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HOW TO ASSESS THE MATURITY OF SMALL AND MEDIUM-SIZED ENTERPRISES TO LEAN SIX SIGMA PROJECTS

This article describes the considerations for the implementation of the Lean Six Sigma (LSS) methodology in small and medium-sized enterprises. Pilot research was conducted in Polish and French SMEs (nine Polish and nine French enterprises from the service and production sectors) referring to the context of the implementation and application of the Lean Six Sigma concept. The studies led to the identification of the motives, needs, expectations, concerns and experiences of these companies and helped to develop criteria assessing the maturity of a smaller enterprise to conduct Lean Six Sigma projects. As one of the results of the study, a maturity indicator to LSS has been developed and presented in this paper. The index is a part of the original comprehensive methodology of the Lean Six Sigma implementation dedicated to the SME sector (LSS Plutus methodology). The indicator allows such projects to be matched to the real needs and preparedness of any small or medium-sized organization.

Keywords: small and medium-sized enterprises, Lean Six Sigma, maturity assessment

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1. INTRODUCTION

Small and medium-sized enterprises (SMEs) play a significant role in all economies and are the key generators of employment and drivers of innovation and growth (Neneh, Vanzyl, 2012; Storey, 2011; Uchikawa, 2009). The definition of SMEs varies globally with key criteria like the number of employees, the turnover of the company, and sector type. In Europe, SMEs are firms employing less than 250 people, however some countries set a limit of 200 employees, and in the US it is considered that SMEs have fewer than 500 employees. Small firms are generally those with fewer than 50 employees, while micro-enterprises have at most ten or in some cases five workers (Tyagi et al., 2014).

When operating on the global market, SMEs that want to maintain a stable position on the market, to gain competitive advantage and to quickly respond to changes in demand are forced to constantly improve the high

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quality of their products and services (Lyu, Liang, 2014; Teixeira et al., 2012; Mendes, 2012; Blanco-Calleyo, Gutierrez-Broncano, 2010; Lee, 2004; Kureshi, Mann, 2009). To achieve this objective it is necessary to implement and maintain an effective and efficient quality management system and to apply the process approach and customer orientation in accordance with Total Quality Management principles.

There are many reasons that oblige SMEs to apply a quality approach. As Kumar et al. (2012) claim, citing Antony et al. (2008) and Wattanapruttipaisan (2002), it must be recognized that large organizations extensively subcontract to SMEs for their operations and thus depend on SMEs for the quality of the required products and services. Moreover, any compromise on quality by SMEs could jeopardize the whole supply chain, resulting in raised costs because of poor quality (Kumar et al., 2012).

The key principle of quality management - customer focus materializes, first of all, thanks to a reduction in the variation of the processes which are essential from the customer's point of view – called Critical to Quality (CTQ) (Gowen, Tallon, 2005; Linderman K. et al., 2003).

Considering the advantages and limitations of the implementation of Six Sigma in SMEs (Antony et al., 2005; Antony, 2008; Thomas, Barton, 2006; Amar, Davis, 2008; Cagnazzo, Taticchi, 2010; Jaglan et al., 2011; Paslawski, 2013; Kwak, Anbari, 2006; Desai, 2006) and Lean Management (Achanga et al., 2006; Yang pingyu, Yu yu, 2010; Yogesh et al., 2012; Sambhe, 2012; Matt, Rauch, 2013), as well as their integrated approach in the form of Lean Six Sigma (LSS), suggested by researchers and practitioners worldwide (Thomas et al., 2009; Laureani, Antony, 2010, Assarlind et al., 2012, Enoch, 2013, Jie et al., 2014), the aim of the article is to present a proposal for the maturity indicator of Lean Six Sigma projects within the framework of the original methodology dedicated to the SME sector.

Scholarly literature still mainly focuses on large organizations, and although much progress has been made in recent years, many questions on how quality management approaches, mainly integrated ones, could be implemented in small and medium-sized enterprises still remain interesting (Gerango, Biazzo, 2013). Based on that, the authors present the thesis that in small and medium-sized enterprises it is necessary to apply dedicated support for LSS methodology.

In the context of this study the key concept is the maturity of the organization to make changes. The idea of process maturity assessment is derived from the concept of Total Quality Management or process management approaches (e.g. BPM - Business Process Management).

In early 1970s the first attempts to develop models for the assessment of maturity were undertaken by P. Crosby, who developed the so-called QMG (Quality Maturity Grid) (Elmaallam, Kriouile, 2013).

