

Implementation of Lean Manufacturing as the Main Foundation of Effective Operational Management

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ABSTRACT

Lean Manufacturing is known as an approach that focuses on eliminating waste and increasing the efficiency of the production process. This research aims to explore and analyze the implementation of Lean Manufacturing as the main basis for achieving effective operational management. This research uses a qualitative approach with descriptive methods. The results of this research indicate that the implementation of Lean Manufacturing as the main foundation for effective operational management has a significant positive impact on company performance. Through planned and sustainable steps, the company succeeded in reducing waste in the production process, increasing operational efficiency, and creating a more structured and productive work environment. Continuous monitoring and evaluation proves that the continuous improvements adopted, such as the implementation of 5S, Kaizen, and the Just In Time concept, consistently result in increased production cycle time efficiency and improved product quality. In addition, active employee participation in continuous improvement initiatives has been proven to make a positive contribution to a company culture that is responsive to change. By integrating the PDCA cycle, the company succeeded in maintaining the continuity of the Main Foundation of Effective Operational Management based on Lean Manufacturing, creating a solid foundation for operational growth and continuity in a dynamic business environment.

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INTRODUCTION

Implementing Lean Manufacturing does not just provide operational guidance, but also designs a comprehensive blueprint for manufacturers to improve production processes and quality in every factory and production center they operate (Bhamu & Sing Sangwan, 2014). This approach not only introduces efficiency principles, but also changes the management paradigm by placing customers and their needs as the main focus in all improvement efforts. In the Lean Manufacturing framework, not only are strategies implemented to reduce waste and increase operational efficiency, but also detailed clear definitions, implementation steps, and ongoing management of each improvement initiative (Mostafa dkk, 2013).

The importance of customers and their satisfaction is emphasized, with Lean Manufacturing directed at creating added value along the production chain. This strategy is not just about internal efficiency, but also involves a deep understanding of customer needs (Nimeh et al., 2018). Thus, implementing Lean Manufacturing is expected to empower manufacturers to attract new customers, maintain existing customer satisfaction, and ultimately achieve solid and sustainable growth through increasing gross margins (Agus & Shukri Hajinoor, 2012). By positioning the customer at the heart of all improvement efforts, Lean Manufacturing becomes more than a methodology, but a philosophy that changes the way companies operate and innovate (Cudney & Elrod, 2011).

The Lean Manufacturing strategy not only functions as a method of operational efficiency, but also as a holistic approach that helps manufacturers achieve maximum results from limited resources (Belekoukias et al., 2014). By focusing on two main pillars, namely maximizing customer

value and minimizing waste, this strategy creates a strong foundation for improving overall business performance (Alves & Alves, 2015). By applying Lean principles, manufacturers can synchronize their workflows, optimize each stage of production, and align priorities across the organization. Thus, the result is not only efficiency in the process, but also improvement in service to customers (Ramadan et al., 2020).

Through the adoption of a Lean approach throughout the organization, manufacturers can secure their position in the competitive market. They become more attractive to customers with improved product and service quality, while also maintaining cost efficiency (Gupta & Jain, 2013). The ability to accelerate production provides an edge in dealing with rapid changes in demand, while greater operational resilience protects against unexpected disruptions. Additionally, Lean strategies help manufacturers plan for potential labor shortages, ensuring sufficient availability to keep daily production schedules running smoothly (Smith & Hawkins, 2004). Thus, Lean Manufacturing is not just about increasing production efficiency, but also about creating a solid foundation for sustainable growth, operational resilience and ongoing customer satisfaction (Henao et al., 2019).

There are eight categories of waste that are most effectively addressed by Lean Manufacturing strategies (Anvari et al., 2011). First, overproduction can be overcome by better understanding market demand and producing only what is needed. Second, waiting for order and delivery status can be avoided through more efficient workflow management and the use of integrated information systems. Third, the lack of inventory to fulfill orders can be minimized by using the Just In Time (JIT) method to maintain inventory in optimal quantities. Fourth, transportation delays can be overcome with better logistics planning and coordination, while fifth, backlogs of orders on the shop floor can be minimized through improved workflow and more effective inventory management. Sixth, defects caught by post-production quality assurance can be avoided by implementing strict quality control throughout the production process. Seventh, redundant or corrective processes can be reduced by reviewing and simplifying workflows, while eighth, underutilization of workers can be addressed by actively involving employees in process improvements and providing appropriate training (Pavnaskar et al., 2003).

