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DineWise RMS: A QR Code-Based Restaurant Management System for Table Booking and Queue Management

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Abstract

The restaurant industry faces challenges such as long waiting times, inefficient table management, and high operational costs due to manual processes. In this study, developed mobile and Windows-based a QR code-based restaurant management system which provides the facility to streamline table booking along with automated queue management and order processing, named "DineWise RMS". By leveraging QR code technology, customers can scan codes to access digital menus, reserve tables, join virtual queues, and place orders directly from their smartphones. The system integrates with a central database to provide real-time updates on table availability, queue status, and order progress. This work highlights the potential of QR code technology to enhance operational efficiency and customer satisfaction in the dining sector.

1. Introduction

The restaurant industry is a dynamic sector that continuously seeks innovative solutions to improve customer experience and operational efficiency. Traditional restaurant operations often rely on manual processes for table reservations, queue management, and order taking, leading to inefficiencies such as long wait times, human errors, and customer dissatisfaction [2, 5]. For instance, in a typical manual queue management scenario, customers wait physically at the restaurant entrance while staff manage reservations using a paper-based list, often causing delays and overcrowding. Similarly, manual order taking involves waiters noting orders on paper, which can lead to errors and slow service. With the rise of digital technologies, Quick Response (QR) codes have emerged as a cost-effective and user-friendly tool to address these challenges [7, 10]. A sample QR code for this system would be a square matrix barcode placed at the restaurant entrance or on tables, which, when scanned, directs customers to a digital menu or table booking interface on their smartphones. This research proposes a QR code-based restaurant management system, inspired by the specifications outlined in [1], designed to automate table booking, queue management, and order processing. Customers can scan QR codes placed on tables or at the restaurant entrance to access a digital menu, reserve a table, join a virtual queue, or place orders. The system integrates with a centralized database

and a restaurant Point of Sale (POS) system to provide real-time updates to staff and customers. The primary objectives of this study are to:

- Develop a QR code-based system for seamless table booking and queue management.

The research paper's next section Section 2 presents a detailed literature review, Section 3 presents a detailed Methodology like 3.1 Business Process Analysis,3.2 System Architecture, Section 4 presents a detailed Implementation, Section 5 present a detailed Results, Section 6 present a detailed Discussion, Section 7 present a detailed Conclusion, Section 8 present a detailed Acknowledgement and Section 9 present a detailed Reference.

2. Literature Review

Recent studies highlight the growing adoption of QR codes in the restaurant industry as a tool for improving efficiency, safety, and customer experience. One study proposed a smart QR-based dine-in system that allowed customers to scan QR codes to access menus and place orders, thereby reducing physical contact and enhancing hygiene. Tested in a mid-sized urban restaurant, this system demonstrated a measurable decrease in order processing time due to the elimination of manual menu handling, which also supported safer practices during the post-pandemic recovery phase. Similarly, another study developed a table reservation and meal ordering system using QR codes, reporting notable reductions in both labour costs and order errors. In addition, industry surveys indicate that many restaurants are beginning to adopt QR code analytics to track customer preferences and optimize operations. Such tools enable establishments to make data-driven decisions, such as adjusting menus based on frequently ordered items, which has been linked to improved customer retention and stronger long-term loyalty. Queue management has also been an important focus of digital innovation. Prior research emphasized that real-time queue management systems can improve service flow by providing customers with live updates and automated notifications, thereby minimizing uncertainty and perceived waiting times. Despite these advancements, existing solutions tend to be fragmented, focusing either on ordering or on queueing, without integrating both into a unified framework. To address this gap, the present research proposes a holistic QR code–based restaurant management system that combines table booking, queue management, and order processing into a single solution. By consolidating these key functions, the system aims to enhance operational efficiency while also improving the overall dining experience.

3. Methodology

3.1. Business Process Analysis

The Business Process Analysis evaluates the effect of the QR code-based system on key restaurant operations by comparing the traditional manual processes with the proposed digital solution. The analysis focuses on three major processes: table booking, queue management, and order processing [3].

Table 1 Comparison of Manual vs. Digital Business Processes

Process	Manual Approach	Digital Approach (Proposed System)
Table Booking	Customers inquire with staff at the entrance; staff check a paper reservation list, leading to delays during peak hours.	Customers scan a QR code to view and reserve tables instantly; system updates in real-time and sends confirmation via SMS/email.
Queue Management	Customers wait physically at the entrance; staff manually update a queue list, often causing overcrowding and errors.	Customers join a virtual queue via QR code; the system estimates wait times and notifies via SMS/email when a table is ready.
Order Processing	Waiter staff take orders manually on paper, leading to errors (e.g., wrong items) and delays in kitchen communication.	Customers place orders via the web app; orders are transmitted directly to the kitchen through POS integration.