The works of W. Shewhart and W. Deming created the foundation for the first comprehensive approaches to the assessment of process maturity by W. Humphrey, described in the book “Managing the Software Process,” published in 1989. This approach, in turn, was the starting point for the development of the process maturity assessment model – the Capability Maturity Model (CMM) for the Software Engineering Institute/ Carnegie Mellon University.

Models of excellence, such as the one created by the European Foundation for Quality Management (EFQM) including the Common Assessment Framework (CAF), promote the introduction and use by interested organizations of TQM principles and allow a diagnosis of their effectiveness in relation to the objectives of the organization. They can therefore also be used to assess organizational maturity, especially because they take into account the aspect of the effectiveness and efficiency of processes.

2. SIX SIGMA AND LEAN MANAGEMENT VERSUS LEAN SIX SIGMA

The first publications concerning conditions linked to the application of Six Sigma in the SME sector started to appear only after the year 2000. Researchers emphasize in their studies the strengths and weaknesses of SMEs in the context of the application possibilities and potential benefits of Six Sigma.

As C. Waxer (Waxer, 2014) shows, in the case of new initiatives to improve an organization, as well as in the implementation of Six Sigma, it is necessary to convince the management as to the fairness of this change. Such objectives cannot be achieved using standard examples of large corporations which are characterized by high amounts of necessary investment, the need for full commitment in the project by top managers or spending a fortune on training the staff. Considering that the level of variability in the processes in SMEs oscillates between 2 ÷ 3 sigmas, the results of follow-up actions are quickly visible, which is most important for leadership, confirming the validity of the decisions taken.

The main objective of the Lean Management concept is to identify and eliminate the causes of wastage – overproduction, unnecessary movement of

people and machines including transport, defective products, downtime and inventory – in the value stream. The value stream is a set of activities that make up the full cycle of a product. Improving the effectiveness of processes in a value stream is realized through the elimination of losses by radical changes, as well as through a gradual, incremental process of improvement.

An organization working according to the concept of Lean Management contributes to an open system that includes not only the processes implemented in the company, but is also in accordance with the principles of economic management regarding the purchasing processes of products and services and the distribution of products.

The application of Lean Six Sigma as a business improvement methodology has increased significantly over the last decade and its usage has broadened from the manufacturing sector to virtually every industry sector and developed country. Its ability to be applied in this way is probably quite unique as it continues to spread out and grow in more diverse business sectors including pharmaceutical and banking. This suggests that the LSS is now the most widely used approach and has replaced Lean and Six Sigma as individual methodologies (Marsh, Perera, 2011). Lean and Six Sigma complement and reinforce each other. Currently, Lean Six Sigma is the leading, internationally established methodology for improving organizational effectiveness, also in SMEs (Thomas et al., 2009; Lauren, Antony, 2010; Assarlind et al., 2012; Enoch, 2013; Jie et al.; 2014; Wessel, Burcher, 2004, Wisniewska, 2009).

There are examples like those referring to SMEs in the Netherlands and presented by Timans et al. (2012), which show that the researched companies make no clear distinction between Lean Management and Six Sigma, but rather apply elements of both approaches. Similar evidence can be found in the article of Thomas et al. (2009), addressed to the UK SME manufacturing sector, and by Enoch (2013) dedicated to Nigerian small and medium-sized manufacturing companies, where both Lean and Six Sigma are key business process strategies which are employed by enterprises to enhance their manufacturing performance. In other studies (Kumar et al., 2006), referring to Indian small and medium manufacturing enterprises and by Amar and Davis (2008) considering the experiences of Indonesian companies, the relevance and benefits of the integrated approach of Six Sigma and Lean Manufacturing in this sector was confirmed and it was explained that LSS was a useful and cost effective methodology to handle critical problems of quality and productivity and for the improvement in the key performance metrics, it can be also used with success in service

companies. Evidence can be found in the case study referring to the consulting sector in Taiwan, presented by Wang et al. (2012).

Moreover, Zhong et al. (2012), referring to LSS implementation in different sectors worldwide, clearly show that LSS has been proved as quite effective in SME organizations and they suggest that there is a need to further explore this sector for the evolution of the theory regarding the implementation of LSS.

3. THE RESEARCH METHODOLOGY

The assumptions of the original method presented in this article are based on a pilot study that helped the authors to find the answer to the question of what the problems and needs are of small and medium-sized enterprises in terms of the implementation and application of LSS methodology. The research was conducted in France and Poland in the period between 2011 and 2013. An important aspect of the research was therefore a comparative analysis, taking into account Polish and French conditions.

