

Benefits of Implementing Lean Management Tools and Techniques in Poland: Survey of Experts*

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Abstract

This article aims to highlight the benefits of using Lean Management tools and techniques, which can be a foundation for achieving long-term environmental, social, and economic goals. The study aimed to gather the opinions of experts with knowledge and experience in implementing Lean Management on the benefits of this concept. The results presented expert opinions on the use of selected Lean Management tools, which lead to the elimination of waste and ensure the efficiency necessary for an organization to be sustainable, responsible, and competitive in the market. The survey results indicate that implementing Lean Management brings numerous benefits to organizations. The most frequently cited benefits include improved comfort and safety at work, as well as financial savings. Furthermore, experts indicated that implementing Lean Management primarily allowed for the optimization of work processes, the avoidance of unnecessary movements or activities, better inventory management, and the prevention of situations in which companies have excessive inventories.

Keywords: Lean Management, benefits, sustainable development

Introduction

In today's world, sustainable development is one of the key concepts in management. This idea assumes that economic growth should take place in a way that maintains a balance between the needs of current and future generations, cares for the natural environment, and supports society. One concept that helps achieve the goals of sustainable development is Lean Management. This management approach focuses on the optimal use of resources, waste elimination, and continuous process improvement. Lean Management is a concept of management based on the use of such methods of business activity to achieve the best results (Walentyńowicz and Omiotek, 2024).

The goals of sustainable development encompass three main areas: economic, social, and environmental. This means that sustainable development aims not only to ensure economic stability but also to improve societal living conditions and protect the natural environment.

The Lean approach to management involves producing goods or services that meet customer expectations while minimizing costs and using resources optimally by eliminating waste across the company's operations. Lean Management is a streamlined production method that achieves remarkable success. Consequently, companies

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aiming to implement Lean thinking focus on producing more with minimal use of material and non-material resources (Womack & Jones, 2011). Initially, the focus should be on implementing the concept in a single selected process. Subsequently, the entire internal and external system (suppliers and customers) must be adapted to the established assumptions (Zamosny, 2014; Fertsch et al., 2011). Standardization forms the basis for further improvement in the spirit of Lean Management (Liker, 2022).

Moreover, a key aspect of the Lean concept is minimizing the time between receiving a customer order and its fulfillment. To achieve this efficiently, waste in the value stream must be eliminated (Pająk, 2007, p. 113). However, during the implementation of the Lean concept, it is essential to first identify the most common and fundamental forms of waste to avoid incurring financial burdens or causing abrupt revolutionary changes.

This publication presents knowledge, benefits, and the effectiveness of Lean Management tools. The article consists of a theoretical part and a practical section based on expert research.

A survey targeting Lean experts allowed for the identification of the benefits arising from implementing Lean Management. The research results were interpreted, and the impact of the Lean concept on sustainable development was analyzed. Through the application of these methods, a range of significant benefits resulting from the implementation of Lean Management was identified.

The primary aim of this work is to highlight the benefits of implementing the Lean Management concept, the potential results it can bring, and the challenges to overcome during the implementation process. This knowledge may prove to be a valuable guide for enterprises planning to implement the Lean concept or aiming to improve their production and logistics processes in the era of sustainable development.

Literature Review

Principles of Lean Management focus on reducing internal waste and increasing value for the customer. Lean Management is a management philosophy aimed at eliminating waste, optimizing processes, increasing efficiency and quality while simultaneously reducing costs. Lean emphasizes continuous improvement, employee engagement, and minimizing all forms of waste.

Sustainability refers to a concept that involves striving to achieve goals without compromising the resources of future generations, which entails responsible management of natural resources, respect for human rights, and fostering social development. In the literature, the Lean Management philosophy is viewed as an instrument for sustainable business management (Kwiatkowski et. al, 2016).

Among the many concepts for managing production activities, it is essential to choose one that positively impacts the natural environment while ensuring the achievement of the company's economic objectives (Trojanowski, 2020 p. 56). One such concept is Lean Management. Additionally, decision-makers require Lean Management competencies to recognize customer value and avoid waste (Hadaś and Pawlak, 2021, p. 574), which is a challenge for many organizations.

