VARIABLE RESEARCH JOURNAL
Volume 02, Number 04, October 2025
E-ISSN: 3032-4084
Open Access

ANALYSIS OF QUEUE THEORY AND SERVICE OPTIMIZATION IN THE *DRIVE THROUGH* SYSTEM OF MCDONALD'S S. PARMAN, SAMARINDA BRANCH USING *THE SINGLE SERVER SYSTEM MODEL*

Nita Priska Ambarita
Universitas Mulawarman, Indonesia
email: nitapriska.ambarita@feb.unmul.ac.id

ARTICLE INFO

Article history:
Received July 25, 2025
Revised September 10, 2025
Accepted October 10, 2025
Available online October 15,2025

Keywords:
Service, Queue, Single Serve System

ABSTRACT

McDonald's is a multinational fast food company originating from the United States that implements a drive-thru system at some of their outlets. The purpose of this study is to see how optimal the service is at McDonald's drive thru S Parman Samarinda branch. McDonald's drive thru S Parman Samarinda branch uses a single server queue system. The results of this study show that a single server system is very appropriate to use because customers can be served well and get optimal time. If the arrival rate (λ) is 8 customers per hour and the service rate (μ) is 12 customers per hour, then the system is stable because λ < μ. This can be seen from the number of individuals or customers waiting in the queue (Lq), which amounted to 1.33. The average number of customers in the system (L) is a total of 2. The probability of the absence of an empty buyer or server (P0) is 33%.

Introduction

The financial difficulties following the Covid-19 pandemic have been many. Typically in situations of financial distress, firms are incentivized to utilize earnings management techniques to alter the picture of their financial situation (Ulfah et al., 2022), stock prices are the reflection of firm value (Ambarita, 2023), During the pandemic, small and medium enterprises (SMEs) need to have the ability and focus on increasing digital capabilities (Defung et al., 2024; Nuraeni et al., 2025). Because of that SMEs required to think crically (Nuraeni et al., 2025; Raharjo et al., 2023). Sustainable performance can be achieved if business owners can continuously innovate according to environmental dynamics (Ambarita et al., 2023) When the dollar exchange rate increases, sellers must adjust the selling price to avoid losses. The level of price elasticity of demand and changes in exchange rates are two variables that determine the price of beef . The development of the increasingly advanced and large population has made us used to waiting. Waiting is identical to a queue process, which of course this problem can be solved. Long queues are a form of non-optimal performance of an existing system. Of course this is a problem that must be solved, considering that customers can be disappointed when they get long service. Facing increasingly fierce global competition and changing economic conditions, companies in the tourism sector are required to maintain optimal financial performance to survive and thrive (Ambarita, Mokodongan, et al., 2025) In a queue there are two main actors, namely customers and waiters. When customers keep coming and waiters are overwhelmed then this will be a problem, hence the queuing theory needs to be considered in a business. The activities carried out by the team have provided benefits to partners who are Mantau Roti traders, partners have felt an increase in their ability to understand financial management, who during the production process have not budgeted production costs, electricity costs, employee salaries and others so that they are able to budget and be able to group them. post expenses, income and capital in simple terms (Ambarita, Nita Priska; Irfan; Fadhilah, Citra Vivi Nadhiatul Fadhiatul; Tyas, 2024)

