PROPOSED IMPLEMENTATION OF LEAN (MANAGING WASTE) IN A SUNDANESE RESTAURANT IN BSD

Sandy Kirana Ritista Atmaja

Institut Teknologi Bandung
sandy_kirana@sbm-itb.ac.id

Abstract. The culinary industry in Indonesia has experienced significant growth, contributing 38.38 percent to the country's GDP. However, food waste remains a major environmental issue, with food losses accounting for 8% of greenhouse gas emissions. This research focuses on Restaurant X, a renowned dining establishment in South Tangerang, known for its Sundanese cuisine. The main challenge faced by Restaurant X is high waste levels, which have a negative impact on profitability. The waste originates from two aspects: fresh materials waste and dry materials waste. The objective of this research is to reduce waste in the restaurant by implementing waste management strategies. The Lean concept and DMAIC (Define, Measure, Analyze, Improve, Control) framework will guide the research process. Waste measurement revealed that Restaurant X has a waste level of 2.61% of their total revenue. To understand customer preferences, a survey using questionnaires was conducted directly with customers. The analysis identified two root causes directly linked to high waste: miscalculations on prepared materials and supplier errors. Value-added analysis was employed to distinguish between value-added and non-value-added activities. The researcher proposes three solutions: enhancement of operational processes, supplier assessment, and waste reduction. A Gantt Chart is provided to assist the restaurant in implementing the proposed solutions. In conclusion, this research highlights the need for waste reduction in Restaurant X, a prominent Sundanese restaurant.

Keywords: DMAIC, Ethnic, Restaurant, Waste, Waste Management

1 INTRODUCTION

In recent years, Indonesia's culinary sector has grown remarkably, playing a vital role in the economy of the nation. The industry contributes a significant 38.38% of Indonesia's GDP, reflecting the country's rich and lively culinary scene, which draws both locals and visitors. Restaurant X distinguishes out among the numerous restaurants in the archipelago as a culinary gem, recognised for its distinctive fusion of Sundanese food. Restaurant X, a sought-after location for traditional Sundanese dining experiences, is situated in the thriving metropolis of South Tangerang. Aiming to maximise earnings while upholding the greatest standards of culinary perfection, Restaurant X was founded with a purpose to provide not only cuisine but also a captivating environment and unmatched customer service. It has built up a devoted and diverse clientele over the years who value its commitment to

providing wonderful cuisine steeped in rich cultural history. The high amount of waste in Restaurant X's operational activities, however, poses a serious problem that could derail its path to success despite the plaudits and popularity. The restaurant's waste management problem has become a pressing issue that needs to be addressed right away because it not only affects the business's profitability but also runs against the company's main goal of maximising earnings. Waste in the food sector is not only a problem for the environment, but it also has a big financial impact. Research indicates that food waste contributes to 8% of greenhouse gas emissions globally, illustrating the wide-ranging effects of this issue. The goal of this study is to investigate and deal with the problem of waste management at Restaurant X, with a focus on the waste produced from both fresh and dry materials. This study attempts to offer actionable recommendations to eliminate waste and realign the restaurant's operations with its primary goal of profitability by examining the causes of waste and how it affects manufacturing costs.

2   THEORETICAL FRAMEWORK

Lean Six Sigma. Lean is a way of thinking that places a strong emphasis on reducing waste and utilising fewer resources to generate high-quality goods. A lean implementation, on the other hand, attempts to improve operations across the entire value stream in order to increase the customer's optimal value and eliminate waste (Gazperz, 2007). Lean is currently widely used throughout the world to continuously improve enterprises. Lean's two key tenets are constant improvement and employee respect. The future expansion of the organisation in a lean environment depends on these two pillars. The lean manufacturing concept is particularly well-liked in the production and service sectors. Lean manufacturing's fundamental goal is to eliminate any procedures or actions that do not enhance the end product. This entails cutting the cost of handling and shipping while also lowering errors, improving manufacturing efficiency, and decreasing inventory. Lean manufacturing, assembly, or management is an output process in a process of manufacture that includes not only the organisational aspect but also the supplier chain inside the company itself (Rathje et al, 2009). While implementing the idea for the first time, the organisation might not certainly achieve the desired outcome (Rathje et al., 2009). The Six Sigma quality management system uses the DMAIC problem-solving approach to enhance business operations. Define, Measure, Analyse, Improve, and Control is referred to as DMAIC.

