



Service Process Improvement Using Lean Service Management in Driving License Administration

Choirunisa Octavia¹

Nurullaily Kartika^{2*}

¹Fakultas Ekonomi dan Bisnis, Universitas Airlangga

Email: choirunnisa.octavia-2021@feb.unair.ac.id

²Fakultas Ekonomi dan Bisnis, Universitas Airlangga

Email: nurullaily@feb.unair.ac.id

*Corresponding Author

Received: 5 June 2026

Reviewed: 24 June 2026

Published: 23 July 2026

Abstract

The service process for issuing Driving Licenses (SIM) at Unit X continues to face long queues and extended waiting times, negatively affecting the effectiveness of public service delivery. This study aims to analyze the service value stream and identify waste using a lean service approach. The research adopts a qualitative methodology through observation, interviews, and process analysis employing Value Stream Mapping (VSM), Process Activity Mapping (PAM), and a Fishbone Diagram. The results of the Current State VSM indicate a total service time of 85.91 minutes. The main sources of waste are waiting and defects, particularly during the theory and practical examination stages. Based on the proposed improvements, the Future State Mapping reduces the total lead time to 57.65 minutes, with value-added processing time of 45.15 minutes, thereby significantly improving service efficiency. These findings demonstrate that implementing lean service effectively reduces waste, streamlines service flow, and enhances the quality and speed of the driving license issuance process.

Keywords: *Lean Service, Value Stream Mapping, Waste, Fishbone Diagram, Public Service*

Abstrak

Proses pelayanan penerbitan Surat Izin Mengemudi (SIM) di Unit X masih sering menimbulkan antrian panjang dan waktu tunggu yang lama, yang berdampak negatif pada efektivitas proses layanan publik. Penelitian ini bertujuan untuk menganalisis alur nilai layanan dan mengidentifikasi pemborosan dengan menggunakan pendekatan layanan ramping (*lean service*). Penelitian ini menggunakan metodologi kualitatif melalui observasi, wawancara, dan analisis proses dengan menerapkan Value Stream Mapping (VSM), Process Activity Mapping (PAM), serta Diagram Fishbone. Hasil VSM saat ini menunjukkan total waktu layanan sebesar 85,91 menit. Sumber utama pemborosan adalah waktu tunggu dan cacat, terutama selama tahap ujian teori dan praktik. Berdasarkan perbaikan yang diusulkan, Pemetaan Kondisi Masa Depan mengurangi total waktu tunggu menjadi 57,65 menit, dengan waktu pemrosesan bernilai tambah sebesar 45,15 menit, sehingga secara signifikan meningkatkan efisiensi layanan. Temuan ini menunjukkan bahwa penerapan layanan ramping secara efektif dapat mengurangi pemborosan, merampingkan alur layanan, serta meningkatkan kualitas dan kecepatan proses penerbitan SIM.

Kata kunci: *Lean Service, Value Stream Mapping, Waste, Fishbone Diagram, Pelayanan Publik.*

INTRODUCTION

In the modern era, human mobility has shown a growing trend in line with changes in societal activity patterns and the development of transportation systems. According to the 2025 Population Mobility and Labor Statistics, Statistics Indonesia (BPS) reported that population movement in

Indonesia has become increasingly active in recent years, both in work-related and daily activity contexts. This rise in mobility has a direct impact on the growing need for personal transportation, particularly motor vehicles. A Driving License (SIM) serves as legal proof of an individual's eligibility to operate a motor vehicle, as well as evidence that the driver has met administrative, health, and driving competency requirements, as stipulated in Indonesian National Police Regulation Number 5 of 2021 concerning the Issuance and Marking of Driving Licenses.

According to data from Statistics Indonesia published through Databoks, the total number of driving licenses recorded between 2017 and 2019 increased annually, reflecting the growing mobility and the need for legal driving authorization among the Indonesian population. Both SIM A (four-wheeled vehicles) and SIM C (two-wheeled vehicles) recorded annual increases from 2017 to 2019, although a decline occurred in subsequent years due to external factors such as the pandemic. Overall, the general trend indicates an annual increase in SIM applications during the observation period, signifying a rising demand for driving licenses in line with the growth of public mobility. In this context, the role of institutions providing SIM issuance services becomes highly crucial. Improvements in the working system of government apparatus aim to enhance the quality of public services to meet the needs and expectations of the community (Osborne, 2023).

According to Wibowo and Kertati (2022), high-quality public services can increase public satisfaction and promote a more efficient system. Law Number 25 of 2009 on Public Services states that service standards encompass several important aspects, including service requirements, procedures, completion time, fees or tariffs, service products, facilities and infrastructure, and the competence of service personnel, as regulated in the Regulation of the Minister of State Apparatus Empowerment and Bureaucratic Reform Number 15 of 2014. The Lean approach originated from the Toyota Production System (TPS), developed by Toyota Motor Corporation after World War II in response to limited resources and a small domestic market. Through key figures such as Taiichi Ohno and Eiji Toyoda, TPS was designed to emphasize the principles of Just In Time and Jidoka, aiming to produce according to demand while building quality from the outset by eliminating waste (*muda*).