In his article, Trojanowski assessed Lean Management as the most advantageous among various methods in terms of environmental and ecological benefits and social features. It is a management approach that incorporates the principles of sustainable development, including waste reduction, increased competitiveness, customer satisfaction, and employee satisfaction through reducing communication barriers and enhancing motivation and loyalty (Trojanowski, 2020).

In the literature, Lean Management is described as one of the tools for sustainable development, allowing companies to evolve dynamically in line with these expectations (Kwiatkowski, et. al., 2016).

To summarize, Lean Management is a concept that has revolutionized the approach to organizing and improving work in manufacturing and service companies. It primarily focuses on enhancing operational efficiency by eliminating waste, minimizing resource consumption, and managing the flow of added value (Hamrol, 2015, pp. 98–99).

Organizations can combine Lean Management with sustainable development by implementing initiatives that simultaneously achieve economic, environmental, and social goals. The joint actions of Lean Management and sustainable development may include:

- Optimization of production processes in a way that not only eliminates waste but also reduces environmental impact.

- Adopting more efficient and eco-friendly technologies in production, such as recycling, the use of renewable energy sources, and minimizing waste.
- Integrating Lean Management practices with CSR initiatives, promoting responsible treatment of employees, supporting local communities, and ensuring social equity.

Combining Lean Management with sustainable development not only enables organizations to achieve economic benefits but also promotes environmental care and social responsibility, contributing to the long-term sustainable development of the entire organization. To benefit from the effects mentioned, Lean Management and Lean practices need to be successfully implemented.

The successful implementation of Lean practices (Walentynowicz, 2013) in companies relies significantly on the quality and breadth of education provided to both management and employees. Lean methodology, rooted in principles of waste reduction, continuous improvement, and value creation, requires not only technical knowledge but also a shift in organizational mindset. As such, education emerges not as a peripheral support but as a foundational enabler of Lean transformation. Only qualified and well-educated employees will be able to control, adapt to, and further develop advanced technologies (Baygin et al., 2016; Benešová and Tupa, 2017).

A recurring theme in the literature is that Lean implementation frequently fails not due to flaws in the methodology itself, but because of inadequate understanding and commitment from management. Particularly in small and medium-sized enterprises (SMEs), leaders may be unaware of the scope and depth of the changes required for Lean adoption. Pearce et al. (2018) emphasize that a lack of knowledge among managers about their roles in the Lean journey can become a primary obstacle to success. This underscores the need for targeted education at the managerial level that not only covers technical Lean tools but also highlights leadership responsibilities and strategic vision.

Beyond management, the broader workforce must also be engaged and equipped with the relevant knowledge to apply Lean methods effectively. The importance of training methods is particularly significant, as the effectiveness of Lean education is closely tied to how it is delivered. Zanchi et al. (2021) compare various training approaches and conclude that the suitability of the training model—whether classroom-based, on-the-job, or via coaching—plays a critical role in learning outcomes and the eventual success of Lean projects.

Equally important is the principle of continuous learning. Lean implementation is not a one-time effort; it requires persistent refinement and adaptation. Hackler et al. (2017) advocate for cultivating a culture of continuous improvement supported by ongoing educational initiatives. This cultural foundation encourages employees to identify inefficiencies proactively and engage in problem-solving, thereby sustaining Lean gains over time.

Education is also essential in managing organizational change, a core aspect of Lean transformation. Implementing Lean involves more than just new tools—it demands a fundamental change in how work is perceived and structured. Almani et al. (2018) propose that knowledge of change management principles is crucial for guiding organizations through this shift. Education in this context serves to align individual behaviors with organizational goals, mitigating resistance and fostering commitment.

As industries evolve with advancements such as Industry 4.0, the intersection between Lean and digital technologies becomes increasingly relevant. Professionals must now be educated not only in traditional Lean tools but also in how to integrate these with emerging digital systems. Urquia et al. (2023) highlight the importance of understanding the synergies between Lean and Industry 4.0 to maximize efficiency gains. This calls for educational programs that span both disciplines and encourage interdisciplinary competence.