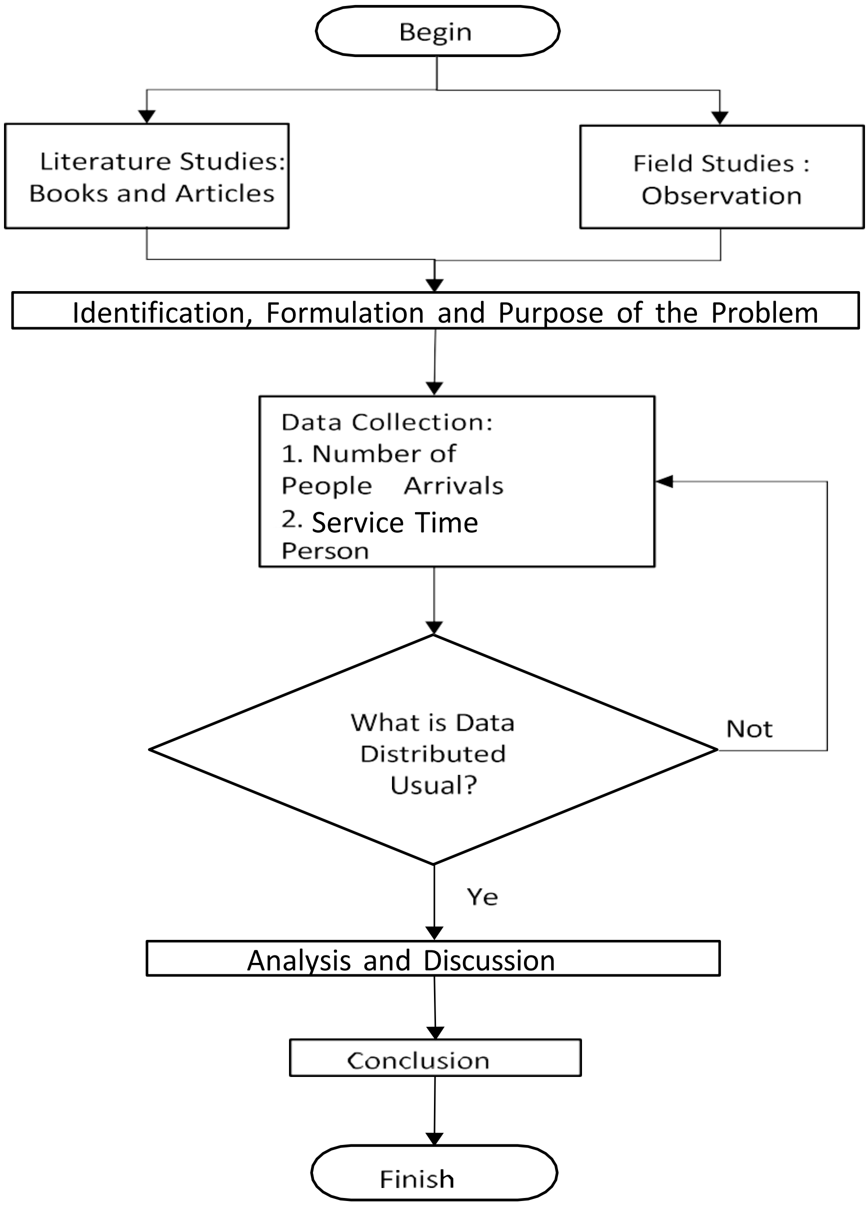
The rapid advancement of digital technology has influenced various economic sectors, including micro, small, and medium enterprises (MSMEs). This community service journal analyzes the role and effectiveness of digital marketing in the development of Warung Dangkita, an MSME located in Samarinda (Ambarita, 2024), the challenges faced, and formulate their development strategies (Ambarita, Wahyuni, et al., 2025; Martiyanti et al., 2024). To retain customers, an organization always strives to provide the best service(Martiyanti et al., 2024; Nuraeni et al., 2025). The best service includes providing fast service so that customers are not left waiting (queuing) for too long. However, the impact of providing this fast service will incur costs for the organization, as it has to add service facilities. Therefore, fast service will be of great help to retain customers, which in the long run will certainly increase the company's profits.

