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# Implementation of Lean and Capacity Planning to Improve Food Truck Operational Efficiency as a Business Expansion Preparation Strategy

**Amaltea Fatimah Firdausi[1], Anton Mulyono Aziz[2]**
[1]Faculty of Economics and Business, Telkom University, Bandung, Indonesia
[2]Faculty of Economics and Business, Telkom University, Bandung, Indonesia
Corresponding: amalteafirdauzi@yahoo.co.id

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**ABSTRACT**

This study examines how Lean principles and capacity planning can enhance operational efficiency in small food businesses, focusing on Yokoso Neng Ikah, a food truck operating in Yaizu City, Japan. The business has faced persistent challenges, including long customer wait times, raw material waste, and uneven staff workloads during peak hours. While Lean and capacity planning are well-established in manufacturing and large service industries, there is limited research on their application in mobile food enterprises. This research aims to fill that gap by exploring how these strategies can streamline workflows, reduce inefficiencies, and improve labor management in a micro-enterprise context. Using a quantitative descriptive approach, data were collected through surveys with 40 respondents comprising the owner, managers, and staff. The data were analyzed with SPSS 31.0 using descriptive statistics to assess current operational practices and the effectiveness of Lean and capacity planning implementations. Results show that Lean tools such as visual aids and standardized routines have been moderately adopted and contributed to simplifying tasks, while flexible scheduling helped manage busy periods more effectively. However, responsiveness to sudden demand spikes remains limited, indicating room for improvement. Overall, this study demonstrates that Lean and capacity planning, although traditionally applied in larger-scale operations, can be successfully adapted to small-scale food service businesses, providing both practical recommendations for improving operational efficiency and contributing valuable insights to the field of micro-enterprise management.



## Introduction

In recent years, food trucks have emerged as a popular micro business model due to their mobility, low capital investment, and ability to directly serve customers in various locations. However, despite these advantages, food truck operators often struggle with operational inefficiencies such as long customer wait times, poor resource allocation, and material waste that hinder their potential for growth. This issue is particularly evident in the case of *Yokoso Neng Ikah*, an Indonesian food truck operating in Yaizu

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City, Japan. The truck frequently experiences unbalanced staffing during peak hours, excess raw material use, and process delays, all of which point to weaknesses in operational planning.

This study was initiated to explore the application of Lean principles and capacity planning as an integrated approach to improving operational efficiency in a food truck environment. Lean focuses on eliminating non-value-added activities, while capacity planning ensures the optimal use of labor and resources according to demand fluctuations. The objective of this research is to assess the current implementation of Lean tools particularly visual aids like Kanban and examine how resource planning can better support daily operations. Ultimately, the findings aim to offer insights that not only improve internal efficiency but also serve as a preparatory strategy for future business expansion.

Relevant literature supports the use of Lean and capacity planning in small business settings. Studies have shown their effectiveness in both manufacturing and service industries. This paper contributes to the growing body of knowledge by applying these concepts in a food truck context, with a specific focus on micro-enterprise development and operational readiness for scaling up.

## LITERATURE REVIEW

### Theoretical Review

Lean thinking, as developed by Womack & Jones (1997), aims to create more value with fewer resources by systematically eliminating waste. In the context of food services, Lean tools such as Kanban, 5S, and visual control can simplify work processes, reduce waiting times, and optimize task flow (Ramesh & Kodali, 2012). Kanban systems, specifically, use visual signals to control production and inventory, leading to improved efficiency and responsiveness in operations Shah & Ward (2022).

Capacity planning complements Lean by ensuring that an organization can meet demand without overextending resources. According to Stevenson (2021), capacity planning involves forecasting workload and aligning it with available resources, including manpower, materials, and equipment. Krajewski et al., (2016) emphasize that effective capacity planning helps maintain service consistency and prevents under- or over-utilization of assets.

Integrating Lean with capacity planning creates synergy in process improvement, as it not only eliminates waste but also ensures the right level of capacity is available to meet customer needs. This integration is particularly useful for small and mobile businesses like food trucks, which often face fluctuating demand and space constraints (Gupta & Jain, 2015).

