explained by the area of study, although it seems that such a considerable difference cannot be the result of the unique nature of companies from the Wielkopolska region. The more convincing reason is the fact that the two studies cover different periods with a gap of a few years between them. Over this time, managers changed their attitudes and began to treat employees as the leading resource of an enterprise.

The analysis of modern management concepts and methods shows that the following ones are applied to a significant extent: Empowerment (EMP), Continuous Improvement (CI), Concurrent Engineering (CE), Outsourcing (OS), Team-Based Working (TBW), Total Productive Maintenance (TPM), Business Process Reengineering (BPR), Learning Culture (LC) and Manufacturing Cells (MC). Integrated Computer Technologies (ICT) are also used relatively widely. Because of the size of enterprises – usually small, sometimes medium-sized – the application is not always consistent with the assumptions made during the analysis of characteristic symptoms. In the regional study interviews, however, we obtained the information which would confirm the use of ICT for supporting management and this served as the proof that the method was used [19].

In the course of conducted research, the application of management methods in the incumbent companies was particularly interesting. In the regional study, the number of firms present in the market for more than 10 years was 59%, while the respective number in the nationwide research was 84% of the companies under study, with enterprises older than 15 years accounting for 60% of the total. This disparity is probably the result of the period of study corresponding to the development of the free market economy in Poland. The statistical observations show that relatively few companies are established in the sector of small and medium enterprises, which is dominated by the firms which have been present in the market for quite some time and it is them that adapt to customers' demands and meet their needs.

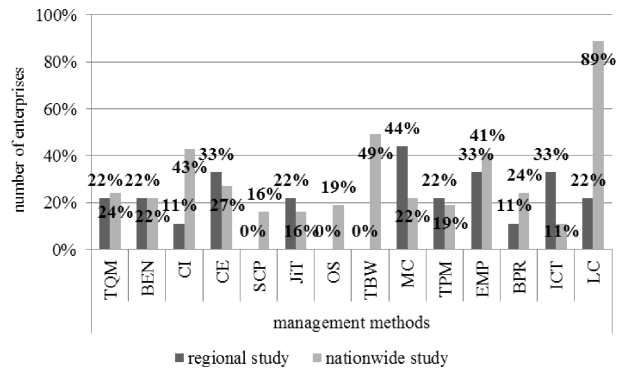


Fig. 10. The application of management methods to a significant degree by the incumbent companies in the gas sector [own study].

As regards the application of the analyzed management methods by the incumbent companies, the biggest differences between the findings of the regional and nationwide studies have been observed in the case of LC, TBW and CI, which is shown in Fig. 10. All of them are related to human capital, knowledge development and the exchange of experience and skills. Enterprises use a resource approach, focusing on the capital that is the most difficult to emulate because it is connected with individual talent and with the knowledge of the company's area of expertise.

In the case of the nationwide study, the scope of the application of management concepts and methods by all companies participating in this research stage and by those which increased production and employment was compared (Fig. 10). The companies which are effective in the market, i.e. those which have doubled their production volume and have raised employment, use such methods more widely than the others. As regards the companies which increase employment, it is particularly visible in the use of Continuous Improvement (CI), Learning Culture (LC), Empowerment (EMP), Total Quality Management (TQM) and Benchmarking (BEN). Especially the first three methods mentioned above are focused on the development of human resources in companies, so their application is fully justifiable.

What draws particular attention is the application of methods such as Supply Chain Partnership (SCP) and Just in Time (JIT), which are used far more widely than all the other examined management practices. This may be due to the growing importance of partnership relations between cooperating entities, which are established as the result of companies' specialization. As small and medium-sized gas enterprises are highly specialized, they need to start cooperation with other firms in seeking con-

tracts for building specific parts of a pipeline. These contracts are usually too complex to be performed by single specialist enterprises. Thus, manufacturers of the specific pipeline parts (transmission pipes, clamps, pressure reduction and metering stations) have to and want to cooperate with each other, and send these parts within the framework of SCP and in accordance with JIT principles to the place where they are used.

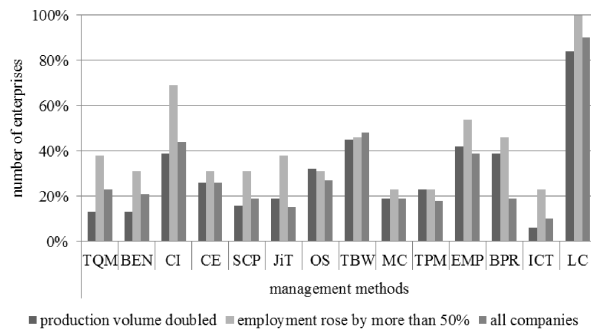


Fig. 11. The application of management methods to a significant degree by the companies examined in the nationwide study in comparison to the scope of their application by the firms increasing their production volume and employment [own study].