Higher education institutions are responding to this need by embedding Lean principles in their curricula. Choomlucksana and Doolen (2013), Witeck and Alves (2020), and Carvalho et al. (2013) illustrate how simulations, serious games, and collaborative learning environments are being used to develop Lean competencies. These approaches not only enhance student engagement but also reflect the real-world complexity of implementing Lean practices.

Finally, Lean education must be inclusive across organizational hierarchies. Zhang et al. (2020) and Alves (2019) argue that Lean competencies are necessary from line operators to executives, each requiring tailored educational support to fulfill their roles effectively. This comprehensive educational strategy ensures that Lean becomes embedded in the organizational fabric rather than confined to isolated departments.

In conclusion, education is a cornerstone in the effective implementation of Lean practices in companies. From management understanding and workforce training to cultural adaptation and integration with modern technologies, educational initiatives are vital at every stage of the Lean journey. Organizations that invest in robust, well-structured educational programs are more likely to realize the full potential of Lean methodologies and sustain their benefits over time.

Undoubtedly, numerous benefits reported in the literature can be achieved through the implementation of Lean tools and techniques. Over the past two decades, many empirical studies have confirmed that Lean implementation leads to improvements in quality, efficiency, and financial performance of organizations across various sectors (Gebeyehu et al., 2022; Urban and Tochwin, 2022). For example, the application of tools such as Kaizen, 5S, Value Stream Mapping, and Just-in-Time enables companies to reduce inventory levels, increase the smoothness of material flow, and shorten order lead times (Habib et al., 2022). Studies conducted in manufacturing plants where Lean has been implemented have demonstrated shortened production cycle times (Gebeyehu et al., 2022) and higher productivity (Tortorella & Fettermann, 2018). In contrast, in small and medium-sized enterprises it has been observed that Lean implementation leads to a reduction in operational costs by an average of 15–20% through the elimination of non-value-added activities (Antony et al., 2016).

Meanwhile, research by Leong et al. (2019) has shown that integrating Lean with sustainable development concepts achieves both economic savings and environmental benefits by reducing material and energy consumption. Similarly, in studies conducted in the automotive industry, Lean implementation was associated with improved product quality and a reduction in production defects of up to 40% (Habib et al., 2022).

It is worth emphasizing that the benefits of Lean are not limited to operational metrics; its impact on organizational culture and employees is also significant. Pawłyszyn (2024) confirms that implementing Lean solutions in a Polish industrial enterprise increased employee efficiency and their sense of responsibility for the processes. Similar results have been observed in European studies, where implementations based on employee participation and the philosophy of continuous improvement led to increased engagement and satisfaction (Bonavia and Marin-Garcia, 2011).

Despite the widely documented benefits, many studies indicate that the effects of Lean are highly dependent on the context of implementation. Urban and Tochwin (2022) found that sustaining these effects critically depends on top management engagement, communication, alignment of strategic objectives, and a long-term approach to process improvement.

Research Methodology

The Lean concept should be present in most Polish enterprises, as staying competitive and maintaining a market position requires alignment with modern development trends. Increasing attention is being paid to sustainable development, which companies can achieve by incorporating Lean Management into their operations.

Given this context, there arises a need to conduct research within Polish enterprises to evaluate their knowledge of Lean, its tools, and techniques. To address this need, an expert study was conducted. This survey method is characterized by its ability to gather insights. It is a qualitative method that provides in-depth information from specialists.

The authors' experience shows that the Lean concept is widely used in enterprises. However, are its tools used effectively and will implementation bring the expected benefits? Therefore, there is a need to conduct research among experts in the field of knowledge to Lean and their solutions in their activities. The study was conducted using a questionnaire sent by e-mail in order to obtain a set of data suitable for further quantitative analysis. The main aim of the research was to answer the following questions:

- Are Lean tools used effectively?
- What are the benefits of implementing Lean Management tools and techniques?
- What Lean Management tools can support the elimination of waste?

