

АНАЛІЗ КЛАСТЕРНИХ ПІДПРИЄМСТВ З ПОГЛЯДУ ЗАСТОСУВАННЯ КОНЦЕПЦІЇ ОЩАДЛИВОГО УПРАВЛІННЯ

© Павлишин І., Вирвіцька М. К., 2016

Стаття стосується функціонування промислових кластерів у Польщі. Метою описаних у статті досліджень було виявлення масштабів застосування концепції ощадливого управління в кластерних підприємствах. Аналіз, проведений у 107 підприємствах різних розмірів, територіально розташованих у різних провінціях, був спрямований на визначення, чи між підприємствами, які використовують інструменти для мінімізації витрат, відбувається обмін інформацією – дифузія знань. Дослідження допомогли виокремити загальну картину ситуації, але не дали змоги виявити бар'єри на шляху використання концепції ощадливого управління в кластерних підприємствах.

Ключові слова: кластери, кластерні підприємства, Lean Management, дифузія знань.

I. Pawłyszyn, M. Wyrwicka
Poznan University of Technology, Poland

ANALYSIS OF CLUSTER ENTERPRISES FROM THE POINT OF VIEW OF LEAN MANAGEMENT CONCEPT APPLICATION

© Pawłyszyn I., Wyrwicka M., 2016

This article deals with the functioning of industrial clusters in Poland. The study described in the article aimed at identifying the scale of application of Lean Management concept in cluster enterprises. The analysis carried out in 107 companies of various sizes, territorially located in various provinces, seeks to identify whether there is an information exchange – diffusion of knowledge, among enterprises that apply tools for waste minimization. The study has helped outline an overall picture of the situation, but has not allowed the identification of barriers to the use of Lean Management concept in cluster enterprises.

Key words: clusters, cluster enterprises, Lean Management, diffusion of knowledge.

Statement of the problem. Industrial clusters are the links uniting entities seeking to consciously build their competitive advantage and jointly cope with new challenges. Ways to build such advantages are many. One of them is the use of tools, techniques and methods of modern management concepts such as Lean Management, as well as dissemination of knowledge about it in the cluster enterprises.

Analysis of recent research and publications. At the turn of the 80–90s American economist Michael Porter pointed out to the territorial concentration of enterprises and in 1990 he formulated a concept of industrial cluster. According to his definition, the cluster “is a geographic concentration of interrelated companies, specialized suppliers, service providers, companies operating in related industries and associated institutions (e.g. universities, training companies, standardization bodies or industrial associations) in a particular field that compete but also cooperate with each other” (Porter, 2001, p. 246). Cooperation in selected areas of activity and at the same time competition among companies within the cluster is referred to in the literature on the subject as competitive cooperation¹.

¹ See more in: (Luo, 2007, p. 129–144; Gnyawali, Park, 2009, p. 308–330; Bengtsson, Kock, 2014, 180–188; Stańczyk-Hugiet, 2014, 342–355; Cygler et al., 2013).

Magdalena Wyrwicka indicates that the cluster is “a network of economic entities creating voluntarily (grass-root level) a system initiated by a number of organizations, (...) with a view of cooperating within the jointly defined area of activity in the strategic perspective” (Wyrwicka, 2009, p. 49). Polish cluster enterprises join their forces in various areas of economic activity, such as logistics, production, research and development, marketing and sales, research on technological trends, etc. Operating in clusters, companies gain a lot of benefits in terms of cost reduction, access to networks and connections, sources of financing other than those designed for an individual company, risk reduction in carrying out own business, etc. (Mikołajczyk et al., 2009, s. 17; Gorynia, Jankowska, 2007, s. 7-8; Palmen, Baron, 2008). The fundamental effect of cooperation within a group is the creation of conditions and resources (including knowledge) enabling the implementation of projects or investment which would be impossible to carry out by individual entities if they act independently.

The cooperation of enterprises within clusters helps enhance the market economy facilitating its development through the creation of innovative solutions and the emphasis on adding value² for clients (Akdeve, Özkanli, 2006, p. 365–374; Брижань, 2011, p. 189–194; Макаренко, 2011, p. 197–206; Войнаренко, 2011). Michael Porter stated that clusters have the potential of enhancing competitiveness in three ways: by increasing companies’ productivity in the cluster, supporting innovation and stimulating the creation of new companies in the chosen field of activity. It is necessary to emphasize a special role of processes that are related to the development of knowledge and innovation. According to economists’ estimates, the increase in companies’ competitiveness is determined by 40% through new investment in buildings, technologies, machines, and by 60% through education and training of employees. One of the main factors determining the level of companies’ innovation capacity is, therefore, the diffusion of knowledge (Zintegrowana analiza..., 2004, p. 68).

The diffusion of knowledge is the process of spreading certain type of information and its dissemination among enterprises – in this case – cluster companies. Such diffusion takes place when knowledge that brings a positive effect for a particular enterprise, is available for use by another company or enterprise. To remain competitive in today's market, companies must have access to such scarce resources as knowledge, skills or experience (Marcinkowska, 2015, 134–135). Even at the turn of 70–80s of the twentieth century, Alvin Toffler introduced the so-called wave theory showing the evolution of society. According to the theory, the first wave was the agricultural revolution, the second wave included the industrial revolution, and the third wave is the era of knowledge and information (Beyer, 2011, p. 8). In 1992, the same fact was also noted by Peter Drucker, indicating that knowledge would become the basic resource, while machines, area, labour or capital would play a secondary role for enterprises (Wyrwicka 2003, p. 76)

In industrial clusters, the diffusion of knowledge is a relatively new and rapidly developing concept of cooperation of various geographically concentrated entities (Godlewska, 2014, p. 46). Bridget Clement underlines in his article a special role played by knowledge in clusters, while at the same time pointing out to the fact that tacit knowledge of individual companies will unlikely be disclosed to other companies or will be disclosed to only a minor extent. At this, he adds that “the degree of knowledge diffusion depends mainly on the quality and potential of social capital within a network. And the more actively and efficiently companies cooperate with each other, the higher is the propensity for sharing various types of resources, including knowledge” (Klemens, 2014, p. 42).

