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Design of A QR Code-Based Food and Beverage Ordering Application for Restaurants

Muh. Rahman Firmansyah*, Alicia Amelia Elizabeth Sinsuw, Arie. S. M. Lumenta
Universitas Sam Ratulangi, Indonesia
Email: muhfirmansyah026@student.unsrat.ac.id*, alicia.sinsuw@unsrat.ac.id, al@unsrat.ac.id

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Abstract

The rapid advancement of information technology has accelerated digital transformation across various sectors, including the culinary industry. However, many restaurants still rely on manual ordering systems, which often lead to order inaccuracies, service delays, and inefficient data management. This study aims to design a QR Code-based food and beverage ordering application for restaurants. The proposed system enables customers to access menus, place orders, and complete transactions directly through their smartphones without requiring a login process. Meanwhile, administrators can manage orders and monitor sales data in real-time through a web-based dashboard. The system is developed using the Rapid Application Development (RAD) method to ensure a fast and iterative design process that aligns with user needs. The results indicate that the designed system can improve service efficiency, reduce ordering errors, and enhance the overall customer experience in restaurant operations. In conclusion, the proposed QR Code-based ordering system is proven effective in addressing manual ordering problems at Coto Maros restaurant. The implications of these findings provide practical contributions for culinary business owners in adopting digital technology to improve operational efficiency, as well as serving as a reference for developing similar systems in other business sectors.

INTRODUCTION

The rapid development of information technology has driven digital transformation in various sectors, including the culinary industry. The use of this technology allows for increased operational efficiency and service quality to customers, so business actors are required to adapt to these developments to remain competitive (Lubis, 2023).

However, in reality, there are still many restaurants that use manual ordering systems. This also applies to the Coto Maros restaurant in Manado, which was the object of this research, where the ordering process is still carried out conventionally. The system has the potential to cause various problems, such as order recording errors, service delays, and difficulties in managing transaction data, especially during peak hours when the number of customers increases significantly (Saputri et al., 2019).

As a solution, the implementation of a digital-based ordering system is an effective alternative in improving service efficiency. The digital ordering system is part of a

technology-based information system that allows customers to make transactions without direct interaction with the server, but through electronic devices such as computers or smartphones (Nurlaila, 2019). One of the technologies that can be used is QR Code, which allows customers to access menus directly through their smartphones without the need to log in (Udvaros *et al.* 2024; Zezar dan Kalifia 2025). The use of QR Codes in the ordering system has been proven to speed up the service process and reduce errors in order recording (Adipradana et al., 2021).

In addition, the integration of the ordering system with real-time data management makes it easier for restaurants to monitor transactions and operations in a more structured manner (Keyworth *et al.* 2018; Alharbi *et al.* 2024). Several previous studies have also shown that the application of technology-based systems can improve the efficiency and quality of services in an information system (Nurdin & Azizah, 2020).

The research was conducted by Monica Kristiani Tulak and Penidas Fiodinggo with the title "Planning of an Online-Based Food Ordering System in Restaurants Using Android Mobile with the Barcode Method" (Tulak & Fanggidae, 2023). The research focuses on the development of mobile-based food ordering applications. There are similarities with this study in the effort to improve ordering efficiency through digital technology. However, this study used a web-based QR Code without app installation, while the previous study used barcodes on the Android mobile platform.

Furthermore, a study by Ahmad Rivai et al., entitled "Implementation of QR Codes in Web-Based Food Ordering Systems in Fast Food Restaurants" (Rivai et al., 2022), implements QR Codes on web-based food ordering systems to facilitate menu access and the ordering process. There are similarities with this research in the use of QR Codes to improve service efficiency. However, this research does not only focus on the implementation of QR Codes, but also includes more thorough system development.

A research by Siti Nurhaliza and Minda Mora Purba, entitled "Development of Food Ordering Information Systems Using the CodeIgniter Framework" (Nurhaliza, 2021), developed a web-based food ordering system using the CodeIgniter framework. The research shares similarities in the development of a web-based ordering system, but differs in that this study incorporates the use of QR Codes, the RAD method, and evaluation using SUS.

