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Analysis Of Queueing System And Teller's Serviceoptimization At The Sub-Branch Office Of Bank Bjb For The Regional Government Of West Bandung Regency

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ABSTRACT

This study investigates the queuing system and service efficiency at the Bank BJB sub-branch office in West Bandung Regency, focusing on enhancing customer service operations. With the significant increase in banking sector customers in Indonesia, including a growth in accounts in both conventional and digital financial institutions, the banking industry faces challenges in maintaining speed and efficiency in customer service. Long queues and time-consuming services have led to customer dissatisfaction and reduced operational efficiency. The research examines the current performance of the queuing system and teller service time, analyzing the root causes of prolonged waiting and service times, and developing strategies to optimize these times. The Bank BJB KCP serves a varied customer base, with complex banking requirements that often lead to longer service times. The queuing system employs a multi-channel, single-phase model, and the tellers offer several services, each with its own service level agreement. Observational data collected over 12 working days revealed the busiest hours and performance metrics, indicating high congestion during peak hours. Root cause analysis, considering both teller and customer perspectives, identified key issues contributing to the queuing system's inefficiency. The study's findings aim to enhance the overall customer service efficiency at Bank BJB KCP.

Keywords : Bank, Teller, Waiting Time, Queueing Theory, Optimization

INTRODUCTION

The growth in the number of customers in the banking sector in Indonesia has experienced a significant increase in recent years. This phenomenon is reflected in the increasing interest of the public in using banking services as a means of finance, investment, and personal financial management. This growth is also reflected in the increasing number of bank accounts, both in conventional banks and in digital financial institutions.

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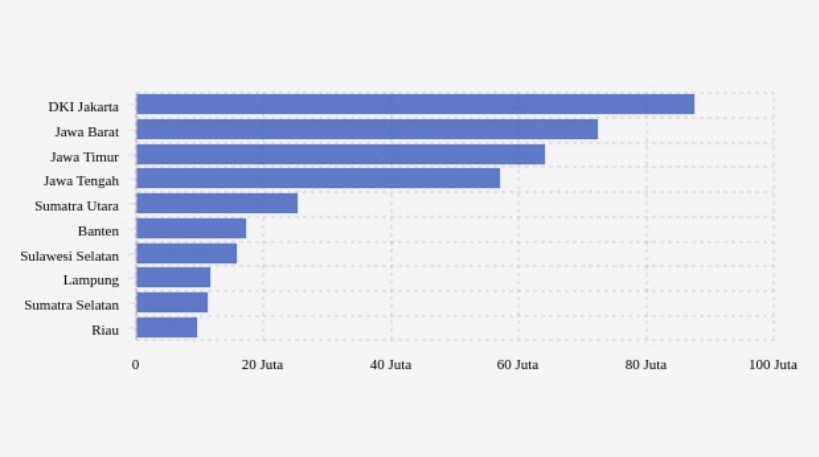

Figure I 10 Provinces with the Most Bank Deposit Accounts in Indonesia (November 2022)
Source:https://databoks.katadata.co.id/datapublish/2022/12/27/10-provinsi-dengan-nasabah bank-terbanyak-jakarta-juara

Based on the data collected by the Deposit Insurance Agency (LPS), in November 2022, there were 489.1 million customer savings accounts in public banks throughout Indonesia. The number of accounts decreased by 3.2% on a monthly basis (month-on-month/mom) but increased by 27.1% on an annual basis (year-on-year/yoy). DKI Jakarta emerged as the province with the highest number of accounts, totaling 87.5 million accounts or 17.89% of the national total. Following closely were West Java with 72.4 million accounts, East Java with 64.15 million accounts, and Central Java with 56.97 million accounts.

However, with the growing number of customers, new challenges have arisen for the banking industry in Indonesia. One of the primary challenges is to maintain the speed and efficiency of customer service. Speed of service has become critical because people now expect a fast, easy, and convenient banking transaction experience.

Therefore, time has become a crucial factor in determining a bank's performance. Long queues, waiting times, and time-consuming customer service present significant challenges for many banks, resulting in customer dissatisfaction, reduced operational efficiency, and potential revenue loss.

The sub-branch office (*Kantor Cabang Pembantu* or KCP) of BJB in the West Bandung Regency Government Complex, located on Jalan Raya Padalarang-Cisarua KM2, operates from Monday to Friday from 08:00 to 15:00. This KCP serves as the central transaction hub for the banking needs of all government agencies under the West Bandung Regency government. In addition to government agency banking needs, the KCP also serves customers, primarily consisting of government employees, teachers, local government honorary staff, and small and medium-sized business owners residing in the

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West Bandung Regency. This indicates that the KCP of BJB in the West Bandung Regency Government serves a more segmented customer base but deals with complex banking requirements related to government functions (such as payroll, allowance processing, SP2D, and local treasury management). As a result, the potential for long queues, waiting times, and customer service duration issues is significant and could lead to customer dissatisfaction with the services provided by the KCP.

To effectively analyze customer queues and service times at Bank BJB KCP of West Bandung Regency Government, a comprehensive review of the current customer service operations is required. This research will encompass a thorough examination of the customer journey. The research begins by observing the arrangement and number of tellers provided by the KCP, then proceeds to examine the customer process from reaching the initial point of contact with the teller, continuing through transaction processing, and concluding with the final interaction. Additionally, interviews will be conducted with relevant parties involved in customer service. This is necessary to identify any constraints or obstacles in queue times and customer service durations, followed by an evaluation of each step of the customer experience and the information gathered. This comprehensive understanding will serve as the foundation for targeted interventions and optimizations aimed at enhancing overall customer service efficiency.

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Business Issue

The KCP BJB for the West Bandung Regency Government has a total of 2 teller counters and 1 customer service counter. According to interviews with Ms. Farah (KCP Supervisor) and Ms. Astrid (Teller), there are four services provided by tellers that are frequently used by customers, namely tax payments, cash deposits, cash withdrawals, and interbank transfers. Each type of service has a different service level agreement that has been predetermined in a standard operating procedure document referred to as the working paper.

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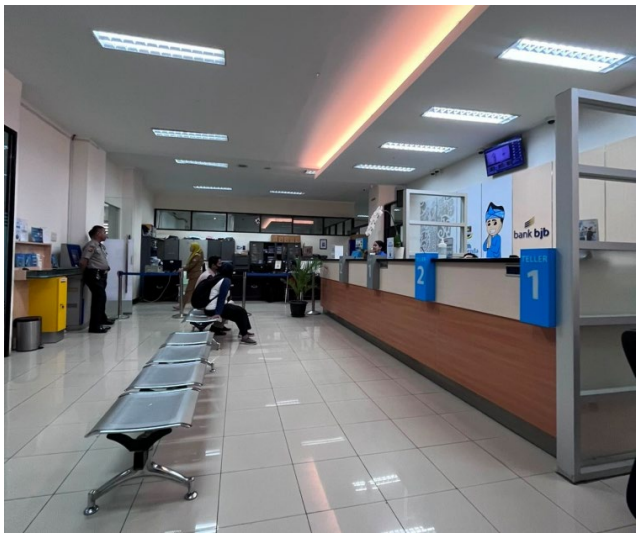

Figure 3
Teller Area

Table 1 Service Level Agreement

Services	Service Level Agreement	Overall SLA
Tax Payment	1 minute	2 minute
Cash Withdrawal	1 minute	
Cash Deposit	2 minute	
Interbank / Book Transfer	3 minute	

Based on the interview results, it was determined that each day, the tellers are able to serve approximately 50-150 customers. It was also revealed from the interviews that there has been no measurement and evaluation of tellers' performance in relation to the established service level agreement, particularly concerning queue times and service times. Furthermore, it is highly likely that queue times and service times at the teller counters exceed the stipulated times in the service level agreement due to the fact that the customers served at this KCP have complex banking needs related to government institutions, resulting in a longer service process. Additionally, the KCP's operating hours often shift and exceed the designated hours as a consequence of these factors. Service times and queue times also tend to be longer because customers frequently conduct more than one type of transaction during their visits.

