

LEAN WASTE REDUCTION AND OPERATIONAL EFFICIENCY: INSIGHTS FROM LITERATURE

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Abstract

This paper explored the concept of lean waste reduction and its importance to operational efficiency of firms. The study synthesized findings from studies on lean practices and tools in different contexts and their report on the benefits of lean practices. Key themes identified in literature include the positive effect of lean tools like total productive maintenance, mistake proofing, workplace organization and continuous quality improvement. Studies emphasize the importance of effective implementation of lean practices to enhance maintenance, training, and control mechanisms for reducing production waste. Additionally, the review highlight that lean waste reduction is a viable frameworks firms can adopt to improve the Triple Bottom Line (people, profit and planet). This is tenable because lean waste reduction enhance cost reduction and optimizes lead time. The paper concludes by emphasizing the importance of dynamic capabilities, integrated methodologies, and strategic frameworks in optimizing operational efficiency and promoting sustainable performance in financial services and other sectors.

Keywords: inventory level, lean waste reduction, operational efficiency, order lead time,

Introduction

In the dynamic landscape of service providers, the pursuit of operational efficiency is paramount. One of the critical paradigms guiding this pursuit is the adoption of lean waste reduction. Lean waste reduction is rooted in the principle of eliminating waste and optimizing processes. The concept hold immense potential for enhancing operational efficiency across various dimensions, including service quality, delivery speed, flexibility and customer satisfaction.

Lean waste reduction offer a systematic approach to identifying and eliminating inefficiencies in organizational processes. By minimizing waste, whether in the form of excess inventory, redundant activities, or delays, firms streamline operations, reduce costs, and enhance overall performance (Sarkis & Sundarraj, 2020). In operating context marked by intense competition and high customer expectations, lean principles are imperative to maintaining competitive edge and sustaining long-term growth (Adeyemi & Adekunjo, 2021).

Operational efficiency, characterized by effective utilization of resources to achieve desired outcomes, is intricately linked with service quality. High service quality, marked by reliability, responsiveness, and accuracy, not only enhance customer satisfaction, it also foster trust and loyalty (Nadube & Barango-Tariah, 2020). Lean waste reduction is pivotal to enhanced service quality by minimizing errors, reducing processing times, and improving overall customer experience (Abu Nimeh et al., 2018).

Delivery speed is another crucial aspect of operational efficiency, especially in the service sector. In today's fast-paced environment, customers expect swift and seamless transactions (Waqas Azfar et al., 2014). Lean waste reduction enable service firms to expedite service delivery while maintaining accuracy and compliance (Oketch et al., 2020; Grönroos, 2017).

At the heart of operational efficiency lies the goal of enhancing customer satisfaction - a key determinant of loyalty and retention (Anderson et al., 2003). By implementing lean waste reduction, service firms optimize operations to better meet customer expectations, foster stronger relationships and drive sustainable growth (Ezeuduji & Okoli, 2019). Despite the

growing recognition of the importance of lean waste reduction to operational efficiency, there remains a gap in the literature regarding their specific application and impact.

This paper reviewed literature adequately conceptualize lean waste reduction and to unravel its impact of on operational efficiency of firms. Fig. 1 provides a framework for the paper. The subsequent sections of the paper present conceptual review on lean waste reduction, operational efficiency and its metrics and empirical review on lean waste reduction and operational efficiency. A conclusion was reached and recommendations made, at the end of the paper.

