

Lean Intervention Strategy to Increase Customer Satisfaction Supported by The Application of Artificial Intelligence for Integrated Services at Universitas Negeri Semarang

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Abstract: *The Integrated Service Unit (ULT) at Universitas Negeri Semarang (UNNES) was established in line with Presidential Regulation Number 97/2014 on the Implementation of One-Stop Integrated Services and Ministry of Research, Technology, and Higher Education Regulation Number 59/2016 on Public Services. This unit includes four Customer Service (CS) representatives dedicated to assisting customers with issues in areas such as academics, student affairs, partnerships, and finance, all while emphasizing quality, reliability, and responsiveness. This type of research is qualitative research with a lean approach. In response to the dual demands of online and offline service in the public sector, the ULT has adopted the Pagoda service system, which leverages Artificial Intelligence (AI) to address the limitations posed by a limited number of CS representatives. The integration of AI within the Pagoda system helps manage high complaint volumes by providing a human-like conversational experience, allowing customers to feel as if they are interacting with real people. This research provides an assessment of ULT services using old service applications, namely (1) Pagoda 1.0 to help offline services, (2) email and live chat to help online services along with all the problems that arise, then intervene with lean management to develop Pagoda 2.0 which is capable Handling problems with old service applications.*

Keywords: *Artificial Intelligence, Chatbot, Pagoda 1.0, Pagoda 2.0, Lean Management*

INTRODUCTION

The Integrated Service Unit (ULT) at UNNES was established under Presidential Regulation Number 97/2014 on the implementation of One-Stop Integrated Services, as well as Ministry of Research, Technology, and Higher Education Regulation Number 59/2016 on Public Services (Tohirin et al., 2021). The UNNES ULT comprises two main components: Customer Service (CS), staffed by four individuals, and the Front Office (FO), staffed by three individuals. The CS team is dedicated to providing efficient and friendly management of complaints in the areas of academics, student affairs, partnerships, and finance. These services are designed to be quick, transparent, effective, efficient, and legally certain. Due to the Chancellor of UNNES's policy, B/1502/UN37/WS/2020, regarding employee work arrangements to mitigate the spread of COVID-19, ULT has transitioned from in-person consultations to an online format. This shift has notably influenced the perceptions of students, lecturers, and administrative staff (tendik) concerning the quality and accessibility of ULT services (Evans & Schenarts, 2016).

This policy also affects the ULT service system, originally implemented through the Pagoda Ticket system, hereafter referred to as Pagoda 1.0, which has transitioned to email and live chat services using the Tawk To application. The Integrated Services Unit operated online from March 24, 2020, to November 24, 2021, as shown in Figure 1. Over this period, ULT handled a total of 12,579 complaints from lecturers, students, alumni, and the general public within a single year (McNeil, 2021).

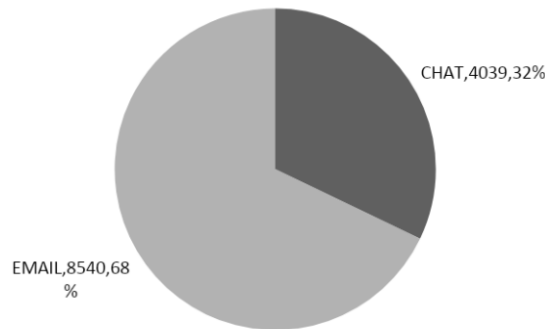


Figure 1. Number of Online Services (Email and Live Chat) by CS during the Pandemic (Source: ULT Primary Data, 2020)

The measurable average length of service via live chat, which is more in-depth, is shown in Figure 2. Based on Figure 2, the most extended average length of service via live chat is 16 minutes and 20 seconds. The most extended service ever provided was 115 minutes. Based on Figure 3, the average response speed by CS to customers requesting service is 5 minutes. This results in customer perceptions regarding integrated services, as shown in Figure 4, which shows satisfaction with ULT of 4004, or around 99% of customers give a neutral assessment. In comparison, the remaining 1% offer a positive assessment. This shows a need for in-depth evaluation and analysis of the profile data above.