In expert studies, sample selection is crucial, and purposive sampling is typically used, where the researcher chooses respondents based on their knowledge, experience, and specific criteria. It is also important to ensure that the sample selection aligns with the research objectives. This sampling approach was applied in the conducted expert study, with the key criterion being knowledge and experience in implementing the Lean

concept. Accordingly, the subjects of the study were selected experts possessing knowledge of the Lean concept and experience in its implementation.

Defining the material and time scope of the research is as follows:

- entity – an expert with experience in implementing Lean Management,
- sample unit – enterprises from various industries with the implemented Lean concept,
- spatial scope – the whole country (Poland),
- time – February and March 2023.

30 experts were invited to participate in the study. From the invited group of managers who declared their willingness to participate in the study based on meeting the criterion of knowledge and experience, 10 were selected. The study was conducted with the use of questionnaires.

The study was conducted as a preparatory study and supported the identification of the problem, the determination of the direction of further research and the formulation of conclusions. From the perspective of the nature of the information obtained, this is qualitative research due to the small sample size. It explains and helps to understand the analyzed phenomena, although it cannot be statistically confirmed. The results cannot be generalized to the entire population due to the small and non-representative research sample. Nevertheless, they provide an evaluation expert and characterize the studied group.

Before the main study, a pilot study was conducted to verify the correctness of the proposed research procedure: the selection of respondents, the adopted variable indicators, and the research tools used. Additionally, prior to conducting the main research, the questionnaire was tested in a trial run to verify its questions.

The purpose of this survey was to gather opinions from Lean Management experts on the effectiveness of the tools and techniques of this methodology, as well as to understand the benefits most often resulting from the application of the Lean concept in companies.

Research Results

The survey was completed by a total of 10 experts, whose knowledge and experience provided valuable insights into the practical application of Lean Management in various industries and organizations. The results obtained during the survey are presented below.

One of the questions asked was: *What, in your opinion, is the purpose of the Lean concept in the companies you have worked with or currently work with?*

The respondents provided the following answers:

- improvement of processes, awareness, and work culture,
- elimination of waste and continuous improvement,
- establishment of a unified standard of work,
- process improvement and increased employee efficiency,
- optimization of production processes,
- streamlining and enhancing processes, creating standards,
- elimination of waste and process improvement,
- increasing employee awareness,
- generating profit for the company,
- cost reduction, increasing production efficiency, eliminating waste in processes, removing bottlenecks,
- overall, the goal is to reduce losses and thereby maximize the company's profits.

In response to the question about the purpose of implementing Lean Management, respondents highlighted various aspects intended to be achieved through the Lean concept in companies. The most frequently mentioned goals included improving processes and increasing efficiency, eliminating waste, and enhancing employee performance and awareness. Some also pointed to generating company profits, establishing a unified work standard, optimizing production processes, or reducing costs. However, many of these objectives are interconnected, and achieving one often positively impacts others within the organization.

These stated goals align with the primary assumptions of the Lean concept, which focuses on eliminating losses

and improving processes. Cost reduction and increased work efficiency are key factors that contribute to better business performance. However, the implementation of Lean requires the involvement of all employees, making it important to enhance awareness and work culture within the organization.

Another question asked was: *Has the implementation of the Lean concept brought benefits to the companies you have worked with or currently work with?*

The responses to this question were compiled and presented in Figure 1.

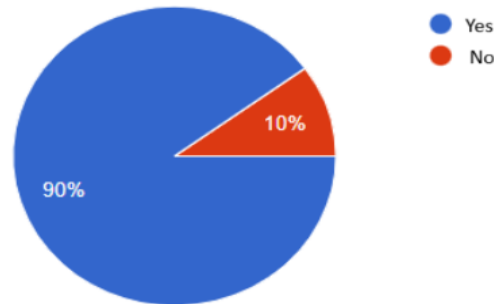


Fig. 1. Respondents' Answers to the Question: Has the Implementation of the Lean Concept Brought Benefits