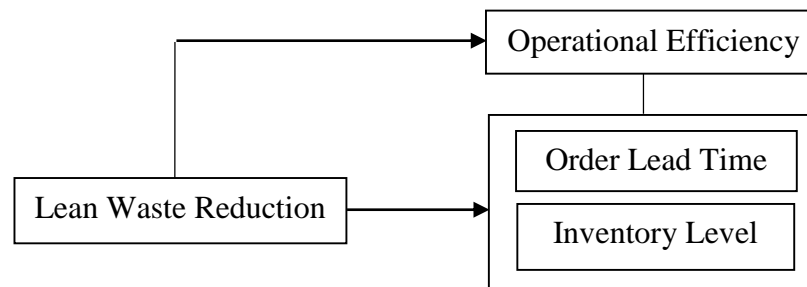


Fig. 1: Conceptual Framework of Lean Waste Reduction and Operational Efficiency

Lean Waste Reduction

Womack and Jones (1996) describe lean waste reduction as a systematic approach to identifying and eliminating non-value-adding activities in organizational processes to enhance efficiency and productivity. Pavnaskar et al. (2003) provided a broader perspective by characterizing lean waste reduction as a holistic approach to enhancing organizational efficiency by eliminating waste across functional areas, including procurement, inventory management, and distribution, with the goal of optimizing resource utilization and enhancing customer value (Adeyemi & Adekunjo, 2021). Thus, lean waste reduction is a continuous pursuit of waste elimination that perfection in organizational processes.

Shah and Ward (2007) contribute to the understanding of lean waste reduction by defining it as a systematic approach to identifying and eliminating wastes in transportation, inventory, production, processing, and skills utilization. Adeyemi and Adekunjo (2021) argue that lean waste reduction as a participatory approach to continuous improvement that emphasize employee involvement in identifying and implementing waste reduction initiatives.

Common sources of waste in the service sector include redundant processes, delays in transaction processing, and inefficient information flow (Olowookere et al., 2020; Abu Nimeh et al., 2018). The implementation of waste reduction initiatives in the service sector yield benefits, including process efficiency and environmental sustainability. By eliminating waste and optimizing processes, service firms reduce operational costs, enhance customer service levels, and minimize their environmental footprint (Ezeuduji & Okoli, 2019).

Despite the potential benefits, implementation of lean waste reduction is beset by several challenges, including regulatory constraints, legacy systems, cultural resistance to change, and limited access to technology and skilled labour (Olowookere et al., 2020). The complexity of service supply chains, coupled with the need for data security and regulatory compliance, adds another layer of challenge to the implementation of lean waste reduction.

Operational Efficiency

Bozarth and Handfield (2016) view operational efficiency as the ability of a firm to deliver products using minimal resources (time, money, and effort) without compromising quality or customer satisfaction. Kumar and Singh (2022) and Melnyk et al. (2020) characterize

operational efficiency as the optimization of processes and resources to achieve organizational goals while adapting to changing market conditions and customer needs in real-time. Nishikawa et al. (2021) and Gupta and Gupta (2020) defines it as the capability of firms to produce goods or services with minimal waste, maximizing productivity, and ensuring timely delivery to meet customer demands.

Operational efficiency is critical to organizational performance due to its potential to enhance frugal resources utilization and achieve desired outcomes while minimizing waste and maximizing productivity (Bozarth & Handfield, 2016). This means that a key aspect of operational efficiency is effective utilization of resources to accomplish organizational objectives (Melnik et al., 2020).

Operational efficiency directly impacts firms' ability to deliver quality service, manage costs effectively, and remain competitive (Adeyemi & Adekunjo, 2021). Operational efficiency is also closely linked to strategic goals and objectives, as organizations strive to align their operations with overarching strategic priorities (Kumar & Singh, 2022). By aligning operational activities with strategic intent, organizations ensure that resources are allocated effectively to support key initiatives and drive sustainable growth and profitability (Nishikawa et al., 2021).

Delivery speedy is essential to operational efficiency in the service sector because reflects ability of service providers to process transactions quickly and efficiently (Ezeuduji & Okoli, 2019; Waqas Azfar et al., 2014). Other crucial element of operational efficiency that affect customer satisfaction and retention include timely execution of transactions and flexibility (Adeyemi & Adekunjo, 2021; Olowookere et al., 2020). This imply that operational efficiency is a multifaceted concept, encompassing cost saving, service quality, delivery speedy, flexibility, and customer satisfaction. In this paper however, order lead time and inventory level are adopted to represent operational efficiency.

