

# Analysis of Lean Strategy in Increasing Production Efficiency: Literature Study

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**Abstract** -. Increasingly tight competition in the manufacturing industry requires companies to increase production efficiency through optimal operational management. One approach that is widely applied is Lean Manufacturing, which focuses on reducing waste and increasing added value in the production process. This research aims to analyze lean strategies in increasing production efficiency based on the results of previous research. The method used is Systematic Literature Review (SLR) by selecting relevant scientific articles through the stages of identification, selection, analysis and literature synthesis. The results of the study show that the application of Lean Manufacturing, both through the Kaizen and Just In Time approaches, Value Stream Mapping, as well as the integration of Lean Six Sigma with FMEA, has been proven to be able to reduce waste, increase productivity and improve operational performance. These findings confirm that lean manufacturing is an effective and adaptive operational management strategy in increasing production efficiency in the manufacturing sector.

**Keywords:** Lean Manufacturing, Production Efficiency, Operational Management, Systematic Literature Review

## I. INTRODUCTION

In the competitive business world, companies are not only required to produce high quality products, but also must be able to maintain the sustainability of the production process amidst limited resources and market uncertainty (Rohman & Irwan, 2025). Implementing lean strategies is very important because lean principles can be contagious. Customers will see huge improvements when implementing lean, and will likely want to be part of the process. This collaborative thinking will also extend to suppliers, who will also want to use lean to deliver their own improvements.

According to Hasibuan, et al (2025), tight market competition, volatility in raw material prices, increasing customer expectations, and pressure to produce goods more quickly, cheaply and with high quality require companies to implement overall efficiency in their production processes. One of the main approaches to facing these challenges is through optimizing operational management. Effective operational management not only manages production and distribution flows, but also integrates various important aspects such as planning, quality control, resource management and cost efficiency.

The problem that prevents production targets from being achieved is waste. The waste referred to is in the form of waiting time, over production, and motion (unnecessary movement) which is an obstacle that reduces productivity and slows down the production rate, so that the planned production volume target is difficult to achieve. In addition, product defects that often occur during the production process cause the need for repair or even product replacement, which costs time and additional raw materials. This repair or rework activity hampers the production flow and has a direct impact on achieving the production target that should be achieved (Pambudi, et al., 2025).

The implementation of lean manufacturing also aims to increase efficiency in the production process as a whole. Efficiency in a manufacturing context refers to a company's ability to optimize resources, both labor, raw materials and production time, in order to produce maximum output at minimum cost. The higher the level of efficiency of a company, the smaller the possibility of waste occurring, thus making it possible to increase production capacity without having to increase large costs (Yulyani, et al., 2025). Lean Manufacturing not only provides benefits in the form of increased efficiency, but also changes the company's work culture to be more focused on continuous improvement (Wijaya, 2024).

However, the implementation of Lean Manufacturing does not always run smoothly and often faces various complex and multidimensional challenges. One of the main obstacles is the difficulty in accurately identifying waste, especially when the production process has been going on for a long period of time and is

considered efficient by management. In addition, employee resistance to changes in work culture is a significant obstacle, because Lean Manufacturing requires changes in behavior, mindset, and active involvement from all levels of the organization. Employees who are not trained or do not understand the benefits of Lean tend to resist change, which can hinder successful implementation (Pratama, 2025).

Effective lean implementation has been proven to be able to contribute not only to operational performance through increasing productivity, quality and reducing waste but also to business performance in the form of increasing profitability, sales growth and customer satisfaction (Sasangka, et al., 2026).

In an effort to reduce costs and increase productivity, the Lean Manufacturing method is a promising strategy. This research aims to analyze the Lean strategy implemented in various previous studies and examine its contribution in increasing production efficiency based on the results of literature studies.

## II. METHOD

This research uses a Systematic Literature Review (SLR) approach to comprehensively examine lean strategies in increasing production efficiency. This research aims to analyze the Lean strategy implemented in various previous studies and examine its contribution in increasing production efficiency based on the results of literature studies. This approach was chosen because it is able to identify, evaluate and synthesize previous research findings in a systematic and structured manner.

The first stage is determining the topic and research objectives, which aim to determine the focus of the study and the direction of the research so that the literature search process runs in a directed manner and is relevant to the problem being studied.

The second stage is identifying databases and keywords. Literature searches were carried out through relevant scientific databases, such as Google Scholar and/or other databases, using keywords related to lean management, lean strategy, and production efficiency.

The third stage is determining inclusion and exclusion criteria. Inclusion criteria include scientific articles that are relevant to the research topic, published within a certain time period, and use language that can be understood. Meanwhile, exclusion criteria include articles that are not relevant to the research focus, non-scientific publications, and articles that are not available in full text.

The fourth stage is article selection, which is carried out through a screening process based on the title, abstract and overall content of the article according to previously established criteria.

The fifth stage is literature analysis and synthesis. The selected articles are analyzed thematically to identify patterns, main concepts, and important findings related to lean strategies in increasing production efficiency. The analysis results are then synthesized to obtain a more comprehensive understanding.