Furthermore, Irjayanti & Mulyono (2012) highlight that SMEs in Indonesia often face structural and managerial inefficiencies, which can be mitigated by adopting systematic operational frameworks such as Lean. Their study identifies common barriers including limited capacity, inconsistent demand management, and high operational waste, all of which align with the areas addressed by Lean and capacity planning.

In line with this, Alamsyah et al. (2022) propose the use of integrated systems for transparency and traceability in supply chains, particularly within the halal food ecosystem. Although their focus is on blockchain, the implication of synchronized processes and efficient resource management resonates with Lean's emphasis on real-time control and minimal waste.

## METHOD

This research applies a quantitative descriptive method to explain clearly how Lean principles and capacity planning are used to improve the daily operations of the Food Truck Yokoso Neng Ikah. The study was conducted at the food truck's main location in Yaizu City, Japan. The focus is on how work is organized, how inventory is managed, how staff are scheduled, and how Lean tools especially Kanban are used during regular service and busier times such as special events. This method helps describe how

the business adapts to different levels of customer demand and resource needs. There are three main variables in this study: Lean Implementation, Capacity Planning, and Operational Efficiency.

Lean Implementation refers to how often and how well Lean practices like Kanban, waste reduction, and 5S are used. This is measured through things like how frequently waste is reduced, how visual tools are used, and how well the staff understand and apply Lean methods.

Capacity Planning relates to how the food truck prepares its staff, materials, and equipment to handle customer demand. It is evaluated by looking at how accurate the work schedules are, how well future demand is estimated, and how efficiently inventory is controlled.

Operational Efficiency shows how smooth and productive the operations are. It is measured using lead time, waiting time, and a percentage that compares value-added activities to the total time spent on each process.

To gather data, the researcher used a structured questionnaire, which was given to 40 people: the owner, two managers, and 37 operational staff. The questions were designed to learn about how Lean tools and capacity planning are being used and how they affect work efficiency. In addition to the survey, the researcher also observed how operations were carried out during the day, especially looking at the use of Kanban and how resources were managed. Other supporting data were also collected from documents such as staff schedules, inventory logs, and activity reports.

All observations and data collection took place in one day, which was chosen because it represented a typical working day. The goal was to observe real-time activities and how Lean and capacity strategies were applied in practice.

The main tool used for analysis was SPSS 31.0 software. Before analyzing, the researcher checked the data for validity and reliability. The reliability test using Cronbach's Alpha showed values above 0.85, meaning the questionnaire was consistent and dependable. Descriptive statistics like mean, frequency, and standard deviation were used to help explain the results clearly.

This method allowed the researcher to describe in detail how Lean and capacity planning were being used, and how they helped improve operations. The findings also offer ideas for making future improvements and preparing for business growth.

## I. Result / Finding

This study assessed the operational efficiency and workload capacity of *Yokoso Neng Ikah*, a food truck offering authentic Indonesian meals during event-based operations in Yaizu, Japan. The business typically serves 600 meals per day, consisting of 200 servings each of bakso, mie ayam, and nasi padang during a 6-hour operational window.

Field observation revealed the average service time required for each menu item was 9 minutes for bakso, 10 minutes for mie ayam, and 8 minutes for nasi padang. This results in a total daily workload of approximately 5,400 minutes. Meanwhile, the available manpower consists of five staff members, each working 360 minutes (6 hours), for a total available capacity of 1,800 minutes.

This indicates a significant overload of 3,600 minutes, as shown in Table 1.

Table 1. Production Time vs Available Capacity

| Description | Minutes |
|---|---|
| Total Time Required (600 meals) | 5,400 |
| Available Time (5 staff × 360 mins) | 1,800 |
| Time Deficit / Overload | +3,600 |

Source: Processed by author (2025)

To validate these findings, a questionnaire was distributed to 40 respondents, including the owner, two managers, and 37 staff members. The results showed that 80% of respondents agreed that service times were too long, often resulting in customer queues and reduced satisfaction. Additionally, only 60% of staff members reported a clear understanding of the Kanban system, signaling a need for improved

visual management training.

To further examine staff perceptions, descriptive statistics were calculated using IBM SPSS 31.0. The results are presented in Table 2.