In order to carry out the research concerning the implementation and the application of the concept of Lean Six Sigma in the SME sector, the authors conducted case studies observations, interviews and pilot studies in Polish and French small and medium-sized businesses. Pilot studies allowed the authors to identify the needs, expectations, concerns and experience of these companies. At the same time, the motives and possible benefits of the implementation of the Lean Six Sigma methodology in SMEs and the barriers to that implementation and application were identified.

The authors selected 60 small and medium-sized enterprises in Poland and France. Out of the group, 23 companies agreed to participate, of which 18 were selected as organizations suitable for comparative analysis. Finally, the pilot study was conducted in 18 companies of the SME sector, nine Polish and nine French organizations. The participation of micro, small and medium-sized organizations was almost identical in this group. Similarly, uniformly (33%) production, production and service and service organizations were selected. The researched companies represented various industries: automotive, financial advisory, trade, transportation, food, clothing, plastics processing, recreational and decorative. In terms of their "quality maturity", 22% had implemented the quality oriented normative management system (e.g. ISO 9001) and 33% used tools of Lean or Six Sigma. Despite the fact that the sample size does not enable the formulation

of far-reaching generalizations, the results of these studies allow important trends and interesting directions to be identified for further analysis in the area of Lean Six Sigma in the sector of SMEs.

4. MOTIVES, NEEDS AND PROBLEMS OF POLISH AND FRENCH SMEs IN THE CONTEXT OF LEAN SIX SIGMA APPLICATIONS

Table 1 shows the results of research on the motives, needs and expectations of the surveyed companies relating to the concept of Lean Six Sigma. Table 2 presents the most important barriers and problems associated with the introduction of elements of LSS identified by the respondents.

The research results generally confirmed the demand for Lean Six Sigma in SMEs. The pilot study indicated that the Lean Six Sigma methodology is considered to be useful in small and medium-sized manufacturing enterprises in Poland and France. Seven out of the nine surveyed companies in Poland and eight out of the nine French companies confirmed the “positive effects for the financial condition of the company” following the introduction of the elements of the Lean Six Sigma concept. Comparing the Polish and French conditions, the authors concluded that there were similar expectations in terms of the needs, barriers and benefits achieved from the implementation of the elements of LSS (Table 1). Moreover, the urgent need to increase productivity in companies may cause a more frequent implementation of Lean and Six Sigma tools. The important differences between the two countries were the expectations related to the implementation of elements of LSS. French SMEs counted on subsidies for cooperation development within the network of enterprises, as well as applying similar methods of process management to large companies – their customers (eight out of the nine organizations in France vs. three out of the nine in Poland). The majority of the researched smaller companies in both countries had difficulty with the correct application of the tools of Lean or Six Sigma (eight in Poland and eight in France).

The study revealed also that micro and service companies had significantly lower motivation for continuous improvement and a lack of a clear need for radical organizational changes (respectively three micro and three service organizations in Poland and three micro and two service organizations in France).

Further analysis confirmed the hypothesis that in spite of the growing interest in modern management methods, SMEs faced numerous constraints

Table 1

Motives, needs and expectations concerning Lean Six Sigma implementation in SMEs – the research results

	Respondents total	Country		Size of a company			Type of activity			Certified normative management systems		LSS elements application	
		Poland	France	micro	small	medium	production	production and services	services	yes	no	yes	no
Requirements of customers – large companies	83%	44%	39%	0%	33%	50%	33%	33%	17%	75%	14%	40%	23%
Requirements of a parent company	67%	56%	61%	0%	17%	50%	33%	33%	0%	25%	21%	60%	8%
Cost reduction	67%	67%	67%	0%	100%	100%	100%	100%	0%	100%	78%	100%	77%
Products quality improvement	50%	44%	56%	0%	50%	100%	50%	67%	33%	100%	36%	100%	31%
Improving management of the company	44%	44%	44%	0%	67%	67%	67%	50%	17%	75%	36%	80%	31%
Increased productivity	44%	56%	33%	17%	67%	50%	83%	50%	0%	75%	36%	100%	23%
Application of methods used by large companies	33%	22%	44%	0%	33%	67%	50%	33%	17%	100%	14%	80%	15%
Reduction of inventories	33%	33%	33%	0%	33%	67%	50%	50%	0%	75%	21%	80%	15%
Shorter delivery times	28%	33%	22%	0%	17%	67%	33%	50%	0%	50%	21%	80%	8%
Obtaining funds for development	28%	11%	44%	0%	50%	33%	50%	33%	0%	50%	21%	40%	23%
Easier cooperation within the network of companies	22%	11%	33%	0%	33%	33%	33%	33%	0%	50%	14%	40%	15%