Implementing Lean Manufacturing significantly improves operational management by addressing eight categories of waste. By adopting Lean principles, manufacturers can improve workflow efficiency, minimize production cycle times, and ensure optimal inventory management (Kilpatrick, 2003). This strategy also helps reduce overproduction, address transportation issues, and reduce order lead times, which in turn speeds up time-to-market and increases customer satisfaction. In addition, the implementation of strict quality control throughout the production process leads to an improvement in overall product quality (Mofolasayo et al., 2022). By involving employees in the improvement process and providing appropriate training, Lean Manufacturing not only improves operational efficiency, but also creates a work environment focused on employee empowerment (Adeodu et al., 2021). Overall, the integration of Lean principles in operational management helps companies achieve greater efficiency, flexibility and competitiveness in dynamic markets.

Literature Review

According to Gaspersz (2007), lean manufacturing is a continuous effort to eliminate waste that occurs in an industrial company to provide added value to products (goods/services) and provide value to customers (customer value). The goal of lean is to continuously increase customer value (continuous improvement) through continuously increasing the ratio between added value to waste. And according to Sundar et al., (2014), Lean Manufacturing is a production activity that always reconsiders all existing resource expenditures to capture economic value for customers without waste, and this waste is the target to be reduced as best as possible. Lean Manufacturing is

a management method and strategy to increase efficiency in manufacturing or Lean production always looks at product value from various customer points of view, where the value of a product is defined as something that customers are willing to pay for (Mostafa et al., 2013).

APICS Dictionary (2005) explains Lean as a business philosophy based on minimizing the use of resources (including time) specifically in various company activities. Lean focuses on identifying and eliminating various non-value adding activities in design, production (for the manufacturing sector) or operations (for the service sector), and supply chain management, which are directly related to customers (Lyons et al., 2013). Based on this statement, a conclusion can be drawn that lean manufacturing is a method that can solve waste problems or various activities that do not have added value within the scope of the company in order to increase efficiency in manufacturing fields. with continuous improvement.

METHOD

This research carries a qualitative approach using descriptive methods. The data collection process involves literature study by referring to relevant previous research, as was done (Yulianah 2022). This method utilizes document search techniques and library sources such as books, scientific journals and supporting research documents. In the context of this research, the author critically analyzes previous studies that are relevant to the research objectives. Data analysis was carried out using a qualitative descriptive approach, following Milles and Hubberman (1994) interactive model which involves data reduction, data analysis, and conclusion drawing and verification stages. This approach allows research to dig deeper into the implementation of Lean Manufacturing as the main foundation for effective operational management, by linking findings with relevant concepts in existing literature .

RESULTS AND DISCUSSION

Lean Manufacturing is a methodological approach that primarily prioritizes reducing waste in manufacturing systems while maximizing increasing productivity. This approach views waste as anything that does not provide added value that is recognized by customers and is not considered worth paying for. By focusing efforts on operational efficiency, lean manufacturing can produce significant benefits, including reduced operating costs. Therefore, lean manufacturing can be considered a key foundation in effective operational management, prioritizing efforts to improve quality, efficiency and customer satisfaction, as well as optimizing the use of resources.

Lean manufacturing requires a relentless pursuit of reducing anything that does not add value to a product, which means waste. This makes continuous improvement, which is the essence of lean manufacturing, a necessity. Other important concepts and processes used in lean include:

- Heijunka: The heijunka concept in Lean Manufacturing involves leveling production to create a continuous and scalable production flow. By implementing heijunka, production is carefully managed so that work is released to the factory at a rate that matches actual demand. This aims to avoid sudden fluctuations in production, thereby minimizing imbalances and reducing interruptions that can disrupt workflow. By adopting heijunka, companies can increase efficiency, optimize resource use, and ensure that production occurs consistently according to customer demand. This not only creates continuity in the workflow, but also increases responsiveness to rapidly changing market demands.
- 5S: The 5S approach is a methodology that focuses on organizing a work space efficiently and effectively, involving a series of structured practices. The principles, which consist of sorting, setting in order (arranging), shining (cleaning), standardizing (setting standards), and sustaining (maintaining), aim to create an orderly and organized work environment. By implementing 5S, companies can increase productivity by reducing time wasted looking for

the tools or goods needed. In addition, job security can be improved through reducing potential dangers due to irregularities. With the adoption of 5S, companies create a disciplined work culture, ensure continued maintenance of standards, and provide a solid foundation for improving overall operational efficiency.