In the late 1980s, this concept was popularized through research at the Massachusetts Institute of Technology (MIT), which introduced the term "Lean" as a universal concept. Conceptually, Lean focuses on creating value for customers by eliminating non-value-added activities, improving process flow, reducing waiting time, and implementing continuous improvement throughout organizational processes (Womack & Jones, 2003). Over time, lean principles have extended beyond the manufacturing sector into the service sector (Danese, 2023). Lean service is an adaptation of lean manufacturing principles applied in service contexts such as banking, healthcare, education, and government, with the aim of eliminating waste, improving efficiency, and delivering maximum value to customers. The implementation of lean service has been widely adopted across sectors to reduce waiting time and improve service accuracy (Sarkar, 2016).

Studies on lean government demonstrate that applying lean in the public sector can reduce total service completion time, enhance operational efficiency, and minimize non-value-added activities in administrative processes (Simamora & Syah, 2020). Lean service plays a vital role for service organizations in meeting increasingly high customer demands. By applying lean principles, service organizations can improve the effectiveness and efficiency of service processes by identifying and eliminating waste (Gupta, Sharma, & Sunder, 2016). Several studies confirm that lean service can maximize service performance: Mollah et al. (2018) found that improving service flow can reduce waiting time and enhance service quality; Wijaya (2023) demonstrated that lean service helps reduce waste and improve customer satisfaction; and Valdivia and Rivas (2021) showed that lean service can reduce non-value-added activities. Collectively, lean service represents an important strategy that drives the development and sustainability of service organizations in a competitive environment. consistent with these findings, Ashari and Abryandoko (2023) confirmed that applying VSM in a lean service approach effectively reduces service time waste, while a systematic review by Tlapa et al. (2020) showed that lean implementation significantly improves patient/customer flow across service settings.

The Driver License Administration Unit X is one of the public service facilities providing offline SIM issuance services in city X. Unit X serves the public through a structured process that starts with administrative registration, followed by the theory examination, and concludes with the practical driving test (Rustopo, 2017). However, the main problem identified is the low efficiency of the SIM issuance process, characterized by long waiting times, accumulated queues, and imbalanced workflow

across service stages. These conditions are primarily caused by limited theory examination computers relative to applicant volume, data input errors, disruptions in the Digital Korlantas system, and applicants' incomplete understanding of the requirements. This is reflected in a Google rating of 4 out of 5 stars, indicating that the service has not yet achieved optimal public satisfaction.

In this study, lean service serves as the key approach to identifying and resolving problems at Unit X. Lean service refers to the application of lean principles in the service sector, focusing on waste reduction, process efficiency improvement, and enhancement of service value delivered to customers (Gupta et al., 2016). To support the implementation of lean service, this study employs Value Stream Mapping (VSM) as a process-mapping tool to visualize the entire SIM issuance service flow, thereby facilitating the identification of bottlenecks (Martin & Osterling, 2014). In addition, the Fishbone Diagram is used as a cause-and-effect analysis tool to systematically identify root causes by categorizing contributing factors into human, method, system, and environment aspects (Heizer et al., 2017). By combining both tools, this study aims to formulate improvement recommendations to streamline process flow, reduce lead time, and enhance the quality of SIM issuance services at Unit X.

LITERATURE REVIEW

Operations Management

Management is a process involving planning, organizing, leading, and controlling organizational resources to achieve goals effectively and efficiently (Daft, 2016). According to Heizer, Render, & Munson (2017), operations management is a set of business activities aimed at creating added value for customers in the form of goods and services by transforming *inputs* into *outputs*. Operations management plays a strategic role in enhancing organizational productivity through effective and efficient resource management, enabling organizations to generate greater *output* with the same or fewer *inputs* (Heizer & Render, 2020). Systematically implemented operations management practices have been shown to contribute to overall organizational performance improvement, including customer satisfaction and long-term competitiveness (Salah et al., 2023).

Lean

The concept of *Lean* originated from the *Toyota Production System* (TPS), developed in Japan in the 1950s by Taiichi Ohno and Shigeo Shingo. The system focuses on achieving high efficiency through *waste elimination*, quality improvement, and the creation of smooth workflow. The TPS philosophy rests on two main pillars: *Just in Time* (JIT) and *Jidoka*. This approach subsequently became the foundation for *Lean Production*, a term first introduced by John Krafcik (Slack & Lewis, 2017).

Lean Thinking formulates Toyota's philosophy into five core principles (Womack & Jones, 1996): (1) *Specify Value* — understanding what the customer considers valuable; (2) *Identify the Value Stream* — mapping all steps required from concept to the customer's hands; (3) *Flow* — ensuring all value-creating activities proceed smoothly without interruption; (4) *Pull* — producing based on actual customer demand; and (5) *Pursue Perfection* — fostering a culture of continuous improvement (*kaizen*) on an ongoing basis.