Source: own study

In the previous question, where respondents were asked whether the Lean concept is beneficial for companies, the answers indicate that the implementation of Lean Management brought benefits to most of the companies the respondents have worked with or are working with. This is a positive result, confirming that the Lean concept can contribute to improving the performance of a company. However, it is worth noting that the answer to this question is not unanimous. For 10% of the respondents, the Lean Management concept did not bring the expected benefits to the organization. This could be caused by several factors, such as: improper implementation of Lean tools, lack of management support, or reluctance from other team members to collaborate in this area. Implementing this concept requires the involvement of the entire organization, not just one department or employees at lower levels of the hierarchy. Another factor could be a lack of sufficient knowledge and skills in Lean, which leads to errors in the implementation process and hinders achieving positive results. Additionally, inadequate process analysis and lack of strict control over them may result in the changes not yielding the desired effects.

The next question concerned the benefits that the implementation of Lean tools brought to the company in which the respondent works. In relation to this question, the respondents provided the following answers, as shown in the diagram below.

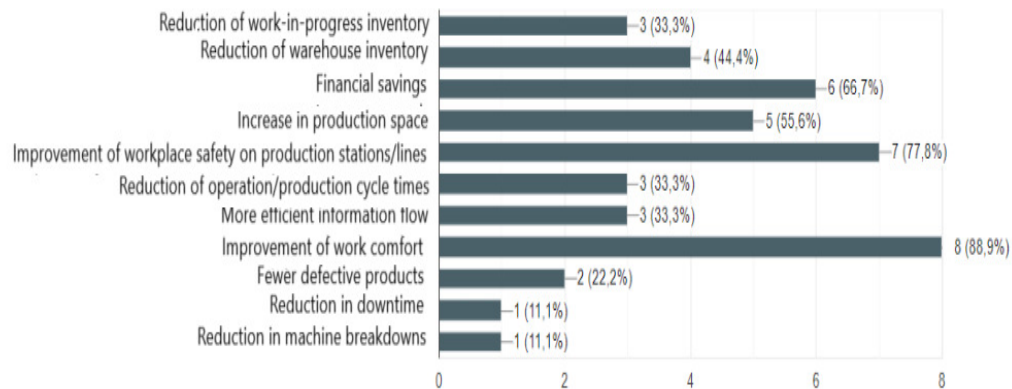


Fig. 2. Respondents' answers to the question regarding the benefits of implementing Lean

Source: own study

In the next question, respondents were asked to clarify the specific benefits that implementing the Lean Management concept brought to the organizations they are or were associated with. The most frequently mentioned answers were improved work comfort (88.9%), improved work safety (77.8%), financial savings (66.7%), and increased production space (55.6%). Less commonly mentioned benefits included: reduced warehouse inventory (44.4%), increased in-process inventory (33.3%), shortened operation times/production cycles (33.3%), more efficient information flow (33.3%), as well as reduced downtime (11.1%) and fewer machine breakdowns (11.1%).

The survey results indicate that implementing Lean Management brings multiple benefits to organizations. Improving work comfort and safety, as well as financial savings, are the most commonly cited benefits. An important aspect is also the increase in production space, which can contribute to the company's growth. Reducing warehouse inventory and shortening operation times/production cycles are additional benefits that improve production efficiency. At the same time, the results suggest that fewer companies experience benefits related to reduced downtime and fewer machine breakdowns, which may be due to the challenges of implementing some Lean practices in specific industries.

In response to the question of whether Lean Management facilitates the management of a company and, thus, the entire supply chain, respondents unanimously answered yes. This suggests that, in the opinion of the respondents, Lean Management is a valuable management concept that helps streamline processes, improve the efficiency of the entire organization, and enhances coordination between various links in the supply chain. Lean Management facilitates the management of the company and the entire supply chain by focusing on continuous process improvement and the elimination of waste. As a result, companies become more efficient and flexible, which allows for better cost management and quicker responses to changing market conditions. Moreover, Lean Management enables the integration of actions throughout the supply chain by removing unnecessary steps and reducing the production cycle time. This way, companies are able to increase the efficiency of their operations, as well as improve the quality and delivery time of their products or services.