- Kanban : Kanban is an effective tool in controlling material flow and maintaining goods availability in accordance with the Just-In-Time (JIT) concept. By using the Kanban system, companies can ensure on-time delivery and avoid waste in production. This concept relies on physical or electronic signals, such as cards or indicator lights, that tell when an item needs to be produced or supplied. Through the implementation of Kanban, companies can increase visibility into inventory, optimize the use of storage space, and respond quickly to changes in customer demand. Thus, Kanban helps achieve production efficiency, reduces storage costs, and creates a smoother work flow in accordance with the Just-In-Time principle.
- Jidoka: Jidoka, as a concept in Lean Manufacturing, carries the philosophy of automation with human control. This approach allows workers to detect abnormalities or problems in the production process and empowers them to stop work and address the problem directly. Jidoka aims to encourage problem solving at its source, thereby preventing defects or abnormalities from progressing to the next stage of the process. By incorporating human control, Jidoka not only improves product quality but also empowers workers to actively participate in process improvements. This creates a work environment that is responsive, proactive and focused on preventing problems, which in turn supports the creation of high-quality products and increased overall production efficiency .
- Andon: The visual tool in question is the poka-yoke or andon, which is used to provide a visual indication of production status or the existence of problems in a process. For example, flashing lights on a poka-yoke or andon provide a clear and direct signal regarding production conditions. These lights can indicate problems that require immediate attention or assistance, allowing production teams to respond quickly to abnormalities. The use of visual tools like these is part of a Lean Manufacturing strategy to increase visibility, encourage responsibility, and identify problems as quickly as possible. With the existence of poka-yoke or andon, companies can create a more responsive and efficient environment, which ultimately supports improving product quality and production process efficiency.
- Poka-yoke : Poka-yoke is a method or device specifically designed to prevent human error in a production process. The main goal is to prevent or detect errors before they can cause defects in the final product. For example, the use of sensors or poka-yoke devices can provide notification or warning to workers if a critical step in the process is missed or does not comply with established standards. Thus, poka-yoke plays an important role in improving product quality, reducing waste, and increasing production efficiency by minimizing the possibility of human errors that can occur during the manufacturing process. By integrating poka-yoke, companies can achieve the goal of Zero Defects and support the Lean Manufacturing philosophy that encourages early defect prevention in every stage of production.
- Cycle time: The concept of cycle time refers to the time required to complete a particular task or process. Measuring and analyzing cycle time is key in identifying potential waste and improving efficiency in an operation. By understanding and analyzing cycle time, companies can identify areas where unnecessary time is being spent and develop strategies to reduce them. Through this approach, companies can increase productivity, optimize resource use, and minimize unproductive time. The concept of cycle time is also important in the context of Lean Manufacturing, where a focus on eliminating time waste is a core principle for

achieving operational efficiency and resilience. By continuously monitoring and managing cycle times, companies can achieve continuous improvements in their operational performance.

Implementing Lean Manufacturing as the Main Foundation of Effective Operational Management requires a series of planned and directed steps to ensure success. First of all, companies need to carefully investigate and identify Lean principles which include Just In Time (JIT) methodology for reducing time and inventory waste, 5S for tidying up and increasing the efficiency of the work environment, Kaizen for implementing continuous improvement, and a deep understanding of value-added.

A deep understanding of Lean principles is the key to effective cultural and operational change. This involves involving all levels of the organization, from management to employees on the production floor. This cultural change process requires strong commitment and effective communication so that each team member understands the importance of implementing Lean in achieving company goals. Concrete operational steps, such as implementing JIT in the supply chain, using 5S principles to tidy up and simplify the work environment, and motivating employees to actively participate in the Kaizen program, are an integral part of the implementation process.

The next step in implementing Lean Manufacturing is to develop a careful and comprehensive implementation plan. This plan must include high-level commitment within the organization, ensuring that leadership and senior management fully support this transformation. This commitment provides an important signal that Lean implementation is not just a temporary initiative, but is an integral part of the company's long-term vision and strategy.

Furthermore, employee involvement is a key factor in successful implementation. Involving employees from different levels and functions not only creates a sense of ownership of the change, but also brings a variety of views and experiences to the table. This engagement requires effective communication of the goals and benefits of Lean implementation, explaining how the changes will impact their daily work, and providing the necessary training to support the adoption of Lean principles in operational routines.