Source: own elaboration

Table 2
Barriers in introducing elements of Lean Six Sigma – the research results

	Respondents total	Country		Size of a company			Type of activity			Certified normative management systems		LSS elements application	
		Poland	France	micro	small	medium	production	production and services	services	yes	no	yes	no
Insufficient funds	94%	89%	100%	100%	100%	83%	100%	100%	83%	100%	92%	100%	92%
High cost of training and consulting	94%	100%	89%	100%	100%	83%	83%	100%	100%	75%	100%	80%	100%
Low motivation and resistance of workers	78%	78%	78%	100%	67%	67%	50%	83%	100%	25%	92%	40%	92%
Lack of consistency in the implementation of changes	67%	67%	67%	100%	67%	33%	67%	50%	83%	25%	78%	0%	92%
Lack of knowledge of LSS tools	61%	67%	56%	100%	50%	33%	50%	50%	83%	0%	78%	0%	84%
Lack of time for improvement activities	39%	44%	33%	50%	50%	17%	33%	50%	33%	25%	43%	60%	31%

Source: own elaboration

and obstacles in the implementation of Lean Six Sigma methods. This conclusion can be formulated with reference to smaller firms in Poland and in France. These results are in accordance with the opinion of other researchers, indicating that both insufficient financial resources to launch improvement projects and the unavailability of qualified specialists in the field of continuous improvement are the main causes of the problem. Due to their small size, good internal communication and simplified decision-making processes in comparison with big companies, there is no need for SMEs to use all the tools available in the repository of Lean Six Sigma (Wessel, Burcher, 2004; Kumar et al., 2006).

The research results also indicated that the vast majority of the tools of Lean Management can be efficiently applied in SMEs, while a large group of tools used in the framework of Six Sigma seem to be too complicated and therefore are usually rejected. This concerns in particular the tools to collect and organize a large amount of data and tools that require advanced knowledge of statistical methods of data analysis.

The final decision about the choice and number of Lean Six Sigma tools to implement should be taken individually by a company, on the basis of real needs and opportunities. There are important differences in the demand for the tools depending on the size and maturity of an organization. Companies employing more than 100 employees are free to use all the tools of Lean and the selected Six Sigma tools for reorganizing their processes, flows and quality control. In the case of small companies, the scope of application of Lean Six Sigma tools is narrowed down to selected “point” improvements in key processes. International experience in the application of Lean Six Sigma shows a growth of interest in this methodology which is associated with the organizational progress represented by large corporations. In the developed European countries and the United States, not to mention Japan, smaller organizations commonly use one of the key tools of SPC and Six Sigma – control charts to ensure the high quality of products through the active control of processes. Most other well-known statistical tools used to identify and solve problems are still considered too complicated, too time-consuming and require specialized qualifications (Zhong et al., 2012; Lyu, Liang, 2014).

Small and medium-sized companies have, in fact, a tendency for the selective, non-systematic application of the tools of Lean and Six Sigma. Corrective actions are not usually backed up by a rigorous analysis of the problem. Areas of improvement are generally selected based on the intuition and experience of selected employees. The lack of a systematic approach and complexity in terms of defining the problem affects the efficiency of

improvement projects significantly. This aspect was confirmed in the pilot study by all nine Polish and all nine French organizations (Table 2).

5. A MATURITY INDICATOR FOR LSS PROJECTS DEDICATED TO THE SME SECTOR

The study showed that smaller companies need to determine the most accurate scope of the LSS project. For this reason, within the comprehensive methodology for the introduction of Lean Six Sigma in SMEs – LSS Plutus