The questionnaire also included the question: Did the implementation of Lean Management help eliminate waste? The responses to this question are presented in Figure 3.

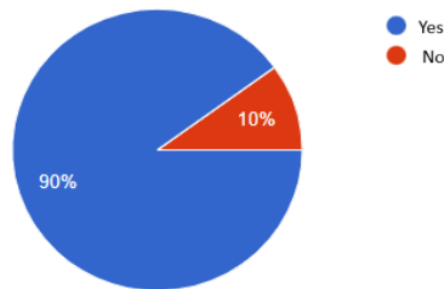


Fig. 3. Responses of respondents to the question of whether the implementation of the Lean concept eliminated waste

Source: own study

The respondents largely (90%) agreed that Lean Management can effectively eliminate waste. However, **10% of the respondents expressed skepticism, believing that it is not entirely feasible to eliminate all forms of waste completely.** It is important to acknowledge that the elimination of all types of waste within an organization is a complex and time-intensive task that requires ongoing improvement and the involvement of all employees. Proper implementation of the Lean concept can help identify and remove the most significant sources of waste, contributing to increased efficiency and cost reduction.

The Lean concept focuses on eliminating all forms of waste that consume the organization's resources without adding value for the customer.

In the following question, respondents were asked to indicate which types of waste had been eliminated after the implementation of the Lean concept. The responses to this question are illustrated in Figure 4.

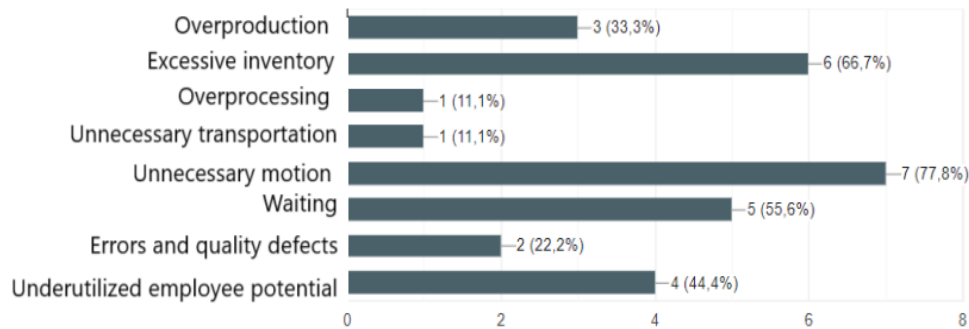


Figure 4. The impact of implementing the Lean concept on waste elimination

Source: own study

When experts participating in the survey were asked to specify which types of waste were eliminated using Lean Management tools, they responded as follows: unnecessary movement (77.8%), excessive inventory (66.7%), waiting (55.6%), unused employee potential (44.4%), overproduction (33.3%), errors and quality defects (22.2%), excessive processing (11.1%), unnecessary transport (11.1%).

The results of the responses to this question show that, through the implementation of Lean Management tools, companies were able to effectively eliminate various types of waste. Lean Management allowed for the optimization of work processes, avoiding unnecessary movements or actions, better inventory management, and preventing situations where companies have too much inventory. It also helped avoid situations where employees are waiting to perform tasks or better utilize their potential.

The next question was: Which Lean tool do you consider the most desirable and necessary for the more efficient functioning of the organization? In response to this question, the respondents provided the following answers, which are presented in Figure 5.

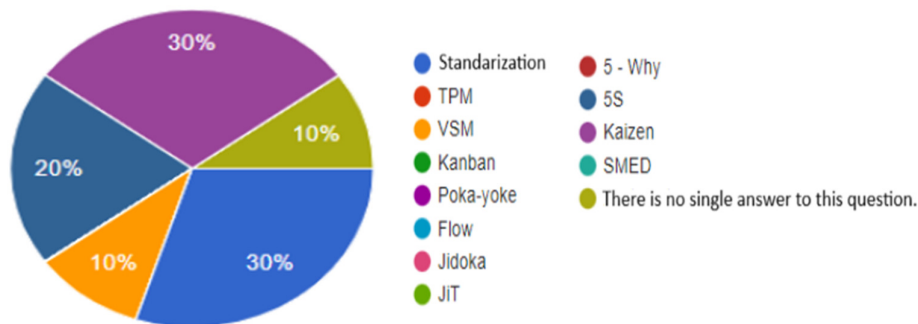


Fig. 5. Desired and necessary Lean tools for the more efficient functioning of the organization