A sample size is a subset of the population that is selected for an experiment or study. The researcher must be conscious of the minimal requirements for responses that must be fulfilled in order for the information to be analysed prior to analysing the customer data. The aim of the smallest number of data is to avoid bias. A sample that is either small or too large could introduce biases or lead to inaccurate conclusions. The researcher is using Cochran's sample size formula since the number of individuals in this investigation is enormous or unknowable.

$$n_0 = \frac{Z^2 * p * q}{e^2}$$

Waste Management. The most widely used strategy for increasing output and efficiency is waste reduction. Waste is any labour that is performed throughout the transformation of a product from its beginnings to its outcome but adds no value (Annisa, 2014). Waste is defined as any work activities along the value stream mapping that do not add value to the process of turning inputs into outputs (Gaspersz, 2011). Waste not only adds no value to any activity but may also cost businesses money. Ohno in his book, Toyota Production System (1998), stated that there are seven plus one type of waste, namely as follows:
1. Defect
2. Overprocessing
3. Waiting
4. Transportation
5. Inventory
6. Motion
7. Overproduction
8. Skill Misused

The inventory will be the researcher's main area of attention in this investigation. The inventory listed here is made up of dry and fresh products. The waste calculation will take the inventory's waste into account. The level and cost of trash at the restaurant will be the focus of the study. For this estimate, the researcher uses data from an earlier study.

$$Waste\ Level = \frac{Total\ Waste\ (Rp)}{Expected\ Revenue\ (Rp)}$$

Where:
Total Waste (Rp) = total calculation of waste in rupiah (Rp)
Expected Revenue (Rp) = average amount per transaction x average customers in a day x 7 days (a week)

$$Preparation = Waste\ Stream + Actual\ Usage$$

The cost of waste will be calculated by the researcher using the formula above. The figure is based on the cost of preparation. When they are first obtained and are still in their initial form, the condition is known as preparation cost. Waste cost happens when the previous state is used and waste remains on the materials.

3   RESEARCH METHODS

The stages that will be taken during the inquiry are outlined in the research technique

chapter, guaranteeing an organised and purpose-driven approach. The DMAIC methodology, which refers to Define, Measure, Analyse, Implement, and Control, was chosen by the researcher to be used in this particular study, which is focused on minimising waste in Restaurant X. This framework offers a well-organized flowchart that directs the research approach and acts as a guide for the waste procedure.
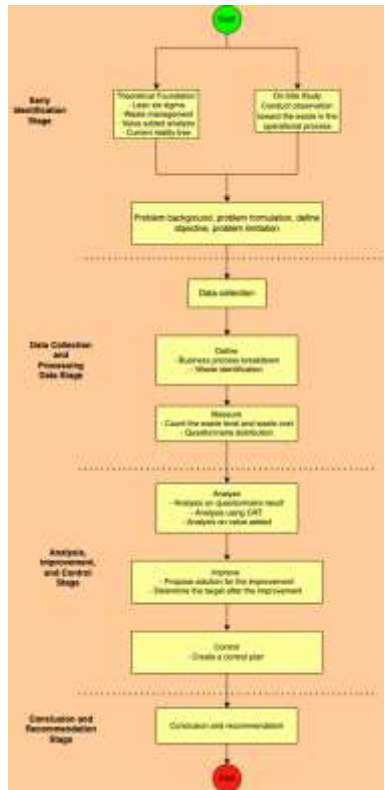

Figure 1. Flowchart of the Methodology

In the way depicted in the graphic above, the researcher will conduct the study. The flowchart comprises four stages: early discovery, data gathering and processing, analysis, improvement, and control, and conclusion and recommendation. There are specific activities for each stage, and each of those activities may contain one or more additional activities. The flowchart is intended to aid in the researcher's comprehension of the process and how the work fits into the overall framework of the study.