Table 2 Actual Service Time

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Services	Average Service Time	Overall Service Time
Tax Payment	04.54 minute	04.50 minute
Cash Withdrawal	04.55 minute	
Cash Deposir	04.24 minute	
Interbank / Book Transfer	04.33 minute	

Based on the preliminary observations conducted by the author, it can be determined that the service time performance by the tellers yields an average that does not align with the established Service Level Agreement (SLA) requirements. Each type of service observed evidently produces service times significantly deviating from the SLA. Prolonged service times can lead to customers waiting for an extended duration, thereby affecting the length of the queue.

RESEARCH & METHODOLOGY

Research Design

The flow diagram in the image shows a study on the queuing and customer service at KCP BJB, a branch of Bank BJB in the West Bandung Regency Government. To identify the problem, The study commences with a preliminary observation, conducted on Thursday, October 5, 2023, from 08:00 to 15:00, in line with the teller's operational hours, resulting in a total of 71 transactions. From the observation's findings, it is evident that the actual average service time is 4.5 minutes. This indicates a non-conformity of the service time at KCP BJB with the established Service Level Agreement provisions, which stipulate an average of 2 minutes.

RESULTS AND DISCUSSIONS

Analysis

Queueing System in Bank BJB KCP of West Bandung Regency Government

The Bank BJB KCP of West Bandung Regency Government frontliner facilities that are divided into three primary services: teller service, customer service, and property tax (*Pajak Bumi dan Bangunan*, PBB) payment service specifically for the West Bandung Regency. The number of tellers available includes 2 teller counters, 3 PBB payment counters, and 1 customer service counter.

The frontliner facilities determine the queuing model utilized by the Bank BJB KCP of West Bandung Regency Government teller services. Since the branch has 2 tellers (Mrs. Astrid and Mr. Mario), it indicates that a dual channel (multi-channel) system is in use, while the process for customers conducting transactions at the teller involves only one stage (single phase). Hence, the queuing model for the teller system is Multi-Channel Single Phase. The arrival rate follows a random pattern, denoted by the number of customers during a specific time period. For random arrivals, a Poisson distribution is employed.

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According to the rules of the multi-channel single-phase queuing model, the service time pattern follows an exponential distribution, and the population size or queue length is unlimited, as this queuing model does not have a predetermined population limit. The queuing discipline applied by Bank BJB KCP of West Bandung Regency is the First-In-First-Out (FIFO) discipline, where customers who arrive first are served first.

The teller service process begins when customers arrive at the office and take a teller queue number. At this point, two security personnel handle customer inquiries and provide assistance related to the service information. Usually, the security personnel inquire about the purpose of the customer's visit to the teller before providing the queue ticket from the queue machine to the customer. Customers then wait to be called and served by the teller. The queue machine's function is to print the queue number ticket and display the queue number information on the screen for customers.

After obtaining their queue ticket, customers can wait in the waiting area, which has a seating capacity of 11 chairs. The seating is allocated based on the type of main services provided: 3 chairs for PBB payments, 4 chairs for teller services, and 3 chairs for customer service. When called based on their queue number, customers approach the teller counter to receive service and can then leave the office. However, customers often return to the waiting area after visiting the teller counter for various reasons, such as incomplete required documentation or the customer's requested service type taking an extended amount of time, allowing the teller to continue serving the queue.

Tellers offer several services, with four commonly used services by customers: tax payments, cash deposits, cash withdrawals, and interbank transfers. Each service type has its own predefined service level agreement, which is outlined in a standard operating procedure document referred to as the working paper.

- Tax Payment

The tax payment services frequently handled by tellers include BPHTB (*Bea PerolehanHakatas Tanah dan Bangunan*) payments, motor vehicle taxes, government taxes, ED-Billing, and others. The service time established in the Service Level Agreement (SLA) for tax payments is set at 1 minute per transaction.

- Cash Deposit

Customers often make deposits for various purposes, such as payments, depositing into their personal accounts, depositing into other accounts, or for government-related matters. The service time stipulated in the Service Level Agreement (SLA) for cash deposits is set at 2 minutes per transaction.

- Cash Withdrawal:

Customers frequently make withdrawals from various financial sources such as personal accounts, payroll checks, government checks, and others.The service

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time stipulated in the Service Level Agreement (SLA) for cash deposits is set at 1 minutes per transaction.

- Interbank Transfer / Book Transfer

Customers frequently engage in interbank transfers and book transfers at the teller counter. The service time specified in the Service Level Agreement (SLA) for interbank and book transfers is set at 3 minutes per transaction.

Figure 4
Queueing Situation

Description of Observation Data

To conduct an analysis of the teller queuing system at Bank BJB KCP of West Bandung Regency Government the author carried out observations for a duration of 12 working days. Below is the list of observation days completed by the author:

- Thursday, 5th October 2023
- Friday, 6th October 2023
- Tuesday, 10th October 2023
- Thursday, 12th October 2023
- Friday, 13rd October 2023
- Monday, 16th October 2023
- Tuesday, 17th October 2023
- Wednesday, 18th October 2023
- Thursday, 19th October 2023
- Friday, 20th October 2023
- Tuesday, 7th November 2023
- Thursday, 9th November 2023

Observations were not conducted for 12 consecutive days due to the author being constrained by their class schedule. Observations were carried out during the office's operating hours, which are from 08:00 to 15:00, The author divided the research time

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into 2-hour work intervals, namely 08:00 - 10:00, 10:00 - 12:00, and 13:00 - 15:00. By segmenting the research time according to working hours, the aim is to identify peak hours for teller services. The total number of transactions successfully observed by the author was 916 transactions over the course of 12 days.

a. Arrival Data

Table 3 Arrival Data

No.	Date	Arrival	Working Hour		
			08.00 - 10.00	10.00 - 12.00	13.00 - 15.00
1	Thursday, 05 October 2023	71	33	14	24
2	Friday, 06 October 2023	77	38	17	22
3	Tuesday, 10 October 2023	62	26	22	14
4	Thursday, 12 October 2023	90	42	22	26
5	Friday, 13 October 2023	36	10	13	13
6	Monday, 16 October 2023	110	54	27	29
7	Tuesday, 17 October 2023	45	16	8	21
8	Wednesday, 18 October 2023	94	49	29	16
9	Thursday, 19 October 2023	67	28	25	14
10	Friday, 20 October 2023	51	24	12	15
11	Tuesday, 7 November 2023	129	61	44	24
12	Thursday, 9 November 2023	84	39	18	27
Total Arrival			420	251	245
Average Arrival Rate (λ)			**17,5**	**10,46**	**10,21**

