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Implementation of Lean Management to Improve the Operational Efficiency of Manufacturing Companies

Christ Windreis[1]
[1] STMIK Dharmapala Riau, Indonesia
Email: christ.windreis@lecturer.stmikdharmapalariau.ac.id

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ABSTRAK

Dalam industri manufaktur, penerapan Lean Management bertujuan untuk meningkatkan efisiensi dan mengurangi pemborosan di setiap langkah proses produksi. Kurangnya pemahaman tentang prinsip-prinsip lean dan resistensi terhadap perubahan di tingkat organisasi merupakan dua tantangan utama dalam implementasi lean. Penelitian ini bertujuan untuk meninjau berbagai jurnal yang membahas penerapan Lean Management di industri manufaktur. Jurnal nasional dan internasional digunakan untuk mencari artikel akademik, dengan arsip dari tahun 2019 hingga 2024. Penelitian ini mengkaji berbagai aspek penerapan Lean Management. Fokus utama dari kajian ini mencakup pengurangan pemborosan, peningkatan aliran produksi, serta perbaikan kualitas. Studi menunjukkan bahwa penerapan Lean Management yang tepat dapat meningkatkan efisiensi operasional, mengurangi biaya produksi, dan meningkatkan kualitas produk. Namun, penerapan lean memerlukan komitmen manajemen dan budaya perusahaan. Kesimpulannya, Lean Management dapat meningkatkan kinerja industri manufaktur jika didukung oleh perencanaan yang matang dan pelatihan berkelanjutan.
Kata Kunci: lean Management, manufaktur, efisiensi operasional

ABSTRACT

In the manufacturing industry, the implementation of Lean Management aims to improve efficiency and reduce waste at every step of the production process. A poor understanding of lean principles and resistance to change at the organizational level are two main issues in implementing Lean. This study aims to review various journals discussing the implementation of Lean Management in the manufacturing industry. National and international journals were used to search for academic articles, with archives from 2019 to 2024. The researcher collected 3 articles that discuss various aspects of Lean Management practices, such as waste reduction, improved production flow, and quality enhancement. The studies indicate that proper implementation of Lean Management can improve operational efficiency, reduce production costs, and enhance product quality. However, the implementation of lean requires management commitment and a supportive company culture. In conclusion, Lean Management can improve the performance of manufacturing industriesifsupported by thorough planning and continuoustraining.

Keywords: Lean Management, manufacturing, operational efficiency

INTRODUCTION

Producing goods that shape nearly every aspect of contemporary life, the manufacturing industry plays a strategic role in the global economy. However, the sector faces pressure to meet evolving customer demands, improve efficiency, and reduce operational costs. Lean management has emerged as a leading paradigm for achieving operational excellence in this context. Rooted in the Toyota Production System (TPS), lean management offers a systematic approach to identifying and eliminating waste while delivering customer-focused value.

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To optimize processes, reduce variability, and increase productivity across the value chain, the lean approach employs various tools and techniques, including just-in-time (JIT), value stream mapping (VSM), kanban, 5S, and continuous improvement (Kaizen). Lean has evolved from merely a tool for enhancing efficiency into a management strategy encompassing cultural, strategic, and operational aspects. In manufacturing, the implementation of lean manufacturing aims to eliminate wastes such as waiting time, transportation, overproduction, over-processing, excess inventory, unnecessary movement, and defective products.

Companies like Toyota, General Electric, and Boeing around the world have successfully implemented lean to improve their operational efficiency. Toyota pioneered this method by integrating organizational culture and lean practices to create a competitive advantage. However, lean implementation often faces challenges such as resistance to change, limited lean-related skills among employees, and difficulties in sustaining continuous improvement.