Furthermore, research by Aas Aisyiah, M. Naufal Muhadzib Al-Faruq, and Nur Aini, entitled "UI/UX Design of the MinaTani Application of Agriculture Technology Information System Using the Design Thinking Method" (Aisyiah et al., 2022), shares similarities in the aspect of user interface (UI/UX) design that focuses on ease of use. However, this study developed a web-based food ordering system integrated with QR Code, covering the entire ordering process through to payment, and thus has a wider scope than previous research.

A research by Ahmad Khainur Nadhif et al., entitled "UI/UX Design of Sales Applications with a Design Thinking Approach" (Nadhif et al., 2021), shares relevance to this research in the aspect of designing a user interface (UI/UX) aimed at improving ease of use and user experience. In contrast, this research not only focuses on interface

design, but also develops a web-based food and beverage ordering system accessible directly through QR Code scanning without the need for app installation. In addition, this research covers the entire ordering process from menu selection to transaction, giving it a wider system scope than research that focuses solely on UI/UX design of sales applications.

Furthermore, a research by Danny Ong, entitled "Analysis and Design of Information Systems for Ordering Food and Beverage Menus in Restaurants Using CodeIgniter" (Ong, 2020), developed a web-based ordering system using the CodeIgniter framework by utilizing an intranet network to improve service efficiency and data management. There is relevance to this research in the development of a digital-based food ordering system. However, this study developed a system that can be accessed more flexibly through QR Code scanning connected to the internet, allowing customers to place orders directly using their own devices without being limited to a local network.

Previous research still presents a number of gaps, such as ordering systems that require login or application installation, a lack of QR Code integration with real-time admin dashboards, the absence of adaptive development methods (RAD) suited for small- to medium-scale restaurants, and evaluations limited to technical aspects without measuring user acceptance. This study offers novelties in the form of a no-login ordering system, the integration of per-table QR Codes with real-time dashboards, the use of an iterative and user-involved RAD method, and satisfaction evaluations from the perspectives of both customers and administrators, which are rarely found in similar studies.

This research aims to design and build a QR Code-based ordering application for Coto Maros restaurant, implement a self-ordering feature without login and a real-time admin dashboard, test functionality with black-box testing, and evaluate ease of use and service efficiency. The theoretical benefit is to enrich the study of information systems and software engineering, particularly the application of RAD to digital ordering systems. Practically, this research benefits Coto Maros restaurant by increasing efficiency and reducing errors, customers by making ordering more practical, managers through real-time monitoring, and future researchers as a reference for the development of similar systems.

RESEARCH METHODS

The method used in this study is Rapid Application Development (RAD), which emphasizes the process of rapid system development through an iterative approach and user involvement. This method was chosen because it is able to produce a system in a relatively short time and is flexible to changing needs.

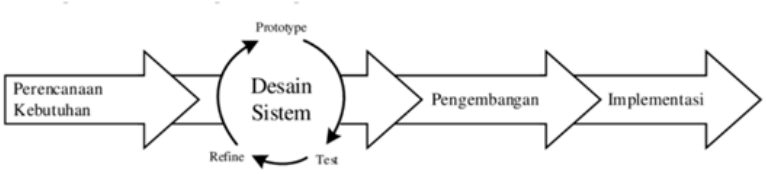

Figure 1. Research Flow

Source: Researcher documentation, 2025

Based on the research flow shown in Figure 1, each stage in the RAD method is interconnected and carried out iteratively to ensure the suitability between the user's needs and the developed system. Each stage has an important role in the design process, from the identification of needs to the implementation of the system. A more detailed explanation of each stage of the RAD method will be outlined as follows.

Needs Planning

The requirement planning stage is the initial stage in the Rapid Application Development (RAD) method which aims to identify system needs based on problems in the food and beverage ordering process in restaurants (Salahuddin et al., 2022). At this stage, an analysis of the running system is carried out to find out the obstacles faced.

