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PROPOSED SOLUTIONS FOR IMPROVING QUEUE MANAGEMENT EFFICIENCY AT BEBEKE OM ARIS

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	ABSTRACT
Keywords: Queue	The rapid growth of the food and beverage sector, especially
management, Operational	in bustling urban environments, requires ongoing
Efficiency, Waiting Line,	improvements in operational effectiveness to keep up with
Simulation, Self-Service,	the rising demand and client standards. This study examines
QR Code, Food service	the queue management system at the Hasanudin branch of
	Bebeke Om Aris, a renowned restaurant in Bandung,
	Indonesia, that specializes in duck and chicken cuisine. The
	restaurant's operational performance is significantly
	impacted by extended waiting times experienced during
	busy periods. The objective of this research is to to develop
	and evaluate strategies for diminishing waiting times and
	enhancing overall efficiency through a quantitative
	methodology. This study was driven by the observed
	inefficiencies in the current queue management system,
	characterized by huge waits and longer waiting periods,
	especially on weekends. These inefficiencies not only
	impede the delivery of services but also provide a possible
	threat to the restaurant's competitive standing in the market.
	The main goal of this study is to determine and recommend
	effective strategies for optimizing queue management in
	order to achieve a maximum waiting time of 5 minutes
	during the busiest hours, as specified by the restaurant's
	management. During a four-week period, a structured
	observation method was used to collect primary data on
	customer arrivals, queue lengths, and waiting times. The
	observation notably targeted Saturday evenings, which are
	known for having the highest client inflow. The gathered
	data was subsequently employed to generate simulation
	models using Arena software, which assessed different
	scenarios, such as the integration of self-service kiosks, the
	adoption of QR code ordering systems, and the
	augmentation of cashier counters. The queuing theory was
	employed to examine these scenarios and assess important
	performance measures, including average waiting time,
	queue length, and system utilization rates. The investigation
	demonstrated that the integration of self-service kiosks and
	QR code ordering systems can effectively decrease waiting
	times and enhance operational efficiency. The self-service
	kiosks enable customers to autonomously place orders,
	thereby decreasing the burden on cashiers and expediting the

ordering procedure. Similarly, the implementation of the QR code system simplifies the procedure by allowing customers to place orders and make payments directly from their smartphones, thereby reducing congestion at the cashier. The simulation results demonstrated a significant reduction in both mean waiting times and queue lengths, thereby successfully attaining the intended performance goals. This study's findings enhance the subject of operational management by showcasing how queuing theory and simulation tools may be practically applied to optimize service delivery in the food service industry. The suggested solutions give a scalable approach that can be customized for other comparable environments, providing a foundation for restaurants seeking to improve their service efficiency and customer satisfaction. Subsequent studies could investigate the enduring impacts of these interventions on customer behavior and business performance, as well as their suitability in various categories of food service enterprises

INTRODUCTION

Waiting in line for service is an activity that takes time away from other pursuits that are more preferable or essential. The primary expense of waiting tends to be emotional, encompassing feelings of stress, monotony, and irritation. Those who decided to wait for the slower queue at airport immigration, airline security, or the store are familiar with the sensation. Varied simulated queue arrangements at a fast-food establishment can impact waiting durations. The duration of waiting time has a substantial impact on how often customers return and directly affects their level of satisfaction (Weng et al., 2017). Fast queue times and short queue lines are crucial for fast food restaurants to attract customers, along with affordable prices, positive worker attitudes, and exceptional food quality (Koh et al., 2014). The duration clients spend waiting at the counter, particularly when the wait is lengthy, can have many negative effects on consumers resulting in inefficiencies. Frequently, clients may experience tiredness and become discouraged from seeking useful services due to the extended duration of waiting lines (Arfa Aleyssa Haron & Ghazali Kamardan, 2021).

An organization that primarily provides services must prioritize efficiency and quality in order to succeed. In recent years, there has been increasing interest in understanding technical efficiency, particularly in how well resources are managed within organizations. This focus has been particularly pronounced in the hospitality and tourism industry (Alberca & Parte, 2018). Managers in food service consistently work on enhancing the efficiency and quality of service. Optimizing service quality and productivity has been a challenging task in the food service business, mostly due to the complexity of handling waiting time. Restaurants are experimenting with creative methods to meet the growing demands of customers due to increased rivalry and rising expectations for service quality (Choi & Sheel, 2012). A business can enhance its profitability by ensuring it fulfils the demands of its client (Jadar & Mugharbil, 2021).