Inadequate infrastructure, work culture, and lean training are additional barriers that hinder lean implementation in developing countries. For instance, in Indonesia, manufacturing companies have incorporated lean as part of their strategy to enhance efficiency. Nevertheless, conventional work patterns and a lack of management support often obstruct implementation (Sarno et al., 2020). Research on lean management in the manufacturing industry has grown significantly. Womack et al. (1990) conducted early studies that highlighted lean as a superior method compared to conventional mass production methods. Shah and Ward (2007) advanced our understanding of core lean components and their relationship to organizational performance. They demonstrated that lean tools are often linked to improvements in quality and productivity, as well as cost reduction. Furthermore, recent studies have integrated sustainability aspects with environmentally friendly practices to minimize the negative environmental impact of manufacturing. In addition, the shift in lean management is being driven by digital transformation. More precise lean implementation can be achieved through enhanced data visibility and process automation enabled by technologies such as big data analytics, the Internet of Things (IoT), and artificial intelligence. However, this transformation also brings challenges. For example, there is a risk that the human element of lean will be overlooked, even though it remains critical to successful implementation.

Although lean is highly beneficial, success is not always guaranteed. Barriers such as fear of change and difficulties in integrating new technologies often arise. On the other hand, the combination of lean with digital technologies and sustainability opens up significant opportunities. In the future, lean has the potential to enhance efficiency, innovation, and customer value by harnessing these potentials.

METHODS

This study employs a systematic literature review approach to explore the implementation of lean management in the manufacturing industry, aiming to identify best practices, challenges, and outcomes derived from the application of this concept. This method was chosen because it allows the researcher to construct a comprehensive understanding of existing lean management implementations across various manufacturing sectors and to evaluate their effectiveness in improving operational efficiency and productivity.

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The first step involved defining the scope of the study. This scope includes the selection of articles focusing on the implementation of lean management in the manufacturing industry. The review was limited to publications discussing the impact of lean on production efficiency, waste reduction, and product quality improvement. Another limitation was the inclusion of only those articles that specifically address the implementation of lean in mass production or large-scale manufacturing, considering various lean techniques such as 5S, Kaizen, Just-in-Time, and Total Productive Maintenance (TPM).

The second step was the identification of relevant keywords for the article search. The three main keywords used were: "lean management", "manufacturing industry", and "operational efficiency". The researcher conducted literature searches through various academic databases, including Google Scholar, Scopus, Web of Science, and JSTOR. Articles selected for this review were from both international and national journals published between 2019 and 2024. The search was initiated using the identified keywords and was limited to articles focusing on empirical studies and case studies related to the application of lean management.

The third step involved the selection and evaluation of articles. In this phase, the researcher assessed the relevance and quality of the articles based on the methodology used, their contribution to the research topic, and the key findings that provide insights into the implementation of lean management. Articles published in reputable journals with a high impact factor were prioritized to ensure the validity and credibility of the data. The researcher also considered whether the articles provided in-depth analysis of the challenges faced by industries in implementing lean, as well as the solutions that have been applied to overcome these challenges.

The fourth step was thematic analysis and synthesis of research findings. The researcher organized the main findings from the selected articles into key themes that emerged from the literature, such as the most widely applied lean techniques (e.g., 5S, Kaizen, Value Stream Mapping), the impact of lean on waste reduction, its influence on product quality, and its effect on customer satisfaction and productivity improvement. The researcher also compared these findings to draw more holistic conclusions regarding the effectiveness of lean management implementation in enhancing efficiency and reducing costs in the manufacturing industry.

The final step was synthesis and conclusion drawing. After evaluating and comparing the main findings, the researcher drew comprehensive conclusions regarding how lean management implementation contributes to improving operational performance in the manufacturing sector. These conclusions also include recommendations for industry practices and the identification of areas requiring further research. Based on this literature review, the researcher hopes to provide insights that can be applied by manufacturing companies to optimize their production processes through lean principles, as well as to make a significant contribution to the existing body of literature on this topic.