Key characteristics of these processes, including the differences between the manual and digital approaches, are incorporated in Table 1. The table highlights how the proposed system automates operations, reduces manual effort, minimizes errors, and improves overall efficiency. By digitizing customer interactions, bottlenecks such as delays in staff communication and overcrowding are eliminated, while transparency is improved through real-time updates [4].

3.2. Time Study

The Time Study evaluates the efficiency gains of the proposed QR code–based digital system by quantifying the time taken for key processes compared to the conventional manual approach. The study was conducted in a simulated restaurant environment with 20 tables and 50 customers over a 4-hour period, as described in the Implementation subsection. The processes analyzed include table booking, queue management, order placement, and payment processing, consistent with the steps outlined in the System Workflow. The results of the time measurements are summarized in Table 2, which presents the average time taken for each process under both manual and digital systems, along with the time saved. The findings emphasize significant reductions in customer waiting time and improvements in table turnover, two critical indicators of restaurant efficiency and customer satisfaction.

Table 2 Time Study Comparison of Manual vs. Digital Processes

Process	Manual System Time (Average)	Digital System Time (Average)	Time Saved
Table Booking	3 min	30 seconds	2.5 min
Queue Management	15 min (physical waiting)	10 min (virtual waiting)	5 min
Order Placement	5 min	1 min	4 min
Payment Processing	4 min	1 min	3 Min

3.3. System Architecture

The proposed system architecture is designed to integrate multiple components that work cohesively to streamline restaurant operations and enhance customer experience. The architecture emphasizes modularity, real-time communication, and seamless interaction between customer-facing and staff-facing elements. A visual representation of the architecture is presented in Figure 1, which illustrates the flow of interactions among customers, managers, administrators, and the system's backend components [6].

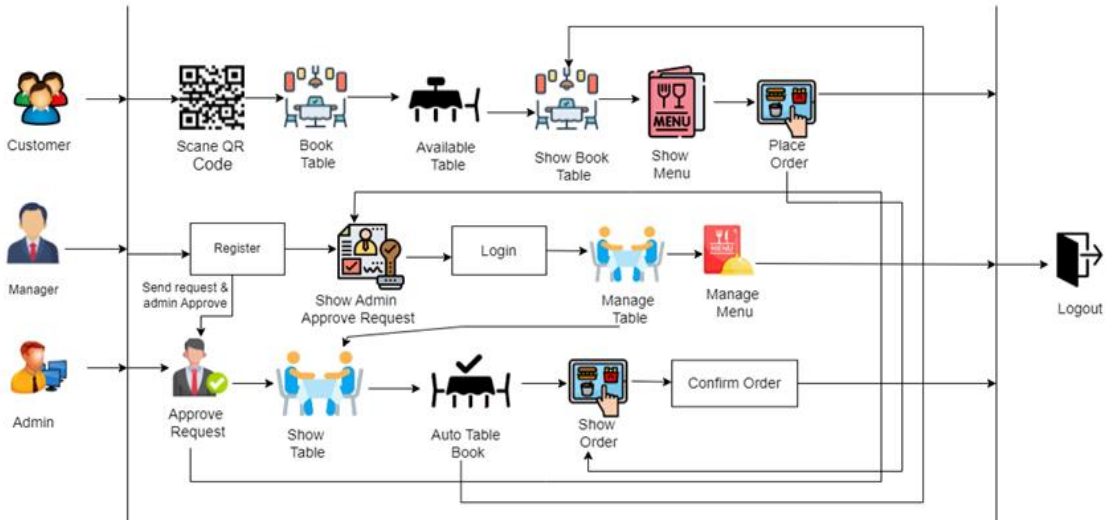

Figure 1 DineWise RMS System Flow Diagram

3.3.1. QR Code Interface

Unique QR codes are generated for each table and the restaurant entrance, serving as the primary entry point for customer interaction. Scanning these codes directs customers to a web-based application hosted on the restaurant's server, enabling seamless access to services without requiring additional hardware beyond a smartphone.