Conclusions

The findings of both stages of the study show that small and medium-sized enterprises in the gas sector are specialized to a high and moderate degree. This specialization usually consists in offering a few or a dozen or so industry-specific products. The high level of specialization of the incumbent companies takes its origin in the way small and medium-sized gas enterprises were established – they were set up by specialists with expertise in the company's field of activity or were the privatized spin-offs of larger corporations.

The application of management methods by gas enterprises is particularly important for drawing conclusions concerning the incumbent companies. The results presented above indicate the growing use of methods connected with human capital. This capital, which is of a unique and creative nature, constitutes the key corporate resource, determining the survival and growth of a company. Managers are increasingly interested in methods such as LC, CI or EMP, because they want to stimulate their employ-

ees' involvement in the development of a competitive enterprise.

Competitiveness involves not only pursuing profitable contracts for building and modernizing pipelines, but also establishing efficient cooperation with other firms [20]. This is why the SCP method is being used more and more widely as it is based on the existence of quality-tested products and processes. At the same time, the number of companies which apply the JIT method is also increasing, which has a positive influence on meeting deadlines and the low cost of work.

Highly specialized small and medium-sized gas enterprises, which have been present in the market for 10–15 years or longer, seek solutions which will help them develop in terms of the quality of products, processes, and, most importantly, human capital.

References

- [1] Bolden R., Waterson P., Warr P., Clegg Ch., Wall T., *A new taxonomy of modern manufacturing practices*, International Journal of Operations & Production Management, 17, 11, 1112–1130, 1997.
- [2] Pawłowski E., Trzcieliński S., *Enterprise management – functions and structures*, Poznan University of Technology publishing house, Poznan, 2011.
- [3] Trzcieliński S., *Lean management and the virtuality of an enterprise*, Scientific Publications of the Institute of Organization and Management at the Wrocław University of Technology. Series: Conferences, No. 3, 2003.
- [4] Trzcieliński S., *Agile enterprise*, Poznan University of Technology Publishing House, Poznan, 2011.
- [5] Lichtarski J.M., *Modern concepts and management methods as a source of success for small and medium enterprises*, H. Czubasiewicz, W. Golnau [Eds.], *The success of the organization, internal and external conditions*, Publications and Materials of the Faculty of Management at the University of Gdansk, Sopot, 2007.
- [6] Morrison D., Ordery J., Couchman P., Badham R., *Modern Manufacturing Practices in Australia*, [in:] W. Karwowski, R. Goonetilleka, Manufacturing Agility and Hybrid Automation, IEA Press, Santa Monica, 1998.
- [7] Wood S.J., Stride C.B., Wall T.D., Clegg C.W., *Revisiting the use and effectiveness of modern management practices*, Human Factors and Ergonomics in Manufacturing, 14, 4, 2004.
- [8] Starzynska B., Hamrol A., *Excellence tollbox: Decision support system for quality tools and techniques*

- selection and application*, Tota Quality Management & Business Excellence, 24, 5–6, 577–595, 2013.
- [9] Hamrol A., *A new look at some aspects of maintenance and improvement of production processes*, Management and Production Engineering Review, 9, 1, 34–43, 2018.
- [10] Ablo A.D., *The micromechanisms of power in local content requirements and their constraints on Ghanaian SMEs in the oil and gas sector*, Norsk Geografisk Tidsskrift – Norwegian Journal of Geography, 71, 67–78, 2017.
- [11] Stat.gov.pl
- [12] Trzcieliński S., Motała D., *Application of modern management methods in small and medium-sized enterprises in the gas sector*, Summer School of Management, Jachranka, 2006.
- [13] Falencikowski T. [Eds.], *Modern enterprises' management. Strategic, innovative and cultural conditions*, WSB in Gdańsk, vol. 7, 2010.
- [14] Kaliski M., Nagy S., Rychlicki S., Siemek J., Szurlej A., *Natural gas in Poland – extraction, consumption and import until 2030* [in Polish], Mining and Geology, No. 3, 2010.
- [15] Zawisza A., *Gas for Poland, The general history of the natural gas sector in the last two decades in Poland*, Sobieski Institute, Warsaw, 2011.
- [16] Zawisza A., Żmijewski K., *Reconstruction and development of the gas transmission and distribution network in Poland in the context of the provisions of the climate and energy package*, E. Kwiatkowski Institute, Warsaw, 2012.
- [17] Haggerty J., Gude P.H., Delorey M., Raskerb R., *Long-term effects of income specialization in oil and gas extraction: The U.S. West, 1980–2011*, Energy Economics, 45, 186–195, 2014.
- [18] PGNiG Annual Report 2016, www.pgnig.pl.
- [19] Gajic G., Stankovski S., Ostojic G., Tesic Z., Miladinovic L., *Method of evaluating the impact of ERP implementation critical success factors – a case study in oil and gas industries*, Enterprise Information Systems, 8, 1, 84–106, 2014.
- [20] Garcia R., Lessard D., Singh A., *Strategic partnering in oil and gas: A capabilities perspective*, Energy Strategy Reviews, 3, 21–29, 2014.