Lean Service

Lean Service is a management approach in service organizations that adapts *Lean* principles from the manufacturing sector to improve the efficiency and effectiveness of service processes (Converso et al., 2025). This approach focuses on identifying and reducing non-value-added activities, enabling organizations to deliver higher value to customers with more optimal resource utilization.

The stages of *lean service* according to Andrés-López et al. (2015) consist of five steps: (1) *Definition of Lean Service Principles* — establishing *lean* principles in the service context through *value stream mapping*; (2) *Customer Role in Service* — identifying customer involvement in the service creation process; (3) *Determination of Waste in Service* — identifying dominant waste as the basis for improvement priorities; (4) *Implementation* — applying the selected *lean service* methods using *current state value stream mapping* and *fishbone diagram*; and (5) *Lean Service Model Validation* — evaluating results through *future state value stream mapping* as the basis for continuous improvement. A recent literature review by Talero-Sarmiento et al. (2024) further highlights common implementation strategies and challenges faced by organizations adopting lean principles in service settings.

Public Service

According to Osborne (2023), *public service* is a collaborative activity among government, citizens, and stakeholders aimed at creating and delivering public value (*public value*) through the provision of services that meet community needs. Public service is no longer understood as a one-sided process from the state to its citizens, but as an interactive and participatory system in which citizens play an active role in *co-design* and *co-production* of services.

The key characteristics of public service include orientation toward the broad public interest, accountability to the state, and operating within a legal and public policy framework (Batley & McLoughlin, 2015). Public service is also grounded in *good governance* principles such as accountability, transparency, participation, effectiveness, and efficiency (Felekech & Guohua, 2020). The delivery of public services must consider a systems approach that evaluates the interrelationships among policy, institutional capacity, and social behavior in the service delivery process (Mansoor & Williams, 2024).

Waste

Waste is the most significant element in the *lean* concept, which emphasizes the elimination of all forms of non-value-added activities. According to Chiarini (2013), there are seven types of waste in the service context: (1) *Overproduction* — service output exceeds current needs; (2) *Waiting* — delays in completing service output; (3) *Motion* — unnecessary movement of people due to poor layout; (4) *Overprocessing* — adding unnecessary procedures to the service process; (5) *Inventory* — long queues or unprocessed requests; (6) *Transportation* — unnecessary movement of materials and information; and (7) *Defects/Errors* — errors occurring in any service process, such as data entry mistakes.

Value Stream Mapping

Value Stream Mapping (VSM) was introduced by Rother and Shook (1999) after studying the *material and information flow mapping* method applied by Toyota, and popularized through the book *Learning to See*. Conceptually, the value stream is defined as the sequence of activities required to design, produce, and deliver goods or services to the customer, encompassing both information flow and material flow (Martin & Osterling, 2014).

VSM is a core tool in the *Lean* approach that enables comprehensive visualization of material and information flow, as well as measurement of production time to identify efficiency improvement opportunities (Dinis-Carvalho et al., 2019). This is reinforced by Marin-Garcia et al. (2021), whose scoping review confirms VSM as a foundational tool for identifying waste and improving process flow in service organizations. More recent developments have also extended VSM design models to support digital process visualization (Frick et al., 2024). The VSM development steps according to Martin & Osterling (2014) consist of: (1) *Initial analysis* through strategy review and *Gemba walk*; (2) developing the *Current State Map* that visualizes the actual process condition; (3) root cause and waste analysis using the *fishbone diagram*; and (4) developing the *Future State Map* as a leaner process design after waste elimination.

Fishbone Diagram

The Fishbone Diagram, also known as the *Cause-and-Effect Diagram* or *Ishikawa Diagram*, is a quality analysis tool first introduced by Kaoru Ishikawa to systematically identify, organize, and trace potential causes of a quality problem (Reid & Sanders, 2012).

According to Krajewski et al. (2016), the *fishbone diagram* has three main components: (1) *Head* — the main problem that serves as the focus of analysis; (2) *Bones* — the main categories of potential causes, consisting of six factors: *People, Methods, Machines, Materials, Measurements*, and *Environment*; and (3) *Ribs* — specific causes within each category enabling researchers to drill down to the actual *root cause*. The diagram construction steps (Hisprastin & Musfiroh, 2020) include: (1) defining the problem; (2) determining main cause categories using the 5M framework (*Man, Methods, Machine, Materials*, and *Milieu/Environment*); (3) identifying causes through *brainstorming* for each category; and (4) analyzing the diagram to determine the most likely root cause as the basis for improvement proposals. Similarly, Sakdiyah et al. (2022) and Tsou and Hsu (2022) demonstrated the effectiveness of fishbone diagrams in identifying root causes of operational problems, while Antonacci et al. (2021) emphasized process mapping as a critical tool supporting root-cause identification in service systems.