Queuing is something that is often done in daily activities and is always avoided. Although it is avoided, in practice this activity cannot be avoided and is found in daily activities. This queue is caused by the service capacity not proportional to the needs of the service [1]. Queue theory is included in the research of operations that will then make a decision about the aspects required to obtain a service [2], [3]. Queuing is part of the service process. The quality of service is important because the better the service provided, the more satisfied customers will be, so the company must continue to improve service to customers (Fitriyani et al., 2025) [4], [5]. Fast service and not long wait will provide the best service (Fitriyani et al., 2025)[6]. These services can be done by improving the queue system because consumers complain a lot about many cases that occur in long waiting times before being processed during transactions. The long queues that occur result in consumer disappointment and trust in these services decreases [7]. The purpose of the queue theory itself is to find out whether the available facilities are running optimally or not, as well as to minimize the total cost, namely direct costs for the provision of service facilities and indirect costs due to customer waiting time.

McDonald's is a multinational fast food company originating from the United States that implements a drive-thru system at some of their outlets. The purpose of this study is to see how optimal the service is at McDonald's drive thru S Parman Samarinda branch. McDonald's drive thru S Parman Samarinda branch uses a *single server queue system*. This research was carried out by looking at the results of service optimization carried out in the form of data on the number of customers in the queue (Lq), the number of customers in the system (L), and the probability of the absence of customers or empty servers (Po), the average time spent by a customer in the entire queue system (W), the average time spent by a customer waiting in the queue until it is served (Wq), The probability that the waiter is busy (U), the probability that the waiter is not busy (I). Optimization is the best and most efficient state in providing solutions to problems so that the problem can be solved properly.

Research Methods

Figure 1 contains an explanation of the research flow or flowchart starting with a literature study by examining theories related to books and scientific articles as well as field studies by observing or seeing directly the object of research, namely the number of people arriving and the length of service time per person. With literature studies and field studies, observation is carried out so that it becomes the basis for identifying problems, formulations and goals of problems. Furthermore, data collection was carried out by observation at one of the McDonald's branches in Samarinda. After the data is collected, analysis and discussion steps are carried out using a single server system. This queue system is used because it sees that there is only one service line, namely 1 cashier service at McDonald's and the last one produces a conclusion.


Begin
Literature Studies: Books and Articles
Field Studies : Observation
Identification, Formulation and Purpose of the Problem
Data Collection:
1. Number of People Arrivals
2. Service Time Person
What is Data Distributed Usual?
Not
Ye
Analysis and Discussion
Conclusion
Finish

Result and Discussion

Data collection was carried out by observation in the drive thru area of the McDonald's S. Parman branch, Samarinda City. The goal is to collect data on the number of consumer arrivals and buyer service time data. This observation was carried out on May 12, 2025, with an observation duration of one hour. Starting at 16:00 to 17:00. Data on the number of arrivals at the S. Parman McDonald's Drive thru service system on May 12, 2025, can be seen as follows:

Observation Data

1. The length of time required for the distribution of time between arrivals

No.	Queue Range	Number of Customers	Arrival Time (minutes)
1	Car 1 to 2	1	10,50
2	Car 2 to 3	1	14,56
3	Car 3 to 4	1	1,22
4	Car 4 to 5	1	18,36
5	Car 5 to 6	1	2,00
6	Car 6 to 7	1	4,11
7	Car 7 to 8	1	3,55
	Total		**54,30**
	Average		**7,76**

Table 1. *Time Distribution Data Between Arrivals Source: Research data (2025)*

Total time between arrivals: 54.30 minutes (3,258 seconds) Average time between arrivals: 8 minutes 16 seconds Number of differences: 7

2. Length of time required for service time distribution

No.	Queue Range	Service Distribution Time (Minutes)	Duration (minutes)
1	Car 1	00:50 - 02:28	1,38
2	Car 2	12:54 - 15:56	3,02
3	Car 3	25:35 - 29:15	3,40
4	Car 4	27:23 - 32:23	5,00
5	Car 5	46:22 - 47:49	1,27
6	Car 6	47:53 - 52:57	4,07
7	Car 7	51:30 - 55:38	4,08
8	Car 8	54:56 - 58:00	3,04
	Total		**25,26**
	Average		**3,16**