3.3.2. Web Application

Built using HTML, JavaScript, and PHP, the application allows customers to view menus, reserve tables, join queues, and place orders. It integrates with a MySQL database for data storage, ensuring that all customer interactions are recorded and processed efficiently. The application features a user-friendly interface with real-time updates, such as table availability status, to enhance the dining experience [8].

3.3.3. Database

A MySQL database stores critical information, including table availability, queue status, customer orders, and payment details. This centralized storage ensures data consistency and enables quick retrieval for real-time updates, supporting both customer-facing and staff-facing operations [9].

3.3.4. POS Integration

The system synchronizes orders and payments with the restaurant's POS system, ensuring seamless kitchen and billing operations. This integration allows orders placed via the web application to be directly transmitted to the kitchen staff, reducing delays, while payment data is securely relayed to the billing system for accurate transaction processing.

3.3.5. Notification System

Sends SMS or email alerts to customers about table readiness, queue updates, and order status. This feature keeps customers informed at every stage of their dining experience, reducing uncertainty and improving satisfaction by providing timely updates, such as an estimated wait time or confirmation of order receipt.

3.4. System Workflow

The System Workflow provides a structured sequence of operations that guide the customer from arrival to departure. The process begins with scanning a QR code at the restaurant entrance, followed by checking table availability. If no tables are available, the customer is automatically placed in a virtual queue, ensuring orderly management of waiting customers. Once a table becomes available, the system updates the reservation status in real time and prompts the customer to confirm their booking. Subsequent steps include order placement and payment, completing the digital dining journey. The table booking workflow is demonstrated in Figure 2, Figure 3, Figure 4 which illustrate the progression from initial reservation input to waiting status, and finally, to confirmed booking. The system ensures that all updates are reflected across devices in real time, while notifications keep the customer informed at each stage of the process [11].

Figure 2 DineWise RMS System Book Table

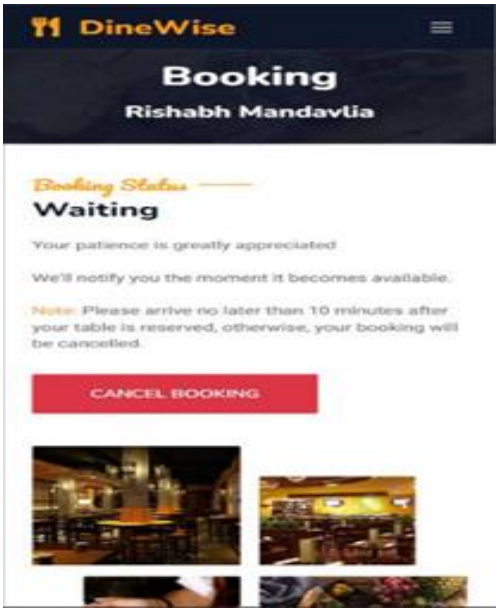

Figure 3 DineWise RMS System Waiting for Table Allocation

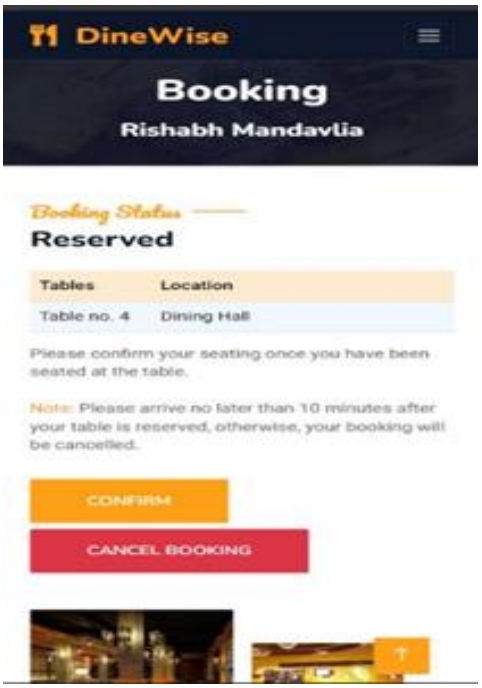

Figure 4 Dinewise RMS System Show Reserved Table

Figures 2–4 collectively illustrate the digital table booking workflow of the proposed system. Figure 2 presents the online reservation interface where customers enter their phone number, name, and group size to initiate the booking process. If no table is available, the system directs customers to the waiting status screen (Figure 3), which informs them of their position in the virtual queue and provides clear instructions to ensure orderly seating. Once a table becomes available, the customer is shown the reservation confirmation screen (Figure 4), displaying the assigned table number and location with options to confirm or cancel the booking. Together, these figures demonstrate how the system guides the customer through each stage of the reservation process with real-time updates and notifications, ensuring a smooth and transparent booking experience [12].