4   ANALYSIS AND DISCUSSION

4.1 Define
4.1.1 Business Process Mapping
A helpful technique for illustrating the flow of contacts and events that occur throughout Restaurant X's everyday operations is business process mapping. By seeing and conversing with stakeholders, the researcher gains a better understanding of the specific steps and practises used in the restaurant. Business process mapping is being used in this study to provide participants a complete understanding of Restaurant X's operating procedures. It aims to record the interactions, inputs, outputs, and activity flow among various groups or individuals involved in running the restaurant. The business process mapping diagram created by the researcher shows the activities that take place from the moment a customer enters the restaurant until their order is delivered. The framework provided by the business process mapping also allows for an examination of how waste impacts operational processes. It makes it possible for the researcher to identify the process-related areas where waste occurs, whether as a result of an excessive amount of inventory, an inefficient workflow, or other factors. An efficient way to comprehend and record Restaurant X's standard operating procedures is through business process mapping. The researcher can more clearly grasp the processes, inputs, outputs, and relationships, pinpoint problem areas, and create practical solutions to improve the restaurant's operational performance. There are 4 main operational procedures at Restaurant X. Planning, ordering/purchasing, storing, and cooking and serving are the four tasks. From beginning to end, the four activities support everything that happens in the restaurant. Each phase in these operational tasks has a distinct purpose and set of goals. Together, these four key procedures in Restaurant X's operational activities make sure that everything runs well and that customers receive exceptional cuisine and service. Each procedure has a unique purpose and goal that adds to the restaurant's overall effectiveness and success. In the long run, Restaurant X will be able to maximise earnings by reducing waste, maximising customer happiness, and continuously monitoring and optimising these operations.

4.1.2 Waste Identification
Waste of Fresh Materials. The fresh ingredients in Restaurant X are not designed to be kept on hand; rather, they are meant to be used within a day. By using the freezer, you may increase the shelf life of these ingredients and lower the risk of deterioration. However, the kitchen staff follows a routine procedure and discards any leftover fresh products at the end of the day if they have not been used. The restaurant has decided to institute a policy whereby all of the remaining fresh materials are thrown away, even though some of them may be designated for use in the preparations the following day.

Waste of Dry Materials. Dry ingredients belong to those that have a lengthy shelf life and are typically maintained on the shelf in Restaurant X as stocks. Compared to fresh materials, which are meant for immediate use and are not kept in stock, dry materials operate as an easy resource that helps reduce wait times and ensures the restaurant isn't running out of

essential ingredients. The restaurant proactively stocks up on dry items to improve the efficiency of the kitchen. Without wasting time waiting for a request or restock, the cooks can rapidly access these components and use them in a variety of cuisines. By doing this, the cooking process is sped up and the likelihood of interruptions brought on by running out of specific ingredients is reduced.

4.2 Measure
4.2.1 Waste Level and Waste Cost Calculation
Restaurant X claimed that their current issue is with the cost of garbage. They ponder what their ideal income would be if they could maximise their resources. They just came to the realisation that their waste costs were eating into their potential revenue. According to them, it raises the expense of their garbage. To be more precise, they should also be aware of the volume of trash in their restaurant. The researcher will want the information on the waste from a number of things from the collaboration with the restaurant in order to measure the waste level and waste cost of Restaurant X. The contents are displayed here, while the appendix contains the remaining materials.

The researcher was able to determine the amount of fresh and dry materials that were completely wasted at Restaurant X using the data. The following formula will be used in this study's goal to determine the level of total waste.

$$Waste\ Level = \frac{Total\ Waste\ (Rp)}{Expected\ Revenue\ (Rp)}$$

Over a period of a single day, the researcher collected data from the eatery and used that data to compute the results. There are typically 264 consumers every day, and the average transaction costs Rp325,000. With the knowledge we have, we can predict the income.

Calculation:
Expected Revenue = Average amount per transaction x Average customers in a day
Expected Revenue = Rp325,000 x 264 x 7
Expected Revenue = Rp600,600,000

We can assume that the materials quantity is 100% once all of the components are prepared for usage and when the restaurant is open. The information that had previously been gathered came from the researcher's direct observation in Restaurant X as well as the restaurant's historical records. Because it is very private and the restaurant did not want to make it public, the researcher was unable to obtain the restaurant's actual revenue. In this instance, the researcher made an effort to collect data through direct observation and compare it to past data in order to determine the assumption on the anticipated revenue.