The final stage is drawing conclusions, which are prepared based on the results of a literature synthesis to answer the research objectives and provide an overview of the implications of implementing lean strategies in increasing production efficiency.

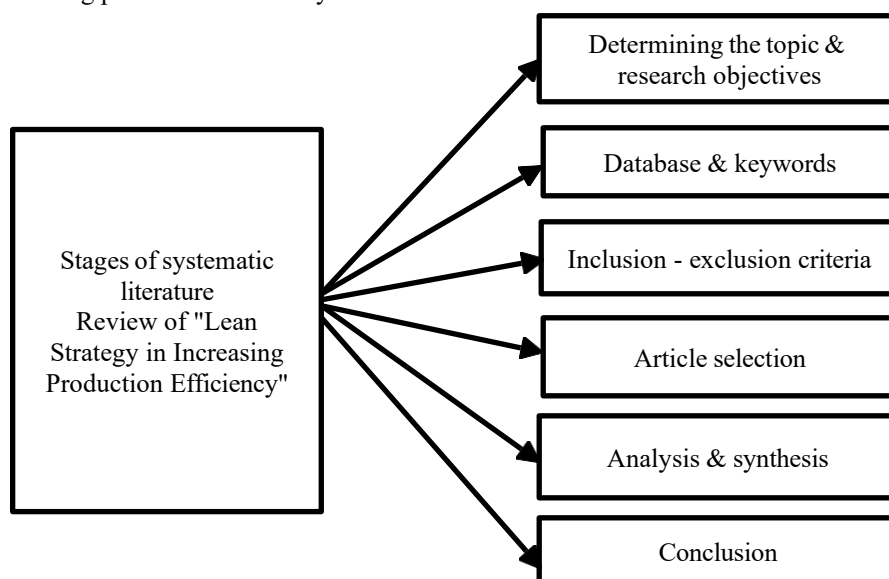


Figure 1. Stages of Systematic Literature Review

**III. RESULT AND DISCUSSION**

Based on the systematic literature review stages that have been carried out, three scientific articles were obtained that met the inclusion criteria and were relevant to the research topic. The three articles were then analyzed to identify the research methods used as well as the main findings related to lean strategies in increasing production efficiency. A summary of the analysis results from each article is presented as follows:

**Table 1.** Results of analysis of research article reviews

AUTHOR	RESEARCH METHODOLOGY	RESEARCH RESULT
Tiara & Martilova (2024)	Lean Manufacturing Method at CV Cassiavera Merapi, owned by Mr. Daswir, in Jorong Lasi Tuo, Canduang District, Agam Regency. This research uses qualitative methods through interviews, documentation, and observations with owners and employees.	Implementing Lean Manufacturing with Kaizen and Just In Time principles reduces operational waste. Kaizen Principles Include 3M (eliminate waste in activities, organize production processes, and reduce excess burden on employees), the 5S concept (separating and arranging goods, cleaning and maintenance), and the PDCA Cycle (Plan, Do, Check, Action) with 5W+1H.
Prakoso, Windyatri, & Pradipto (2025)	Using a quantitative descriptive approach with the aim of analyzing waste problems at PT. Tunas Tumbuh Bersama and provide recommendations for improvement. The research was carried out at PT. Tunas Tumbuh Bersama, Jababeka industrial area, South Cikarang, Bekasi, from February to April 2024. The research object is focused on the efficiency of the production process flow, from the arrival of raw materials to the final product. The data used consists of primary and secondary data.	PT. TTB through the implementation of lean manufacturing with the help of value stream mapping.
Saladin & Suf (2025)	The type of research used in this research is quantitative methods. The method that will be used to identify, analyze and increase productivity at PT. XYZ is the Lean Six Sigma and Failure Mode and Effects Analysis (FMEA) method. This research involves several stages, namely data collection, analysis, implementation of recommendations,	The results of the improvement recommendations were able to increase the sigma level from 3.2 to 4.5, the OEE percentage to 85%, and reduce production lead time by 1.74 hours. This research proves that the combination of the Lean Six Sigma and FMEA approaches is able to effectively increase productivity and control the risk of failure in liquid soap industry problems.

The operational management strategy at CV Cassiavera Merapi using the Lean Manufacturing Method with the Keizen and Just In Time principles can reduce several wastes during operations including 3M (muda to eliminate wasteful activities, mura to organize the production activity process, and muri to eliminate burdens beyond the employee's capabilities), 5S concept (seiri to separate objects that are needed from those that are not needed, seiton to arrange objects in an attractive and neat way, seiso to carry out cleaning, seiketsu to make

continuous efforts to maintain the 3S above, and shitsuke to motivate workers.), and the PDCA concept (Plan, Do, Check, Action) using the 5W+1H concept to ensure the continuity of keizen. And the JIT principle to eliminate waste and consistently increase productivity so that timeliness can be achieved.

