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Operational Analysis Using Lean Six Sigma at Warkop Kak Tama Cikalang Tasikmalaya

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Abstract: *This study analyzes and improves the operational process of Warkop Kak Tama, Cikalang, Tasikmalaya, particularly food and beverage serving delays. A descriptive qualitative case study supported by descriptive quantitative analysis was conducted using Lean Six Sigma through Define, Measure, Analyze, Improve, and Control (DMAIC). Data were obtained through interviews, observation, documentation, and seven-day delay check sheets. The initial observation of 200 customer orders identified 123 delays (61.5%). Main dishes accounted for 56 delays and mixed beverages for 42; together, they represented 79.67% of all delays and became the improvement priorities. Waiting was the primary waste, associated with manual recording, verbal communication, uncontrolled order sequences, overlapping duties, ingredient readiness, shared equipment, and the absence of time standards. Improvements were implemented through standardized order sheets, order and table numbers, status monitoring, an order-control person in charge, clearer task allocation, preparation checklists, equipment arrangement, and serving-time standards. A second observation of 200 orders found 95 delays (47.5%). Priority-category delays decreased from 98 to 70 (28.57%), below the minimum 30% target. Thus, implementation reduced delays but had not achieved the established target and requires longer adaptation, more consistent control, and capacity improvement.*

INTRODUCTION

The development of food and beverage service businesses in Indonesia shows that this sector has extensive business activity and increasingly intense competition. Badan Pusat Statistik recorded approximately 5.28 million food and beverage service businesses in 2024. The large number of businesses indicates that culinary entrepreneurs need strong operational capabilities to

maintain product and service quality amid the many choices available to consumers (Badan Pusat Statistik, 2025).

Competition in food and beverage businesses is not only related to price, menu variety, and product taste, but also to the entire experience received by customers. In a culinary business, customers directly experience a sequence of service processes, from selecting a menu, placing an order, waiting, and receiving food or beverages to completing consumption. Therefore, the operational process has a direct relationship with customers' assessments of service quality.

Pan and Ha (2021) distinguish restaurant service quality into process service quality and outcome service quality. Process service quality concerns how service is provided, including employee responsiveness and attitude, whereas outcome service quality concerns the result received by customers, including food taste and serving speed. Thus, good-tasting food does not necessarily create a positive customer experience when the ordering process is disorganized, serving time is too long, or customers do not receive clear information about their orders.

Customer experiences are also communicated through digital platforms such as Google Maps. Ratings and reviews can be viewed by prospective customers before they decide to visit a business. Park et al. (2021) found that online rating levels influence consumers' intention to purchase restaurant services and relate to stronger trust in restaurant information. Previous research also indicates that changes in restaurant ratings may affect demand and business performance (Anderson & Magruder, 2012).

Operational problems related to customer ratings were identified at Warkop Kak Tama in Cikalang, Tasikmalaya. The business serves university students and nearby residents and is also used as a place to gather, discuss, and work. At the beginning of the study, its overall Google Maps rating was 4.6 out of 5. However, the visible reviews observed from March to May 2026 had an average rating of 5.00, whereas 22 visible reviews in June 2026 averaged 4.18. Several low-rating reviews in the same period complained about long food and beverage serving times.

Based on the content of the reviews, some customers reported waiting for more than one hour, even when the outlet was not considered crowded. Customers also complained that employees did not provide satisfactory responses when asked about order status. These complaints indicate a difference between positive assessments of food, price, and place and negative assessments of the service process. The main problem therefore appeared to originate from the operational process of receiving, processing, and serving orders rather than from the attractiveness of the products or the location.

Serving delays cannot be viewed only as a matter of employee cooking speed. Serving time is formed by a sequence of connected activities: recording the order, transferring information to the food and beverage sections, preparing ingredients and equipment, processing the products, checking the order, and delivering it to the customer. A disruption at one stage can affect the total serving time. Therefore, this study aimed to analyze the actual operational process, identify waste and root causes of long serving times, formulate improvement recommendations, and design control mechanisms using Lean Six Sigma through the Define, Measure, Analyze, Improve, and Control stages (de Mast & Lokkerbol, 2012; Snee, 2010).