The most important feature of knowledge is the possibility of its transmission (transfer) and practical use (Wyrwicka, 2009, p. 117). Therefore, the diffusion of knowledge has two sides: passive – involving the adoption of existing knowledge; active – involving its use, and in most cases it is not about new knowledge on a global scale, but it implies the use of any knowledge in a way previously unknown (Integrated analysis ..., 2004, p. 68). In this article, knowledge is viewed from the point of view of Lean Management – the concept of management that has developed due to a relentless pursuit to eliminate any kind of waste, providing for the involvement of each employee in the processes of company’s

² *Value added* means all activities that change inputs into a value for a client [Productivity Press Development Team, 2008, p. 12], in other words the client is ready to pay only for activities which convert a product or information, and which are actually made the first time (without modifications or amendments).

improvement, as well as the maximum customer orientation (Kpot, 2011, p. 212). The implementation of this concept³ aims to maximize the added value for a client using as few human, material, time and territorial resources as possible for this purpose. Lean Management was developed by Taiichi Ohno, a Japanese engineer at Toyota Motor Company. He focused on small batch manufacturing and the elimination of redundant activities and waste of resources, and also acknowledged that the highest potential came from employees. For practical purposes, he determined a number of tools that help identify and eliminate waste in a company. They include: 5S, Visual Management, Jidoka, JiT, Poka-Yoke, VSM, TPM, SMED and others (Pawłowski et al., 2010; Rother, Shook, 2009, Ortiz, Park, 2011).

Cluster enterprises striving to achieve high competitiveness in the market should pay special attention to processes being implemented and effects thereof, and they should also develop knowledge designed to reduce the cost of product manufacturing by improving these processes. This is a highly specialized knowledge (and therefore tacit), and it relates to specific technologies, production systems and management concepts that impact the manufacturing process. The development of this knowledge allows for streamlining of operations. The diffusion of new knowledge and the improvement of technology is an essential element of innovation. The diffusion process often involves more than just the adoption of knowledge and the application of new technology, since companies are learning thanks to new knowledge and technologies selected, relying on them in their future activity (Podręcznik Oslo, 2008, p. 34). The literature on the subject provides many examples of a positive impact on processes in certain organizations from implementing Lean Management. It is worth considering the possibility of expanding the scope of implementation of the concept from a single organization to the whole cluster. Expanding knowledge about the implementation of Lean Management in the group of related companies should take place with a view of producing high-quality and customer-tailored products in less time and at a more competitive price. According to the authors, lean activities within an individual entity of the cluster can result in a significant reduction of the production cycle, the decrease in costs, and the achievement of synergistic effects from activities jointly undertaken.

Goals of the article. A goal pursued in the framework of this study is to identify the scale of application of Lean Management concept in cluster enterprises, namely, to verify the knowledge of this concept, identify the most frequently used tools and the most important benefits of its use, or the causes for resignation from lean activities. The study also aimed to analyse reasons for implementing lean activities or the absence of the latter, as well as to obtain information about the exchange of knowledge concerning Lean Management with other members of the cluster.

The main material of research. Cluster initiatives in Poland first appeared in late 90s (Okoń-Horodyńska, 1998, p. 207). In 2002, the Institute for Market Economics conducted a survey that helped identify 18 clusters of enterprises in eight Polish provinces. The report on cluster inventory in Poland dated 2015, which was presented by the Polish Agency for Enterprise Development, has identified 134 clusters in all 16 provinces (Raport z inwentaryzacji..., 2016, p. 16). In so far as Lean Management has its origins in the production sphere, while gradually entering the services' sector, the companies engaged in production activity, as well as production and service activity have been selected for the purpose of this study. Precisely these companies have been contacted. The method of survey used in the study is a quantitative research technique – telephone interviews (CATI – Computer Assisted Telephone Interview). Questions addressed to individual companies were modified depending on responses received.

As part of the interviews, there were received 107 responses from representatives of cluster enterprises, of which 48 companies (45 %) carried out solely manufacturing activity, while 59 companies (55 %) were operating in the production and service sector. The chart below shows the distribution of enterprises surveyed in terms of their size (fig. 1).

³ See more in: (Ohno, 2008; Womack, Jones, 2001; Bednarek, 2007; Lisiński, Ostrowski, 2006).

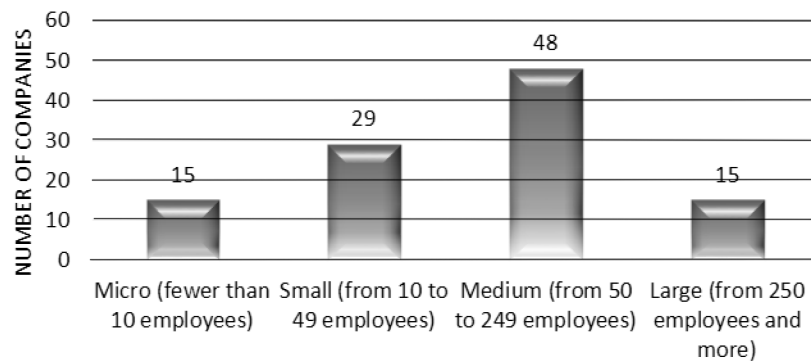


Fig. 1. Breakdown of enterprises surveyed based on their size

Source: own elaboration

The highest number of companies participating in the study were medium-sized enterprises – 48 companies (45 %). Small companies made up another large group – 29 companies (27 %). The smallest group comprised large companies and micro enterprises. In both groups the number of enterprises participating in the survey was 15 (14 %). In Poland, clusters are mostly created by micro, small and medium-sized enterprises. Large companies constitute the smallest group in clusters (Raport z inwentaryzacji..., 2016, p. 22).

The breakdown of the enterprises surveyed according to Polish provinces is presented in the table below (tab. 1).