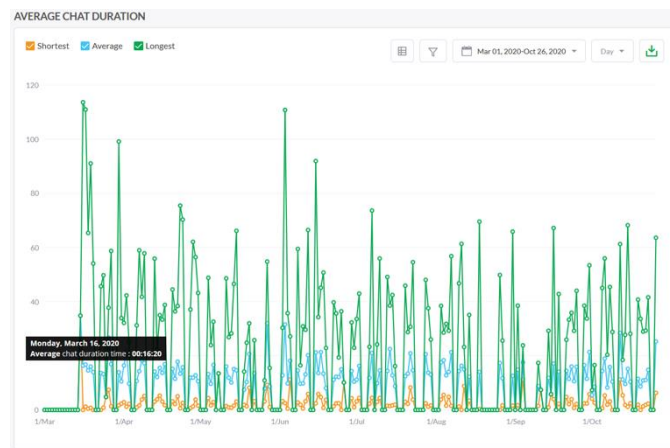


Figure 2. Average Length of Service during the Pandemic (Source: ULT Primary Data, 2020)

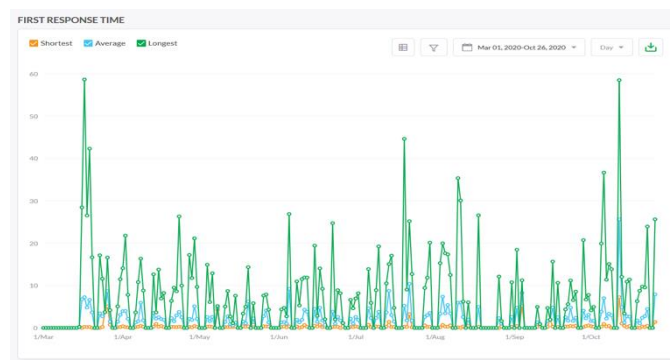


Figure 3. Speed of Responding to Incoming Customers (Source: ULT Primary Data, 2020)

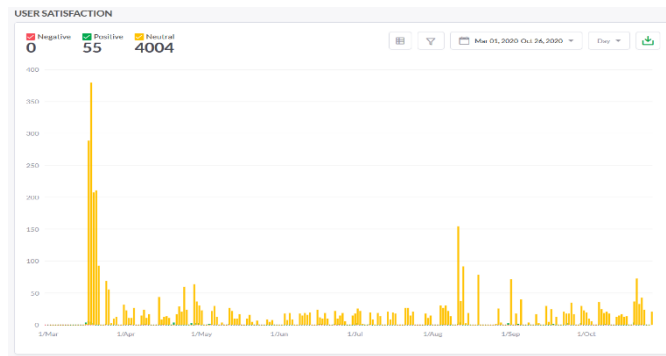


Figure 4. Integrated Service Satisfaction Index via Live Chat during the Pandemic
(Source: ULT Primary Data, 2020)

Although ULT can deliver comprehensive online services, it faces challenges in managing the reporting process (Ouzzani et al., 2016). Currently, ULT spends additional time gathering recaps from email and live chat interactions, which are later processed into reports for leadership. Furthermore, the use of two separate service channels—email and live chat—enables applicants to submit requests multiple times, complicating the work for customer service (CS) and consuming more time. In contrast, the Pagoda 1.0 system, developed in-house by UNNES, offers complete reporting capabilities without additional access costs. However, unlike email and live chat, Pagoda 1.0 lacks two-way communication between CS and applicants (now referred to as customers). Despite this limitation, online services have allowed CS to handle a higher volume of complaints daily compared to offline services. This is because, with online service, the structured chat mechanism minimizes unrelated conversations outside the scope of the issue, significantly reducing the time needed to resolve complaints (Carneiro et al., 2014).

On December 30, 2022, the Government decided to revoke the policy of implementing restrictions on community activities (PPKM). This policy was conveyed by the President of the Republic of Indonesia, Joko Widodo, at the State Palace, Jakarta, accompanied by the Minister of Health and the Minister of Home Affairs (Kurniawan, n.d.). Even though PPKM has been revoked, the effects of habits formed during the pandemic have become ingrained and become a solution to the problem of distance and space, including the service system. Therefore, UNNES, through ULT, still has to provide online and offline services. Considering online and offline services separately raises different issues. If, in the future, it will be created jointly, then the Pagoda 1.0 service system needs to be innovated to overcome offline and online service problems by considering the limited number of CS.