Table 3

Evaluation criteria of the maturity of SMEs for conducting LSS projects

Criteria	Description
1	2
A. The number of processes	<ul style="list-style-type: none"> • Medium-sized business and/or • Numerous and complicated business processes and/or • Complex relationships between processes
B. Need for change	<ul style="list-style-type: none"> • High costs of the production or service process and/or • Money frozen in surplus stocks and/or • High price of products or services compared to the competition and/or • Strong competition and/or • Low customer satisfaction, loss of clients or numerous complaints and/or • Intention to acquire new customers and/or • Low quality of products or services and/or • Need for the development of new products or services and/or • Need for streamlining the current manufacturing process or the introduction of a new production line and/or • Long order execution time and/or • Long reaction time to fluctuations in demand and/or • Need for introducing production to order and/or • LSS tools unsuitable or implemented selectively and improperly and/or • Demand for introducing a management system from a corporation and/or • Inability to permanently maintain improvement and/or • Low use of the competence and experience of personnel and/or • Need for improving working conditions and/or • Strong motivation to develop the company and/or • Intention to implement a quality system and industry standard and/or • Motivation to win awards for quality and/or • Intention to cooperate with partners within a logistics chain and/or • Intention to cooperate within a cluster or with research institutions and universities
C. Difficulties in obtaining customer satisfaction	<ul style="list-style-type: none"> • Lack of knowledge on the level of customer satisfaction or considerable difficulties in identifying it and/or • Products or services not fulfilling the expectations of clients or lack of knowledge on customer needs and/or • Loss of clients or lack of regular clients and/or

1	2
	<ul style="list-style-type: none"> • Numerous complaints and/or • Long-time order execution or untimely deliveries and/or • High price in comparison with competition
<p>D. Acquired competence regarding quality oriented production management</p>	<ul style="list-style-type: none"> • Implemented methods of organization and production management (including Lean Six Sigma, TQM) and/or • Experience in the independent running of an improvement project and/or • Appropriate self-evaluation of company results (e.g. self-evaluation according to the criteria of the EFQM or CAF models, corporation criteria, agreements with business partners, own criteria) and/or • Performed audits of operation (e.g. internal audits in compliance with ISO type standards, industry standards) and/or • Completed training on production management
<p>E. Knowledge of Lean Six Sigma</p>	<ul style="list-style-type: none"> • Knowledge of the Lean Thinking concept and the practical application of LSS tools and/or Six Sigma • Capability of the appropriate selection and effective implementation of LSS tools and/or • Capability of the autonomous running of an improvement project based on Lean Six Sigma and/or • Capability of independently maintaining the introduced LSS solutions and/or • Presence of a specialist responsible for continuous improvement
<p>F. Organizational culture conducive to the implementation of permanent development</p>	<ul style="list-style-type: none"> • Organizational culture based on trust, respect, recognition, motivation and cooperation and/or • Project awareness in the organization and/or • Permanent involvement of all personnel in continuous improvement, including the most senior management and/or • Interest in and recognition for the efforts of the staff, shown by the senior management and/or • Permanent support for the involvement and/or the functioning of a quality circle in a company and/or awarding achievements and/or • Autonomy of work connected with delegating competences and increasing the sense of responsibility for the completed task and/or • Versatility and/or team work and/or • Sharing skills within one team (cross training) and organization (internal benchmarking) and/or • Lack of communication barriers between departments and/or • Announcing results to staff and/or • Lack of resistance to change
<p>G. Time availability for conducting an LSS project</p>	<ul style="list-style-type: none"> • Time reserves for conducting an improvement project and/or • Time availability for training
<p>H. Availability of financial resources for activities connected with improvement</p>	<ul style="list-style-type: none"> • Possibility of devoting considerable financial resources to improvement and/or • Low cost of improving activities and/or • Availability of considerable financial resources from the mother company and/or obtained the EU or state funding and/or • Ease of obtaining a loan and/or financial resources for training

Source: own elaboration based on: Achanga et al., 2006; Antony et al., 2008; Cagnazzo, Taticchi, 2010; Grudowski, Leseure, 2010; Jie et al., 2014; Neneh, Vanzyl, 2012; Thomas et al., 2009; Yogesh et al., 2012.

(Grudowski, Leseure, 2010; Grudowski, Leseure, 2013) – proposed by the authors, a maturity indicator for SMEs for the LSS project has been suggested. This allows for the adjustment of the LSS project characteristics to the real internal and external needs of a business and to the opportunities of realizing them. The indicator is based on the evaluation criteria listed in Table 3. These criteria and their descriptions have been identified on the basis of an extensive literature study as well as the results of the same studies which were presented earlier in this article (the most common suggestions of the respondents in France and in Poland).