Currently, there has been significant progress in the field of mobile applications for online transactions, particularly in the food and beverage industry. This is demonstrated by the growing convenience of ordering meals and beverages without the need to wait queues at the dining establishment. This shift in paradigm has a substantial influence on culinary enterprises of all sizes, including small, medium, and large ones (Suharianto et al., 2020). In the rapidly changing digital age, the hospitality and food and beverage (F&B) service sectors have

embraced technological advancements to improve the experience of guests and increase the efficiency of their services. Both small and large enterprises operating in a changing business environment must utilize assistive technology to enhance services and optimize operational efficiency and performance (Agyei et al., 2015). By utilizing technology, F&B industry may enhance operational efficiency, optimize inventory management, and enhance the overall guest experience (Suharto et al., 2024). An innovative environment has the ability to encourage consumer participation and interaction. Therefore, innovativeness is crucial in developing a customer service-oriented experience (Ghali et al., 2024). Several studies have indicated that implementing technological advancements, such as online-based ordering and self-service kiosks, can effectively decrease the length of customer waits (Kambli et al., 2020).

Food service establishments, such as hotel, restaurants, cafeterias, takeout, canteens, and function rooms, offer varying forms of service and ideas. Elite dining establishments provide exceptional service, while fast food restaurants prioritize efficiency and quickness. Not all quick service restaurants are considered fast food establishments, but they are characterized by efficient service, affordable food, and minimalist décor (Lahap et al., 2018). The food and beverage sector is distinctive as it satisfies fundamental human needs. This sector is experiencing rapid growth and is among the fastest-growing industries globally. The food business in India constitutes more than 40% of the country's Consumer Packaged Goods (CPG) market and is experiencing significant growth (Chowdhury et al., 2020). The food and beverage (F&B) sector in Asia has experienced substantial expansion in recent decades, propelled by swift economic growth, urbanization, and evolving consumption habits. (Statista, 2023) predicts that the food and beverage market in Asia will generate a total revenue of USD 1.57 billion by 2027. This projection is based on a compound annual growth rate (CAGR) of 11.26% from 2022 to 2027. This projection, illustrated in Figure I.1 indicates significant potential for industry participants to further expand and develop.



Source : Statista

The food and beverage industry in Indonesia has experienced significant expansion and has emerged as a key sector that contributes to the country's Gross Domestic Product (GDP). Based on data from Katadata (Kusnandar, 2022), the food and beverage industry emerged as the primary contributor to the GDP of the industrial sector during the second quarter of 2022, as shown in Figure I.



Figure 2 Industrial Sector GDP by Subsectors Source : Katadata 2022

The culinary arts are timeless. In Indonesia, numerous culinary specialties have been commercialised through economic enterprises. Locals offer a wide range of gastronomic delights (V, 2022). The food and beverage industry is one of the most crucial manufacturing sectors, contributing significantly to national economic growth. Its performance achievements have been steady and positive, beginning with its involvement in raising productivity, investment, and exports and progressing to employment (Mardjuni et al., 2022).

The food and beverage service industry in Bandung is expanding rapidly. The increasing number of new outlets makes it difficult for food and beverage service enterprises, particularly cafés and restaurants, to compete with one another (Azzahra & Putranto, 2023). That is the reason that most entrepreneurs decide for a culinary theme when establishing their business. Although numerous enterprises currently manufacture a wide array of food products from different countries, traditional culinary delicacies have remained popular. One of the options available is a menu featuring processed duck (Feni Freycinetia F, 2014). One of them is Bebeke Om Aris, Bebeke Om Aris is a restaurant famous for its fried duck.

Bebeke Om Aris started from a street in Bandung City called Jl. Dipatiukur, then took the courage to continue moving forward, finally in 2017 Bebeke Om Aris succeeded in opening the first branch with a partnership concept in Bogor City. Until finally continuing to open new branches with a partnership concept to this day. To maintain quality, Bebeke Om Aris implements centralized production in Cimahi, for further distribution to all partner outlets.

This final project focuses on the Hasanudin branch of Bebeke Om Aris, aiming to improve business procedures related to queue management. The study aims to compare and evaluate techniques for decreasing wait times in order to fulfill the owner's demand of a maximum wait time of 5 minutes during peak hours. This research aims to offer practical suggestions to Bebeke Om Aris for improving its operations and sustaining its competitive advantage.