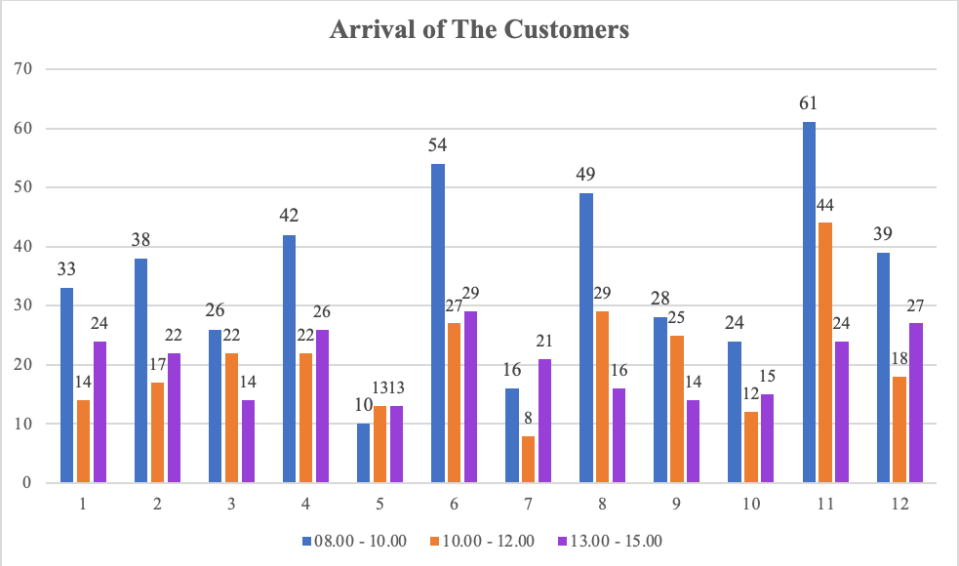

Figure 5
Arrival of The Customers Chart

From the results of the 12-day observation with a total of 916 transactions, It can be observed that the highest arrival of customers occurred during the first working hours, from 08:00 to 10:00, totalling 420 customers with an arrival rate of 17.5 customers per hour. The second peak of customer arrivals was during the 10:00 - 12:00 working hour, with an arrival rate of 10.46 customers per hour. The lowest customer arrival was

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observed between 13:00 - 15:00, with an arrival rate of 10.21 customers per hour. The arrival rate was determined by dividing the total number of customers by 2 working hours multiplied by 12 days of observation.

b. Service Time Data

Table 4 Service Time Data

no.	Date	Working Hour		
		08.00 - 10.00	10.00 - 12.00	13.00 - 15.00
1	Thursday, 05 October 2023	10.55	05.06	06.22
2	Friday, 06 October 2023	04.48	03.59	03.51
3	Tuesday, 10 October 2023	03.54	04.24	03.45
4	Thursday, 12 October 2023	03.45	03.41	03.36
5	Friday, 13 October 2023	04.06	04.19	05.10
6	Monday, 16 October 2023	04.02	04.44	03.49
7	Tuesday, 17 October 2023	27.09	10.28	05.41
8	Wednesday, 18 October 2023	04.09	03.35	04.11
9	Thursday, 19 October 2023	05.00	05.16	03.48
10	Friday, 20 October 2023	12.06	03.48	04.54
11	Tuesday, 7 November 2023	04.14	04.48	07.27
12	Thursday, 9 November 2023	06.39	05.31	04.21
Average Service Time		07.34	04.58	04.45
Service Rate		7,93	12,08	12,63
Average Service Rate (μ)		**10,88**		

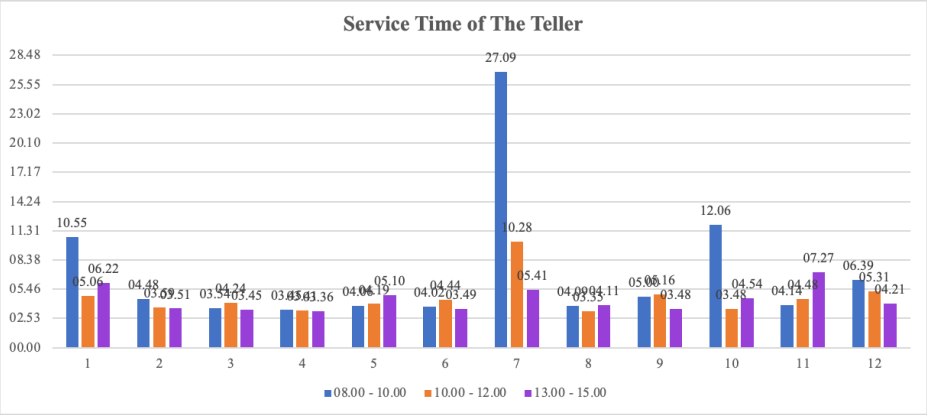

Figure 6 Service Time of The Teller Chart

It is evident that the working hours with the highest average service time are between 08:00 - 10:00, with a duration of 7.34 minutes. The second-highest average service time occurs between 10:00 - 12:00, lasting 4.58 minutes, while the working hours with the lowest average service time is 4.45 minutes. The service rate achievable by the tellers is 10.88 services per hour.

Current Queueing System Analysis

After conducting observations and gathering the necessary data for the analysis of the queuing system at Bank BJB KCP of West Bandung Regency Government, the next step is to measure the performance metrics of the queuing system to assess its

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performance in the teller queue. The performance metrics used in this analysis include ρ (traffic intensity), Po (probability of no customer in the system), Ls (average number of customers in the system), Ws (average total time in the system), Lq (average number of customers in the waiting line), and Wq (average time in the waiting line).

Table 5 Current Queueing System Performance Metrics

Performance Metrics / Time	ρ	Ls	Lq	Ws (minutes)	Wq (minutes)	P0
08.00 - 10.00	0,804	4,1	3,29	14,04	11,28	0,196
10.00 - 12.00	0,481	0,927	0,446	5,317	2,558	0,519
13.00 - 15.00	0,469	0,884	0,415	5,195	2,437	0,531

Analysis of performance metrics based on working hour :

1. 08.00 – 10.00
   - The traffic intensity (ρ) is relatively high (0.804), indicating a high level of congestion. This suggests that the system is operating close to its maximum capacity (1) and may struggle to handle the incoming traffic efficiently.
   - The average number of customers in the system (Ls) and the average number of customers waiting in queue (Lq) is relatively high (4.1 and 3.29). This indicates that, on average, there are over 4 customers (including those being served and in the queue) within the system.
   - The average time a customer spends in the system (Ws) and in the queue (Wq) is 0,234 hours (14.04 minutes) and 0,188 hours (11.28 minutes), respectively. This indicates that customers spend a considerable amount of time in the service process, both while waiting and during the service itself.
   - The probability of having no customers in the system (P0) is around 0.196, suggesting that the system is often occupied and customers may frequently encounter queues.

Based on these metrics, the queuing system is experiencing high congestion and relatively long wait times at this working hour.

2. 10.00 – 12.00
   - The traffic intensity (ρ) is approximately 0.481, indicating the system is moderately loaded.
   - The average number of customers in the system (Ls) and in the queue (Lq) is around 0.927 and 0.446, indicating that, on average, there's almost one customer in the system (including those being served and in the queue).
   - The average time a customer spends in the system (Ws) and in the queue (Wq) is 0.089 hours (5.34 minutes) and 0.0446 hours(2.68

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minutes), respectively. These wait times may potentially exceed the Service Level Agreement (SLA) requirements.

- The probability of having no customers in the system (P0) is around 0.519, suggesting the system is often occupied.

Based on these metrics, this queuing system faces moderate congestion, and the wait times might be at the threshold of meeting SLA requirements.

3. 13.00 – 15.00
    - The traffic intensity (ρ) is approximately 0.469, indicating the system is moderately loaded.
    - The average number of customers in the system (Ls) and in the queue (Lq) is around 0.884 and 0.415, indicating that, on average, there's almost one customer in the system (including those being served and in the queue).
    - The average time a customer spends in the system (Ws) and in the queue (Wq) is 0.087 hours (5.2 minutes) and 0.041 hours(2.46 minutes), respectively. These wait times may potentially exceed the Service Level Agreement (SLA) requirements.
    - The probability of having no customers in the system (P0) is around 0.531, suggesting the system is often occupied.

This queuing system faces moderate congestion, and the wait times might be at the threshold of meeting SLA requirements.

Based on the calculated performance metrics for each working hour, the author can conclude that the 08:00 - 10:00 working hour is the busiest and most critical period. This segment displays overall metrics resulting in poor performance, particularly concerning Ws and Wq metrics, may significantly affecting customer satisfaction with the service provided by the tellers. Consequently, the research will be focused on this working hour.