The data collection process is carried out through direct observation, interviews, and the distribution of questionnaires to customers and management. The data obtained is used to understand the order flow, identify problems such as queues, recording errors, and service delays, and determine the needs of the system to be developed. Based on the results of the analysis, system needs are divided into functional and non-functional needs which include menu ordering features, order management, and ease of use of the system by customers and admins. Details of the system requirements that have been identified are shown in the following table.

System Design

The System Design Stage is the stage of system design that is carried out based on the needs that have been identified in the previous stage. At this stage, the design of the interface (user interface) and system flow is carried out which aims to provide an initial overview of the system to be developed (Hardjaloka, 2021). This design includes the creation of use case diagrams, activity diagrams, and system display designs (high fidelity design). Furthermore, a prototyping process is carried out which aims to produce an initial design of the system that can be simulated. The prototype is developed using Figma, allowing for visualization and interaction of the system before the development stage. The prototype that has been created then goes through the refine prototyping stage, which is the process of refining the design based on feedback obtained from a limited number of users. After the refinement process, the prototype is tested to ensure that the system design is in accordance with the needs and is easy to use. Evaluation is done simply through input from limited users, which is then used as a basis in the system development process at the next stage.

Development

The development or construction stage is the stage of system development based on the design results that have been carried out in the previous stage (Perdiyanto, 2021). At this stage, the process of implementing a web-based food and beverage ordering system developed to support the operations of restaurants, especially for Coto Maros restaurants, is carried out. System development is carried out with reference to the design of the interface and the flow of the system that has been designed, so that it can be easily accessed through the user's device. In addition, at this stage, a coding process is also carried out to realize system functions, such as menu ordering, order management, and transaction processes. The developed system is designed to run according to the needs of users that have been identified at the requirement planning stage. After the development process is completed, initial testing of the system is carried out to ensure that each function runs well according to the design that has been made before the system is implemented in the next stage.

Implementation

The implementation stage is the implementation stage of the system that has been developed based on the design results in the previous stage (Nita et al., 2022). At this stage, a web-based food and beverage ordering system began to be implemented to support the ordering process at Coto Maros restaurants. Implementation is carried out by ensuring that the system is properly accessible through the user's device and that all features can be used according to their functions.

In addition, initial testing was carried out using the blackbox testing method to ensure that each system function runs according to the predetermined needs.

RESULTS AND DISCUSSION

In this section, the results of the development of a web-based food and beverage ordering system that has been designed using the Rapid Application Development (RAD) method are presented. The system developed aims to improve the efficiency of the ordering process and minimize errors in order recording at Coto Maros restaurants. The results of system development include the implementation of key features such as scanning QR Codes to access the system, menu selection, ordering process, and payment transactions. In addition, the system also provides an order management feature that can be used by admins to monitor and manage orders in a more structured manner. The discussion in this section is carried out by displaying the results of the system implementation in the form of a user interface and evaluating the performance of the system based on the tests that have been carried out.

System Access Page (QR Code)

The system access page is the initial stage used by customers to start using a web-based food and beverage ordering system. Customers can access the system by scanning the QR Code available at each table at the Coto Maros restaurant using their respective devices. After the scanning process is done, the system will display a start page containing brief information regarding the location of the table as well as the initial view of the

system before the customer proceeds to the menu page. On this page, customers can press the button available to enter the food and beverage menu list. Through this mechanism, customers can easily access the system without the need to download additional applications, making the ordering process more practical and efficient.