RESEARCH METHODS

This study employs a quantitative methodology to minimize waiting times and enhance queue management at the Hasanudin branch of Bebeke Om Aris. The research commences by gathering quantitative data on the lengths of queues, waiting periods for customers, and the general flow of customers. This data is essential for comprehending existing difficulties and assessing possible enhancements.

The study employs Arena simulation software to determine the most efficient queue management tactics. The simulations simulate many scenarios, such as the introduction of self-service kiosks, the implementation of QR code ordering systems, or the addition of more cashier counters. These models aid in visualizing the effect of each solution on lowering waiting times during peak hours.

After conducting the simulations, precise Queuing Theory calculations are utilized to carry out in-depth analysis. This entails calculating important measures such as the anticipated quantity of consumers in the queue (Lq), the mean waiting time in line (Wq), and system usage. These calculations offer a more profound understanding of the efficacy of each scenario and aid in pinpointing the most efficient method

RESULTS AND DISCUSSION

Business Solution

The queue management issues observed at Om Aris' Hasanudin Bebeke branch were addressed by using Arena simulation and queuing theory calculations. The operational scenarios, including the incorporation of cashiers during peak hours, the deployment of selfservice kiosks, and the utilization of QR codes for ordering and payment, were modeled using Arena simulation. Furthermore, the financial ramifications of each proposed scenario were evaluated by employing queuing theory to perform cost calculations.

Table 1 Simulation Results of Queue Management Scenarios					
Scenario	W_q	L_q	W_s	L_s	ρ
	(minute)	(person)	(minute)	(person)	
Current system	101.4	43.28	103.2	44.26	98%
Model 1	2	0.25	4	2	54% cashier 1, 55% cahier 2
Model 2	<1	0.0015	1	<1	4% cashier, 8% QR Barcode
Model 3	1	0.21	2	1	52% cashier, 47% self- service kiosk

According to the Arena simulation findings, the Model 2 demonstrates the highest level of efficiency in terms of controlling both the waiting time and the number of clients in the system. The outcome is an extremely short average waiting time in the queue, less than one minute, and an essentially negligible average number of people in the queue, 0.0015 customers. The system experiences an extremely low average customer count (<1 customer), and the average duration of a client's presence in the system is 1 minute. The cashiers and tables have low utilization rates of 4% and 8% respectively, suggesting that the system's capacity is highly efficient in managing customer flow.

Model 3 demonstrated exceptional performance, with an average queue waiting time of 1 minute and an average number of clients in the system of 1. The cashier has a usage rate of 52% and the self-service kiosk has a utilization rate of 47%. This indicates that this model is relatively efficient.

Model 1 shows notable enhancement in comparison to the existing system, but, it is not as efficient as Model 2 and Model 3. This model has a mean line waiting time of 2 minutes and a mean queue size of 0.25 customers. The system has an average customer population of 2, with an average duration of 4 minutes per customer. The utilization rate for both cashiers is approximately 54%, suggesting a workload that is more favorable than the current system but less efficient compared to Model 2 and Model 3.

The simulation results using Arena showed Model 2 as the most efficient in reducing waiting time and queue management capacity. However, the cost impact of each scenario must be considered. The analysis will evaluate daily operational costs, including human resources and technology, for each scenario. The focus is on whether adding new technology systems or increasing staffing will add unnecessary costs or contribute t10 increased revenue through improved efficiency.

Scenario	Total Waiting Cost/Hour	Total Waiting Cost/Day	Operational Cost/Day	Total Cost/Day
Current System	Rp817.992	Rp6.543.936	Rp90.000	Rp6.633.936
Adding 1 Cashier	Rp106	Rp847	Rp180.000	Rp180.847
Adding QR Barcode System	Rp0,01	Rp0,12	Rp98.200	Rp98.200
Adding Self-service Kiosk	Rp64	Rp513	Rp113.200	Rp113.713

 Table 2 Cost Analysis of Queue Management Scenarios

According to the cost analysis, Model 2, which incorporates a QR Code ordering system, is the most economical choice for the Bebeke Om Aris Hasanudin shop. Model 2 has the lowest overall waiting cost of Rp0.18 per day and a reasonable operational cost of Rp98,200 per day. Therefore, the total cost for Model 2 is Rp98,200, which is the lowest among all scenarios. This model provides significant cost savings and enhances customer experience by almost eliminating waiting periods. It is the best alternative for improving operational efficiency and reducing costs.