Table 1

Breakdown of cluster enterprises surveyed according to provinces

Province	Dolnośląskie	Kujawsko-Pomorskie	Łódzkie	Lubelskie	Lubuskie	Małopolskie	Mazowieckie	Opolskie	Podkarpackie	Podlaskie	Pomorskie	Śląskie	Świętokrzyskie	Warmińsko-mazurskie	Wielkopolskie	Zachodniopomorskie
Number of companies surveyed	7	8	3	12	3	3	8	1	35	10	4	5	2	0	3	3
Share in percentage	6 %	7 %	3 %	11 %	3 %	3 %	7 %	1 %	33 %	9 %	4 %	5 %	2 %	0 %	3 %	3 %

Source: own elaboration

The majority of cluster enterprises that participated in the survey were located in Podkarpackie, Lubelskie and Podlaskie province. While the lowest number of enterprises were in Łódzkie, Wielkopolskie and Zachodniopomorskie province. There were not received any responses in Warmińsko-Mazurskie province.

When carrying out the study, attempts were made to reach top executives or specialists with a good knowledge of the subject area. Thus, chief executives (including the president, vice president, owner, partner, member of the board) – 36 people (accounting for 34 %) made up the largest number of respondents. The second group included respondents holding director positions (including those responsible for management, production, research and development, operative management, etc.) – 33 people (31 %). Another group comprised respondents holding managerial positions (including managers of a quality department, production, sales and project management, marketing and procurement, etc.) – 14 people (13 %). The next group included a group of specialists (including specialists for research

and development, production preparation, marketing and trade, etc.) – 7 people (6 %). The last group comprised other people (includes persons in charge of the quality management system, or supervising production processes, project and development coordinators, etc.) – 17 people (16 %).

The survey was seeking to divide companies into five groups, as was initially planned:

- 1) enterprises that have carried out and are carrying out activity related to Lean Management (A group);
- 2) enterprises that have carried out activity related to Lean Management, but are not carrying out it now (B group);
- 3) enterprises that have not carried out any activity related to Lean Management, but they intend to undertake such activity (C group);
- 4) enterprises that have not carried out, and have no plans to carry out activity related to Lean Management (D group);
- 5) enterprises that are not familiar with Lean Management concept (E group).

The results of the survey have shown that 72 cluster enterprises surveyed (67 %) were familiar with Lean Management concept, while 35 enterprises (33 %) – were not. The verification of enterprises that are familiar with Lean Management suggests that (fig. 2):

- 41 enterprises (38 %) have carried out and are carrying out activity related to a given concept;
- 4 enterprises (4 %) have carried out such an activity, but do not carry out it now;
- 22 enterprises (20 %) have not carried out lean activities yet, but plan to carry out them;
- 5 enterprises (5 %) have not carried out such activity, and have no plans to carry out it.

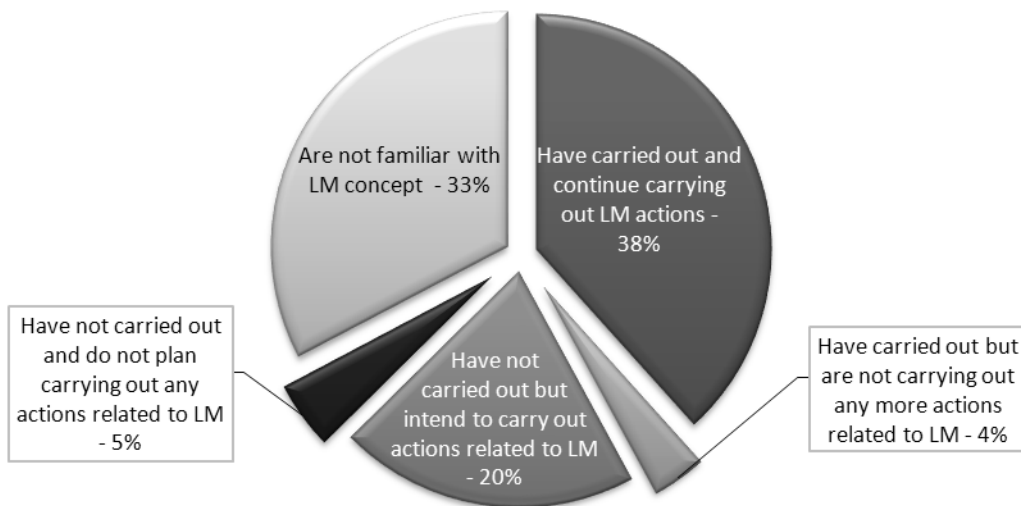


Fig. 2. Interest in Lean Management concept in cluster enterprises

Source: own elaboration

The analysis of the results indicates that as many as 1/3 of the companies surveyed have no knowledge about Lean Management. However, most of those surveyed (2/3 companies) are familiar with the concept being considered in this study. The chart in Figure 2 shows that the largest group includes companies that have carried out lean activities and continue implementing them. A significant group also represents companies that have the knowledge about benefits that Lean Management concept can bring, thus they are preparing for its implementation. A small but very important group includes companies that have ceased applying the concept. A small number of companies (5 %) were not interested in the implementation of Lean Management, despite being familiar with the concept.

Let us consider in more detail each group of companies.

A. Companies that have carried out lean activities and continue implementing them. This group, consisting of 41 companies, comprises one micro enterprise, 10 small companies, 17 medium-sized companies and 13 large companies. It should be noted that this group includes almost all large companies

that have been surveyed. The companies, which have taken actions to eliminate waste and continue implementing them, have been asked to outline tools that are most commonly used by them. The results have been categorized in tab. 2.

Table 2

The most frequently used tools and methods of Lean Management in A group of companies

No.	Tools/method	Number of responses	No.	Tools/method	Number of responses
1	Teamwork	35	11	Poka-Yoke	15
2	5S	27	12	JiT	14
3	Kaizen	26	13	One piece flow	14
4	Standardised work	26	14	VSM	12
5	Visual Management	22	15	Pull	10
6	TPM	20	16	Supermarket	10
7	Kanban	18	17	SMED	10
8	Production cells/lines	18	18	Jidoka	7
9	Tact time	17	19	Andon	5
10	Production levelling	17	20	Other	4

Source: own elaboration

Responses received indicate that the most common method of Lean Management used by the companies is teamwork (35 responses). It constitutes a key aspect in creating a lean culture and the pursuit of perfection. The next two methods that are often applied by the companies are 5S (workplace improvement) and Kaizen (small steps for improvement). They are quite simple to implement because they do not require specialized knowledge and high costs. Some authors suggest that lean implementation should be based on these methods. Standardized Work, Visual Management and TPM (process maintenance) are other tools that are frequently applied by cluster companies. The least frequently used tools are Jidoka (suspension of the production line in case of error detection) and Andon (error signalling system). Jidoka is one of the fundamental pillars of Lean Management enabling to control quality at source and achieve high quality of a product. However, this method often remains undervalued when it comes to lean implementation.