RESEARCH METHODS

This study adopts a qualitative approach with the aim of providing an in-depth description of the SIM issuance service process at Unit X (Sekaran & Bougie, 2016). The research subject is the SIM issuance process for new applicants (SIM A and SIM C) at Unit X. Data collection techniques include direct observation of the service flow, interviews with Satpas officers, and documentation in the form of applicant volume reports, average service times, and operational procedures. In addition, a literature review of scientific journals and books related to *lean service* and public service was conducted.

Data analysis was carried out through five stages. First, the development of *Value Stream Mapping* (VSM) to map the entire service flow and identify processing time, waiting time, and total *lead time* (Martin & Osterling, 2014). Second, identification and classification of waste based on seven *Lean Service* categories. Third, waste weighting using a questionnaire to determine improvement priorities. Fourth, application of *Value Stream Analysis Tools* (VALSAT) to select the most appropriate analytical tool. Fifth, formulation of *Lean Service*-based improvement proposals visualized in a *future state value stream map*. Data validity was strengthened through source triangulation (interviews, observation, and documentation) and method triangulation (Sekaran & Bougie, 2016).

RESULTS AND DISCUSSION

Process Activity Mapping

Process Activity Mapping (PAM) was conducted to classify all 17 service activities into three categories: value-added (VA), non-value-added (NVA), and necessary non-value-added (NNVA). The mapping results are presented in Table 1.

Table 1. Process Activity Mapping

No.	Activity	Time (min)	VA	NVA	NNVA
1	QR Code Collection	0.17			✓
<i>Registration</i>					
2	Form Collection	0.42	✓		
3	Form Filling	2.82	✓		
<i>Data Input</i>					
4	Data Input Queue	2.85		✓	
5	SIM Registration	3.03	✓		
<i>Photo & Scan (Biometric Room)</i>					
6	Photo Booth Queue	2.67		✓	
7	Photo	3.12	✓		
8	Fingerprint Scan	0.92	✓		
9	Signature Scan	0.70	✓		
<i>Theory Examination</i>					
10	Theory Exam Queue	12.27		✓	
11	Theory Examination	17.35	✓		
12	QR Code Collection (Theory)	0.87			✓
<i>Practical Examination</i>					
13	Practical Exam Queue	18.82		✓	
14	Practical Examination	16.23	✓		
15	QR Code Collection (Practical)	1.12			✓
<i>Payment</i>					
16	Data Verification & BRI Voucher Exchange	2.05			✓
17	SIM PNBP Payment	0.50	✓		
Total		85.91	45.09	36.61	4.21

Source: Processed Data (2025)

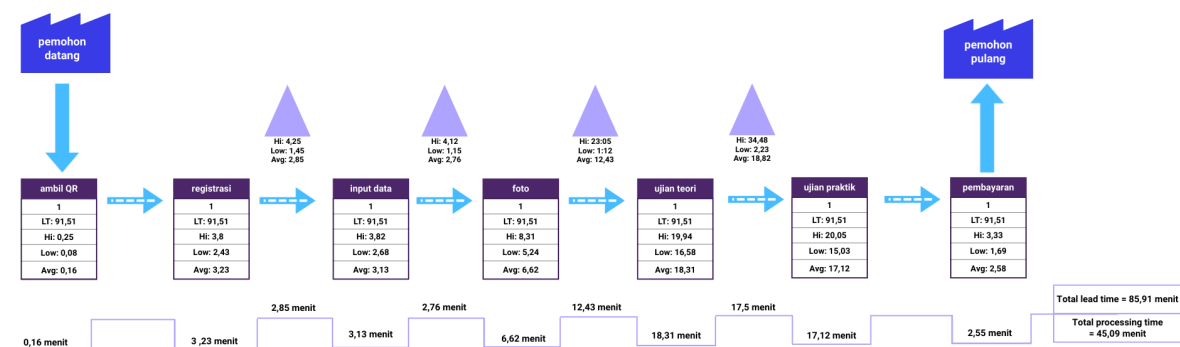
Based on the measurement results, total process time was recorded at 85.91 minutes, comprising VA activities of 45.09 minutes (52.48%), NVA activities of 36.61 minutes (42.61%), and

NNVA activities of 4.21 minutes (4.90%). These figures indicate that nearly half of the time spent by applicants is genuinely productive, while the remainder is absorbed by activities that do not directly contribute to service output.

Current State Value Stream Mapping

The Current State Value Stream Map visualizes nine main stages of the SIM issuance process: QR code collection, registration, data input, biometric capture, theory examination, practical examination, payment, SIM printing, and applicant exit. Total processing time representing actual value-added work is 45.09 minutes, while total *lead time* from start to finish reaches 85.91 minutes. The 40.82-minute difference represents non-value-added time dominated by waiting and inter-process delays, indicating that idle time still exceeds productive activities in the current service flow.