In this instance, the researcher uses information from the 224 materials in the food and beverage category. Based on the information we gathered, Restaurant X generated

Rp15,653,896 worth of garbage between May 29 and June 4, 2023. According to our calculations, Restaurant X has a waste level of 2.61%. The waste level for Restaurant X is 2.61%, which means that some of their revenue is lost to material waste. The profitability and financial success of the restaurant may be directly impacted by this waste. Waste results in a loss of potential revenue because of the expense of the items that are left unused or discarded. This loss is expressed as a proportion of the restaurant's overall income. The waste level of 2.61% in the case of Restaurant X indicates that, on average, 2.61% of the restaurant's weekly revenue is lost owing to material waste.

4.3 Analyze
4.3.1 Questionnaire Survey
In relation to the computation, the outcome is 96.04, which we round up to 97. Thus, 97 will be the required minimum number of respondents. In this instance, the researcher was able to compile 159 respondents from the questionnaire, exceeding the required minimum. The researcher will use the questionnaire's results to compile his or her thesis; the restaurant will also use some of the information to make improvements. This survey yields two results: the preferences and interests of the customers.

Table 1. Customer's Interest in the Dishes

No	Dish	Customer's Interest (Real Number)	Customer's Interest (Percentage)
1	Nasi Timbel Cianjur	33	13.69%
2	Iga Bakar Lada Hitam	35	14.52%
3	Ayam Betutu	35	14.52%
4	Gurame Bakar	40	16.60%
5	Sop Buntut	23	9.54%
	Total	241	100%

With 40 customers choosing it, Gurame Bakar is the restaurant's most popular dish, as seen from the table. This is equivalent to about 16.60% of the respondents. With 35 individuals voting for each dish, Iga Bakar Lada Hitam and Ayam Betutu tied for second and third place. For each dish, this corresponds to roughly 14.52% of the responders. With 33 individuals choosing it as their favourite dish, nasi timbel cianjur is the fourth most popular dish. This is equivalent to about 13.69% of the respondents. With 23 people choosing it as their favourite meal, sop buntut ranks sixth in terms of popularity. This represents about 9.54% of the respondents. These data provide insightful data on the most popular dishes among Restaurant X's patrons.

Table 2. Customer's Interest in the Beverages

No	Dish	Customer's Interest (Real Number)	Customer's Interest (Percentage)
1	Mocktail	11	5.82%
2	Juice	59	31.22%
3	Tea	33	17.46%
4	Coffee	35	18.52%
5	Equil	35	18.52%
	Total	189	100%

According to the data, there were 59 persons who chose juice as their beverage at Restaurant X, making it the most popular option. This represents about 31.22% of the respondents. Coffee and Equil are the second and third most popular drinks, with 35 people choosing each. Each of these options corresponds to roughly 18.52% of the respondents. With 33 people choosing tea as their preferred beverage, tea is the fourth most popular beverage. This represents about 17.46% of the respondents. The fifth most chosen option, chosen by 11 people, is the mocktail. This is equivalent to 5.82% of the responders. These numbers reveal important information about Restaurant X patrons' preferences for beverages.

4.4 Improve
4.4.1 Enhancement of Operational Processes
The researcher suggests improving operational processes as a remedy for Restaurant X's underestimation of prepared supplies and waste reduction. Without altering any laws or technological details, this solution concentrates on enhancing and incorporating new operations inside the current operating framework. The objective is to reduce error and maximise the use of new materials.

4.4.2 Supplier Assessment
The study suggests using supplier assessment as a remedy to address the problem of supplier errors and lessen waste brought on by inconsistencies in the supply chain. This solution focuses on choosing the best suppliers based on a variety of criteria that are essential for productive collaboration. The objective is to make certain that the selected suppliers have the skills required to fulfill Restaurant X's criteria and reduce errors.

4.4.3 Waste Reduction
In this phase, the researcher will make waste reduction recommendations to the management. Improving the financial industry and lowering waste levels are the goals of waste reduction. As we already know, the restaurant wastes 2.61% of its whole revenue.