The respondents could also outline other tools and methods they apply. Among those methods are 5: Why method, IPMA (project management), TOC (theory of constraints) and Six Sigma (quality management). Although the last three tools do not actually belong to lean methods, as they are distinct concepts, but when combined with Lean Management they produce substantial benefits for a company.

Further, respondents have been asked to indicate the three most important benefits of lean implementation that companies have received/receive. The distribution of responses is shown in fig. 3.

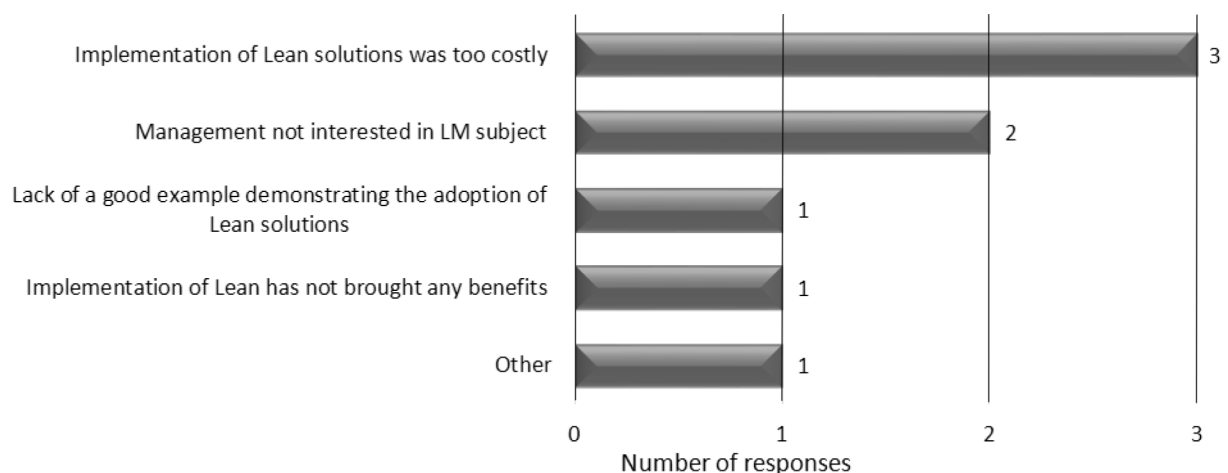


Fig. 3. Benefits received from implementing Lean Management

Source: own elaboration

Among the biggest benefits of implementing the concept identified by the respondents is a significant improvement of the quality of manufactured products and services rendered. Precisely, the quality improvement is one of the most important priorities in the application of Lean Management. The reduction of the process cycle and the improvement of work organization are, according to cluster enterprises, the next two important aspects that are referred to when carrying out lean activity. The improvement of work organization implies specific changes in behaviour patterns and habits. New knowledge and skills prompt changes in the behaviour with a view of identifying waste and striving for continuous improvement. Streamlining operations at each stage then results in the reduction of certain business processes.

The participants of the survey could also provide their own responses. Two respondents used this option, having mentioned such benefits as improving cooperation with a client and increasing labour productivity.

In the next part of the survey, questions were asked concerning the exchange of information (transfer/acquiring) with other business partners in the cluster in terms of methods, tools and effects of lean implementation. 19 organizations indicated that such an exchange took place between the company and other members of the cluster, while 22 organizations denied that the exchange existed.

The last question was related to providing a short description of the exchange of information about the Lean concept, if relevant, or indicating the causes for lack of any such exchange.

Companies that confirmed the exchange of information indicated that in most cases it related to information regarding the methods, techniques and tools, as well as the results obtained from lean implementation (9 responses). Respondents mentioned that the exchange of experiences was based not only on consultations regarding the applicable tools and methods, but also on benefits and results obtained, or problems faced in the course of their implementation. The exchange also concerned information about production techniques and technologies used (5 responses). Other responses pointed to training courses and conferences, which provide companies with the opportunity to communicate and exchange experiences (4 responses). One response mentioned the exchange of information concerning human resources management.

These responses indicate that cluster companies look to obtain some proven methods and tools from their business partners with a view of implementing the selected ones. In other words, they look for a good example to follow.

Companies that signalled the lack of information exchange, most frequently attributed it to lack of time, as well as lack of interest on the part of their business partners (11 responses). Another reason for the lack of exchange of lean-related information was the lack of knowledge that such exchange can actually take place (4 responses). Two companies mentioned the absence of need for such information exchange and two companies pointed to the lack of close cooperation within a cluster. Three other responses related to other priorities pursued by the company, high competition and the absence of exchange due to a relatively short period of the concept implementation.

The analysis reveals that the main factors hindering the exchange of information between companies in the cluster is the lack of time and interest in such an exchange among participants of the cluster. It is also worth mentioning a group of companies that declared that such an exchange could have taken place but the issue (issue under consideration) was not discussed in a cluster.

B. Companies that have carried out activity related to Lean Management, but do not carry out it now. This group comprising four enterprises includes one company of each size. Similarly to A group of enterprises, the representatives of this group have been asked about the implementation of the above-mentioned lean methods and tools. Results are shown in tab. 3.

Table 3

Lean Management tools and methods applied by companies included in B group

No.	Tools/Methods	Number of responses
1	Teamwork	3
2	5S	2
3	Kaizen	2
4	JiT	1
5	One piece flow	1
6	Kanban	1
7	Production levelling	1
8	Production lines/cells	1
9	Visual Management	1
10	Standardized work	1

Source: own elaboration

Comparing the results received with A group of cluster enterprises, it can be noted that B group of companies applied the same tools and methods. In this case, teamwork, 5S and Kaizen have ranked at the top. As mentioned above, these methods do not require special financial resources, nor highly specialized knowledge. But it is necessary to look into the cause why lean activity undertaken has proved unsuccessful.