Order lead time

Order lead time is a crucial metric operational efficiency. This concept of order lead time has evolved over time, with contemporary definitions reflecting the complexities of modern supply chains and the increasing emphasis on customer satisfaction and responsiveness. It represent the time it takes for a customer order to be fulfilled from the moment it is placed until it is delivered (Simchi-Levi et al., 2021). Mentzer et al. (2001) and Mangan et al. (2020) describe order lead time as the elapsed time from the placement of an order to the receipt of product, encompassing order processing, manufacturing, transportation, and delivery. Chopra and Meindl (2016) and Lee (2004) provides that order lead time is the total time required to fulfil a customer order, including order processing, production, warehousing, transportation, and delivery, with a focus on minimizing delays and improving responsiveness.

As a critical metric in supply chain performance, order lead time, reflects the duration between the initiation of a customer order and its fulfilment. Order lead time is pivotal to operational efficiency, particularly in the context of service firms. Order lead time is fundamental to assessing efficiency and responsiveness of operations; as well the effectiveness supply chain management (Simchi-Levi et al., 2021; Lee, 2004). Firms try to minimize lead time through efficient processes, streamlined logistics, and effective coordination with suppliers and partners (Simchi-Levi et al., 2021).

Adeyemi and Adekunjo (2021) highlight the relevance of order lead time to meeting customer demands for swift transactions in the service sector. Delays in order fulfilment can lead to

customer dissatisfaction and loss of business opportunities (Ezeuduji & Okoli, 2019). This suggests that shorter lead time and enhance operational efficiency (Olowookere et al., 2020).

Inventory level

Chopra and Meindl (2016) and Bowersox et al. (2013) define inventory level as the volume of goods or materials maintained by an organization to support production, distribution, and customer service activities. This definition emphasizes the strategic relevance of inventory to balancing efficiency with service level objectives. Simchi-Levi et al. (2008) view it as the amount of stock a company holds at various stages of the supply chain to meet customer demand. These definitions highlight the multifaceted nature of inventory, and its importance to supply chain management (Stevenson & Hojati, 2017; Monczka et al., 2015).

Inventory level is critical to operational efficiency. Effective management of inventory is optimize resources, minimize costs, and enhance customer satisfaction. Oketch et al. (2020) and Abu Nimeh et al. (2018) highlights that inventory level is essential to meeting customer demand, balancing supply and demand, and minimizing costs associated with excess or inadequate inventory. By maintaining optimal inventory level, firms ensure sufficient liquidity to meet customer demands while managing risks associated with market fluctuations.

Waqas Azfar et al. (2014) argue that inventory levels must be aligned with organizational objectives; and emphasizes the implementation of lean practices, and leveraging technology to enhance inventory visibility and control. The adoption of technology enable real-time tracking of transactions, enhance risk management, and improve transparency in inventory management processes (Oketch et al., 2020).

Lean Waste Reduction and Operational Efficiency

Lean waste reduction is a widely acclaimed driver of operational efficiency across industries. Researchers have explored different lean practices to examine their effectiveness in reducing waste, enhancing productivity, and promoting sustainability. Tariku (2018) assessed the impact of lean manufacturing on waste reduction in the Arjo Didessa Sugar Factory, focusing on total productive maintenance, mistake-proofing, 5S, continuous quality improvement, and worker involvement. The results showed that although lean tools were implemented, production waste remained evident. Factors like worker involvement and continuous quality improvement were significant, yet the overall poor implementation hindered effective waste reduction.

Alzoubi et al. (2020) explored the relationship between sustainable supply chain strategies, supply chain collaboration, and competitive priorities in Jordanian pharmaceutical companies. The study found that integrating sustainability into the supply chain improved social and environmental achievements, promoting collaborative strategies with supply chain partners.