The examination stages represent the primary bottleneck, with average processing times of 18.31 minutes for the theory examination and 17.12 minutes for the practical examination, both accompanied by lengthy waiting times. Stages such as QR code collection, data input, and payment, although operationally quick, also experience delays due to upstream bottlenecks. The current state map further reveals imbalanced workload distribution across service stages and suboptimal inter-departmental coordination. Overall, the VA ratio of 52.48% indicates moderate process efficiency with significant room for improvement, as NVA activities still account for 42.61% of total service time.



Source: Processed Data (2025)

Fig 1. Current state value stream mapping

Waste Weighting

Identification and weighting of waste types were conducted through a questionnaire administered to Satpas officers. The weighting results are presented in Table 2.

Table 2. Waste Weighting Results

No.	Waste Type	Total	Average	Rank
1	Waiting	10	2.0	2
2	Overprocessing	9	1.8	3
3	Defects	13	2.6	1
4	Transportation	8	1.6	4
5	Motion	8	1.6	4
6	Inventory	9	1.8	3
7	Overproduction	7	1.4	5

Source: Processed Data (2025)

Defects emerged as the most dominant waste type (average 2.6), stemming from name spelling errors and difficulty reading the fingerprints of elderly applicants. In second place is *waiting* (average 2.0) due to limited theory examination computers and disruptions to the Digital Korlantas system. *Overprocessing* and *inventory* both recorded an average of 1.8, reflecting repeated manual data checks and unintegrated filing systems. These findings establish defects and waiting as the primary improvement priorities.

VALSAT Tool Selection

The Value Stream Analysis Tools (VALSAT) method was applied to determine the most appropriate analytical tool based on its relevance to the dominant waste types. Each tool was scored for its suitability to each identified waste category, and the results are presented in Table 3.

Table 3. VALSAT Tool Selection Results

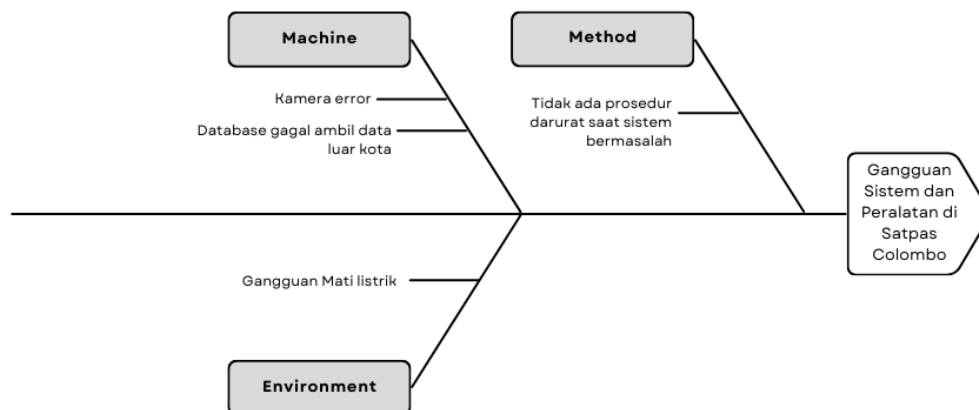
No.	Mapping Tool	Total Score	Rank
1	Process Activity Mapping	74.8	1
2	Supply Chain Response Matrix	34.8	2
3	Demand Amplification Mapping	24.6	3
4	Decision Point Analysis	16.6	4
5	Quality Filter Mapping	16.2	5
6	Production Variety Funnel	11.0	6
7	Physical Structure Mapping	4.2	7

Source: Processed Data (2025)

Process Activity Mapping (PAM) achieved the highest total score of 74.8, making it the most effective tool in this service context. PAM is highly suitable as it maps the activity flow in detail, including waiting times, inter-room movements, and non-value-added activities, enabling management to identify specific bottlenecks such as the theory examination and photo stage queues, and to determine which activities can be eliminated or simplified.

Fishbone Diagram Analysis

A fishbone diagram was constructed to systematically identify the root causes of the two dominant waste types: defects and waiting. For waste defects, three root cause categories were identified. From the man factor, both officers and applicants paid insufficient attention to data accuracy during verification and printing, resulting in human errors due to carelessness. From the method factor, the absence of automatic data validation means all verification is performed manually, allowing typing errors and name spelling inconsistencies to go undetected until the final stage. From the material factor, incomplete or non-standard applicant documents and discrepancies between physical documents and system data, such as name spelling differences or birthplace format variations, increase the likelihood of errors in the final output.