Table 2. Descriptive Statistics of Research Variables (N = 40)

| Variable | N | Min | Max | Mean | Std. Deviation |
|---|---|---|---|---|---|
| Lean-Kanban | 40 | 17.0 | 25.0 | 23.10 | 1.96 |
| Capacity Planning | 40 | 17.0 | 25.0 | 22.83 | 2.16 |
| Operational Efficiency | 40 | 17.0 | 25.0 | 22.98 | 2.08 |

Source: IBM SPSS Statistics 31.0, 2025

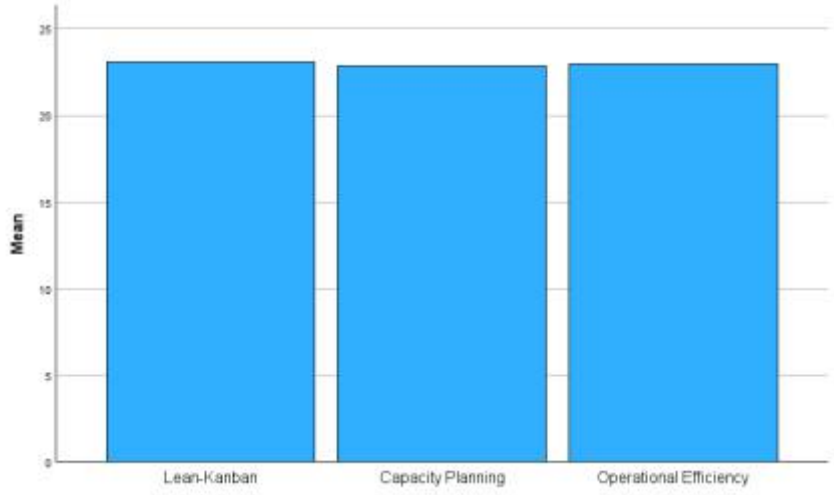


Figure 1. Mean Scores of Lean-Kanban (X1), Capacity Planning (X2), and Operational Efficiency (Y) (Source: IBM SPSS Statistics 31.0, 2025)

Figure 1 illustrates the average scores of each variable measured in the study. The Lean-Kanban variable scored the highest with a mean of 23.10, followed closely by Operational Efficiency at 22.98, and Capacity Planning at 22.83. The small differences between these values reflect a fairly consistent perception among respondents, although there remains room for strengthening planning capacity to match the lean implementation.

Rather than increasing the number of workers, the food truck implemented a lean-based solution: the Kanban system. This visual workflow control system was simulated across three primary workstations: preparation, cooking, and assembly/plating. Work-in-progress (WIP) limits were established to balance tasks and reduce bottlenecks. The workflow simulation is shown in Table 3.

Table 3. Simulated Kanban Workflow for 5-Person Team

| Station | Task | Avg. Time | WIP Limit | Notes |
|---|---|---|---|---|
| Preparation | Ingredient cutting, boiling, portioning | 2 mins | 3 trays | Restocked every 10 minutes |
| Cooking | Heating soup, boiling noodles/rice | 4–5 mins | 5 trays | Depends on stove/pan availability |
| Assembly / Plating | Garnishing, packaging, handover | 2–3 mins | 3 trays | First-in-first-out (FIFO) with Kanban cards |

Source: Processed by author (2025)

This system allows the food truck team to reduce service delays, synchronize tasks, and minimize motion waste without increasing labor. The use of Kanban cards, tray based WIP limits, and task zoning

provides a visual and disciplined method of balancing production flow, even during peak hours.

The combination of workload analysis, staff perception, and Kanban simulation highlights the importance of lean and capacity planning as a foundation for business scalability and sustainable operational improvement.

## DISCUSSION

This section discusses the research results by linking data obtained from descriptive statistical analysis with relevant theories and previous findings. The purpose is to logically explain how the implementation of Lean and capacity planning impacts the operational efficiency of the Food Truck Yokoso Neng Ikah.

Survey results from 40 respondents, including the owner, managers, and operational staff, show that most understand and apply Lean principles in daily operations. In particular, they use the Kanban system to manage workflow and prevent work-in-process buildup. This has been proven to speed up service, reduce waiting times, and decrease food waste such as rice and protein. These results align with findings by Gładysz & Buczacki (2020), who stated that Kanban implementation effectively improves operational efficiency and reduces waste in food service.