Implementation Plan & Justification

The last stage of this study entails establishing a detailed implementation strategy and reasoning for addressing the queue management difficulties at the Bebeke Om Aris Hasanudin outlet, after performing comprehensive research and assessing different options. This plan is designed to outline a clear strategy for implementing the QR Code ordering system, which has been identified as the most efficient method for improving operational efficiency. The rationale for this method is based on data-driven insights obtained from the arena simulation and calculations of queuing theory. These insights show that the QR Code ordering system is superior in reducing both waiting times and operational expenses.

Implementation of QR Code Ordering System

This implementation will involve setting up a QR Code ordering system at Om Aris Hasanudin's Bebeke outlet. Customers can utilize this technology by scanning the QR code located on the table or near the entry. This will grant them access to the digital menu, enabling them to place an order and make payments directly from their smart phones.

Justification :

The implementation of the QR Code ordering system is supported by its substantial influence on diminishing waiting times and queues, as well as its cost-efficiency. The system's capacity to reduce the overall waiting cost to Rp0.18 per day and sustain a low operating cost of Rp98,200 per day established it as the most cost-effective option. The solution is in line with the company's objective to enhance customer experience through the implementation of innovative technologies that streamline the ordering process.

Implementation location :

The initial installation will occur at the Hasanudin outlet, a strategically chosen location with a high volume of customers, making it a perfect testing ground for assessing the effects of the new system on customer flow and operational efficiency.

Table 5 Implementation Tian for QK code Ordering System						
Action		Timelir	ne	Key Stakeholder Involded		
System	Setup	and	1 mont	h	Third-Party	Vendor,
Integration					Management Team	
Staff Training		1 week		Third-Party Vendor, H		
					Department,	Operations
					Team	
Educate Customers		3 weeks		Marketing	Team, Staff	
					Outlet	
Soft La	unching	and	1 week		Operations	Team, Outlet
Feedback C	Gathering				Staff	
Evaluation			2 week	S	Managemen	t Team,
					Operations	Team, Third
					Party Vendo	r
Full Scale Implementation		1	month	Operations	Team, Third-	
-		(following		Party Vendor, Outlet Staff		
			evaluati	ion)	-	

Table 3 Implementation Plan for QR Code Ordering System

Introducing the QR Code system at the Hasanudin location will be in line with the company's objective to improve operational efficiency and customer happiness. This method guarantees the active participation of all stakeholders in the process of change. The education supplied by outlet staff, including SPV, waiters, and cashiers, will guarantee that all employees comprehend the new procedure and deliver exceptional customer service. Conducting a soft launch, which includes asking open-ended questions, will assist in identifying potential problems and implementing the required remedies to enhance the implementation of the QR Code system. Conducting regular assessments following the installation would assist the organization in enhancing the system's efficacy in lowering wait times and enhancing customer satisfaction. Establishing strong vendor relationships with the development and system integration teams, as well as throughout the implementation process, will guarantee the smooth functioning of all technical components. By implementing these measures, the company will be able to enhance its operational and customer service methods, thereby ensuring its competitiveness in the fast expanding food market.

By using this QR Code ordering system, Bebeke Om Aris Hasanudin can enhance service capacity without incurring substantial operational expenses, while delivering a quicker and more streamlined client experience. The organization demonstrates its dedication to adapting and meeting client expectations in the digital world by using cutting-edge technology like the QR Code system into its customer service.

CONCLUSION

According to the completed analysis, there are numerous strategies that can be used to decrease the waiting time at the Hasanudin outlet. Among the three methods assessed, namely the inclusion of a cashier, the adoption of a QR Code ordering system, and the utilization of a self-service kiosk, it was found that the QR Code ordering system was the most efficient approach. The adoption of this system successfully achieved a significant reduction in the average number of customers waiting in queue (Lq), bringing it down to an almost negligible value of 0.0015 customers. Additionally, it effectively decreased the average waiting time (Wq) to less than one minute. By enabling consumers to place orders and make payments directly via their mobile phones, the system expedites the service process and diminishes the need for cashier personnel. Furthermore, by minimizing face-to-face interaction between consumers and staff, the requirement for extra cashier personnel can be diminished, thereby decreasing the number of customers who have to wait in lines and enhancing overall operating efficiency.

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