Source: own study

In the above question, respondents were asked to identify which Lean Management tool they considered the most desirable and necessary for the more efficient functioning of the organization. Based on the responses, it was found that the most desired and necessary Lean tools for the majority of respondents were Kaizen and Standardization. Both tools contribute to continuous process improvement, waste elimination, and increased efficiency. Moreover, Kaizen and Standardization are tools that support sustainable development by improving operational efficiency, reducing waste, conserving resources, and increasing environmental and social responsibility. The use of these approaches in organizations can lead to more efficient and less harmful production processes, while also supporting sustainable development goals. The 5S tool, which was the third most frequently chosen tool, also helps improve organization and workflow, while value stream mapping allows for better visualization of processes. However, it is worth noting that 10% of respondents were unable to provide a definitive answer, suggesting that the choice of the most important Lean tool may depend on the specific needs and context of the organization.

The next question was linked to the previous one, as respondents were asked to justify their choice. In justification of their choice, the respondents provided the following reasons:

- Standardization is the foundation of any improvement efforts.
- Continuous improvement leads to the introduction of additional tools.
- Kaizen is about continuous problem-solving, constant improvement, and streamlining of the organization through employee knowledge and involvement. It involves the continuous identification and elimination of waste.
- Standardization ensures the most optimal way of completing tasks.
- Creating an optimal workspace supports the introduction of further significant changes.
- Kaizen is one of the most effective tools, aimed at continuous improvement, and thus always allows for enhancements.
- The efficient functioning of a company involves organized and effective processes without waste. VSM allows capturing these processes, verifying material and information flows, identifying bottlenecks, and detecting potential disruptions.
- Organizing the space leads to easier access to the necessary tools for the job.
- Without a standard, everything will deteriorate because there is no clear path.
- Lean tools are used to address a specific problem. The choice depends on the issue at hand. It is rare to use just one selected tool, even for one problem.

Experts involved in the study were asked to justify their response regarding which tools are most desirable in companies. The most frequently cited reasons concerned standardization as the most fundamental and necessary tool, forming the basis for implementing further tools. Respondents also often pointed out that Kaizen itself serves continuous improvement, streamlining the organization's actions, engaging employees, and increasing their awareness. It is also important to note responses in which Lean Management tools were indicated as being used depending on the problem the company is facing at a given time—sometimes one problem may require several tools, and vice versa.

At the end of the survey, respondents were asked to specify the industry with which they were associated. As much as 70% of the Lean experts were associated with the automotive industry. The remaining respondents indicated the pharmaceutical, electronics and electrical, and furniture industries. This fact explains the varied responses of the survey participants to individual questions – each of these fields is different and has its own specific needs, and thus different Lean Management tools will be more or less useful in a given organization. However, regardless of industry, the Lean concept overwhelmingly brings benefits to organizations.

Sustainability and Lean Management are two approaches often considered distinct, but they can complement each other in organizations striving for operational efficiency and environmental and social responsibility. Managers believe that implementing Lean Management will positively impact sustainable development if waste is also redefined as "environmental waste" (emissions, waste, water/energy consumption). Strategy implementation should combine hard tools (e.g., VSM, 5S) with employee engagement (Kaizen) to ensure that economic goals (Lean Management) align with ecological and social goals (Sustainable Development).

Discussion

Based on survey results, several key benefits of implementing the Lean Management concept can be highlighted, which yield positive outcomes for businesses, the environment, customers, and employees.

One such benefit is process repeatability and stability, enabling more predictable results and better process control.

Another advantage of Lean Management implementation is increased flexibility, or the ability to respond quickly to changing market needs.