LITERATURE REVIEW

Lean Six Sigma is a process-improvement approach that combines Lean and Six Sigma. Lean is oriented toward creating customer value by reducing waste and activities that do not provide added value, whereas Six Sigma is oriented toward improving quality by reducing defects and process variation. The combination can be used to improve the speed, efficiency, consistency, and quality of a service process (Snee, 2010).

In Lean Six Sigma, waste refers to activities that use time, labor, information, materials, equipment, or other resources without creating added value for customers. The eight forms of waste are defect, overproduction, waiting, non-utilized talent, transportation, inventory, motion, and extra-processing. Waiting was the main concern in this research because the initial phenomenon showed repeated customer complaints about long serving times.

Six Sigma views a process as the source of its results. Variation can be seen when similar orders require different completion times or when service outcomes are not consistent. In a culinary business, variation may be related to differences in menu complexity, availability of ingredients, employee workload, use of equipment, and the flow of order information. Variation that is not identified and controlled can create different customer experiences.

The Lean Six Sigma analysis was conducted through DMAIC. Define is used to determine the problem, research scope, customer requirements, Voice of Customer, and Critical to Quality. Measure describes the actual condition of the process and establishes baseline data. Analyze identifies waste, process variation, and root causes. Improve formulates recommendations based on verified causes, and Control designs standards, monitoring indicators, and evaluation mechanisms so that future improvements can be maintained (de Mast & Lokkerbol, 2012).

Waiting time is the duration from the beginning of the ordering process until the customer receives the ordered food or beverage. It is influenced by order arrivals, service capacity, menu characteristics, employee coordination, ingredient readiness, equipment, and information flow. Customers may respond positively when actual waiting is shorter than expected and increasingly negatively when waiting is much longer than expected (Caruelle et al., 2023). Clear status information and realistic time estimates are therefore part of managing the customer's waiting experience.

METHOD

This study employed a qualitative method with a descriptive approach and a case study design, supported by descriptive quantitative analysis. The object of the research was the operational process of serving orders at Warkop Kak Tama, Cikalang, Tasikmalaya. The process boundary began after the cashier completed order recording and payment and ended when all food and beverage components were received by the customer. The study was conducted from June to July 2026.

Research participants were selected purposively because they were directly involved in or experienced the operational process. The participants consisted of one owner who also worked as the cashier, two kitchen employees, and seven customers. The owner provided information about business management and operational policies; the employees explained work flow, task allocation, equipment, ingredients, and operational constraints; and customers described ordering, waiting, order accuracy, information, and their service experience.

Table 1. Research Informants

Code	Role	Number	Contribution to the Study
PM-01	Owner and cashier	1	Explained the operational system, task allocation, constraints, and business decisions.
KD-01–KD-02	Kitchen employees	2	Explained food-production flow, equipment, ingredient readiness, coordination, and operational obstacles.
PL-01–PL-07	Customers	7	Described ordering, waiting, order accuracy, information, and service experience.

Source: Research design, 2026.

Data were collected through semi-structured interviews, direct observation, documentation, and the recording of delay occurrences using a check sheet. Observation was conducted for seven days and involved 200 customers. The check sheet recorded customers who experienced delays and classified the delay occurrences into main dishes, mixed beverages, snacks, and instant or sachet beverages. Documentation included order notes, WhatsApp messages, Google Maps reviews, and operational photographs.

The data analysis followed the Define, Measure, Analyze, Improve, and Control stages. Qualitative data were processed through data condensation, data display, and conclusion drawing and verification (Miles et al., 2014). Source triangulation compared information from the owner, employees, and customers, while technique triangulation compared interviews, observations, documentation, and check-sheet data. Pareto analysis was used to determine the priority categories, and a fishbone diagram was used to group possible causes according to man, method, machine, material, measurement, and environment.

The Improve stage implemented actions based on the verified root causes, while the Control stage applied a standard operating procedure, monitoring indicators, check sheets, routine evaluation, and corrective action. The initial improvement target was a minimum 30% reduction in delay occurrences within the priority categories. Implementation was conducted for seven days, followed by a second observation of 200 customer orders using the same categories and delay criteria as the baseline observation.