To address common issues in both offline and online services, such as frequently repeated customer questions that can be answered with standard responses from the FAQ, Artificial Intelligence (AI) offers a promising solution. AI, which enables machines to perform human-like tasks (Al-Khowarizmi & Lubis, 2023), is anticipated to help reduce redundant customer service inquiries by providing consistent answers to recurring questions. AI will be implemented in Pagoda 1.0 to assist Customer Service (CS) with inquiries that align with the FAQ, utilizing tools like chatbots. A chatbot simulates real-time conversations in natural language (Hartati, 2021), which can enhance customer satisfaction by delivering responses in a polite, conversational style that mimics human interaction. This design aims to create a more personalized experience, making customers feel as though they are engaging directly with a human representative.

Based on the data and description above, it is necessary to develop the pagoda system into pagoda version 2.0 (pagoda 2.0) with the application of AI to provide flexible online and offline compliant services (Garrido et al., 2024). The system developed is expected to be able to increase the advantages and reduce the shortcomings of Pagoda 1.0 as well as provide convenience to CS and customers, be able to overcome problems that arise in online or offline services, including issues if online and offline services are provided together, and most importantly be able to improve customer satisfaction.

Lean management is an effort to eliminate waste and increase the added value of goods and services to customers (Andrés-López et al., 2015). Lean as a business philosophy is based on minimizing the use of resources such as time. The intended focus is identifying and eliminating activities that add value to the design and production processes or operations directly related to customers (Anggraini &

Ilhamda, 2020). The use of lean can have an impact on improving quality, improving quality culture, improving the environment, and even increasing time efficiency (Kusdarmadji et al., 2021). Lean management reduces the waste of time, budget, and resources to improve quality and customer satisfaction, saving costs or time and high profits. Quoted from the book *Lean Thinking: Banish Waste and Create Wealth in Your Corporation* by Womack, James P., and Daniel T. Jones (2020), lean management applies five principles, namely (1) focus on value, (2) creating value streams and eliminating remaining less efficient value, (3) creating seamless flow, (4) using a “pull” system, and (5) improvising and developing. With lean intervention in designing Pagoda 2.0, we can create a service system to answer all possible deficiencies.

MATERIALS AND METHODS

This research adopts a qualitative approach with a focus on lean management. It assesses ULT services using Pagoda 1.0 in offline settings and email and live chat in online settings, examining the challenges that emerge within these modalities. Additionally, lean management principles were applied to guide the development of Pagoda 2.0, aiming to create a more innovative, efficient, comprehensive, user-friendly, and accurate service experience that upholds values of quality, reliability, and responsiveness in customer service. This process ultimately contributed to the conceptualization of an ideal service model for UNNES.

1. Research Focus

This research leads to a description of the service system used, namely Pagoda. This system is a tool for providing ideal service, seen from the speed and accuracy in handling problems by paying attention to the customer's side as a human being who has subjectivity in providing satisfaction ratings and conformity with all SOPs used by CS. The ideal system is measured from the perceptions of CS and customers based on the ease, speed, completeness, friendliness, and accuracy of the services provided.

2. Data Source

Data was obtained from primary and secondary sources. Researchers got secondary source data through supporting documents from UNNES and outside UNNES, while researchers obtained primary source data through research instruments given to respondents. Respondents, namely ULT service customers, were taken using a random sampling technique.

3. Analysis and Interpretation Techniques

Initial analysis was carried out on secondary data to strengthen the research focus. Next, data analysis uses lean principles and the Aliyyah et al. model on qualitative data, namely carrying out data reduction activities on secondary and primary data by summarizing, selecting the main things, focusing on answers to the problem formulation, looking for themes and patterns, and then presenting the data. display) in the form of narrative text, graphics, modules, and flowcharts to facilitate understanding of the problem and make it easier to plan further work. The series of analyses ends with a conclusion (Aliyyah et al., 2020).