The next question in the survey aimed at identifying causes for the refusal from applying the lean concept. The respondents could give a maximum of three responses. The results are summarized in the chart (fig. 4).

It has turned out that the main reason for resignation from applying Lean Management is that it is too costly to be implemented (3 responses). Respondents also pointed to a lack of interest from management about the subject (2 responses), which is a key element for the effective and efficient implementation of a given concept. One option was chosen suggesting a lack of good practical examples concerning the implementation of lean solutions, while one response indicated that actions related to lean did not bring any benefits. The list of responses also included such options as reluctance and lack of employees' involvement in lean practices, or knowledge about the lean concept has proved insufficient. None of the respondents mentioned these options.

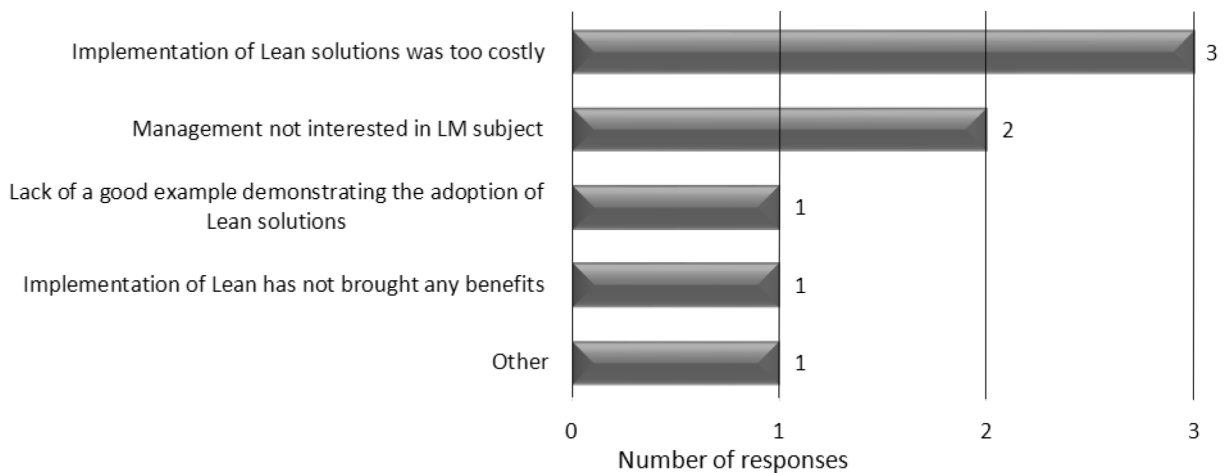


Fig. 4. Reasons for resignation from implementing Lean Management

Source: own elaboration

Respondents could also give their own answer. This option was used by one respondent who indicated that the abandonment from lean practices was caused by a company's reorganization.

The obtained results are puzzling. Lean solutions, especially at the initial stage of implementation, are not expected to entail any significant costs. Perhaps it was lack of involvement by the management, or lack of availability of a good example (and thus, insufficient knowledge of the proper implementation of

specific solutions) that prompted the resignation from further implementation. But it should also be taken into account that quite a small number of companies in the group were surveyed.

As in the previous group of companies surveyed, respondents were asked about the exchange of knowledge. The company that mentioned the reorganization as a reason for resignation from Lean Management, pointed to the exchange relating to the improvement of production, data flow, HR management, provision of the best product and service to a customer. The other three respondents attributed the absence of exchange of information concerning the Lean Management concept to the lack of time and interest in exchange among business partners, the diversity of companies and institutions within the cluster, as well as due to the fact that mainly large companies were involved in such exchange.

C. Companies that have not carried out any actions related to Lean Management, but intend to undertake them. This group comprising 22 companies includes four micro enterprises, five small companies and 13 medium-sized companies. C group of companies does not include any large company. Enterprises of this group were first of all asked about the most important benefits they expect to derive from implementing the Lean Management concept (the respondents could give a maximum of three answers). The distribution of answers of representatives of individual companies is shown in fig. 5.

Companies intending to implement this concept seek primarily to achieve with its help the improvement of quality of products manufactured and services provided. They point out that through the implementation of lean solutions they seek to reduce the duration of processes. The improvement of business processes, and, consequently, the quality of products is expected to translate into the improvement of the company's financial performance, which has been highlighted by respondents as the third most important benefit they expect to obtain. The respondents could provide their own answers, but none of them used this option.

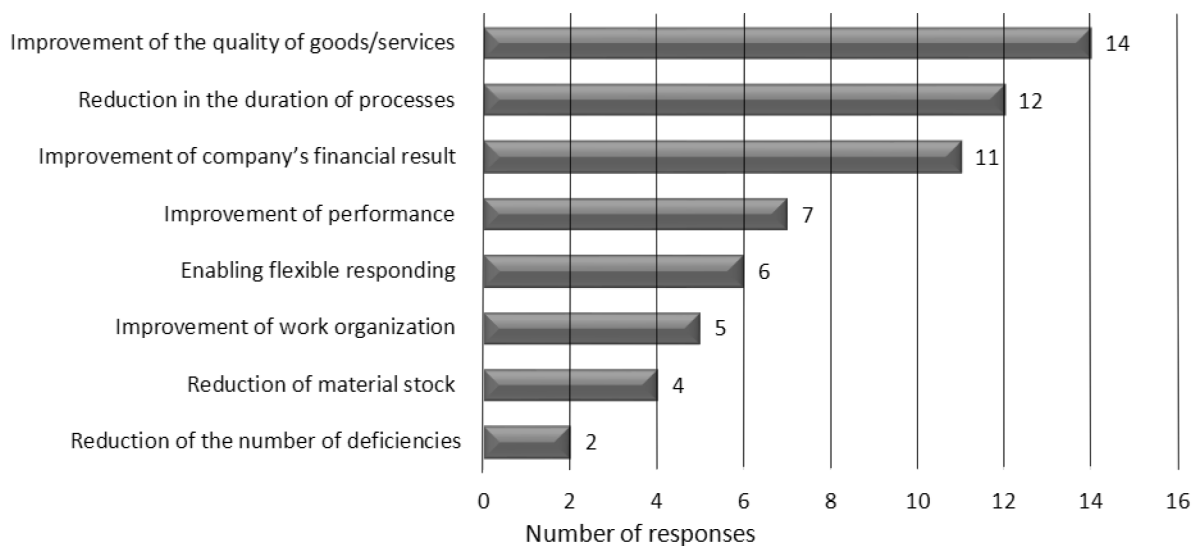


Fig. 5. Benefits that cluster enterprises expect to obtain from implementing LM concept