In addition, effective communication about the implementation process, including its stages and performance evaluations that will be carried out, is also very important. This helps create a shared understanding across the organization about why this change is necessary and how each individual can contribute to overall success. By detailing the steps clearly and communicating them transparently, companies can ensure that all team members are on the same page and committed to the journey towards more effective operations with Lean principles.

During the implementation phase of Lean Manufacturing, the company's main focus is identifying and overcoming all forms of waste in every stage of the production process. This involves in-depth analysis of existing workflows, with the aim of identifying activities or steps that do not add value and can be eliminated or optimized. Companies must also consider using supporting technology to increase process efficiency, such as implementing an integrated information system or automation in several production stages.

In addition, employee involvement is key in achieving continuous improvement. By encouraging active employee involvement in improvement initiatives, companies can identify potential problems from a broader perspective, increase the effectiveness of solutions, and create a culture that supports continuous improvement. It is important to provide proper training to employees so that they understand Lean principles and can apply them in their daily tasks. It's not just about understanding concepts, but also about empowering employees to actively participate in improving their own work processes. Thus, through identifying and addressing waste, effective

use of technology, and employee involvement, companies can achieve significant improvements in operational efficiency and product quality.

Continuous monitoring and evaluation is an important stage in ensuring the success of Lean Manufacturing implementation. Companies need to continuously monitor implementation progress to ensure that each step is in accordance with the established plans. This monitoring includes direct monitoring of operational changes, employee involvement, and the application of Lean principles in daily activities. Continuous monitoring provides an opportunity to identify potential obstacles or necessary changes quickly and proactively.

Regular evaluation is also important to measure implementation success. Companies must establish key performance indicators, such as operational efficiency, product quality, production cycle time, and customer satisfaction. Through this evaluation, companies can analyze the real impact of the changes they have implemented and identify areas that require further improvement. The results of this evaluation can provide valuable insights for optimizing production processes, identifying improvement opportunities, and ensuring that Lean implementation contributes positively to company goals and strategies.

Lastly, the cycle of continuous improvement, known as PDCA (Plan, Do, Check, Act), is becoming an important element in the Lean Implementation life cycle. With the first step "Plan," the company creates a detailed plan for improvement, sets specific goals, and details the steps to be taken. The "Do" stage involves implementing the plan in a production environment. Next, in the "Check" stage, an evaluation is carried out to compare the results with the initial objectives, identify potential non-conformities, and analyze the causal factors. Finally, in the "Act" stage, the company takes corrective action and designs strategies to implement the identified improvements.

By carrying out the PDCA cycle continuously, companies can create an environment that is responsive to change and improvement. Regular evaluation helps in identifying potential for further improvement, adjusting implementation plans, and ensuring that Lean Manufacturing remains relevant and effective. Apart from that, this cycle also creates an organizational culture that is proactive towards improvement, by involving all levels of employees in efforts to increase efficiency and quality on an ongoing basis. By integrating the PDCA cycle, companies can maintain the continuity of the Main Foundation of Effective Operational Management based on Lean Manufacturing, creating an environment that is dynamic, adaptive, and continues to develop according to changing market demands.

CONCLUSION

Implementing Lean Manufacturing as the Main Foundation of Effective Operational Management involves a series of planned and sustainable steps. These steps include identifying Lean principles, such as Just In Time (JIT), 5S, Kaizen, and added value as the basis for cultural and operational change. A comprehensive implementation plan must involve a high level of commitment within the organization, employee involvement, and adequate resource allocation. During implementation, the primary focus is identifying and addressing waste in each stage of the production process, involving workflow improvements, use of enabling technology, and employee engagement in continuous improvement initiatives. Employee training is key to understanding and implementing Lean principles. Continuous monitoring and evaluation helps ensure implementation conforms to plans, by measuring operational efficiency, product quality, production cycle time, and customer satisfaction as indicators of success. Finally, the cycle of continuous improvement (PDCA) is integral in ensuring the sustainability of the Main Foundation of Effective Operational Management based on Lean Manufacturing. By carrying out the PDCA cycle continuously, companies can improve processes, maintain adaptability to change, and create an environment that is proactive towards continuous improvement. Overall, this approach allows

companies to achieve operational efficiency, high product quality, and responsiveness to market dynamics .

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