Figure 1. DMAIC-Based Research Analysis Flow

RESULT AND DISCUSSION

Operational Context and Define Stage

Warkop Kak Tama provides various foods and beverages and is used by customers as a place to eat, gather, discuss, and work. The operational process begins when customers select the menu, place an order, and pay at the cashier. The cashier records the order and forwards the information to the food and beverage sections. Employees check the menu, quantity, ingredients, and equipment, process the food and beverages, inspect the completed order, and deliver it to the customer.

The Define stage showed that the main operational problem was inconsistency in serving time. Customers generally considered the ordering process easy and continued to evaluate the food, price, and place positively. However, all seven customers described occasions when serving time was longer than expected. Several customers reported waiting for more than one hour, while others stated that food and beverages from the same order did not arrive at the same time.

"Waiting for more than one hour makes the service seem poor, even when the food is good. Customers also need certainty while waiting." (PL-07, interview, 2026)

Customers also experienced uncertainty about whether an order had been recorded, was being processed, or had been delayed. In several cases, customers had to ask employees more than once. An order detail, such as the level of spiciness, could also be incorrect and require

correction. These conditions show that the operational problem was not limited to the duration of cooking but also involved order information, accuracy, responsiveness, and synchronization.

Based on the Voice of Customer analysis, customers required reasonable serving time, clear order status, proactive information during delays, correct order details, and better synchronization between food and beverages. Serving time was selected as the primary Critical to Quality characteristic because it was the most consistent complaint and could be observed directly through the operational process. Order-status clarity, responsiveness, order accuracy, and synchronization were treated as supporting quality characteristics.

Measure Stage: Current Order System and Delay Distribution

At the Measure stage, orders were recorded manually and communicated to the kitchen through WhatsApp, with verbal clarification when necessary. Although WhatsApp provided a message-sending timestamp, the format did not consistently contain an order number, order-entry time, table number, complete order details, special requests, or processing status. The absence of a visible monitoring system also made it difficult to determine which orders were waiting, being processed, completed, or delayed.

Observation over seven days involved 200 customers. The check sheet showed that 123 customers, or 61.5%, experienced serving delays, while 77 customers, or 38.5%, were not recorded as delayed. The 123 delay occurrences were then grouped by product category to describe the actual distribution of the problem and determine the categories that should receive priority attention.

Table 2. Distribution of Serving Delays by Product Category

Product Category	Daily Counts (Days 1–7)	Total	Percentage	Cumulative
Main dishes	9, 8, 7, 9, 8, 8, 7	56	45.53%	45.53%
Mixed beverages	6, 6, 6, 7, 6, 6, 5	42	34.15%	79.67%
Snacks	3, 3, 2, 3, 2, 3, 1	17	13.82%	93.49%
Instant/sachet beverages	1, 1, 1, 1, 1, 1, 2	8	6.50%	100.00%
Total	**19, 18, 16, 20, 17, 18, 15**	**123**	**100.00%**	—

Source: Seven-day observation and delay check sheet, 2026.