RESULTS AND DISCUSSION

1. Identify Pagoda 1.0

Providing online and offline services can pose many obstacles for CS and customers. ULT hopes that the system developed will be able to answer the barriers that arise (Dwivedi et al., 2023). It is expected that artificial intelligence can be integrated with Pagoda 2.0 to improve the resolution of complaints quickly and precisely by machines. The obstacles that CS faces when providing online services using email and live chat are as follows:

- a. Suppose the same complaint is submitted more than once by one customer. In that case, this stems from the customer's concerns about whether the complaint that has been submitted has been successfully sent or not, apart from worries about whether CS still needs to handle the complaint.

- b. The existence of two service channels means that customers will send to various channels. The two things above will take up CS time, which could otherwise be turned to other customers or complaints.
- c. All complaints sent via email are challenging to process data to be used as material for performance reports.
- d. The same question from many customers with the same answer, according to the FAQ

The obstacles that arise when offline services use the Pagoda 1.0 system are as follows.

- a. The system is designed to be one-way, namely CS, to customers, while customers communicate directly with CS. The Pagoda system only conveys the final solution provided by CS to customers during the offline service process.
- b. The limited number of complaints CS can resolve daily is due to chats between CS and customers, whether chats are related to complaints or not.
- c. The same question from many customers with the same answer, according to the FAQ

2. *Lean Intervention*

Quoted from the book *Lean Thinking: Banish Waste and Create Wealth in Your Corporation* by Womack, James P., and Daniel T. Jones (2020), lean management applies five principles, namely (1) focus on value, (2) creating value streams and eliminating remaining less efficient value, (3) creating seamless flow, (4) using a “pull” system, and (5) improvising and developing. The following describes the five lean management implemented to improve services in the Pagoda 2.0 system.

a. Focus on Value

This principle is oriented towards things that are essential for customers. Focus on producing services that can have an impact on customers. Several questions are used to find value in UNNES services so that ULT can reduce unnecessary processes (ISLAM et al., 2024). The list of questions and answers to determine the value is as in Table 1. It is hoped that Pagoda 2.0 can focus on values that cover central problems served by competent officers and resolve them wholly and optimally.

Table 1. Questions and Answers for Determining Service Value

No	Questions	Answers	Value
1	What terms and conditions must customers fulfil to get services through Pagoda 2.0?	Terms and conditions that customers must fulfill: 1. students or employees who have academic problems that cannot be resolved at the study program and faculty level 2. general customers who request academic and non-academic information	The problems that come are problems that can only be solved by central service
2	What is the appropriate time?	Ideal service can be completed in one visit by the same officer.	One officer solves one customer's problem
3	What is the timeline for requesting services and distribution of required services?	The customer submits a request, and it is immediately resolved entirely.	customers can easily access services and get complete solutions

b. Creates Value Streams and Generates Residual Value Less Efficiently

After finding the value above, the next step is to create a flow to achieve that value. This principle eliminates various processes that should not be needed and wastes a lot of time (Bosnich, 2019). The value stream is limited to service activities and its relationship with other work units. A brief overview of how a service process can run as a whole is shown in Figure 1.

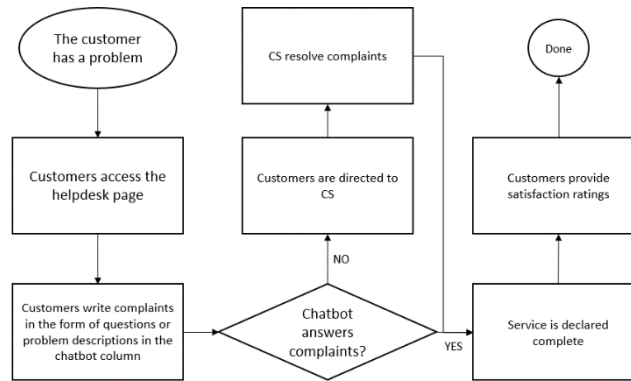


Figure 5. Service Flowchart Diagram

c. Creates Seamless Flow

Based on this principle, seamless flow can be implemented if lean management actors (service officers) ensure that previous value-based processes can move with a tight workflow so that service processes can run smoothly and consistently (Fruin, 2019). This process is challenging because officers will likely have to check the processes in ULT's external environment. But if this can be done, ULT's productivity level can increase rapidly. Among them is control of the following.