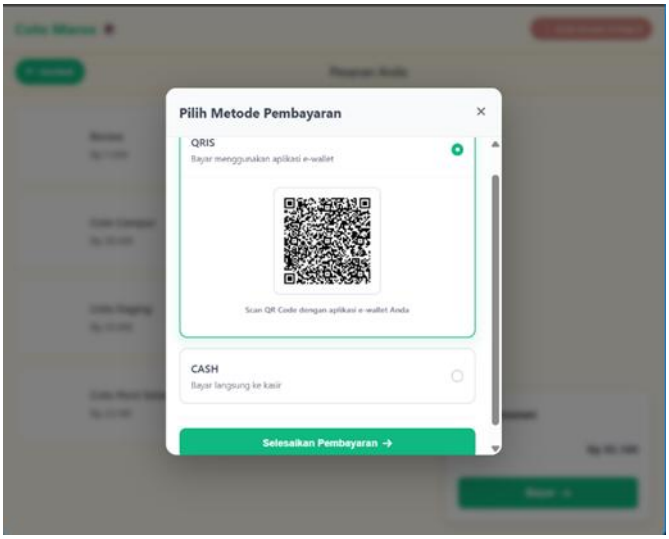

Figure 1. Display of the starting page after scanning the available QR Code

Source: System implementation results, 2025

Menu Page

The menu page is the main display displayed after the customer successfully accesses the system through a QR Code scan. On this page, the system displays a complete list of food and beverage menus available at Coto Maros restaurants. Customers can view menu information such as menu names, prices, and a brief description of each available food and beverage. In addition, the system also provides a menu selection feature that allows customers to directly add orders to the order list. With this menu page, customers can easily select and determine orders according to their needs without having to wait for a waiter, so the ordering process becomes faster and more efficient

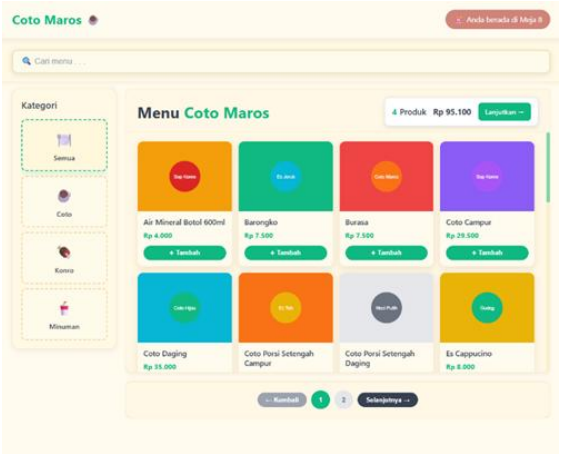

Figure 2. Menu Page Display After Successfully Accessing the System via QR Code

Source: System implementation results, 2025

Booking Page

The order page is a display that displays a list of menus that have been selected by the customer before making a transaction. On this page, customers can see the details of the orders that have been added, such as the menu name, the number of orders, and the total price to be paid. In addition, the system also provides a feature to change the number of orders or delete the menu that has been selected, so that customers can adjust the order according to their needs. After making sure the selected order is suitable, the customer can proceed to the next process, which is the payment stage. With this order page, customers can double-check the order that has been selected so that they can minimize errors in the ordering process.

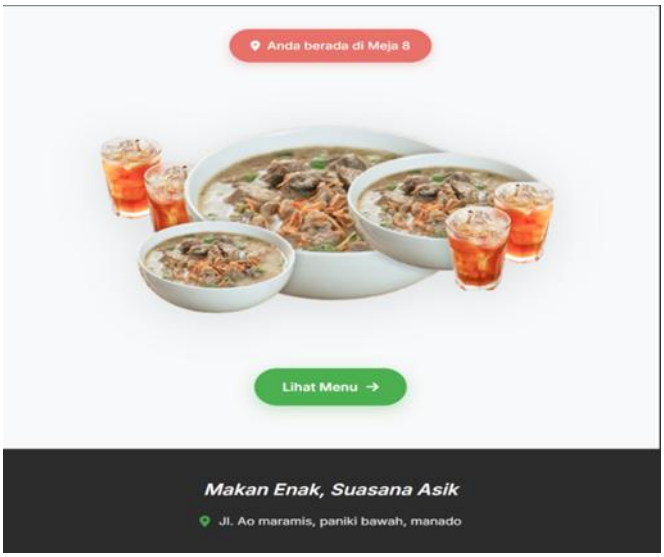

Figure 3. Booking Page View

Source: System implementation results, 2025

Checkout Page

The payment page is the final stage in the order process made by the customer. On this page, the system displays the final order details along with the total cost that must be paid by the customer. Customers can confirm their order and choose the available payment method according to the system implemented. After the payment process is made, the system will process the order and forward the order information to the admin for follow-up. With this payment page, the transaction process becomes more structured and makes it easier for customers to complete orders independently.