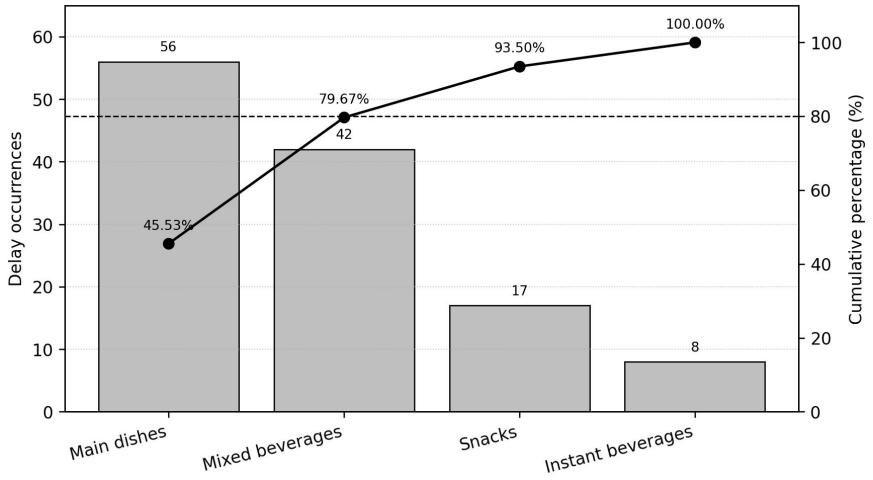


Figure 2. Pareto Analysis of Serving Delays

The Pareto Diagram showed that main dishes experienced 56 delay occurrences, or 45.53%, and mixed beverages experienced 42 delay occurrences, or 34.15%. Together, the two categories contributed 98 of 123 delay occurrences, or 79.67%. Because this cumulative proportion was close to the 80% Pareto guideline, main dishes and mixed beverages were established as the priority categories for improvement.

The priority pattern indicates that menu categories requiring longer cooking or mixing stages, shared equipment, and coordination with other order components were more likely to experience bottlenecks. Nevertheless, the Pareto result only determined priority and did not by itself explain why delays occurred. Therefore, the Analyze stage examined waste and possible causes through interviews, observation, documentation, triangulation, and a fishbone diagram.

Analyze Stage: Waste and Root Causes

The Analyze stage identified waiting as the dominant waste because customers directly experienced long elapsed time and 123 of 200 observed customers experienced serving delays. Waiting was accompanied by other forms of waste. Motion occurred when employees moved repeatedly to obtain tools or ingredients. Transportation occurred when order information moved manually from the cashier to production. Defect occurred when an order detail was incorrect and required correction. Extra-processing occurred through repeated confirmation, inventory appeared as accumulated unfinished orders, and non-utilized talent was related to overlapping duties without a dedicated order controller.

Table 3. Waste Identified in the Serving Process

Waste	Operational Evidence	Relationship to Delay	Status
Waiting	123 of 200 customers experienced serving delays; customers also waited for information, production, or completion.	Directly extended customer serving time.	Dominant
Motion	Employees repeatedly moved to obtain ingredients or equipment.	Added labor time and interrupted the work sequence.	Supporting
Transportation	Order information moved manually from cashier to production.	Created risk of late, misplaced, or unclear information.	Supporting
Defect	A special request or order detail could be incorrect and require correction.	Generated rework and additional waiting.	Supporting
Extra-processing	Employees or customers repeatedly reconfirmed order details or status.	Added steps that did not directly create customer value.	Supporting
Inventory	Unfinished orders accumulated in food and beverage queues.	Extended the waiting of subsequent orders.	Supporting
Non-utilized talent	Employees held overlapping roles without a dedicated order controller.	Reduced focus and accountability for the overall flow.	Supporting
Overproduction	No sufficient evidence that products were made beyond demand.	Not established as a source of delay.	Not found

Source: Interviews, observation, and researcher analysis, 2026.

The fishbone analysis grouped the possible causes into six factors. Man factors included unclear task allocation, overlapping duties, and the absence of an employee who consistently controlled the order flow. Method factors included manual recording, unstructured WhatsApp messages, verbal communication, an order sequence that could not be monitored consistently, and the absence of a written workflow. Machine factors involved shared stoves and cookware.

Material factors involved ingredients that were not always ready. Measurement factors included the absence of serving-time standards and routine delay records. Environment factors involved limited workspace and congestion during busy periods.