Table 2. *Service Time Distribution Data Source: Research data (2025)*

1. The number of customers in the queue

No.	Queue	Cars in Queue	Sum
1	Wed-1	Mobile 1	1
2	Wed-2	Mobile 2	1
3	Wed-3	Cars 3 and 4	2
4	Wed-4	Mobile 5	1
5	Wed-5	Cars 6 and 7	2
6	Wed-6	Cars 7 and 8	2
	Total		**8**

Table 3. *Data on the Number of Customers in the Queue*
Source: Research data (2025)

2. Length of time in the system to serve queues per customer

No.	Arrival Hours	Number of Customers	Service Time (minutes)
1	16:00:00 - 16:03:28	1	3,28
2	16:11:04 - 16:15:56	1	4,52
3	16:24:15 - 16:29:15	1	5,00
4	16:25:30 - 16:32:23	1	6,53
5	16:44:10 - 16:47:49	1	3,39
6	16:46:24 - 16:52:57	1	6,33
7	16:50:26 - 16:55:38	1	5,12
8	16:54:16 - 16:58:00	1	3,44
	Total		**37,61**
	Average		**4,70**

Table 4. *Service Time Data in the System*
Source: Research data (2025)

Total time in the system: 37.61 minutes (2,257 seconds)
Average time in the system: 5 minutes 10 seconds Number of Customers: 8

Number of customers in the system in a day: (Assumption 8 vehicles/hour) So, 24 hours x 8 vehicles = 192 customers/day

3. Average waiting time in a queue for 1 customer: Cars 3 and 4: Car 4 wait for 2 minutes (27.28-29.28)
Cars 6 and 7: Car 7 waited for 1 minute 42 seconds (51.30-53.12)

Cars 7 and 8: Car 8 waits for 1 minute 4 seconds (54.56-56.00)

Average = 95.33 seconds or 1 minute 35 seconds (rounded)

Data Analysis

The following are the results of observations of McDonald's drive thru:

No.	Arrival Hours	Number of Customers	Serving Time (Minutes)
1	16:00:00 - 16:03:28	1	3,28
2	16:11:04 - 16:15:56	1	4,52
3	16:24:15 - 16:29:15	1	5,00
4	16:25:30 - 16:32:23	1	6,53
5	16:44:10 - 16:47:49	1	3,39
6	16:46:24 - 16:52:57	1	6,33
7	16:50:26 - 16:55:38	1	5,12
8	16:54:16 - 16:58:00	1	3,44
	Total		**37.61 minutes**
	Average		**5.10 minutes**

Table 4. *Service Time Data in the System Source: Research data (2025)*

Before entering into the calculation to be searched, it is to find the operating characteristics for a single queue system. First look at the arrival rate (how often customers are in the queue), is the number of arrivals during the one-hour time period on the drive thru queue system and the service rate (how quickly the customer is served), is the average number of customers that can be served during the one-hour time period on the drive thru queue system.

For **the level of arrival,** it is expressed by **the symbol (λ)** and for the **level of service** is expressed by **the symbol (μ).**

a) Finding the arrival rate **(λ)** in an hour:

In the observation carried out in one hour, there were 8 customers who came in the drive thru queue system. So the customer arrival rate in one hour is 8 customers.

(λ): 8 customers coming in one hour

b) Searching for service level **(μ)** in one hour:

As is known from the data above, it is found that the average service time per customer is 5.10 minutes per customer or rounded to 5 minutes per customer, after which the average time is entered into the formula to find the level of service **(μ),** with the calculation as follows:

Then, because in this study we use a reference of 1 hour or 60 minutes, we have to find the level of service **(μ)** in one hour. To find the level of service in one hour, you must multiply the level of service by 60 minutes with the following calculation:

$\textbf{Service Level } (\mu) = \textit{Total customers per minute} \times 60 \textit{ minutes}$
$\textbf{Service Level } (\mu) = 0,2 \times 60 \textit{ minute}$
$\textbf{Service Level } (\mu) = 12 \textit{ customers served in one hour}$

From the calculation above, the level of customer service in one hour is 12 customers.