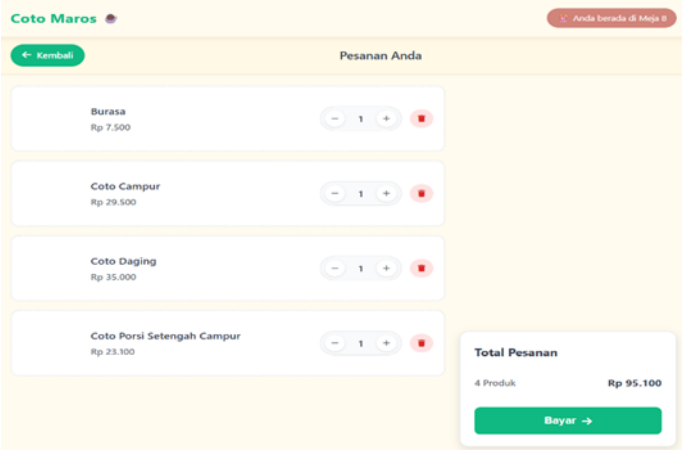

Figure 4. Payment Page View

Source: System implementation results, 2025

Dashboard Admin

The admin dashboard is a page used by the management to monitor and manage all booking activities carried out by customers. On this page, the system displays a list of incoming orders in a structured manner that makes it easier for admins to manage orders. Admins can view order information such as menu names, order quantities, and the status of orders being processed. In addition, the system also provides a feature to update the status of orders according to conditions, such as orders being processed or completed. With this admin dashboard, the order management process becomes more organized and helps improve operational efficiency at Coto Maros restaurants.

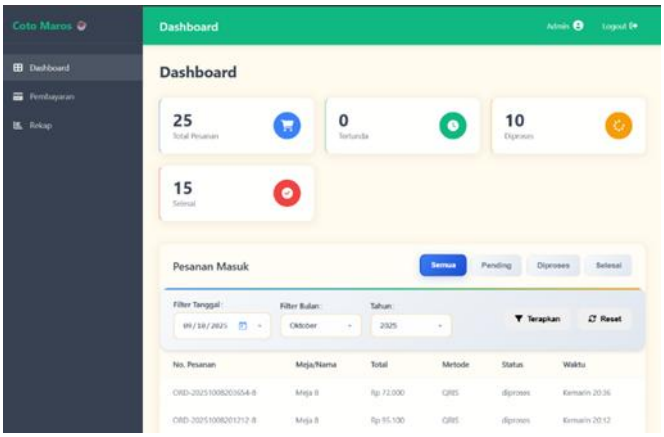

Figure 5. Admin Dashboard View

Source: System implementation results, 2025

System Testing (Blackbox Testing)

System testing is carried out to ensure that every function in the web-based food and beverage ordering system can run according to the predetermined needs. The test method used is blackbox testing, which is a test that focuses on the compatibility between input and output without paying attention to the internal processes of the system. Testing was carried out on several main features of the system, such as the system access process

through QR Codes, menu selection, order additions, and transaction processes. Each feature is tested to ensure that the system responds as expected. The test results show that all system functions can run well according to the test scenario that has been carried out.

CONCLUSION

This research has succeeded in producing a web-based food and beverage ordering system that can help improve the efficiency of the ordering process at Coto Maros restaurant. The developed system allows customers to place orders independently through QR Code scanning without the need for manual recording by waiters. The results of the implementation show that the system is able to display menus, process orders, and support order management by administrators effectively. Based on testing using the black-box testing method, all system functions performed according to predetermined requirements. Thus, the developed system can serve as a solution in overcoming queue problems, reducing recording errors, and improving the quality of service in restaurants.

For further development, it is suggested that the system be expanded by adding integrated digital payment features, such as QRIS or digital wallets, the development of native mobile applications for a more optimal user experience, and the implementation of the system across more than one restaurant to test its scalability and reliability. For future researchers, it is recommended to conduct a more in-depth evaluation using the System Usability Scale (SUS) method to measure the level of user satisfaction quantitatively.

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