Root Cause Analysis

The root cause analysiscenters on the predetermined busy hour determined based on the results of queueing analysis. During this busy hour, which spans from 08:00 to 10:00, the system experiences high congestion in the teller queue. This designation is established due to the fact that, during these working hours, the teller queue system is considered to undergo high congestion, as indicated by the longest average time a customer spends in the system (Ws) and the longest average time a customer waits in the queue (Wq) compared to other working hours, with each time period amounting to 14.16 minutes and 11.34 minutes, respectively.

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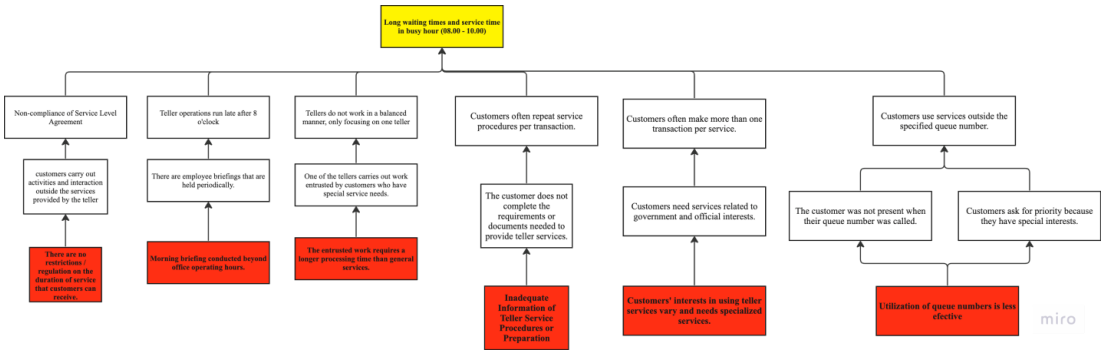

Figure 7 Current Reality Tree

The root cause analysis is facilitated through the utilization of the current reality tree tool. This analysis is created based into two perspectives: an analysis based on the teller's perspective and an analysis based on the customer's perspective. The Current Reality Tree based on the customer perspective is constructed through direct observation and in-depth interviews with a teller named Ms. Astrid and a customer named Ms. Riztrya, who is an academician. She has utilized teller services approximately five times.

The objective of conducting a root cause analysis from both perspectives is to identify the root causes from both parties, which can then be synergized to formulate a solution aimed at resolving the issues faced by both parties. This effort is made to reduce the duration of queues and teller service times at Bank BJB KCP of West Bandung Regency Government

- Undesirable Effect (UDE):
  Long waiting times and service time in busy hour (08.00 – 10.00).
- Intermediate Effects:
  1. Non Compliance of Service Level Agreement

  The non-compliance with the service level agreement (SLA) has been substantiated through preliminary observations, indicating that the average overall service time provided by tellers is 4.50 minutes, which does not align with the established SLA of an overall average service time of 2 minutes. The failure to meet the SLA for service time is identified as one of the causes of prolonged queuing times because the extended service time increases the likelihood that customers waiting in line will experience longer waits.

  Based on observations and interviews with tellers, the non-compliance with the service level agreement is attributed to customers engaging in activities and interactions outside the services provided by the teller. Additionally, customers often engage in activities and interactions unrelated to the ongoing transaction, such as inquiring about bank service procedures beyond teller services. This necessitates explanations from the teller, resulting in extended service times.

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Moreover, tellers frequently promote new products or services to customers verbally during teller service, further contributing to longer service times outside the transaction processing period.

2. Teller Operations Run Late After 8 O'Clock

During the 12 days of observation, the author noted that on 6 working days, the tellers did not commence operations promptly at 08:00; usually, there was a delay of approximately 5 to 20 minutes. This leads to an extended waiting time for teller services because by the time operational delays occur, customers have already started arriving, resulting in a considerable queue as they await the commencement of teller operations. According to interviews with tellers, the cause of the operational delays is attributed to routine morning briefings conducted 2 to 3 times a week. These briefings take place before the operational hours of the office and encompass all employees of Bank BJB KCP of West Bandung Regency Government.

3. Tellers Do Not Work Ina Balanced Manner, Only Focusing On One Teller

Based on the observations conducted by the author, it is noted that often only one teller is serving customers. Sometimes, Teller 1 tends to serve customers more frequently than Teller 2, or vice versa. The distribution of services appears unbalanced between the two tellers, resulting in customers waiting longer because only one teller is attending to them. According to interviews with the tellers, the reason for tellers not working in a balanced manner, focusing only on one teller, is that one of the tellers will concentrate on tasks assigned in advance, such as handling banking matters for the local government or government offices in the West Bandung Regency. This is particularly relevant as the branch is located within the premises of the West Bandung Regency government complex.

4. Customers Often Repeat Service Procedures Per Transaction

Based on the results of direct observation and interviews, the author found that customers often repeat service procedures per transaction. The repetition occurs because customers frequently fail to fulfill the requirements or provide the necessary documents for using services, such as filling out slips, not bringing their passbooks, and so forth. Despite the security personnel informing customers, they often proceed with the service and leave the teller area to fulfill the requirements first. This significantly impacts the waiting time for customers in the queue.

5. Customers Often Make More Than One Transaction Per Service

Based on the results of observation and interviews, author found that customers often engage in more than one transaction per service. Frequently, customers perform multiple transactions within a single teller service, causing the service time to be prolonged. Typically, tellers handle up to 5 transactions in one service,

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which are processed sequentially alongside other customer services or are processed after the bank's operational hours. Additionally, it is noted that the BJB KCP of West Bandung Regency Government serves customers with interests related to officialand government duties. As a result, customers frequently conduct transactions related to both official duties and personal interests simultaneously. This dual nature of transactions can prolong the time required for each transaction, subsequently leading to increased waiting times.

6. Customers Use Services Outside The Specified Queue Number.

Based on the results of observation and interviews, the author found that customers often use services outside the specified queue number. Some customers frequently approach the teller without obtaining a queue number or waiting to be called by their designated number. This occurs because certain customers are not present in the waiting area, so when their number is called, they do not approach the teller immediately. Instead, they approach the teller when they return to the area, thereby disrupting the queue for other customers. Additionally, some customers often request priority service, citing their involvement in official or governmental matters. This results in them being served ahead of customers who have already taken a queue number. Although the services they require may not be time-consuming, such actions disrupt the established queue order and can extend the waiting time, particularly for customers who have been waiting patiently.

- Root Causes:
  1. There Are No Restrictions / Regulation On The Duration Of Service That Customers Can Receive

Based on the preceding intermediate effects, the author can conclude that the first root cause identified from the non-compliance with the service level agreement is there are no restrictions/regulations on the duration of service that customers can receive. Although tellers have already limited the maximum number of transactions a customer can conduct in one service to 5 transactions, there is no regulation or time restriction for customer service. Consequently, customers are inclined to engage in interactions with tellers beyond the primary services, leading to an extended duration of time within the system. This, in turn, triggers prolonged waiting times for customers in line to be served by the teller.

2. Morning Briefing Conducted Beyond Office Operating Hours

Based on the preceding intermediate effects, the author can conclude that the second root cause identified from "Teller operations run late after 8 o'clock" is the morning briefing conducted beyond office operating hours. The author infers that the regularly scheduled morning briefing often extends beyond the start of office operational hours, causing tellers to experience operational delays as they

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attend the briefing first. However, the commencement of the bank's operational hours is a critical time for teller services, as it falls within the busy hour according to the queueing analysis conducted earlier.