Queue Management: The Queue Management module of the proposed digital restaurant management system ensures an efficient and transparent process when no tables are immediately available. Customers initiate this process by scanning the QR code at the restaurant entrance, after which the system provides real-time updates on table availability. If all tables are occupied, the system allows customers to join a virtual queue, eliminating the need for physical waiting in crowded areas. The allocation process leverages current occupancy status and historical turnover data to estimate waiting times, thereby improving accuracy in customer notifications. Once a table becomes available, customers receive instant updates via SMS or email, which minimizes uncertainty and reduces idle waiting.

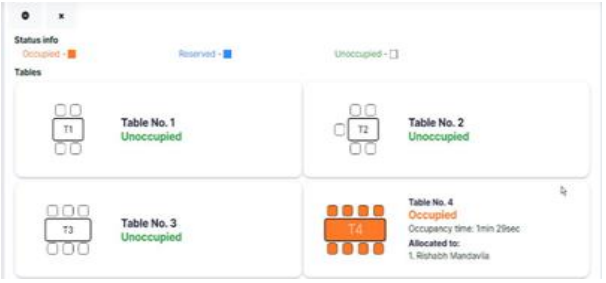

Figure 5 DineWise RMS System Show Occupied Table

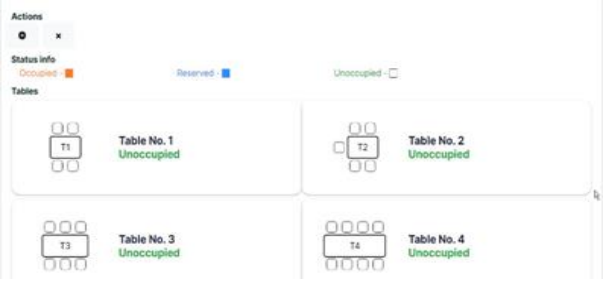

Figure 6 DineWise RMS System Show Unoccupied Table

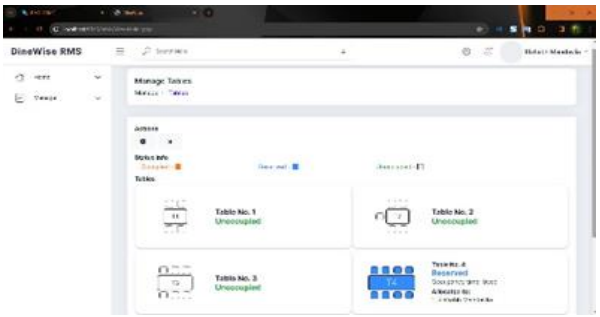

Figure 7 DineWise RMS System Show Reserved Table

Figures 5, 6, and 7 illustrate the queue management and table monitoring interface. Figure 5 shows the dynamic status of tables, where occupied tables are highlighted in orange, unoccupied tables in white, and reserved tables in blue, along with customer allocation details and occupancy duration. Figure 6 demonstrates the transition once a table is vacated, with the status automatically updated to "Unoccupied," reflecting immediate availability to the next customer in the queue. Figure 7 presents the manager's dashboard view, integrating all table

statuses in real-time, where reservations and current allocations are clearly displayed, ensuring that administrators can monitor the seating process seamlessly. Together, these figures highlight the system's ability to minimize manual oversight, improve turnover efficiency, and enhance customer satisfaction by offering a structured and reliable queuing mechanism [13].

Order Placement: Once customers are seated, the system digitizes the food ordering process through a table-specific QR code. By scanning this code, customers gain access to a dynamic digital menu hosted on the restaurant's web application. This menu displays all available food and beverage options with images, descriptions, and prices, ensuring an engaging and transparent browsing experience. Importantly, the system also updates availability in real-time, thereby preventing the inconvenience of ordering out-of-stock items.