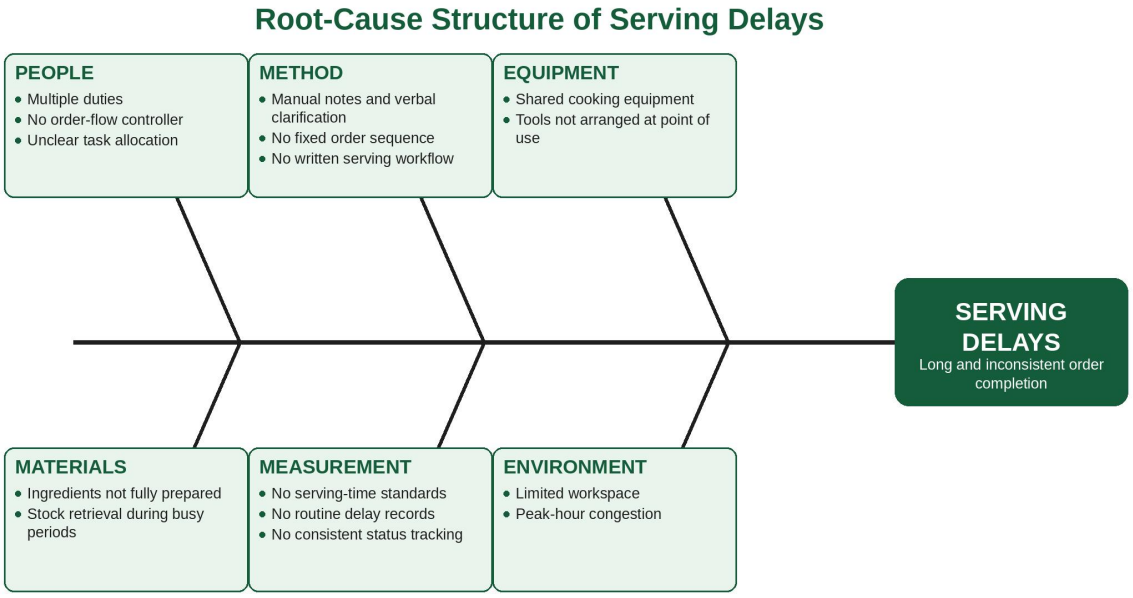


Figure 3. Fishbone Diagram of the Root Causes of Serving Delays

Source: Researcher analysis based on interviews, observation, and documentation, 2026.

Possible causes were verified by comparing the statements of the owner, two kitchen employees, and seven customers with direct observation and documentation. The strongest evidence concerned order recording, information flow, order sequence, and responsibility. Internal participants consistently explained that tasks overlapped when orders accumulated, while customer accounts confirmed uncertainty, long waits, and food and beverages arriving at different times. Observation also showed repeated movement, shared equipment, ingredients prepared after orders arrived, and no formal serving-time record.

Table 4. Verified Root Causes of Serving Delays

6M Factor	Verified Cause	Evidence Summary	Classification
Man	Unclear task allocation and overlapping duties	Owner and kitchen employees described task switching when orders accumulated.	Primary
Man	No dedicated order-flow controller	Sequence and completeness checks depended on whichever employee was available.	Primary
Method	Manual recording, unstructured WhatsApp messages, and occasional verbal clarification	Notes could accumulate; messages lacked consistent order, time, table, and status fields; verbal clarification could be missed.	Primary
Method	Order sequence was not consistently monitored	Employees and customers observed orders completed out of perceived sequence.	Primary
Method	No written workflow and serving-time SOP	No formal rules governed sequencing, completeness checks, or long-waiting orders.	Primary

6M Factor	Verified Cause	Evidence Summary	Classification
Machine	Cooking equipment was used alternately	Several main dishes depended on the same stove or cookware.	Supporting
Material	Ingredients were not always ready for immediate use	Some ingredients had to be retrieved or prepared after the order arrived.	Supporting
Measurement	No serving-time standard	The business lacked a written threshold for on-time or delayed orders.	Primary
Measurement	Delays were not routinely recorded or reviewed	No check sheet existed before the research observation.	Primary
Environment	Busy periods and limited workspace	Simultaneous arrivals and restricted movement intensified system weaknesses.	Trigger

Source: Source and technique triangulation, 2026.

These findings show that the delay was an operational system problem rather than a problem caused only by the speed of individual employees. Serving time was formed by the relationship among people, methods, information, ingredients, equipment, measurement, and the work environment. A weakness in one part of the process could produce waiting and additional waste in another part.

The findings also show that process service quality and outcome service quality can produce different customer assessments. Customers continued to value the food, price, and place, but long and uncertain waiting reduced their assessment of the service process. This supports Pan and Ha's (2021) explanation that restaurant customers evaluate both the way service is delivered and the outcome they finally receive.