3. The Entrusted Work Requires A Longer Processing Time Than General Services.

Based on the preceding intermediate effects, the author can conclude that the third root cause identified from tellers do not work in a balanced manner, only focusing on one teller is the entrusted work requires a longer processing time than general services. The author infers that entrusted tasks, which involve special services and transactions exceeding 5, demand a significantly longer processing time than typical services. As a result, both tellers must allocate their tasks to serve customers directly and complete the entrusted work, which has predetermined deadlines. Additionally, the location of the branch within the West Bandung Regency government complex contributes to the complexity and increased volume of banking needs from government and official services compared to general banking services. Consequently, tellers require more focus and time to handle these specialized services.

4. Customers Often Repeat Service Procedures Per Transaction

Based on the previously identified intermediate effects, the author can conclude that the first root cause identified from customers often repeating service procedures per transaction is inadequate information about teller service procedures or insufficient preparation. Many customers are not fully informed about the information and procedural flow of teller services, leading to a lack of preparation for the required documentation and causing customers to repeat transactions.

5. Customers Often Make More Than One Transaction Per Service

Based on the preceding intermediate effects, the author can conclude that the second root cause identified from customers often making more than one transaction per service is the varying interests of customers in utilizing teller services, which necessitate specialized services. Customers of BJB KCP of West Bandung Regency Government have interests related to both personal matters and official duties and government affairs. These two types of interests involve different levels of service complexity, leading to varying service durations. Official duties and government-related matters typically require a longer service time, thereby triggering longer waiting times in the customer queue.

When a customer requires additional transactions, they may directly request assistance from the teller and fulfill the necessary requirements during the ongoing transaction. This may result in extended service duration for a single client, as they are engaging in more than one transaction per service session.

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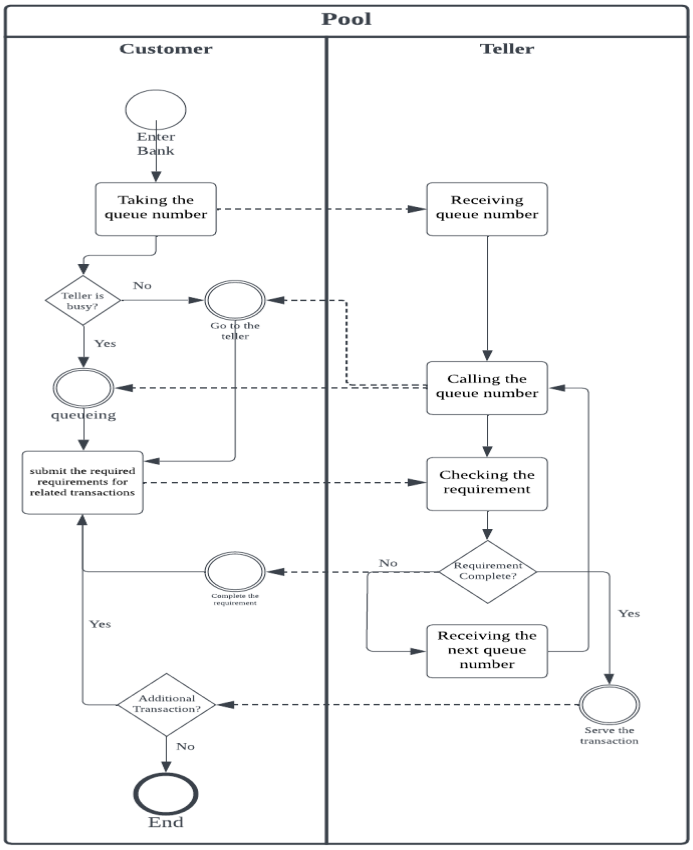

Figure 8
Current Process Flow of Teller Services

6. Customers Use Services Outside The Specified Queue Number

Based on the preceding intermediate effects, the author can conclude that the third root cause identified from customers using services outside the specified queue number is the less effective utilization of queue numbers. With occurrences of customers not being present when their queue number is called and prioritizing service for customers based on their interests, the use of queue numbers is considered less effective. The queue numbers assigned to customers do not align with the sequence, causing delays in service and waiting times in the queue. This can also lead to customer dissatisfaction due to the uneven prioritization of service among customers.

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Table 6 Root Causes Summary

No,	Root Causes
1	There Are No Restrictions / Regulation On The Duration Of Service That Customers Can Receive
2	Morning Briefing Conducted Beyond Office Operating Hours
3	The Entrusted Work Requires A Longer Processing Time Than General Services.
4	Customers Often Repeat Service Procedures Per Transaction
5	Customers Often Make More Than One Transaction Per Service
6	Customers Use Services Outside The Specified Queue Number

After conducting a root cause analysis, considering both the teller's perspective and the customer's perspective, the author has identified three root causes from each perspective that contribute to long queueing times and service times during busy hours. Each identified root cause will serve as a foundation for developing solutions and strategies to reduce queueing time and service time, particularly during busy hours.

Business Solution

Solution RecommendationsFrom Root Causes

The development of solutions to address the root causes observed in the queue at the BJB KCP Bank of West Bandung Regency Government is facilitated through the utilization of the BCOR framework (Benefit, Cost, Opportunity, and Risk) and PPT framework (People, Process, and Technology). This framework is employed to devise solutions that take into consideration both the positive and negative effects of the proposed measures also The PPT framework is utilized to classify each developed solution within the framework, enabling alignment with one another based on the categorization of people, process, and technology. By utilizing the framework, the

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development of solutions aims to be judicious, seeking to minimize or even eliminate long queue times and service durations, particularly during busy hours of teller services

Table 7 BCOR Framework For Root Cause Analysis

No.	Root Causes	Impact	Solution Reccomendation	Benefit	Cost	Opportunity	Risk
1	There Are No Restrictions / Regulation On The Duration Of Service That Customers Can Receive	Non-compliance of Service Level Agreement	The establishment of Standard Operating Procedures (SOPs) governing the duration of customer interactions with the teller service.	Service time will become more effective and efficient, thus reducing the occurrence of prolonged waiting times and compliance of SLA	Cost for HRD Departement	Improving service consistency	The service time has become more stringent and less flexible for customers.
2	Morning Briefing Conducted Beyond Office Operating Hours	Teller operations run late after 8 o'clock	The formulation of regulations to grant tellers the allowance to leave the morning briefing, especially during busy hours.	Tellers will operate punctually in accordance with operational hours and provide effective customer service.	-	Preventing the occurrence of queue buildup in case of teller operational delays.	The delayed receipt of information by the teller regarding the content covered in the morning briefing.
3	The Entrusted Work Requires A Longer Processing Time Than General Services.	Tellers do not work in a balanced manner, only focusing on one teller	Adding one dedicated teller to handle entrusted work particularly during busy hours.	Other tellers can focus on serving customers who do not have additional tasks to entrust, ensuring a smooth service flow.	More labour cost	Reducing workload of the tellers	Relying on one dedicated teller for entrusted work during busy hours may create a dependency on that individual. If they are unavailable or absent, it could result in a backlog of entrusted tasks.
4	Inadequate Information of Teller Service Procedures or Preparation	Customers often repeat service procedures per transaction.	Installing banners or signs containing information regarding the process and requirements for teller services before the queue number issuance area.	Customers will be informed and better prepared in advance regarding the service process and the requirements to be fulfilled before queuing.	More cost for adding properties	Educating customers , fostering a more informed and knowledgeable customer base.	Misinterpretation of information and ineffective communication
5	Customers' interests in using teller services vary and needs specialized services.	Customers often make more than one transaction per service.	Dividing teller tasks into various categories of service transactions, such as personal transaction services and special transaction services.	Tellers will be utilized according to their transaction categories, preventing prolonged service and waiting times.	-	Reducing workload of the tellers	Misclassification of transaction categories
6	Utilization of queue numbers is less efective	Customers use services outside the specified queue number.	Implementing a digitalized queuing system that can directly integrate with customers.	Customers will find it easier to request a queue number and receive information related to queue calls.	Research & Development and IT Cost	Improving customer experience	User adoption challenges and technical issues