Source: own elaboration

Comparing these results to the data received in A group of cluster companies, which implement lean actions on a constant basis, the similarity can be noted. The first two replies in both groups are similar, certifying the fact that the intended objectives can be achieved with an appropriate approach to implementing various Lean Management tools and methods.

As in the previous two groups, representatives of the companies were asked about whether there was an exchange of information about the concept among business partners. 12 companies indicated that such an exchange with other members of the cluster took place, and 10 companies denied the fact.

Brief characteristics of knowledge sharing mentioned by companies referred to: sharing of the results of the implementation of lean solutions, as well as techniques, methods and tools applied

(7 answers); exchange of information regarding work organization (2 answers); exchange of information on manufacturing processes and technologies (2 answers); joint implementation of projects (1 answer).

Replies of the companies that plan implementation, focus on obtaining information from their business partners about applicable Lean Management solutions and their results. This knowledge is said to reassure them as to the expediency of using such solutions, and will enable them to receive information on the implementation of proven tools, or difficulties of implementing the selected tools.

Companies that indicated the lack of exchange attributed this to: the lack of time or interest among partners in the cluster in the exchange (7 answers); the absence of necessity in such an exchange (1 answer); insufficient number of meetings relating to the subject (1 answer); poor communication between companies (1 answer).

As in the case of A group of companies, which also signalled the lack of knowledge exchange, this group emphasized that the lack of information exchange between companies in clusters was caused by the lack of time and interest of members of the cluster in such an exchange.

D. Companies that have not carried out, and have no plans to carry out actions related to Lean Management The group comprising 5 companies, includes two micro enterprises, one small and two medium-sized enterprises. D group of companies does not include any large enterprise, the same as in C group. Representatives of the group were asked only one question – what are the reasons for the lack of willingness to implement lean solutions in the company? Respondents could provide a maximum of three answers. The answers received are summarized in the figure below (fig. 6).

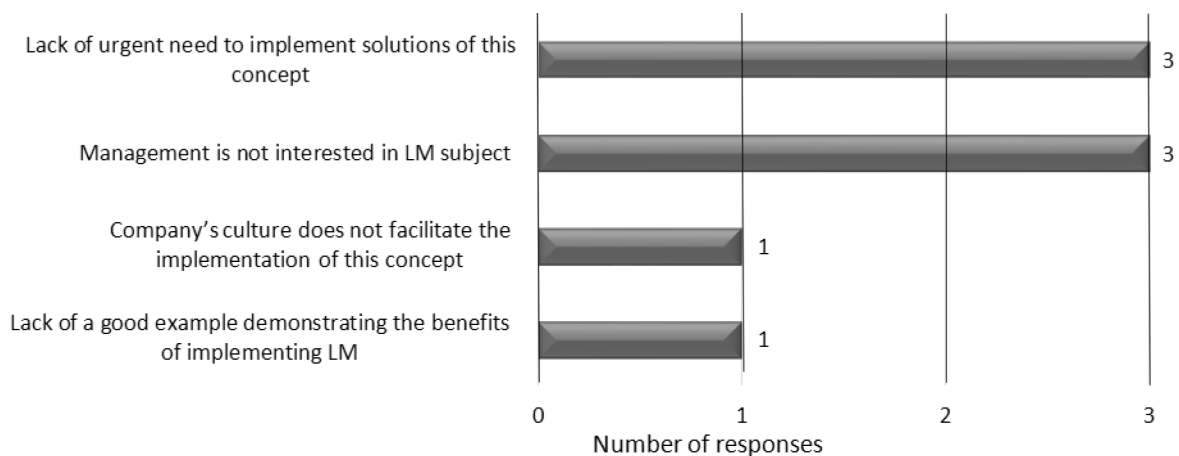


Fig. 6. Reasons for the lack of willingness to implement Lean Management

Source: own elaboration

Cluster enterprises that do not plan to carry out lean activity have highlighted two aspects that explain the lack of willingness to implement the concept – the lack of urgent need for the implementation of such solutions (3 answers) and the lack of interest of company's management in the subject (3 answers). One answer referred to an inadequate culture as well as the lack of a good example to follow. Other possible answers included: knowledge about the concept is insufficient, risk aversion and own answer. None of them has been mentioned.

The analysis of responses received in this group of companies indicates that companies do not see the need to identify waste in the company. Such an approach may be due to the belief that certain processes cannot be improved. It should also be emphasized that a small number of companies in this group was analysed.

E. Companies that are not familiar with the Lean Management concept. This group comprising 35 companies includes seven micro enterprises, 12 small enterprises, 15 medium-sized enterprises and one large company. As in D group, representatives of this group were asked one question concerning their willingness to expand knowledge about benefits of the Lean Management concept. Answers are shown below (fig. 7).