Improve and Control Stages

The Improve stage implemented operational changes to reduce waiting and make the order-fulfillment process more consistent. Main dishes and mixed beverages were prioritized because they accounted for 79.67% of the recorded delays. A minimum 30% reduction was established as the implementation target. Based on 98 priority-category delay occurrences, the target was no more than 68 occurrences in a comparable observation of 200 customer orders.

The main improvement was the standardization of order recording and monitoring. Each order used a standardized sheet containing an order number, order-entry time, table number, menu, quantity, and special requests. Visible table numbers connected the written order with its destination. A structured WhatsApp format contained the same information so that communication was more complete and consistent. Order status was classified as waiting, in process, completed, or delivered.

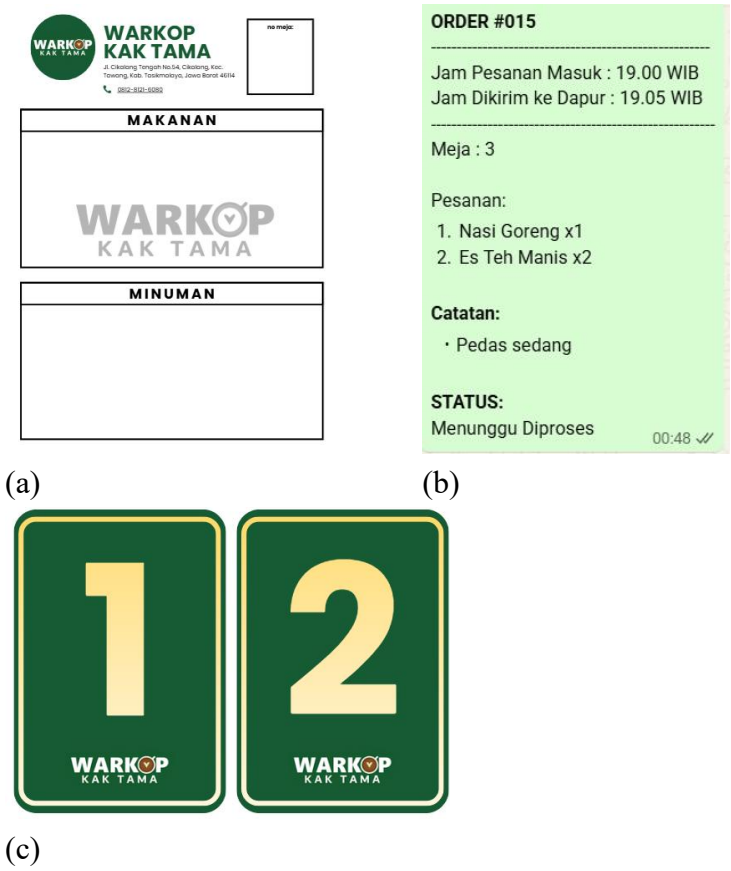


Figure 4. Implemented Order Recording and Monitoring System

Source: Adapted from the researcher's implemented designs, 2026.

The order-control system was supported by an employee assigned as the order-flow controller or PIC. The PIC checked order completeness, confirmed receipt by the food and beverage sections, maintained the processing sequence, updated status, verified order accuracy, and identified long-waiting orders. Written task allocation, preparation checklists, fixed locations for frequently used equipment, category-specific serving-time standards, and daily equipment checks were also applied. During busy periods, however, the PIC still had to support other tasks, so order-status monitoring was not always performed consistently.