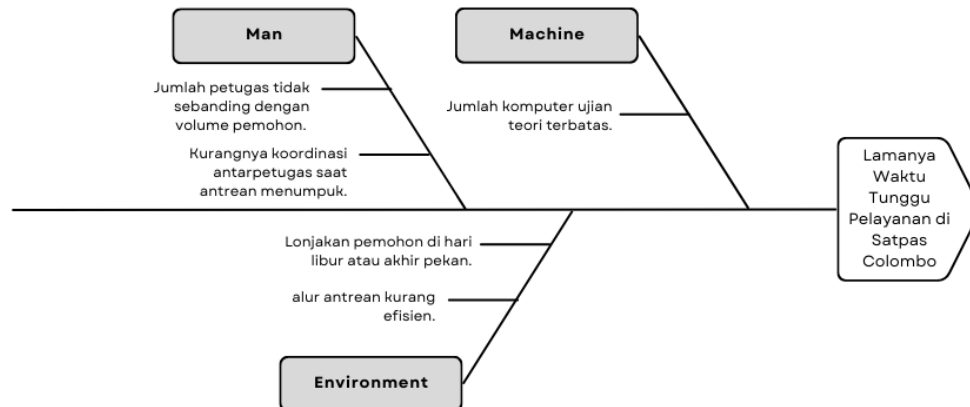


Source: Processed Data (2025)

Fig 2. Fishbone Diagram (Defects)

For waste waiting, three root cause categories were identified. From the man factor, the number of officers is disproportionate to the applicant volume during peak hours, and inadequate inter-officer coordination when queues accumulate slows service delivery. From the machine factor, the limited number of theory examination computers (15 units) forces applicants to wait for extended periods, with waiting time further dependent on each applicant's competency and examination duration. From the

environment factor, surges in applicant volume during weekends and school holidays exceed service capacity, while inefficient queue layout and limited service space prolong waiting time between stages.



Source: Processed Data (2025)

Fig 3. Fishbone Diagram (Waiting)

Improvement Proposals

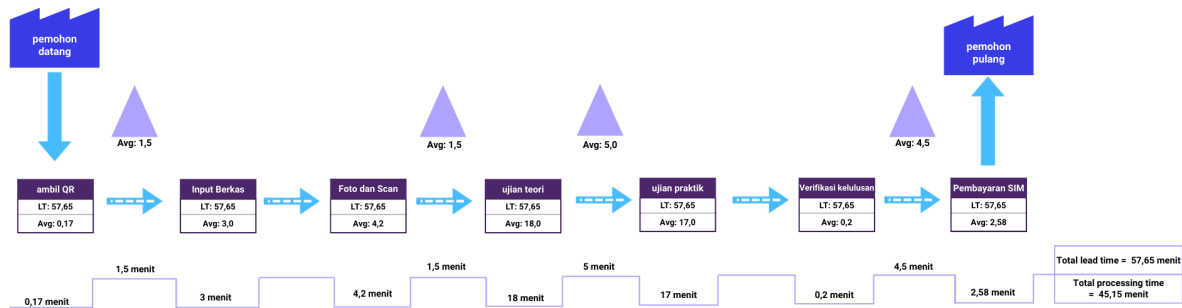
Based on the fishbone diagram analysis, targeted improvements were proposed for each root cause. To address *defects*, the following interventions are recommended: (1) implementing a mandatory double-check system in which both officers and applicants review data accuracy prior to biometric capture and printing; (2) developing automatic validation features within the SIM information system to detect format errors and data inconsistencies at the point of entry; (3) providing clear document checklists at service areas and the online registration application, accompanied by a dedicated preliminary verification officer; and (4) integrating the SIM system with the Dukcapil (civil registration) database to enable automatic population of applicant identity data from official records, thereby minimizing manual input errors and spelling discrepancies.

To address *waiting*, the recommended improvements include: (1) redistributing officer assignments according to real-time applicant volume, particularly during peak hours and weekends, to balance workload across service stages; (2) establishing a digital queue dashboard to improve real-time coordination among officers; (3) increasing the number of theory examination computers or implementing an online booking system for scheduled examination sessions to prevent simultaneous congestion; and (4) implementing an online appointment system allowing applicants to select service time slots in advance, thereby distributing demand evenly and reducing physical crowding in the waiting area.

Future State Mapping

Based on the PAM results and improvement proposals, a *Future State Value Stream Map* was developed to represent the redesigned service flow after waste reduction. The *Future State Map* consolidates the registration and data input stages into a single integrated step with an average processing time of approximately 3 minutes, eliminating the manual form-filling step that previously generated additional queuing. Biometric capture activities including photo, fingerprint, and signature are centralized in one location with a combined processing time of approximately 4.2 minutes.

Theory and practical examinations remain as the core value-added activities. In the *future state*, waiting time before the theory examination is reduced to approximately 1.5 minutes and before the practical examination to approximately 5 minutes, compared to the current state averages of 12.27 minutes and 18.82 minutes respectively. Post-examination result verification is automated through the system at approximately 0.2 minutes, followed by payment and SIM printing with a waiting time of approximately 4.5 minutes. Total *lead time* in the *future state* is reduced to 57.65 minutes, with a value-added processing time of 45.15 minutes. Compared to the current state *lead time* of 85.91 minutes, this represents a reduction of 28.26 minutes or approximately 32.9%, demonstrating a significant efficiency gain while preserving all mandatory competency assessment activities and procedural compliance.