(μ): 12 customers served in one hour

Then it can be known:

Arrival Rate (λ): 8 customers arriving in one hour Service Level (μ): 12 customers served in one hour

Then input the known data into the operating characteristic formula for this system, the calculation is attached to the following formulas:

1. Service Sensitivity Level (*P):*

$$P = \frac{\lambda}{\mu} = \frac{8}{12} = 0,67 = 67\% \text{ level of insensibility.}$$

2. The probability of no customer presence in a queue system:

$$P_0 = 1 - \frac{\lambda}{\mu} = 1 - \frac{8}{12} = \frac{12-8}{12} = \frac{4}{12} = 0,33 = 33\% \text{ probability of no customer presence}$$

in the system.

3. The average number of customers in a queue system (the number of customers served and those in the queue):

$$L = \frac{\lambda}{\mu - \lambda} = \frac{8}{12-8} = \frac{8}{4} = 2 = \text{average customers in the queue system.}$$

4. The average number of customers in the queue:

$$Lq = \frac{\lambda^2}{\mu\,(\mu-\lambda)} = \frac{8^2}{12\,(12-8)} = \frac{64}{12\,(4)} = \frac{64}{48} = 1,33 \text{ average customer in the queue.}$$

5. The average time a customer spends in the entire queue system (i.e. time to wait and be served):

$$W = \frac{1}{\mu - \lambda} = \frac{1}{12-8} = \frac{1}{4} = 0,25 \text{ hours}$$

0.25 hours x 60 minutes = 15 minutes of average time per customer in the system.

6. The average time a customer spends waiting in the queue until it is served:

$$Wq = \frac{\lambda}{\mu\,(\mu - \lambda)} = \frac{8}{12\,(12-8)} = \frac{8}{48} = 0,167 \text{ hours}$$

0.167 hours x 60 minutes = 10 minutes of average time per customer in the queue.

7. The probability that a server is busy (i.e. the probability that a customer will have to wait), known as the utility factor:

$U = \frac{\lambda}{\mu} = \frac{8}{12} = 0{,}67$ the probability that the waiter will be busy and the customer will have to wait.

8. The probability that the waiter is not busy (is the probability that a customer can be served):

$I = 1 - U = 1 - 0.67 = 0.33$ probability of the waiter not being busy and the customer can be served.

So, the results of the summary calculation of the Single Serve System queue system can be seen in **Table 5**.

Drive Thru McDonald's Samarinda	
P	67%
P0	33 %
L	2
Lq	1,33
W	15 minutes
Wq	10 minutes
U	0,67
I	0,33

Table 5. *Queue Analysis Calculation*
Source: Research data (2025)

Conclusion

Based on the results of the summary calculation of the queue analysis of the Drive Thru McDonald's S. Parman Branch, it can be seen that the *Single Server System* queue model is very appropriate to use because customers can be served well and get optimal time. If the arrival rate (λ) is 8 customers per hour and the service rate (μ) is 12 customers per hour, then the system is stable because λ < μ. This can be seen from the number of individuals or customers waiting in the queue (Lq), which amounted to 1.33. The average number of customers in the system (L) is a total of 2. The probability of the absence of an empty buyer or server (P0) is 33%. The calculation results show good performance.

Reference

Ambarita, Nita Priska; Irfan; Fadhilah, Citra Vivi Nadhiatul Fadhiatul; Tyas, D. N. N. (2024). *Jurnal PEDAMAS (Pengabdian Kepada Masyarakat) Volume 2 , Nomor 6 , November 2024 ISSN : 2986-7819 COUNSELING ON FINANCIAL GOVERNANCE OF SMALL AND MEDIUM-SIZED*. *2*(November), 1761–1764. https://pekatpkm.my.id/index.php/JP/article/view/511

Ambarita, N. P. (2023). *PENGARUH RASIO KEUANGAN TERHADAP HARGA SAHAM LQ45 THE EFFECT OF FINANCIAL RATIOS ON STOCK PRICE IN*. *1*(1), 258–271. https://humasjournal.my.id/index.php/HJ/article/view/84