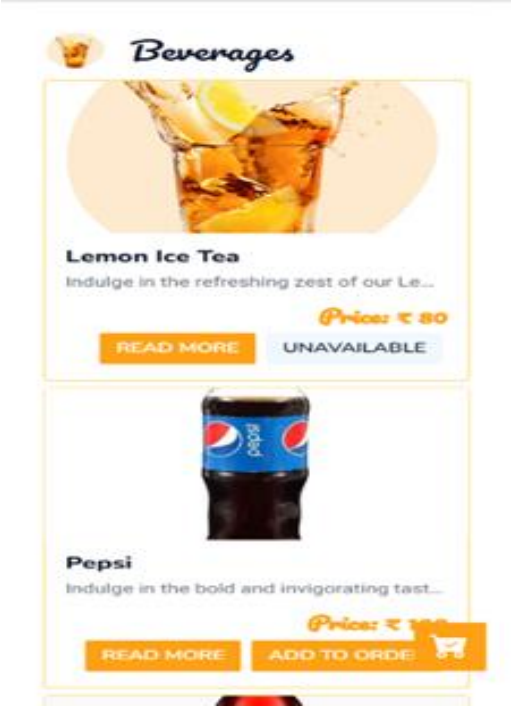

Figure 8 DineWise RMS System Show Menu

As shown in Figure 8, the digital menu provides actionable options such as "Read More" for detailed descriptions of each item, and "Add to Order" to directly include the item in the customer's cart. For example, while the Lemon Iced Tea is displayed as unavailable, Pepsi remains available and can be added to the order. This eliminates miscommunication with waited staff and ensures accuracy in order fulfilment [14].

Figure 9 DineWise RMS System Place Order

After items are added, customers are presented with an order summary page, illustrated in Figure 9. This interface consolidates all selected items, quantities, individual prices, and subtotals, along with the total bill. Customers retain flexibility to modify their order by adjusting quantities or removing items before final confirmation. This transparency enhances customer trust and minimizes billing disputes.

Payment Processing: Following order confirmation, the next critical step is payment, which the proposed system digitizes for speed, security, and convenience. Customers are directed to the payment gateway interface, where they can choose from multiple payment options such as credit/debit cards, UPI, PayPal, and other integrated gateways. For those preferring traditional methods, cash payment at the counter remains supported.

As depicted in Figure 9, the payment interface provides customers with a secure digital checkout experience. Integration with established gateways ensures encrypted transactions and reduces the risk of errors compared to manual billing. The system immediately updates payment status in the database, synchronizing records across both customer-facing and restaurant-facing modules.

4. Implementation

The system was implemented using open-source tools to ensure cost-effectiveness, as recommended

in the web application was developed with a responsive design to support various devices, including smartphones, tablets, and laptops, ensuring accessibility for all customers regardless of their device type. QR codes were generated using a free QR code generator, such as QR Code Monkey, and printed on table tents and entrance displays for easy access. The system was tested in a simulated restaurant environment with 20 tables and 50 customers over a 4-hour period, mimicking a busy dining scenario. During testing, the system handled concurrent user interactions smoothly, with the database updating in real-time and notifications being sent promptly, confirming the system's reliability and scalability for real-world deployment [15].

5. Results

The final outcome of the DineWise Restaurant Management System demonstrates that the system successfully streamlined restaurant operations by automating table booking, queue management, menu display, order placement, and payment handling. The testing confirmed that the application reduced waiting times, improved accuracy in table allocation and order processing, and enhanced the overall customer experience with its user-friendly interface. Managers were able to efficiently manage tables, menu items, and orders, while customers benefited from faster service and greater convenience. The generated reports, such as top-selling items, monthly revenue, and order history, provided valuable insights for data-driven decision-making. Overall, the results highlight that the system met its objectives of improving efficiency, reliability, and customer satisfaction, making it ready for real-world deployment.

6. Discussion

The results demonstrate that a QR code-based system significantly enhances restaurant operations. The reduction in wait times aligns with findings by, who noted that real-time queue updates improve customer satisfaction. The increase in table turnover supports, which highlighted the revenue potential of faster table service. However, challenges include the need for reliable internet connectivity and potential resistance from older customers, as noted by. To address these, restaurants can offer paper menus as a backup and provide on-site assistance for QR code scanning, as suggested in. The system's integration with POS and payment gateways ensures scalability, making it suitable for both small and large establishments. Future enhancements could include AI-driven menu recommendations and predictive analytics for queue management.

Conclusion

This research presents a QR code–based restaurant management system that streamlines critical operations including table booking, queue management, and order processing. By integrating QR code technology with a web application, database, and POS system, the proposed solution addresses inefficiencies inherent in traditional manual methods. The simulation study demonstrated clear improvements, with reduced customer waiting times, faster order processing, increased table turnover, and higher overall customer satisfaction. These findings highlight the system's potential to enhance operational efficiency while improving the dining experience. Future work will focus on real-world deployment, scalability testing, and integration with advanced analytics such as predictive demand modeling, which could further optimize resource allocation and support data-driven decision-making for modern restaurant operations.