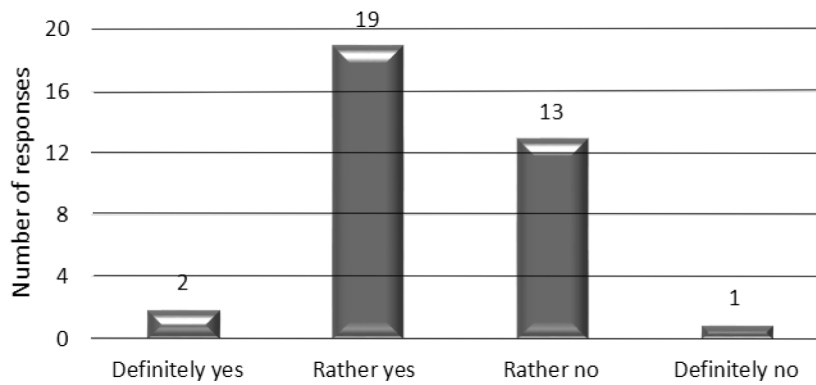


Fig. 7. Number of answers concerning the willingness to learn about benefits of implementing LM
Sources: own elaboration

The majority of respondents that are not familiar with the lean subject, answered that they would rather learn more about the concept (19 answers). Two respondents indicated that they were definitely interested in the concept. A relatively large group (13 answers) said they would rather not want to expand their knowledge about the subject. And one answer indicated a definite lack of interest.

The analysis of the results shows that 60 % of respondents that are not familiar with the Lean Management concept would like to expand their knowledge about the subject, while 40% are rather not interested in it.

Conclusions and recommendations for further research. The cluster is more than just a group of entities characterized by geographical proximity. This is a purposely created network that through mutual interaction and influence has the ability to generate a sustainable competitive advantage. The role of clusters for the Polish economy was recognized at the turn of the twentieth/ twenty-first centuries. Using the potential of clusters, the country's economy can gain a competitive advantage on the global market.

It is important to be aware that the development of cooperative relations depends primarily on mutual trust and willingness of cluster members to cooperate. Coordinators (agents) of the clusters, as well as local authorities should direct their efforts towards integrating cluster enterprises to seek synergies, which result from such a cooperative approach.

Process and organizational innovations are becoming increasingly important in the functioning of the market economy. The Lean Management concept provides a wide range of these solutions. According to the authors, the right approach, along with the implementation and expansion within a cluster of knowledge about the possibilities of eliminating waste are believed to bring tangible benefits to each of the participants in the network.

The analysis of results obtained in the framework of the study permits the following conclusions concerning the cluster enterprises that have been surveyed:

- the majority of companies (67 %) are familiar with the lean concept, 38 % of which have carried out or continue carrying out actions in this regard, and 20 % of companies plan to undertake such actions;
- the most important benefits obtained by the companies that have adopted lean solutions are the improvement of the quality of products and services, the reduction of process cycles and enhanced work organization;
- the most commonly used tools outlined by cluster companies are Teamwork, 5S and Kaizen;
- companies that plan to implement Lean Management are primarily seeking to improve the quality of products manufactured and services provided, reduce the process cycles, as well as to improve the financial result;
- companies that have carried out but suspended the implementation of Lean Management (4 %) point to high costs of the implementation or the lack of interest from company's management;
- almost all the companies, who abandoned the implementation of lean solutions, had not exchanged knowledge about the lean concept with other partners in the cluster;

- organizations that are familiar with the concept (5 %) but do not adopt it had indicated the lack of need for its implementation along with the lack of interest of company's management;
- organizations that are familiar with the concept (33 %) are in most cases eager to learn about its benefit and features – 60 %;
- when asked about the information exchange with partners within a cluster, 48 % of the companies have indicated that such an exchange takes place and relates mainly to information about techniques, tools and methods applied, as well as the success of their implementation;
- 52 % of the companies have indicated that such an exchange does not take place, attributing this to the lack of time and interest among partners within a cluster.

It is comforting that 87 % of all cluster enterprises that are familiar with the Lean Management concept continue to implement or plan to implement actions related to it. This means that more companies become aware about lean and that it brings the anticipated results. However, there is still a big number of companies (1/3 of surveyed enterprises) that do not know about the existence of this concept, and therefore do not possess knowledge that could help streamline processes in a company through the elimination of waste. The results of the study also confirm the effectiveness of applying lean methods and tools, which is mainly reflected in the improvement of quality of products and services, as well as the reduction of process cycles.

Companies that abandoned the lean concept most likely did not have a good example, and thus the necessary knowledge for proper implementation of solutions within the framework of this concept. The lack of management's involvement in actions undertaken is another important aspect that was mentioned. When it comes to lean implementation, the management is the most important example to follow. If it is not interested in changing the organizational culture, chances are small that the implementation of lean solutions will be successful.

Enterprises that are familiar with the concept, but do not show interest in it, are probably not able to identify waste within their structure, and therefore do not undertake any actions for improvement. This demonstrates that such companies have a short-sighted approach, because Taiichi Ohno pointed out that the process of continuous improvement is endless, even a well-functioning system can be improved.

A positive signal is the fact that most of the companies, which were not familiar with the Lean Management concept, expressed interest in expanding knowledge on the subject (after the presentation of the concept's definition).

As for the diffusion of knowledge in cluster enterprises, it should be noted that almost half of the companies surveyed have exchanged their experience with other members within a cluster. In this way it acquires valuable knowledge on the proved tools and techniques related to the lean concept. This approach enables closer cooperation and integration of members of the cluster. However, more than half of the companies do not engage in the exchange of information, pointing to the lack of time and the involvement of partners in the cluster. It is necessary to emphasize an important role of a coordinator who should act as a link connecting cluster enterprises with one another with a view of exchanging information which is useful for them.

The analysis of the survey has contributed to forming an initial overview concerning the implementation of the Lean Management concept by cluster enterprises. It does not include, however, the diagnosis of such aspects as barriers or facilitation of lean implementation, nor does it indicate precisely which areas have undergone improvements. These and other issues should be tackled in further research on this subject.

The clustering idea in Poland is relatively new and it is still developing. For this reason, local and regional authorities should support its development in order to create added value for both domestic and foreign customers. Its development should be supported not only through financing, but also making sure that cluster enterprises get specific knowledge and information, which is crucial for the development of clusters in Poland.

1. Akdeve, E., Özkanlı Ö., (2006), *Cluster and Innovation as Regional Development, Presented in II. International Strategic Management Conference 8-10 Mayıs 2006, Conference Proceedings Book, İstanbul, s. 365-374.* 2. Bednarek M., (2007), *Doskonalenie systemów zarządzania: nowa droga do*

przedsiębiorstwa lean, Difin, Warszawa. 3. Bengtsson M., Kock S, (2014), *Coopetition - quo vadis? Past accomplishments and future challenges*, [w:] *Industrial Marketing Management*, No. 43(2), s. 180–188.