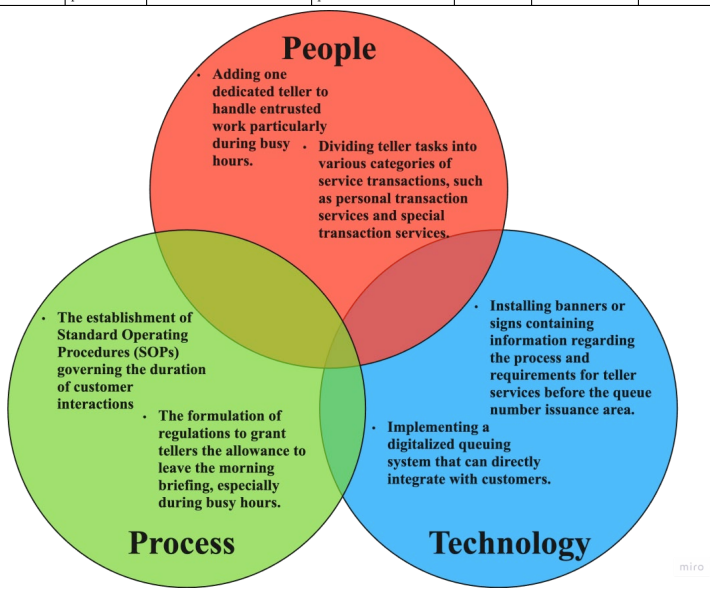

Figure 9 PPT Framework

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Process-based Solution :

1. The Establishment of Standard Operating Procedures (Sops) Governing The Duration of Customer Interactions

This solution is related to process improvement, as it aims to standardize and optimize the duration of customer interactions. It involves defining and implementing a structured process for how tellers interact with customers.

The Standard Operating Procedure (SOP) formulated to address the root causes of "There Are No Restrictions/Regulation On The Duration Of Service That Customers Can Receive" is an SOP that entails imposing a limitation on the duration for which a customer can be served by a teller. The reference for the duration, which can be set as a limit, ranges between 5 to 10 minutes per transaction. This duration reference is derived from feedback provided by customer Ms. Riztrya during an in-depth interview. According to her, this timeframe is considered sufficient for serving one customer to ensure that others do not have to wait excessively in the queue. In addition to the duration limitation, restricting the number of transactions can also be suggested as a solution. During busy hours, customers are allowed to perform only one transaction per service. If additional transactions are required, customers are required to take a queue number and join the line again.

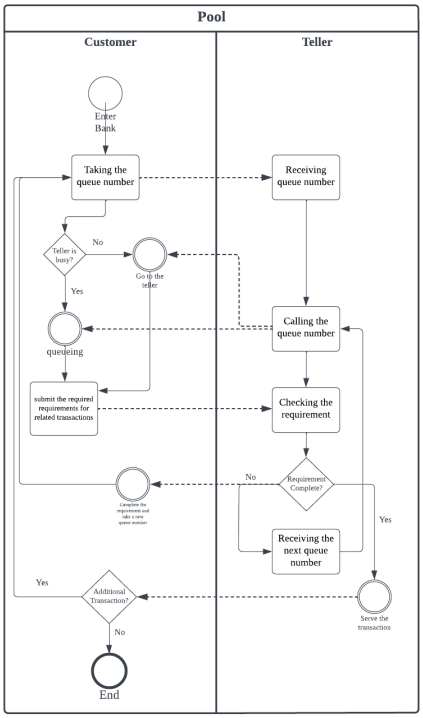

Figure 10 Process Flow Solution for Teller Services

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2. The Formulation of Regulations to Grant Tellers The Allowance to Leave The Morning Briefing, Especially During Busy Hours.

This solution addresses the process of scheduling and workforce management. It involves formulating regulations to streamline the morning briefing process and ensure it aligns with operational needs.

People-based Solution:

3. Adding One Dedicated Teller to Handle Entrusted Work Particularly During Busy Hours

This solution has a people-centric focus, as it involves the addition of a dedicated teller to the team. It relates to workforce management and ensuring the availability of individuals to handle specific tasks during busy periods.

Due to high congestion experienced in the queueing system during busy hours (from 08:00 to 10:00), resulting in prolonged wait times and service durations, the author proposes the addition of one teller during busy hours. This teller can be designated specifically for handling entrusted work that requires a longer processing time than other services, allowing the other two tellers to focus on customers requiring direct service.

Based on the analysis conducted on the current queuing system, it can be concluded that the service performance of the BJP KCP Bank of West Bandung Regency Government, which employs two servers, is still suboptimal during busy hours (08:00 - 10:00). With the use of two servers, the average service rate(μ) provided by the tellers is 10.88 services per hour, and the arrival rate(ƛ) during busy hours is 17.5 customers per hour. This results in poor performance metrics, as the queuing system experiences high congestion during busy hours, with average times a customer spends in the system (Ws) and in the queue (Wq) being 0.236 hours (14.16 minutes) and 0.189 hours (11.34 minutes), respectively.Therefore, the author proposes an alternative solution to the queuing model by adding one teller server, making a total of three tellers used during busy hours

Table 8 Performance Metrics Comparation Between Two Scenarios

Performance Metrics / Server Scenario	ρ	Ls	Lq	Ws (minutes)	Wq (minutes)	P0
2 Teller	0,804	4,1	3,29	14,04	11,28	0,196
3 Teller	0,536	1,16	0,62	3,963	2,125	0,464

Comparing the two scenarios:

- Traffic Intensity (ρ): With three servers, the traffic intensity is lower (0.536) compared to two servers (0.804), indicating a less congested system with three servers.

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- Average Number of Customers in the System (Ls): The average number of customers in the system is lower with three servers (1.16) compared to two servers (4,1), demonstrating improved system efficiency.
- Average Number of Customers in the Queue (Lq): The average number of customers in the queue is lower with three servers (0.62) compared to two servers (3.29), indicating a shorter queue length
- Average Time a Customer Spends in the System (Ws): The average time a customer spends in the system is shorter with three servers (0.066 hours / 3.96 minutes) compared to two servers (0.234 hours / 14.04 minutes), reflecting reduced wait times.
- Average Time a Customer Spends Waiting in the Queue (Wq): The average time a customer spends waiting in the queue is shorter with three servers (0.035 hour / 2.13 minutes) compared to two servers (0.188 hour / 11.28 minutes), signifying reduced wait times.
- Probability of No Customer in the System (P0): The probability of having no customers in the system is higher with three servers (0.464) compared to two servers (0.196), indicating the system is more often available for new arrivals.

Table 9 Percentage of Reduction From 2 Teller to 3 Teller Scenario

3 Teller Scenario	
Performance Metrics	**Percentage of Reduction**
ρ	33,30%
Ls	71,80%
Lq	81,16%
Ws	71,77%
Wq	81,16%

Adding 3 teller scenario underscores the positive impact of introducing a third server to the queuing system specially in busy hour (08.00 – 10.00). The lower traffic intensity reduced average number of customers in the system, and shorter waiting times collectively contribute to an improved customer service experience. The substantial decrease in the average number of customers in the queue and the corresponding reduction in the time customers spend waiting in the queue signify a more streamlined and efficient service process.

Moreover, the higher probability of having no customers in the system with three servers suggests enhanced system availability. This aspect is particularly crucial during busy hours of bank teller service, where long waiting times may lead to

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customer dissatisfaction. The addition of a third server emerges as an effective solution to address the challenge of long waiting times during peak hours, as it significantly enhances the system's capacity to handle customer requests promptly.

In conclusion, the introduction of a third server not only aligns with the objective of optimizing service efficiency but also plays a pivotal role in meeting customer expectations during busy hours. This strategic enhancement has the potential to positively impact customer satisfaction and uphold the service level agreement by mitigating the problem of long waiting times in the bank teller service queue.