The restaurant must establish its goal waste level in order to achieve the waste reduction. It is necessary for the target waste level to be lower than the current waste level. As an illustration, the goal waste level will be set at 1%.

Table 3. Waste Calculation Comparison

Comparison	Preparation Cost	Waste Stream	Actual Usage
Existing	Rp96,779,024	Rp15,653,896	Rp81,125,128
After Implementation	Rp87,122,789	Rp5,997,661	Rp81,125,128

We can observe from the data above that decreasing preparation costs and waste streams are causing waste levels to decrease. This claim indicates that Restaurant X is successfully using the researcher's suggested remedy to address their present waste-related issue. It would be much preferable for Restaurant X to enhance actual usage in order to significantly lower waste levels. With this suggested remedy, Restaurant X might be able to achieve their goal of maximising earnings.

4.5 Control
Following the formulation of an alternative for Restaurant X, the researcher uses a control plan as a framework to ensure that the improvement strategy is always on course and is under management supervision. The major procedures and controls put in place to guarantee constant quality and adherence to standards in a restaurant are outlined in the control plan. The proposed control plan's five main areas of concentration are food, service, operational processes, suppliers, and waste.

5   CONCLUSION

In order to get as much data as possible for the study, the researcher conducted direct observation and interviews with the stakeholders. The researcher used a present reality tree to perform a root cause analysis to address the problem. Five underlying causes—price is too high, customers have little time, customers want to be serviced first, calculation errors on the produced materials, and supplier mistakes—have been determined via the efforts. Reduced client traffic is being caused by the first three fundamental reasons, while excessive restaurant waste is being caused by the last two. The researcher in this study is more concerned with the waste. The researcher advises applying an improvement to operational processes to address the issue of miscalculation. This entails increasing planning precision, predicting client demand, and making sure that inventory is managed effectively. Restaurant X can reduce waste and manage costs by matching the quantity of prepared products with actual demand. The researcher advises developing a supplier assessment programme in relation to supplier errors. In order to do this, suppliers must be assessed based on criteria like credibility, dependability, pricing, communication, and availability. The restaurant can decrease supply chain errors, minimise extra inventory, and improve overall operational efficiency by choosing reliable and effective suppliers. The researcher also emphasises the significance of conducting routine evaluations and

collecting client feedback via surveys. As a result, the restaurant may better understand patron preferences, identify popular and unpopular menu items, and adjust the menu as necessary. Restaurant X may increase patron pleasure and loyalty by fulfilling expectations and continually improving the dining experience.

The DMAIC framework, which stands for define, measure, analyse, improve, and control, was used to conduct this investigation. During the define step, the researcher will break down the operational procedures into a business process diagram. The researcher will then identify the trash. In the measure step, the researcher will hand out questionnaires to customers of Restaurant X and calculate the cost and waste level of the establishment. Thirdly, the researcher will review the survey results and the added value that meal preparation and service provide. The next step is analysis, which uses a current reality tree to identify the root cause. The researcher will determine the restaurant's future waste target and provide answers for the current issue for the stage of improvement. The researcher will next provide a control strategy for the restaurant in the control stage after completing the improve stage. The researcher also makes recommendations for lowering waste in the direction of the desired waste. By concentrating on trash, the restaurant can minimise its waste expenditures and target its waste level. This aids in the restaurant's ability to operate successfully and accurately plan its food budget. Profitability and sustainability may be enhanced after the restaurant makes a commitment to the goal of minimising waste and maximising profit. Overall, by implementing these suggested solutions and consistently monitoring and improving operational procedures, Restaurant X can efficiently manage waste, reduce expenses, and work towards achieving its primary goal of maximising profits while providing a memorable dining experience for its patrons.