Based on the results of research and discussions that have been carried out, the application of lean manufacturing with the support of Value Stream Mapping (VSM) to minimize waste in the motorbike holder production process at PT. TTB has resulted in the following conclusions: 1). The dominant types of waste identified in the motor holder production process include (waiting) waiting for the product to be finished from the trimming process, (overproduction) making excess product above the PO, waste (inventory) due to inaccurate inventory data, waste (motion) due to inefficient movement of goods, and (defect) NG products due to sticking to the mold. Based on the results of process activity mapping, delay activities contributed 10 activities with a total time of 357.1 seconds (28%) of the entire motor holder production process. 2). The main factors causing this waste include not yet optimal process management, lack of work standardization, less efficient facility arrangement, and machine maintenance that is not yet optimal, thus disrupting the smooth running of production. 3). The strategy for optimizing production capacity is carried out using the Value Stream Mapping (VSM) approach to map current process conditions (current state) and design ideal conditions (future state). Through this analysis, companies can identify non-value added activities, determine improvement priorities, and design improvement steps such as layout adjustments, standardization of work procedures, reduction of waiting time, improvement of material and information flow, and implementation of scheduled machine maintenance.

Based on the data collected, several main factors that cause inefficiency in production at PT XYZ are high defect rates, uncontrolled machine downtime, and imbalances in production flow. Through calculations of Overall Equipment Effectiveness (OEE) and First Pass Yield (FPY), it is known that the effectiveness of production machines is still at a less than optimal level. By implementing the Lean Six Sigma strategy and making improvements in human resource management, machine maintenance, and stricter quality control, PT XYZ succeeded in reducing the defect rate significantly and increasing production efficiency. In addition, the results of the Failure Mode and Effects Analysis (FMEA) identified that the riskiest failure modes in packaging are packaging leaks, inaccuracies in product filling, and errors in product labeling, which have the highest Risk Priority Number (RPN) value and must be corrected immediately. The contribution of this research is to integrate OEE and FPY performance metrics with FMEA in waste improvement problems in the manufacturing industry.

Comparatively, these three studies show that lean strategy does not stand as a uniform approach, but is contextual and adaptive to the characteristics of operational problems faced by each company. The different methods used range from qualitative approaches based on Kaizen and Just In Time, value stream mapping through Value Stream Mapping, to the integration of Lean Six Sigma with FMEA which indicates that the effectiveness of lean is greatly influenced by the level of complexity of the production process, the level of maturity of the management system, and the improvement goals to be achieved. Thus, lean manufacturing not only functions as a technical tool to reduce waste, but also as a strategic framework for operational decision making.

Furthermore, the findings from these three studies show that the success of lean implementation is highly dependent on the organization's ability to systematically identify the root causes of inefficiencies. When waste is analyzed thoroughly, originating from process flow, facility layout, machine reliability, and work behavior, the improvement strategy designed becomes more focused and has a significant impact on production performance. This shows that lean is not just a partial improvement effort, but rather a holistic approach that demands integration between processes, people and technology.

In addition, the integration of lean with supporting methods such as VSM, OEE, FPY, and FMEA strengthens the role of lean as a data-driven improvement approach. This approach allows companies to not only reduce visible waste, but also control the risk of process failures that have the potential to disrupt production sustainability. In other words, lean contributes not only to short-term increases in efficiency, but also to the stability and reliability of production systems in the long term.

From a managerial perspective, the results of this synthesis confirm that the implementation of lean strategies needs to be accompanied by management commitment and active employee involvement. Lean manufacturing demands a change in mindset from simply pursuing output to focusing on value creation and continuous improvement. Therefore, the success of lean is not only determined by choosing the right method, but also by the organization's ability to build a work culture that supports continuous improvement. These findings strengthen the position of lean manufacturing as a relevant and effective operational management strategy in increasing production efficiency in the manufacturing sector.

#### IV. CONCLUSION

Based on the results of a systematic literature review of three relevant studies, it can be concluded that the Lean Manufacturing strategy has proven effective in increasing production efficiency in the manufacturing sector. Consistent implementation of lean is able to reduce various forms of waste, such as waiting time, overproduction, inventory, motion and defects, which have been the main causes of not achieving production targets and low company productivity.

The synthesis results show that the effectiveness of lean is greatly influenced by the selection of methods that suit the characteristics of the company's operational problems. Kaizen and Just In Time based approaches are effective in building continuous improvement and work discipline, while Value Stream Mapping (VSM) plays an important role in identifying non-value added activities and designing improvements to the production process flow. In addition, the integration of Lean Six Sigma with Failure Mode and Effects Analysis (FMEA) has been proven to be able to improve quality, reduce the risk of process failure, and measurably increase machine performance and productivity.

Conceptually, lean manufacturing not only functions as a technical tool for operational efficiency, but also as a strategic approach that encourages data-based decision making and long-term performance improvements. Successful implementation of lean requires management involvement, human resource readiness, and an organizational culture that supports continuous improvement. Thus, lean manufacturing can be positioned as a relevant and sustainable operational management strategy in facing the challenges of an increasingly competitive manufacturing industry.

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