4. Dividing teller tasks into various categories of service transactions

This solution also falls under the people category. It involves categorizing tasks based on customer needs of transaction. It emphasizes the importance of individuals in carrying out different types of transactions effectively.

The author suggests categorizing service types based on the transaction needs of customers. This categorization is proposed because the BJB KCP Bank of West Bandung Regency Government serves customers with both personal and governmental needs. Therefore, the tellers can be divided into those catering to customers with personal needs and those catering to customers with governmental and official requirements.

This solution aims to optimize the efficiency and effectiveness of teller services, especially during busy hours, to prevent prolonged wait times and service durations.

Technology-based Solution:

5. Installing banners or signs containing information regarding the process and requirements for teller services before the queue number issuance area.

This solution has elements of both process and technology. While it involves the physical process of installing signs, it also incorporates technology indirectly by using visual aids to communicate information.

The installation of banners or signs containing information about the teller service process and service requirements is aimed at ensuring that customers are already familiar with the service process and can prepare the necessary documents before using teller services. This is intended to prevent queue duplication due to discrepancies in the process or requirements. The following are some examples of posters that can serve as references for banners and signs applicable to BJB KCP Bank of West Bandung Regency:

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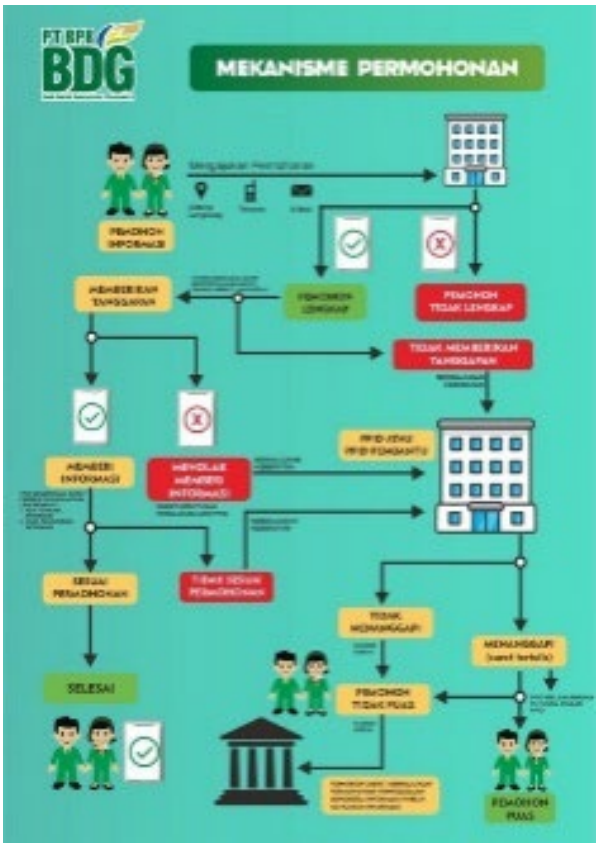

Figure 11 Example of The Poster
Source:https://bankgunungkidul.co.id/alur-layanan-informasi-publik/

6. Implementing A Digitalized Queuing System That Can Directly Integrate with Customers.

This solution is technology-driven. It involves the implementation of a digitalized queuing system, leveraging technology to enhance the customer experience and streamline the queuing process.

The digitization of the queuing system is necessary to enable customers to utilize queue numbers effectively. The author suggests the creation of a platform or application that customers can use on their devices. This platform would function to book queue numbers and receive notifications for queue call-ups. The purpose of this is to allow customers to pre-book transactions, eliminating the need for physical queuing, and to receive notifications when their queue number is about to be called. Customers can also select a preferred service time. Through this digitization, it is anticipated that a queuing system can be established that is more directly integrated with customers.

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Implementation Plan & Justification

After completing several stages of research, ultimately leading to the development of several solutions aimed at addressing the issues at the BJB KCP Bank of West Bandung Regency Government, the final stage of this research involves creating an implementation strategy and justification. This strategy serves to assist in mapping the developed solutions for comprehensive and structured implementation. The implementation strategy employed is PDCA (Plan, Do, Check, and Act) cycle and justification aims to provide a clear and concise rationale for implementing the strategiesto guide decision-makers in making informed choices that balance operational efficiency and customer satisfaction for a sustainable banking operation.

PDCA cycle for each developed solution:

1. The Establishment of Standard Operating Procedures (SOPS) Governing the Duration of Customer Interactions With The Teller Service.

Justification:

The implementation of standardized procedures for customer interactions ensures consistency and efficiency in service delivery. While training costs may be incurred initially, the long-term benefits include reduced service times and improved customer satisfaction, leading to potential revenue growth.

Plan:

- Develop a comprehensive SOP outlining the acceptable duration for customer interactions.
- Clearly define the criteria and considerations for determining appropriate service times.
- Communicate the new SOP to all relevant staff members.

Do:

- Implement the SOP in the teller service operations.
- Train tellers on the new SOP and its implications.
- Monitor and ensure adherence to the defined service durations.

Check:

- Periodically review service interactions to assess compliance with SOP.
- Gather feedback from both staff and customers regarding the effectiveness of the new SOP.
- Analyze any deviations from the set standards.

Act:

- Adjust the SOP if necessary based on feedback and performance analysis.

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- Provide additional training or resources if non-compliance issues persist.
- Continuously improve and refine the SOP as needed.

2. The Formulation of Regulations to Grant Tellers The Allowance to Leave The Morning Briefing, Especially During Busy Hours.

Justification:

Granting tellers the flexibility to leave morning briefings during busy hours addresses the need for increased staffing during peak times. While potential overtime costs may be incurred, the improved efficiency and customer satisfaction outweigh the financial impact, leading to enhanced customer loyalty and positive word-of-mouth.

Plan:

- Develop clear regulations outlining the conditions under which tellers can be excused from the morning briefing, particularly during busy hours.
- Establish communication channels for notifying management of the need to leave the briefing.

Do:

- Implement the new regulations in the morning briefing process.
- Train tellers and management on the updated policies.
- Ensure effective communication channels for timely notifications.

Check:

- Monitor the adherence to the new regulations.
- Collect feedback from tellers and management regarding the impact on operations.
- Assess whether the regulations are effectively addressing the identified issues.

Act:

- Make adjustments to the regulations based on feedback and performance data.
- Provide additional support or resources as needed.
- Continuously review and update the regulations to ensure relevance.

3. Adding One Dedicated Teller to Handle Entrusted Work Particularly During Busy Hours.

Justification:

The allocation of additional staffing resources during peak hours directly addresses the demand-supply gap, reducing waiting times and improving service efficiency. While there is an associated cost in terms of salary, the potential revenue gain from increased customer throughput and satisfaction justifies this investment.

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Plan:

- Assess the workload during busy hours to determine the optimal time and role for the dedicated teller.
- Define the responsibilities and tasks assigned to the dedicated teller.
- Communicate the changes to the staff and customers.

Do:

- Introduce the dedicated teller position during busy hours.
- Train the dedicated teller on entrusted work and related processes.
- Inform customers about the new service arrangement.

Check:

- Monitor the performance of the dedicated teller.
- Collect feedback from staff and customers regarding the impact on service quality.
- Evaluate the efficiency of handling entrusted work during busy hours.

Act:

- Adjust the schedule or tasks of the dedicated teller based on performance analysis.
- Provide additional training or resources if needed.
- Continuously optimize the role of the dedicated teller to enhance efficiency.

4. Installing Banners or Signs Containing Information Regarding The Process And Requirements For Teller Services Before The Queue Number Issuance Area.

Justification:

Categorizing teller tasks based on service transactions allows for specialization, optimizing teller efficiency. The costs associated with staff training and potential restructuring are offset by the long-term gains in productivity and improved service quality.