REFERENCES

1. Ahmad, F. (2020). PENGERTIAN RESTORAN: Jenis, Tujuan, Produk dan Sistem Pelayanan. [online] Available at: https://www.amesbostonhotel.com/pengertian-restoran/.
2. Anderson, H. et al. (2023) "Differences in food parenting at home versus restaurants among parents of 3-to-8-year-old children," Appetite, 183, p. 106456. Available at: https://doi.org/10.1016/j.appet.2023.106456.
3. Angelia, D. (2022). Usaha Kuliner di Indonesia dalam Bingkai Statistik. [online] GoodStats. Available at: https://goodstats.id/article/lebih-dari-10000-usaha-kuliner-ada-di- indonesia-bagaimana-statistiknya-OTIU5.
4. Aria, P. (2022). | Industri Makanan dan Minuman Akan Kembali Normal pada 2022. [online] Available at: https://www.gapmmi.id/article/read/7669/industri-makanan-dan-minuman-akan-kembali-normal-pada-2022
5. Aybek, G. and Özdemir, B. (2022) "Effects of ethnic restaurant experience on prospective tourist intentions: Mediating role of food image," Tourism Management Perspectives, 44, p. 101034. Available at: https://doi.org/10.1016/j.tmp.2022.101034.
6. Dettmer, H.W. (1998) Breaking the constraints to World-Class performance. Available at: http://ci.nii.ac.jp/ncid/BA41047439.
7. Du, Z., Fan, Z.-P. and Sun, F. (2023) "O2O dual-channel sales: Choices of pricing policy and delivery mode for a restaurant," International Journal of Production Economics, 257, p.

108766. Available at: https://doi.org/10.1016/j.ijpe.2022.108766.

8. Kemenperin: Tumbuh lampaui 5 Persen, Industri manufaktur berjasa besar katrol kinerja ekonomi (no date). Available at: https://kemenperin.go.id/artikel/23851/Tumbuh-Lampaui-5-Persen.

9. Le, P.N. and Needham, C. (2019) "Factors contributing to the success of ethnic restaurant businesses in Canada," Open Journal of Business and Management, 07(04), pp. 1586–1609. Available at: https://doi.org/10.4236/ojbm.2019.74110.

10. Lee, S. et al. (2023) "The effect of vaccination during the COVID-19 for the restaurant industry," International Journal of Hospitality Management, 110, p. 103451. Available at: https://doi.org/10.1016/j.ijhm.2023.103451.

11. Manuel, C. et al. (2023) "Hand hygiene product use by food employees in casual dining and quick-service restaurants," Journal of Food Protection, 86(2), p. 100004. Available at: https://doi.org/10.1016/j.jfp.2022.10.003.

12. Nanjundeswaraswamy, T.S. and Divakar, S. (2021) "DETERMINATION OF SAMPLE SIZE AND SAMPLING METHODS IN APPLIED RESEARCH," Proceedings on Engineering Sciences, 3(1), pp. 25–32. Available at: https://doi.org/10.24874/pes03.01.003.

13. Negara, D.J.K. (2022) Kondisi Industri Pengolahan Makanan dan Minuman di Indonesia. Available at: https://www.djkn.kemenkeu.go.id/kanwil-suluttenggomalut/baca-artikel/15588/Kondisi-Industri-Pengolahan-Makanan-dan-Minuman-di-Indonesia.

14. Petrescu, D.C., Vermeir, I. and Petrescu-Mag, R.M. (2019) "Consumer Understanding of food quality, Healthiness, and Environmental Impact: A Cross-National Perspective," International Journal of Environmental Research and Public Health, 17(1), p. 169. Available at: https://doi.org/10.3390/ijerph17010169.

15. Rafdinal, W. and Suhartanto, D. (2020) "Loyalty Model for Ethnic Restaurants: The Role of Quality and Value", International Journal of Applied Business Research, 2(02), pp. 122-137. https://doi.org/10.35313/ijabr.v2i02.104.

16. Scherrer-Rathje, M., Boyle, T.A. and Deflorin, P. (2009) "Lean, take two! Reflections from the second attempt at lean implementation," Business Horizons, 52(1), pp. 79–88. Available at: https://doi.org/10.1016/j.bushor.2008.08.004.

17. Tiganis, A., Grigoroudis, E. and Chrysochou, P. (2023) "Customer satisfaction in short food supply chains: A multiple criteria decision analysis approach," Food Quality and Preference, 104, p. 104750. Available at: https://doi.org/10.1016/j.foodqual.2022.104750.