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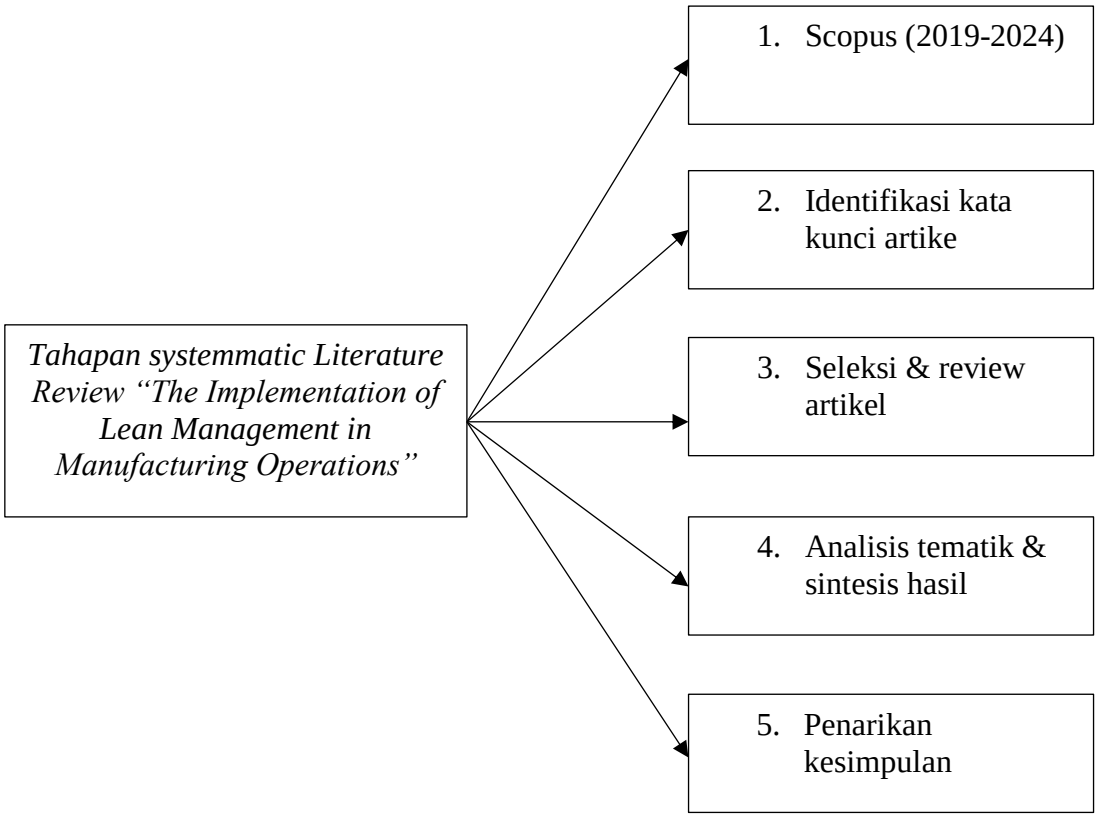

fig 1. *Systematic Literature Review*

RESULT AND DISCUSSION

The results of the review of three scholarly articles on lean management are presented in the following table:

Table 1. *Analysis Results of Reviewed Research Articles*

Identitas	Research Methodology	Research Results
(Shou et al., 2020). Australia	Identify and eliminate waste through literature review, case studies, and 4D BIM simulation to build a VSM-based lean management framework for LNG plants	As shown in the case study, VSM can be used to optimize Turnaround Maintenance (TAM) processes in the oil and gas sector.
(Choudhary et al., 2022) India	This study analyzed data from 233 ceramic companies to identify company profiles based on size and export orientation using SEM, cluster analysis, and RBV.	Indian ceramic companies use quality and lean management to improve operational and environmental performance, but this has a negative impact on economic performance. Larger companies benefit more from this approach.

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(Yaw et al., 2020). Ghana	Using PLS-SEM, the study analyzed data from 259 manufacturing companies in Ghana taking into account company size and environmental concerns.	Both environmental practices and lean management improve business and environmental performance and provide competitive advantages; however, environmental practices are better at creating environmental performance, while lean management is better at creating competitive advantages.

Source : Author's Data Analyst

The implementation of lean management in the manufacturing industry, as demonstrated in several studies, has shown a significant impact in improving operational efficiency and reducing waste. One relevant study is by Shou et al. (2020), which identified and eliminated waste through literature review, case studies, and 4D BIM simulations to develop a lean management framework based on Value Stream Mapping (VSM) at an LNG plant. In that case study, VSM proved effective in optimizing Turnaround Maintenance (TAM) processes in the oil and gas sector. VSM can be used to map value streams in production processes and improve inefficient aspects, which aligns with lean management principles focused on waste reduction and value enhancement.