Improved workplace safety is another benefit arising from adopting Lean practices.

Increased employee engagement and awareness is also a significant advantage of Lean implementation. Survey findings highlight positive effects in this area, confirming that greater employee involvement and awareness translate into better business outcomes.

Enhanced customer satisfaction, as well as financial gains, waste reduction, and increased market competitiveness, are essential benefits resulting from the implementation of Lean principles.

The conducted studies and literature review clearly indicate that Lean Management implementation brings numerous benefits – both economic and organizational. The most frequently cited effects in the literature include:

- shortened process lead times,
- reduced operating costs,
- improved quality of products and services,
- increased customer and employee satisfaction,
- better utilization of resources and increased organizational flexibility.

It should also be noted that many authors emphasize that the success of Lean implementation depends on organizational culture, management commitment, and continuous improvement. Research gaps mainly pertain to the long-term effects of Lean in the service sector and in micro and small enterprises, where the adaptation of Lean management principles faces different barriers than in large corporations (McDermott et al., 2022; Pawłyszyn, 2024). Tortorella and Fettermann (2018) note that in companies with a low culture of collaboration, Lean implementations often end in failure or only partial success. It is also worth noting that organizations that treat Lean as a management philosophy, rather than as a set of tools, achieve better and more sustainable results.

Conclusions

Sustainability and Lean Management are two approaches often considered distinct, but they can complement each other in organizations striving for operational efficiency and environmental and social responsibility.

Lean Management and sustainability are not conflicting concepts; rather, they are highly complementary. Waste reduction, continuous improvement, and delivering customer value are core elements of Lean Management that align well with sustainability goals. This synergy between Lean Management and sustainability paves the way for creating more efficient, sustainable, and socially responsible organizations, contributing to the overall well-being of people and the planet. In today's world, where environmental and societal concerns are increasingly significant, combining Lean Management with sustainable development becomes a critical success factor.

Moreover, sustainability and Lean Management can work in synergy, helping organizations achieve a higher level of operational efficiency while simultaneously protecting the environment, ensuring social equity, and fostering long-term growth. The integration of these two approaches can lead to a more responsible and profitable business model.

The findings from the conducted research clearly indicate that implementing Lean principles in a company delivers numerous tangible benefits, including improved product quality, increased efficiency, cost reduction, and enhanced customer and employee satisfaction. Implementing Lean Management tools allows for the optimization of production and storage processes, minimization of various types of waste, and improvement in operational efficiency. By applying the Lean concept, a company can boost its market competitiveness and achieve better financial performance.

Lean Management and sustainability both emphasize a philosophy of continuous improvement (kaizen). This enables organizations to gradually implement initiatives that bring benefits from the perspective of both operational efficiency and sustainable development.

Trainings, workshops, and internships should be focused on specific technical skills and soft skills to support Lean Management implementation. Education in this area is very important and helpful.

The objective of the article was achieved, and the benefits of using Lean Management tools and techniques were demonstrated. This knowledge can serve as a valuable guideline for companies that plan to implement the Lean concept or seek to improve their production and logistical processes.

The presented research model is characterized by a sufficiently high degree of compatibility that it can be assumed applicable for studying sectors different from those presented. However, it is recommended to undertake research to increase the adaptability and tailoring of the method for studying other sectors (i.e., the universalization of the research method). It also seems reasonable to extend the research in order to more thoroughly develop a set of the most important Lean tools that influence the efficiency of logistics and

production processes. The authors highlight the need to develop additional metrics for each area of Lean management, so that they help verify in even greater detail the level of effectiveness of improvement activities undertaken in companies. Further research should also include verifying the applicability of the developed tools in a broader range of companies (with a larger sample). Indeed, it can be assumed that this will yield more detailed information that can be used in the course of further investigations (broader exploration).

Declaration of Generative AI and AI-assisted technologies in the writing process

During the preparation of this work the authors used the support of the Scopus database literature search, translation, and editing was checked with Generative AI and Writefull tools. After using this tools, the authors reviewed and edited the content as needed and take(s) full responsibility for the content of the publication. Research results are original.

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