Plan:

- Design informative banners or signs detailing the process and requirements for teller services.
- Identify strategic locations for installing these banners or signs.
- Develop a communication plan to inform customers about the new information sources.

Do:

- Install the banners or signs in the designated areas.

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- Communicate the availability of new information sources to customers and staff.
- Ensure the clarity and visibility of the installed banners or signs.

Check:

- Monitor customer interactions and inquiries to assess the effectiveness of the new information sources.
- Gather feedback from customers and staff regarding the clarity and helpfulness of the installed banners or signs.

Act:

- Make adjustments to the content or placement of banners/signs based on feedback.
- Provide additional communication or training if necessary.
- Continuously update information on banners or signs to reflect any procedural changes.

5. Dividing Teller Tasks into Various Categories Of Service Transactions, Such As Personal Transaction Services And Special Transaction Services.

Justification:

Clear communication of processes and requirements reduces customer confusion, minimizing transaction errors and service delays. The initial investment in signage is relatively low compared to the long-term benefits of streamlined operations, reduced waiting times, and improved customer satisfaction.

Plan:

- Analyze the types of transactions and customer needs to determine relevant categories.
- Develop a clear categorization system for teller tasks.
- Communicate the new task categorization to staff.

Do:

- Implement the new task categorization system.
- Train tellers on the revised task assignments and categories.
- Monitor the distribution of tasks and ensure adherence to the categorization system.

Check:

- Assess the efficiency and effectiveness of the new task categorization.
- Collect feedback from tellers and customers regarding the impact on service quality.
- Analyze whether the categorization aligns with customer needs.

Act:

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- Adjust task categories if needed based on feedback and performance data.
- Provide additional training or resources as required.
- Continuously refine the task categorization to align with evolving customer needs.

6. Implementing A Digitalized Queuing System That Can Directly Integrate with Customers.

Justification:

The adoption of a digitalized queuing system not only enhances customer experience by reducing physical waiting times but also offers operational benefits by optimizing staff allocation. While there is an initial investment in technology, the long-term cost savings in improved efficiency and customer satisfaction make it a financially sound decision.

Plan:

- Select or develop a suitable digital queuing system.
- Define the integration points with customer devices and internal systems.
- Develop a comprehensive communication plan to introduce the digital queuing system.

Do:

- Implement the digital queuing system.
- Train staff and customers on how to use the new system.
- Monitor the integration with internal systems and customer devices.

Check:

- Evaluate the customer adoption rate and satisfaction with the digital queuing system.
- Monitor the system's performance and identify any technical issues.
- Gather feedback from staff and customers on the effectiveness of the new system.

Act:

- Make adjustments to the system based on feedback and performance analysis.
- Provide additional training or support if necessary.
- Continuously update and enhance the digital queuing system based on technological advancements and customer needs.

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Table IV.8 Solution Implementation Timeline

No.	Solution	2024											
		1	2	3	4	5	6	7	8	9	10	11	12
1	The establishment of Standard Operating Procedures (SOPs) governing the duration of customer interactions with the teller service.	PLAN											
				DO									
				C			H			E			CK
				ACT									
2	The formulation of regulations to grant tellers the allowance to leave the morning briefing, especially during busy hours.	PL											
			DO										
				C			H			E			CK
				ACT									
3	Adding one dedicated teller to handle entrusted work particularly during busy hours.	PL											
			DO										
				C			H			E			CK
				ACT									
4	Installing banners or signs containing information regarding the process and requirements for teller services before the queue number issuance area.	PL											
			DO										
				C			H			E			CK
				ACT									
5	Dividing teller tasks into various categories of service transactions, such as personal transaction services and special transaction services.	PL											
			DO										
				C			H			E			CK
				ACT									
6	Implementing a digitalized queuing system that can directly integrate with customers.	PLAN											
						DO							
							CH			E			CK
						ACT							

The solutions developed based on the research in this final project will be scheduled for implementation in the year 2024. The milestone timeline has been established using the application of the PDCA cycle for each solution. The author proposes initiating the "plan" phase for all proposed solutions at the beginning of 2024, followed by the "do" phase after completing the "plan" phase for each solution. Subsequently, the "check" phase, as suggested by the researcher, is proposed to be conducted every quarter or three months for each solution. This will be followed by the final stage, the "act" phase, which will be carried out continuously throughout the implementation and execution of the solutions to ensure that the principle of continuous improvement is sustained.

CONCLUSION & RECOMMENDATIONS

After completing the entire research process, the author is able to address the research questions that were formulated based on the identified business problem in this study. The following presents the research questions along with their corresponding answers.

1. What is the current performance status of the queueing system and teller's customer service time at the KCP BJB for the West Bandung Regency Government?

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From the results of the 12-day observation with a total of 916 transactions, It can be observed that the highest arrival of customers occurred during the first working hours, from 08:00 to 10:00, totalling 420 customers with an arrival rate of 17.5 customers per hour. The second peak of customer arrivals was during the 10:00 - 12:00 working hour, with an arrival rate of 10.46 customers per hour. The lowest customer arrival was observed between 13:00 - 15:00, with an arrival rate of 10.21 customers per hour. The arrival rate was determined by dividing the total number of customers by 2 working hours multiplied by 12 days of observation.

Based on the calculation of queueing theory analysis performance metrics for each working hour, the author can conclude that the 08:00 - 10:00 working hour is the busiest and most critical period. This segment displays overall metrics resulting in poor performance, particularly concerning The average time a customer spends in the system (Ws) and in the queue (Wq) is 0,234 hours (14.04 minutes) and 0,188 hours (11.28 minutes), respectively, may significantly affecting customer satisfaction with the service provided by the tellers.

2. What are the causes of the issues regarding prolonged waiting times and teller's service time at the KCP BJB for the West Bandung Regency Government?

To identify the causes of issues related to prolonged waiting times and teller service durations, a Root Cause Analysis was conducted using the Current Reality Tree tool to pinpoint the root causes. The analysis was based on direct observations and interviews with both the teller and customer stakeholders. The following are the identified root causes:

- There Are No Restrictions / Regulation On The Duration Of Service That Customers Can Receive
- Morning Briefing Conducted Beyond Office Operating Hours
- The Entrusted Work Requires A Longer Processing Time Than General Services.
- Customers Often Repeat Service Procedures Per Transaction
- Customers Often Make More Than One Transaction Per Service
- Customers Use Services Outside The Specified Queue Number

3. What strategies can be implemented to optimize waiting times and teller's service time at the KCP BJB for the West Bandung Regency Government?

After conducting a comprehensive series of analyses, the researcher can develop strategies for Bank BJB KCP of West Bandung Regency Government that can be implemented to optimize teller waiting times and service durations. The following outlines the formulated strategies:

- The Establishment of Standard Operating Procedures (Sops) Governing The Duration of Customer Interactions

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- The Formulation of Regulations to Grant Tellers The Allowance to Leave The Morning Briefing, Especially During Busy Hours.
- Adding One Dedicated Teller to Handle Entrusted Work Particularly During Busy Hours
- Dividing teller tasks into various categories of service transactions
- Installing banners or signs containing information regarding the process and requirements for teller services before the queue number issuance area
- Implementing A Digitalized Queuing System That Can Directly Integrate With Customers.

Recommendation

1. Introduce engaging workshops or online sessions for customers to familiarize them with the bank's services, transaction categories, and the digital queuing system. This personalized approach enhances customer understanding and confidence in using banking services.
2. Develop tailored assistance programs for customers who may need extra support during transactions. This could include dedicated personnel to guide elderly or first-time customers through the process, ensuring a positive and inclusive banking experience for everyone.

Conduct customer journey mapping exercises to identify pain points and areas of improvement. Organize regular feedback sessions inviting customers to share their experiences and suggestions, emphasizing the bank's commitment to continuous improvement based on customer insights.

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