Table 5. Implemented Improvement and Control Plan

Operational Issue	Implemented Improvement	Control Indicator	Implementation/Frequency
Incomplete records	Standardized sheet with order/table numbers, times, items, and requests.	Every record complete.	Every order; cashier/PIC
Unclear sequence	Sequential numbers, structured WhatsApp, and visible status.	No omitted order; status visible.	During service; PIC
No flow owner	Order-flow PIC with a supporting PIC when required.	Sequence and long waits monitored.	Each shift; owner/PIC

Operational Issue	Implemented Improvement	Control Indicator	Implementation/Frequency
Overlapping duties	Pre-shift task allocation and backup roles.	Primary role understood.	Each shift; owner
Ingredients not ready	Pre-peak checklist and refill threshold.	Priority ingredients ready.	Daily; production staff
Equipment bottlenecks	Point-of-use arrangement and constraint records.	Tools ready; bottlenecks logged.	Before service/weekly
No time standard	Category-specific maximum serving times.	Consistent delay classification.	Every order; PIC
No performance review	Delay check sheet and corrective review.	Overall delay rate maximum 46.5%.	Daily/weekly evaluation
Customer uncertainty	Realistic estimates and proactive status.	Information provided during delays.	At ordering; cashier

Source: Improvement implementation and control records, 2026.

A seven-day observation after implementation covered another 200 customer orders. The number of delays decreased from 123 to 95 occurrences, reducing the overall delay rate from 61.5% to 47.5%. Main-dish delays decreased from 56 to 40 and mixed-beverage delays decreased from 42 to 30. The priority-category total therefore decreased from 98 to 70 occurrences, equivalent to a 28.57% reduction. Overall delays decreased by 28 occurrences, or 22.76%. No reduction was recorded for snacks or instant/sachet beverages during the implementation period.

Table 6. Comparison of Delays Before and After Implementation

Product Category	Before	After	Reduction	Reduction Percentage
Main dishes	56	40	16	28.57%
Mixed beverages	42	30	12	28.57%
Snacks	17	17	0	0.00%
Instant/sachet beverages	8	8	0	0.00%
Total	**123**	**95**	**28**	**22.76%**

Source: Before-and-after delay check sheets, 2026.

The implementation improved performance but did not achieve the predetermined target. The actual priority-category reduction of 28.57% remained 1.43 percentage points below the minimum 30% target. The overall delay rate of 47.5% also remained one percentage point above the maximum 46.5% target, while 95 delayed orders were two occurrences above the target of 93. Therefore, the implementation was classified as not yet successful in achieving its performance target.

The unmet target was associated with a short adaptation period, inconsistent status updates during busy periods, overlapping PIC responsibilities, ingredient replenishment during operations, and limited equipment capacity. The Control stage therefore continued the SOP, daily check sheet, and weekly evaluation while defining corrective actions: extend the adaptation period, appoint an assistant PIC, establish minimum ingredient stock, update status at each process change, prioritize shared equipment by order sequence, and evaluate additional capacity when recurring bottlenecks remain.

CONCLUSION

The main operational problem at Warkop Kak Tama was inconsistent and excessively long serving time. The Define stage showed that customers experienced long waiting, unclear order status, occasional order inaccuracies, limited information, and poor synchronization between food and beverages, even though they generally evaluated the food, price, and place positively.

The Measure stage showed that 123 of 200 customers, or 61.5%, experienced serving delays during seven days of observation. Main dishes accounted for 56 delay occurrences and mixed beverages for 42. Together, the two priority categories contributed 98 of 123 delay occurrences, or 79.67%. The Analyze stage identified waiting as the dominant waste, accompanied by motion, transportation, defect, extra-processing, inventory, and non-utilized talent.

The verified root causes included manual order recording, unstructured and partly verbal communication, an order sequence that could not be monitored consistently, unclear task allocation, the absence of an order-flow controller, limited ingredient and equipment readiness, and the absence of serving-time standards and routine records. Implemented improvements consisted of standardized order sheets, order and table numbers, structured WhatsApp messages, order-status monitoring, clearer task allocation, preparation checklists, equipment organization, serving-time standards, check sheets, an SOP, and weekly evaluation. After implementation, delays decreased from 123 to 95 occurrences and the overall rate decreased from 61.5% to 47.5%. Priority-category delays decreased from 98 to 70 occurrences, or 28.57%. Because this result remained below the minimum 30% target and the overall delay rate remained one percentage point above the maximum 46.5% target, the implementation had not yet achieved the established performance target. Longer adaptation, more consistent PIC control, minimum-stock rules, and equipment-capacity evaluation are required.

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