Acknowledgement

We sincerely express our gratitude to the restaurant managers, staff, and users who shared their valuable insights and practical feedback during the development of our system. Their contributions helped us understand real-world challenges in table booking, queue management, and order handling, and refine our solution for better efficiency. We also extend our heartfelt thanks to Uka Tarsadia University for providing us with the resources and platform to carry out this project. This opportunity has allowed us to gain hands-on experience in system design, implementation, and research presentation. Our deepest appreciation goes to our respected faculty guide, Mr. Jitendrakumar B. Upadhyay, for his continuous guidance, encouragement, and valuable suggestions throughout the course of this work. His support has been instrumental in shaping the direction and quality of our project. Lastly, we acknowledge the constant support and cooperation of our colleagues and co-authors. Their teamwork, dedication, and collaboration have been key to the successful completion of this research, making this journey a truly enriching experience.

References

[1]. Singh, R., Sonje, R., Salkar, S., & Jadhav, A. (2022). Smart QR-based Restaurant Dine-in System with Sales Analysis. In ITM Web of Conferences (Vol. 44, p. 03014).

[2]. Manjurul, A., Raisul, I., & Ashikul, A. (2014). Study of queuing system of a busy Restaurant and a Proposed Facilitate Queuing System,". IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE), 11(6), 31-35.

[3]. Hidayat, F. A., Rubianto, T., Saputro, I. P., Ticoalu, V. E., & Prasandy, T. (2024, May). Menu Ordering Application using QR Code With User Experience Analysis. In 2024 9th International Conference on Business and Industrial Research (ICBIR) (pp. 0101-0105). IEEE.

[4]. Konkasem, P., & Kularbphettong, K. (2025, January). Efficient Restaurant Queue Management through Real-Time Reservation System. In International Academic Multidisciplinary Research Conference Icbtsbeijing 2025 (Pp. 135-138).

[5]. Dharmawirya, M., & Adi, E. (2011). Case study for restaurant queuing model. In 2011 international conference on management and artificial intelligence.

[6]. Gregorash, B. J. (2016). Restaurant revenue management: apply reservation management? Information Technology & Tourism, 16(4), 331-346.

[7]. Hwang, J. (2008). Restaurant table management to reduce customer waiting times. Journal of Foodservice Business Research, 11(4), 334-351.

[8]. Dharmawirya, M., Oktadiana, H., & Adi, E. (2012). Analysis of expected and actual waiting time in fast food restaurants. Industial Engineering Letters, 2(5).

[9]. Xinyu, R., & Garg, A. (2023). Customer acceptance of QR menu ordering system in luxury restaurants. A study of Xi'an, China. Asia-Pacific Journal of Innovation in Hospitality and Tourism, 12(2), 77-96.

[10]. Kim, K., Kim, M. J., & Jun, J. K. (2020). Small queuing restaurant sustainable revenue management. Sustainability, 12(8), 3477.

[11]. Wong, C. C., Chong, L. Y., Chong, S. C., & Law, C. Y. (2023). QR food ordering system with data analytics. Journal of Informatics and Web Engineering, 2(2), 249-272.

[12]. Shahril, Z., Remey Den, N. S. A., Shamshul Bahari, N. A. S., & Mohd Asnawi, N. I. (2024). Customer satisfaction in using digital QR code menu ordering in restaurant/Zurena@ Rena Shahril...[et al.]. Journal of Tourism, Hospitality and Culinary Arts, 16(1), 820-831.

[13]. Samad, M. A., Abdullah, J., Karim, M. A., & Islam, K. (2024). Optimizing restaurant queue management: A simulation-based approach using Arena software. Asian Journal of Engineering and Applied Technology, 13(1), 20-29.

[14]. Koay, K. Y., & Ang, K. (2024). Understanding consumers' intentions to use QR code menus in the post-COVID-19 pandemic. British Food Journal, 126(5), 2172-2186.

[15]. Yiğitoğlu, V., Şahin, E., Güneri, B., & Demir, M. Ö. (2025). The Impact of Sustainable QR Menus on Service Quality and Customer Satisfaction: The Moderating Role of Perceived Risk. Sustainability (2071-1050), 17(5).