Udokporo et al. (2020) examined the adoption of lean, agile, and green (LAG) practices in fast-moving consumer goods (FMCG) companies and their effect on competitiveness, particularly in reducing costs, lead time, and environmental waste. Using SEM, the study showed that while combining LAG practices improve competitiveness, their effectiveness in reducing waste depend on product life cycle stage; and that insufficient knowledge of LAG paradigms by companies hinder waste reduction.

Akpan and Nsentip (2021) conducted a study on lean accounting's effect on waste management in Nigerian Breweries, focusing on Champion Breweries. Using a survey research design, data from 50 respondents were analyzed using ordinary least square regression. The study found that lean accounting significantly impacted process waste management but had little effect on product quality and inventory management. In another study by Ertz et al. (2021), it was

observed that perceived consumer effectiveness (PCE) is influential to predicting zero waste behaviour.

Rodrigues et al. (2021) addressed food waste in online retail supply chains, proposing a framework to measure and mitigate food waste. Based on interviews, surveys, and archival data, the study emphasized the need for dynamic capabilities to address the complexities of food waste in supply chains. The findings advanced the Natural Resource-Based View (NRBV) and introduced a food waste minimization model that could inform further research and practical applications in managing waste in online food retail supply chains.

Atep et al. (2021) investigated lean manufacturing design in reducing waste in customer complaint services in the Indonesian coil industry. By integrating Value Stream Mapping (VSM) and Waste Assessment Model (WAM), the study identify key wastes, including defects and overproduction, and proposed solutions to reduce complaint resolution time by nearly a day. The findings emphasized the importance of identifying and addressing waste sources in customer service processes to enhance operational efficiency and reduce waste.

Teixeira et al. (2022) examined impact of lean and green (LG) practices on competitive advantage in Portuguese companies, with lean maturity as a moderator. The results highlighted the importance of lean maturity in maximizing the benefits of LG practices for waste reduction and competitiveness. While the study of Kirin et al. (2022) which investigated lean management implementation in Serbian primary schools, found that lean management tools were effective in reducing waste in the education process.

The foregoing review demonstrates how lean waste reduction, when implemented effectively, significantly enhance operational efficiency, competitiveness, and sustainability. Each study highlights the importance of tailored lean practices, the integration of sustainable strategies, and the role of dynamic capabilities in achieving waste reduction and improving performance.

The review also present a comprehensive analysis of studies related to lean practices and their impact on operational efficiency and competitive advantage (Teixeira et al., 2022) of service (Lizarelli et al., 2024; Atep et al., 2021; Tariku, 2018); manufacturing (Rodrigues et al., 2021; Alzoubi et al., 2020; Udokporo et al., 2020); food and beverages sector (Akpan & Nsentip, 2021); and waste management firms (Ertz et al., 2021). Overall, literature provides valuable insights into the importance of lean waste reduction to operational efficiency and sustainable performance of firms. This position underscore the need to adopt lean waste reduction to optimize supply chain management and operational processes.

Conclusion and Recommendations

This paper delved into the concept of lean waste reduction and its import to operational efficiency. Based on the systematic literature review conducted, it was observed that lean waste reduction facilitate continuous improvement and process reliability, and enhance efficiency by eliminating non-value-adding activities. It also observed that lean waste reduction optimizes resource utilization and boosts environmental and social responsibility.

In addition, literature reveals that lean waste reduction enhance responsiveness to market dynamics and customer demands, inventory management, and customer satisfaction. The paper concludes that lean waste reduction streamline processes, reduce waste, and enhance service quality, and improves customer satisfaction and organizational performance. Thus, the paper recommends that services providers in that seek improved operational efficiency should lean waste reduction as a key lean supply chain management practice. This means that they must invest in training and development and to equip relevant personnel on lean principles and integrate sustainability into their supply chain management practices.

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