Ambarita, N. P. (2024). *Jurnal PEDAMAS (Pengabdian Kepada Masyarakat) Volume 2 , Nomor 3 , Mei 2024 ISSN : 2986-7819 ANALISIS DIGITAL MARKETING DALAM PENGEMBANGAN UMKM WARUNG DANGKITA , SAMARINDA DIGITAL MARKETING ANALYSIS IN THE DEVELOPMENT OF MSMEs , WARUNG*. *2*, 906–910.

Ambarita, N. P., Mokodongan, A., Virgiawan, A., Oleona, L., Kristanti, D. A., & Suharto, B. (2025). *PENGARUH STRUKTUR MODAL TERHADAP PROFITABILITAS*. *14*(September), 4291–4300. https://doi.org/10.34127/jrlab.v14i3.1842

Ambarita, N. P., Nur, D., Ahsan, A., Ristianingsih, D., Ulum, M. H., & Mulawarman, U. (2023). *Jurnal PEDAMAS (Pengabdian Kepada Masyarakat) Volume 1 , Nomor 4 , November 2023 ISSN : 2986-7819 Pendahuluan Hasil dan Pembahasan*. *1*(November), 1034–1037.

Ambarita, N. P., Wahyuni, S., Purwanti, I. R., & Amara, N. A. (2025). *Jurnal PEDAMAS (Pengabdian Kepada Masyarakat) Volume 3 , Nomor 3 , Mei 2025 ISSN : 2986-7819 PENINGKATAN PEMASARAN UMKM KRIPIK BAYAM DI KOTA SAMARINDA*. *3*, 1212–1220.

Defung, F., Yudaruddin, R., Ambarita, N. P., Che-Yahya, N., & Bahrudin, N. Z. (2024). *The impact of ESG risks on bank stability in Indonesia. Banks and Bank Systems, 19 (4), 194-204*. https://doi.org/10.21511/bbs.19(4).2024.15

Fitriyani, S., Martiyanti, D., & Ambarita, N. P. (2025). *Peran Kepuasan sebagai Variabel Mediator dalam Hubungan antara Atribut Toko dan Pengalaman Pelanggan terhadap Niat Membeli Kembali pada Generasi Z The Role of Satisfaction as a Mediating Variable in the Relationship between Store Attributes and Consumer Experience on Repurchase Intention among Generation Z*. *27*(4), 793–805.

Martiyanti, D., Alghifari, M. F., & Aisyah, S. (2024). Pelatihan Pembuatan Search Engine Optimization (SEO) sebagai Upaya Mengoptimalkan Pemasaran Digital UMKM. *Jurnal Pengabdian UNDIKMA: Jurnal Hasil Pengabdian & Pemberdayaan Kepada Masyarakat*, *5*(2). https://doi.org/oi:https://doi.org/10.33394/jpu.v5i2.10938

Nuraeni, H., Indriastuti, H., & Martiyanti, D. (2025). *The Influence of Product Innovation on Marketing Performance through Iconic Product Advantages of Bead Craft Business Actors in East Kalimantan*. *4*(9), 1969–1980.

Raharjo, S., Ambarita, N. P., Ramadhani, M. A., & others. (2023). *Berpikir kritis dan kreatif*. MainPro Publishing. https://scholar.google.com/citations?view_op=view_citation&hl=en&user=_NxpLiIAAAAJ&citation_for_view=_NxpLiIAAAAJ:zYLM7Y9cAGgC

Ulfah, Y., Ambarita, N. P., Hidayani, R. Y., & Lesmana, D. (2022). Board Structure and Earning Management: A Comparative Study Between the Pre-Pandemic and During the COVID-19 Pandemic Periods. *Corporate and Business Strategy Review*, *3*(2), 177–187. https://doi.org/10.22495/cbsrv3i2art16