Another study by Choudhary et al. (2022) on the implementation of quality management and lean practices in a ceramic company in India found that although both practices can improve operational and environmental performance, they negatively affect the company's economic performance. Based on data from 233 ceramic companies, the study found that larger firms were more capable of benefiting from lean management implementation. This highlights the importance of company size in influencing the effectiveness of lean implementation. Larger firms have more resources to apply complex lean systems and address operational transformation challenges, including training needs and technology adoption.

Research by Yaw et al. (2020) in Ghana provides additional insights into the dual benefits of lean management and environmental sustainability practices. Using PLS-SEM on data from 259 manufacturing firms, the study shows that both environmental practices and lean management can enhance business and environmental performance, offering competitive advantages to firms. However, environmental practices were more effective in driving environmental performance, while lean management was more effective in creating competitive advantage. This study emphasizes that integrating lean management with environmental initiatives can yield dual benefits improving operational efficiency while reducing environmental impact, which aligns with increasingly prioritized sustainability goals in the global manufacturing sector.

Overall, these studies demonstrate that lean management can positively impact production efficiency, waste reduction, and overall company performance. However, its effectiveness largely depends on company size and industry context. As explained by Shou et al. (2020), VSM-based lean implementation can help optimize processes in specialized sectors such as oil and gas, while Choudhary et al. (2022) highlight the challenges faced by smaller firms in successfully implementing lean. Yaw et al. (2020)

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also emphasize the importance of integrating environmental practices with lean management to create sustainable competitive advantages. Thus, the application of lean management in the manufacturing industry contributes to increased efficiency, waste reduction, and improved environmental performance. However, companies must consider their size, resources, and industry context to ensure successful lean implementation. These findings can serve as an important guide for companies in designing and implementing effective lean strategies.

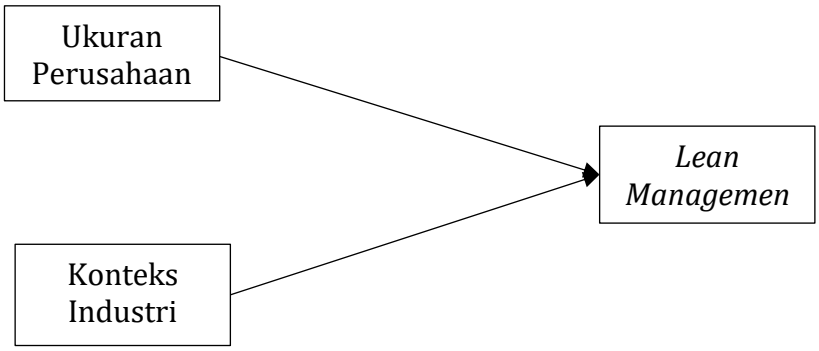

Fig 2. *Factors Influencing the Implementation of Lean Management*

CONCLUSION

According to this literature review, the implementation of Lean Management in the manufacturing industry has the potential to enhance operational efficiency, reduce waste, and increase value for customers. Lean management, which originated from the principles of the Toyota Production System (TPS), has evolved into a strategic framework focused on efficiency, adaptability, sustainability, and digital transformation. Previous studies show that lean tools and techniques such as Value Stream Mapping (VSM), Just-in-Time (JIT), Kaizen, and Kanban consistently improve productivity and reduce process variability. Organizations like Toyota have demonstrated the success of integrating lean with corporate culture to create sustainable competitive advantages worldwide. However, lean implementation also faces challenges, such as resistance to change, limited human resources, and the high demand for management commitment. In developing countries, additional issues such as infrastructure deficits and lack of lean training are major obstacles. Nevertheless, the local application of lean methods has shown some evidence of success. Furthermore, the shift of lean towards integration with digital technologies such as the Internet of Things (IoT), big data analytics, and artificial intelligence opens new opportunities for improving the efficiency and accuracy of lean implementation. In addition, these methods can support sustainability practices through waste and carbon emission reduction. In summary, implementing lean management in the manufacturing industry is a relevant and effective approach to addressing contemporary operational challenges. However, its success requires a structured approach, appropriate use of technology, and adaptation to local conditions. Further research is needed to explore the full potential of lean in the digital and sustainability era.

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