The criteria presented in Table 3 are given in Table 4 in reference to the needs and capabilities of a company in implementing the elements of the Lean Six Sigma concept. Table 4 enables the self-evaluation of a company. Rating 5 represents full compliance with the description of the criteria set out in Table 3. When the majority of responses to criteria A, B and C is at

Table 4
Maturity of SMEs for the LSS project scale

SME evaluation categories	SME maturity evaluation criteria for running the LSS project	Company maturity evaluation for LSS (1=definitely no, 2=no, 3=partly/maybe/hard to say, 4=yes, 5=definitely yes)				
		1	2	3	4	5
Needs	A. Large number of processes					
	B. Need for change					
	C. Difficulties in obtaining customer satisfaction					
Capabilities	D. Competence in production management					
	E. Knowledge of LSS					
	F. Organization culture conducive to the implementation of continuous improvement					
	G. Time availability for the implementation of the LSS project					
	H. Availability of financial resources for improvement activities					
Needs or capabilities:		Small		Medium-sized	Big	

Source: own elaboration

the level of 1 and 2, the need for improvement can be defined as small. If the results of self- evaluation to A, B and C are at the level of 4 and 5, it can be concluded that the need is great. When the rating of criteria A, B and C is generally 3 or the ratings are scattered across the scale, the need for improvement can be regarded as moderate. An analogous classification is made on the basis of criteria D, E, F, G and H regarding the capability a company has to pursue improvements. Figure 1 helps to interpret the results with reference to the needs and capabilities of an enterprise, according to which an organization is approved for an LSS project from Zone 1 or Zone 2. The division into these zones denotes the ability to effectively and efficiently carry out the implementation of Lean Six Sigma at the primary level (Zone 1) or the advanced one (Zone 2).

According to the guidelines resulting from Figure 1, the deciding factors of the level of advancement of an LSS project are first of all the internal and external needs of an organization in the form of the number of processes, the need for change or the need to improve customer satisfaction. The additional element supporting the decision are the possibilities available to the company including knowledge and skills in production management, especially Lean Six Sigma, the pro-quality culture of an organization and the availability of time and financial resources to carry out the LSS project.

As a general rule, small needs and small capabilities to improve place a company in Zone 1, where the LSS project is executed at a basic level. High needs and big capabilities of improvement place a company in Zone 2, which indicates that the LSS project will be implemented using methods, techniques, tools and indicators. It is worth noting that when the demand for improvement is insignificant in a company, and its organizational potential is considerable, the LSS project should be run at a basic level.

NEEDS of SMEs	Big	ZONE 1 (preparation for Zone 2)	ZONE 1 or 2 (decision of the company)	ZONE 2
	Medium-sized	ZONE 1	ZONE 1 or 2 (decision of the company)	ZONE 1 or 2 (decision of the company)
	Small	ZONE 1	ZONE 1	ZONE 1
		Small	Medium-sized	Big
CAPABILITIES of SMEs				

Fig. 1. Interpretation of the maturity indicator for SMEs for an LSS project

Source: own elaboration

In particular cases there are situations where a company has a high or moderate need for an improvement project, but the capabilities of its implementation are modest. Then, basic improvements corresponding to the scope of Zone 1 are recommended. When the demand for improvement is high and the resources are few, carrying out the LSS project at a basic level is the basis for introducing better solutions within criteria D, E and F, which could be a preparation for the implementation of more advanced projects in the future. An alternative solution in this situation is to postpone the launch of the LSS project in the scope of Zone 2 until the capabilities of a company are significantly increased, for example through the employment of a specialist in the implementation of Lean Six Sigma projects, or by obtaining a development grant. Other results from the self-evaluation of a company, according to which it could be placed either in Zone 1 or 2, create the possibility of an individual choice about the scope of the LSS project with regard to the weight of expectations and the barriers with reference to effective and sustainable improvement activities.

CONCLUSIONS

Companies belonging to the SME sector are characterized by simplified dependencies between processes, efficient internal and external communication, the ability to make quick decisions and flexibility in adapting to fluctuations in demand. However, as a result of the occurrence of naturally existing barriers in the form of limited resources, their potential for improvement, particularly in the case of the smallest organizations, is limited.

The pilot research results presented in the first part of the paper helped to create the framework for the design of an advanced quality and efficiency oriented improvement methodology for SMEs. The identified motives, expectations and barriers for the implementation and use of Lean Six Sigma in small and medium-sized companies in Poland and France have also allowed the authors to develop a diagnostic tool enabling the better adaptation of this concept to the specifics of this sector. The original maturity indicator used to determine the scope of and preparedness for an LSS project can serve as a tool for self-evaluation to identify the key weaknesses of smaller organizations and the directions for the development of their management systems.

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