- 1) Types of problems that should be resolved within the study program/faculty area are directly conveyed to central services.
- 2) Complaints that one officer cannot resolve.
- 3) Publication of solutions to frequently occurring complaints.
- 4) Mass problems arise due to a policy or application maintenance.

d. Using a "Pull" System

The "Withdraw" system means that each customer can withdraw their right to receive service when needed. This means that ULT can only provide services to the correct number of customers and at the right time. The main goal of this concept is to reduce and eliminate unneeded resources. Elements destroyed in the service process to increase work efficiency and effectiveness are as follows.

- 1) Diversion of mass complaints entered on the ult page to be forwarded to other units
- 2) Standard Operational Procedures that are not concise
- 3) Manual archive recording

d. Improvisation and Development

The final step must be to ensure that ULT can re-develop the four principles above, which have previously been implemented well (Sneed & Verhoef, 2019). So, ALT must continue to evaluate and eliminate ineffectiveness and unnecessary activities in the future. So, ALT still has to repeat the four principles above continuously because inefficient processes and extreme activities could happen again in other sectors. The lean management developed in this research is the first improvisation and system development cycle. It is possible to carry out further improvisation and development in the second cycle and beyond.

3. Flowchart Design

The service flow in Pagoda 2.0 is designed to reduce the weaknesses found in Pagoda 1.0 as follows.

- a. Added a mass response feature for complaints of the exact nature via the Chatbot feature
- b. They added online and offline queuing features to create queues separately to optimize complaint handling.
- c. Added chatbot feature to reduce questions coming into ULT
- d. Add a limited feature for submitting complaints if previous complaints have not been answered. This is to avoid the same complaints being sent repeatedly by customers.

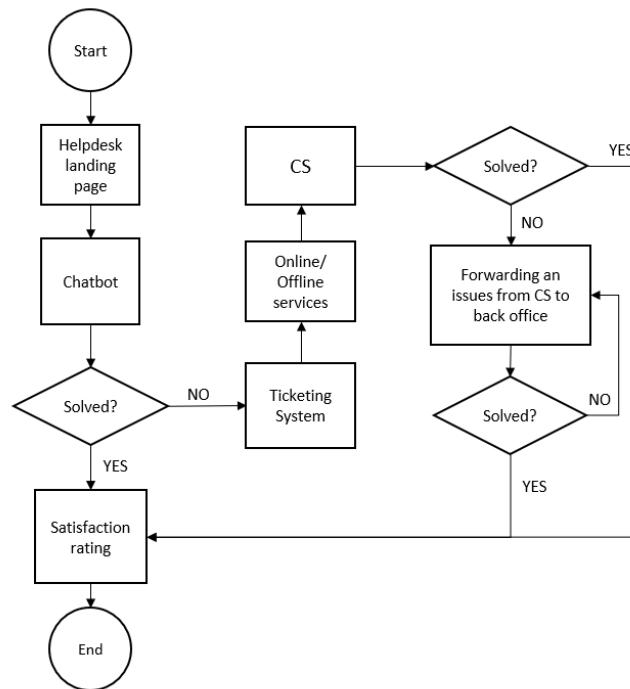


Figure 6. Pagoda 2.0 Service Flow

CONCLUSION

This research assesses ULT services provided by legacy applications, specifically (1) Pagoda 1.0 for offline services and (2) email and live chat for online services, identifying various issues that arise within these systems. To address these challenges, lean management principles were applied to develop Pagoda 2.0, a service system that retains the strengths of previous applications while overcoming their limitations. The Pagoda 2.0 service application, enhanced by lean management interventions, is designed to be more innovative, effective, and efficient, offering scalable solutions to serve a large customer base effectively. Additionally, integrating Artificial Intelligence (AI) in a chatbot, aligned with lean management principles, further supports the Pagoda 2.0 system in delivering responsive and optimized service interactions.

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