Source: Processed Data (2025)

Fig 4. Future State Value Stream Mapping

CONCLUSION

This study applied a Lean Service approach using Value Stream Mapping (VSM) to analyze and reduce waste in the driving license (SIM) issuance process at Unit X. Based on these findings, it is hoped that the management will use the results of the Value Stream Mapping analysis and the identification of waste as a basis for designing policies to improve service efficiency. The implementation of Lean Service needs to be strengthened through concrete steps such as improving staff accuracy through regular training and a double-check system, updating data verification SOPs, and developing automatic validation features in the driver's license system. Additionally, integrating the driver's license system with the database.

SUGGESTION

Practical Suggestions

1. Service Process Efficiency
Add exam computers, implement a digital queuing system, and create a more flexible service schedule to reduce waiting time at theory and practical exam stages.
2. Digital Technology & System Integration
Strengthen SIM-Dukcapil database integration for automatic data validation, and encourage applicants to register online via the Digital Korlantas app before arriving.
3. Facilities & Technical Readiness
Conduct routine equipment maintenance and provide backup units (cameras, computers, fingerprint devices) to prevent service disruptions due to technical failures.
4. Human Resource Development
Provide periodic training on data entry accuracy, basic troubleshooting, and public service communication skills.

Theoretical Suggestions

1. Broader Research Scope
2. Expand the study to multiple SIM service units across different regions to allow comparison of lean service implementation outcomes.
3. Additional Variables & Approaches
4. Include variables such as applicant satisfaction, digitalization effectiveness, or post-improvement impact for a more comprehensive analysis.

REFERENCE

Andrés-López, E., González-Requena, I., & Sanz-Lobera, A. (2015). Lean service: Reassessment of lean manufacturing for service activities. *Procedia Engineering*, 132, 23–30. <https://doi.org/10.1016/j.proeng.2015.12.455>

- Antonacci, G., Lennox, L., Barlow, J., Evans, L., & Reed, J. (2021). Process mapping in healthcare: A systematic review. *BMC Health Services Research*, 21(1), 342. <https://doi.org/10.1186/s12913-021-07132-1>
- Ashari, F., & Abryandoko, E. W. (2023). Pendekatan lean service untuk mengurangi pemborosan waktu layanan service mobil dengan metode value stream mapping (VSM). *Buana Ilmu*, 7(2), 157–167. <https://doi.org/10.36805/b.v7i2.5375>
- Batley, R., & McLoughlin, C. (2015). The politics of public services: A service characteristics approach. *World Development*, 74, 275–285. <https://doi.org/10.1016/j.worlddev.2015.05.018>
- Chiarini, A. (2013). *Lean organization: From the tools of the Toyota production system to lean office*. Springer-Verlag Italia.
- Converso, G., Guizzi, G., Salatiello, E., & Vespoli, S. (2025). Lean service waste classification and methodological application in a case study. *Journal of Manufacturing and Materials Processing*, 9(4), 121. <https://doi.org/10.3390/jmmp9040121>
- Daft, R. L. (2016). *Management* (12th ed.). Cengage Learning.
- Danese, P., Manfè, V., & Romano, P. (2023). Lean service: A contingency perspective. *Operations Management Research*, 16(3), 1271–1289. <https://doi.org/10.1007/s12063-023-00350-7>
- Dinis-Carvalho, J., Guimarães, L., Sousa, R. M., & Leão, C. P. (2019). Waste identification diagram and value stream mapping: A comparative analysis. *International Journal of Lean Six Sigma*, 10(3), 767–783. <https://doi.org/10.1108/IJLSS-04-2018-0042>
- Felekech, T., & Guohua, W. (2020). Service delivery and good governance in public sectors: A review of literature. *International Journal of Academic Multidisciplinary Research*, 4(11), 24–32.
- Frick, N., Terwolbeck, J., Seibel, B., & Metternich, J. (2024). Design model for the digital shadow of a value stream. *Systems*, 12(1), 20. <https://doi.org/10.3390/systems12010020>
- Gupta, S., Sharma, M., & Sunder, V. (2016). Lean services: A systematic review. *International Journal of Productivity and Performance Management*, 65(8), 1025–1056. <https://doi.org/10.1108/IJPPM-02-2015-0032>
- Heizer, J., Render, B., & Munson, C. (2017). *Operations management: Sustainability and supply chain management* (12th ed.). Pearson Education.
- Heizer, J., & Render, B. (2020). *Operations management: Sustainability and supply chain management* (13th ed.). Pearson Education.
- Hisprastin, Y., & Musfiroh, I. (2020). Ishikawa diagram dan failure mode and effect analysis (FMEA) sebagai metode yang sering digunakan dalam manajemen risiko mutu di industri. *Majalah Farmasetika*, 6(1), 1–9. <https://doi.org/10.24198/mfarmasetika.v6i1.27106>
- Krajewski, L. J., Malhotra, M. K., & Ritzman, L. P. (2016). *Operations management: Processes and supply chains* (11th ed.). Pearson.
- Mansoor, Z., & Williams, M. J. (2024). Systems approaches to public service delivery: Methods and frameworks. *Journal of Public Policy*, 44(2), 258–283. <https://doi.org/10.1017/S0143814X23000405>
- Marin-Garcia, J. A., Vidal-Carreras, P. I., & Garcia-Sabater, J. J. (2021). The role of value stream mapping in healthcare services: A scoping review. *International Journal of Environmental Research and Public Health*, 18(3), 951. <https://doi.org/10.3390/ijerph18030951>
- Martin, K., & Osterling, M. (2014). *Value stream mapping: How to visualize work and align leadership for organizational transformation*. McGraw-Hill Education.
- Mollah, M. K., Munir, M., & Sari, A. W. (2018). Peningkatan kualitas pelayanan dengan metode pendekatan lean service di perusahaan jasa transportasi (Studi kasus: PT KAI Daop 8 Surabaya). *Prosiding Seminar Nasional Sains dan Teknologi Terapan VI 2018*, 593–598. Retrieved from <https://ejurnal.itats.ac.id/sntekpan/article/view/392>
- Osborne, S. P. (2023). Public service logic: Creating value for public service users, citizens, and society through public service delivery. *Routledge*. <https://doi.org/10.4324/9781003150053>