Most staff reported that the work system became more organized after applying the Kanban board, as the entire team could view work status in real time. This supports Burgo et al. (2024), who noted that visualizing work through Kanban enhances coordination among staff. Additionally, the concept of limiting the number of tasks in progress (WIP limit) helps prevent task overload during busy hours, consistent with Danylenko (2021) research.

From the capacity perspective, data shows that increasing production volume does not always lead to higher efficiency. This is evident in the food waste graph, which rises as output increases. This situation reflects the need for proper capacity planning to adjust production volume with demand fluctuations. According to Stevenson (2021), capacity planning must consider three main components: design capacity, effective capacity, and actual output. In this case, actual capacity increased, but waste also rose because effective capacity was not yet optimal.

With an integrated Lean approach combined with capacity strategy, some respondents acknowledged that they began to understand the importance of adjusting working hours, staff rotation, and task distribution based on realistic workloads. This aligns with Calystania et al. (2022), who argued that culinary SMEs must be able to adapt their resources to demand fluctuations to avoid overcapacity or undercapacity.

Based on questionnaires and observations, operational efficiency indicators such as lead time, productivity, and waste volume improved compared to before Lean implementation. Average service time decreased from 15 minutes to about 7 minutes per order, which is close to the results achieved by food trucks in Danylenko (2021) study. Meanwhile, raw material waste was reduced from around 20% to below 10% after standardizing work and applying demand-based stock control (Just-In-Time).

From the staff perspective, the Kanban-based work system and capacity allocation enabled them to work more focused and collaboratively. They felt that visual tools like daily task boards helped reduce confusion in decision-making. This supports the study by Matindana & Shoshiwa (2025), which showed that visual management through the use of labels, boards, and signs helps improve team communication and operational synchronization in units with limited resources and space. These findings also agree with Gładysz & Buczacki (2020), who found that flexible visual layouts positively affect team adaptation and coordination when facing demand variations.

Furthermore, the research shows that this efficiency improvement opens opportunities for more structured business expansion. When work systems are well organized and resources are used efficiently, the business owner can better estimate operational needs for new branches or franchise collaborations.

However, this study also found that the implementation of Lean and capacity planning is not yet fully optimal. Some staff admitted they have not received formal training on Lean principles or Kanban use. This indicates the need for continuous training and consistent use of Lean tools to achieve better results, as recommended by Saddikuti et al. (2021) in their continuous improvement (kaizen) approach.

Overall, this research supports that integrating Lean and capacity planning positively affects the operational efficiency of the food truck, especially in a mobile microbusiness context like Yokoso Neng Ikah. Applying these principles has proven to reduce waste, speed up service, and balance production capacity. These findings align with Martis et al. (2023), who stated that efficiency-based strategies are crucial in preparing for sustainable business expansion.

Study limitations include reliance on self-reported data and a single-case design. Future research could track waste patterns longitudinally.

## CONCLUSION

This study explored the application of Lean methods and capacity planning in improving the operational efficiency of the Food Truck Yokoso Neng Ikah. Based on the findings, it can be concluded that implementing Lean especially through the Kanban system helped streamline workflows, reduce food waste, and shorten service times. The use of visual tools such as task boards allowed better coordination and communication among team members. Although production increased, the rise in food waste indicated that capacity planning must be improved to avoid inefficiencies caused by demand fluctuations. In summary, integrating Lean principles with effective capacity planning has proven to benefit small mobile food businesses by optimizing processes, improving time efficiency, and preparing the business for sustainable growth.

Recommendations based on the study are as follows:

1. Employee Training: Continuous training on Lean principles and Kanban tools is essential to enhance staff understanding and maintain consistency in implementation.

2. Optimize Capacity Planning: Business owners should regularly review actual capacity and adjust production according to customer demand to reduce waste.

3. Strengthen Workflow Standardization: Clear task divisions, realistic workload distribution, and visual monitoring systems should be maintained and improved.

4. Support Sustainable Expansion: The efficiency gained from Lean practices can serve as a strong foundation for planning future branches or franchise models.

5. Monitor Key Performance Indicators (KPIs): Regular tracking of service times, waste levels, and staff productivity will help ensure ongoing improvement.

These conclusions and recommendations are expected to support micro-businesses, especially mobile food services, in becoming more efficient, adaptive, and growth-ready.

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