4. Beyer K., (2011), *Wiedza jako kluczowy zasób w nowej gospodarce*, [w:] *Studia i prace Wydziału Nauk Ekonomicznych i Zarządzania Uniwersytetu Szczecińskiego*, No. 21, s. 8.

5. Брижань I, (2011), *Вплив кластерних об'єднань на розвиток підприємств і регіонів*, [w:] *Вісник Хмельницького національного університету*, № 2, s. 189–194.

6. Cygler J., Aluchna M., Marciszewska E., Witek-Hajduk M., Materna G., (2013), *Kooperencja przedsiębiorstw w dobie globalizacji. Wyzwania strategiczne, uwarunkowania prawne*, Wyd. Wolters Kluwer, Warszawa.

7. Gnyawali D., Park B., (2009), *Co-opetition and technological innovation in small and medium-sized enterprises: A multilevel conceptual model*, [w:] *Journal of Small Business Management*, No. 47(3), s. 308–330.

8. Godlewska S., (2014), *Klasy jako katalizator rozwoju gospodarczego i myśli innowacyjnej*, [w:] *Kwartalnik nauk o przedsiębiorstwie*, No. 4, SGH, Warszawa, s. 46.

9. Gorynia M., Jankowska B., (2007), *Wpływ klastrów na konkurencyjność i internacjonalizację przedsiębiorstw*, *Gospodarka Narodowa*, s. 7–8.

10. Klemens B., (2014), *Koncepcja klastrów a zagadnienia transferu wiedzy w perspektywie 2014-2020*, [w:] *Barometr Regionalny, Wyższa Szkoła Zarządzania i Administracji w Zamościu*, Tom 12, No. 2, s. 42.

11. Кром Ю., (2011), *“Непродуктивні витрати: визначення та зміст”*, [w:] *Науковий вісник ЧДІЕУ, Управління підприємством*, № 4 (12), s. 212.

12. Lisiński M., Ostrowski B., (2006), *Lean Management w restrukturyzacji przedsiębiorstwa*, Antykwa, Kraków.

13. Luo Y., (2007), *A coopetition perspective of global competition*, [w:] *Journal of World Business*, No. 42(2), s. 129–144.

14. Макаренко М., (2011), *Формування регіональної кластерної політики*, [w:] *Актуальні проблеми економіки*, №1, s. 197–206.

15. Marcinkowska E., (2015), *Klasy i ich wpływ na innowacyjność małopolski*, [w:] *Zeszyty Naukowe Uniwersytetu Ekonomicznego w Katowicach*, No. 225, s. 134–135.

16. Mikołajczyk B., Kurczewska A., Fila J., (2009), *Klasy na świecie. Studia przypadków*, Difin, Warszawa, s. 17.

17. Ohno T., (2008), *System produkcyjny Toyoty: więcej niż produkcja na wielką skalę*, ProdPress, Warszawa.

18. Okoń-Horodyńska E., (1998), *Narodowy System Innowacji w Polsce*, AE, Katowice, s. 207.

19. Ortiz C., Park M., (2011), *Visual Controls. Applying Visual Management to the Factory*, CRC Press Taylor & Francis Group, New York.

20. Palmen L., Baron M., (2008), *Przewodnik dla animatorów inicjatyw klastrowych w Polsce*, PARP, Warszawa.

21. Pawłowski E., Pawłowski K., Trzcieliński S., (2010), *Metody i narzędzia Lean Manufacturing*, Politechnika Poznańska, Poznań.

22. *Podręcznik Oslo, (2008), Zasady gromadzenia i interpretacji danych dotyczących innowacji. Organizacja Współpracy Gospodarczej i Rozwoju, Urząd Statystyczny Wspólnot Europejskich*, Warszawa, s. 34.

23. Porter M., (2001), *Porter o konkurencji*, PWE, Warszawa, s. 246.

24. *Productivity Press Development Team, (2008), Identyfikacja marnotrawstwa na hali produkcyjnej*, ProdPress.com, Wrocław, s. 12.

25. *Raport z inwentaryzacji klastrów w Polsce 2015, (2016), Polska Agencja Rozwoju Przedsiębiorczości*, Warszawa, s. 16, www.pi.gov.pl (dostęp 01.09.2016).

26. Rother M., Shook J., (2009), *Naucz się widzieć (second edition)*, Lean Enterprise Institute Polska, Wrocław.

27. Stańczyk-Hugiet E., (2013), *Koewolucja i kooperacja. Podążając za kontekstem*, [w:] *Prace naukowe Uniwersytetu Ekonomicznego we Wrocławiu*, No. 372, s. 342–355.

28. Войнаренко М., (2011), *Кластери в економіці, Хмельницький: ХНУ, ТОВ «Триада-М»*, s. 502.

29. Womack J., Jones D., (2001), *Odchudzanie firm: eliminacja marnotrawstwa— kluczem do sukcesu*, Centrum Informacji Menedżera, Warszawa.

30. Wyrwicka M. K., (2009), *Dyfuzja wiedzy w klastrze*, [w:] Wyrwicka M.K. (red.): *Struktury klastrowe i ich funkcjonowanie*, Wielkopolska Izba Przemysłowo-Handlowa, Poznań, s. 117.

31. Wyrwicka M.K., (2003), *Endogenne przesłanki organizacyjne rozwoju przedsiębiorstwa*, Politechnika Poznańska, Poznań, s. 76.

32. Wyrwicka M.K., (2009), *Proces rozwoju inicjatywy klastrowej*, [w:] Wyrwicka M. K. (red.), *Struktury klastrowe i ich funkcjonowanie*, Wielkopolska Izba Przemysłowo-Handlowa, Poznań, s. 49.

33. *Zintegrowana analiza ekonomiczna województwa podkarpackiego, (2004), Rzeszowska Agencja Rozwoju Regionalnego S. A., Rzeszów*, s. 68.