- Reid, R. D., & Sanders, N. R. (2012). *Operations management: An integrated approach* (5th ed.). John Wiley & Sons.
- Rother, M., & Shook, J. (1999). *Learning to see: Value stream mapping to add value and eliminate muda*. Lean Enterprise Institute.
- Rustopo, N. (2017). Implementasi Surat Izin Mengemudi (SIM) online di Satuan Penyelenggara Administrasi SIM (SATPAS) Colombo Surabaya. *Publika*, 5(3). <https://doi.org/10.26740/publika.v5n1.p%25p>
- Sakdiyah, S. H., Eltivia, N., & Amelia, A. A. (2022). Root cause analysis using fishbone diagram: Company management decision making. *JABTER*, 1(6), 566–576. <https://doi.org/10.54408/jabter.v1i6.103>
- Salah, M. M., Çağlar, D., & Zoubi, K. (2023). The impact of production and operations management practices on organizational performance. *Sustainability*, 15(20), 15140. <https://doi.org/10.3390/su152015140>
- Sarkar, D. (2016). *Lean for service organizations and offices: A holistic approach for achieving operational excellence and customer satisfaction*. ASQ Quality Press.
- Sekaran, U., & Bougie, R. (2016). *Research methods for business: A skill-building approach* (7th ed.). John Wiley & Sons.
- Simamora, J. M., & Syah, T. Y. R. (2020). The lean government development on public services over publishing letter police record at State Police Office, Indonesian Republic. *Journal of Multidisciplinary Academic*, 4(2), 108–113. Retrieved from <https://kemalapublisher.com/index.php/JoMA/article/view/433/0>
- Slack, N., & Lewis, M. (2017). *Operations strategy* (5th ed.). Pearson Education.
- Talero-Sarmiento, L. H., Escobar-Rodríguez, L. Y., Gomez-Avila, F. L., & Parra-Sanchez, D. T. (2024). A literature review on lean healthcare: Implementation strategies, challenges, and future research directions. *Cogent Engineering*, 11(1), 2411857. <https://doi.org/10.1080/23311916.2024.2411857>
- Tsou, P., & Hsu, H. (2022). Applications of fishbone diagram and DEMATEL technique for improving warehouse operations: A case study on YMT overseas imported components. *China-USA Business Review*, 21(4), 143–154. <https://doi.org/10.17265/1537-1514/2022.04.001>
- Tlapa, D., Zepeda-Lugo, C. A., Tortorella, G. L., Baez-Lopez, Y. A., Limon-Romero, J., & Alvarado-Iniesta, A. (2020). Effects of lean healthcare on patient flow: A systematic review. *Value in Health*, 23(2), 260–273. <https://doi.org/10.1016/j.jval.2019.11.002>
- Valdivia, G., & Rivas, J. (2021). Management model based on lean service to increase the effectiveness of operational processes in a service company. In *19th LACCEI International Multi-Conference for Engineering, Education, and Technology*. <https://doi.org/10.18687/LACCEI2021.1.1.405>
- Wijaya, H. (2023). Penerapan lean service dalam meningkatkan tingkat kepuasan konsumen di PT Honda KJM (Cabang Ahmad Yani). *Jurnal Rekayasa Sistem Industri*, 8(2), 39–42. <https://doi.org/10.33884/jrsi.v8i2.7241>
- Wibowo, A. A., & Kertati, I. (2022). Reformasi birokrasi dan pelayanan publik. *Public Service and Governance Journal*, 3(1), 1–12. <https://doi.org/10.56444/psgj.v3i01.628>
- Womack, J. P., & Jones, D. T. (2003). *Lean thinking: Banish waste and create wealth in your corporation* (2nd ed.). Free Press.