

Integrated QR Code-Based Cafe Ordering with Point of Sale and Electronic Receipt

Hasna Anggun Nafisa^{1,*}, Erna Hudianti Pujiarini²

^{1,2} Informatics, Faculty of Information Technology, Universitas Teknologi Digital Indonesia, Yogyakarta

ARTICLE INFO

Article history:

Received Jan 23, 2026
Accepted May 29, 2026
Available online May 31, 2026

Keywords:

Information System
QR Code Ordering
Cafe Management System
Point of Sale
System Design
Waterfall Method

How to Cite :

H. A. Nafisa and E. H. Pujiarini,
“Integrated QR Code-Based Cafe
Ordering with Point of Sale and
Electronic Receipt,” Journal of
Information System and
Technology Research, vol. 5, no. 2,
pp. 270–280.

ABSTRACT

The development of information technology has driven digital transformation in the culinary sector, one of which is through the implementation of QR Code-based ordering systems. This study aims to design and visualize a QR Code-based cafe ordering system integrated with a Point of Sale (POS) system and electronic receipts (e-receipts) to improve service efficiency, transaction transparency, and ease of access to information for customers. The system development method used in this research is the Waterfall model, which consists of requirement analysis, system design, implementation, and functional testing stages. The research output is a prototype website of a QR Code Cafe System that is able to represent the digital ordering workflow, starting from QR Code scanning by customers, menu selection, order placement, payment confirmation by the cashier, to the provision of downloadable digital receipts. Functional testing results indicate that all main system features operate in accordance with the defined requirements. Although the developed system is still in the form of a prototype and has not yet been directly integrated with a back-end system and database, this study has successfully validated the system workflow and user interactions. The resulting prototype can be used as an academic demonstration tool and as a foundation for the development of a more complex cafe ordering system ready for real-world implementation.

© 2026 The Author(s). Published Ali Institute of Research and Publication (AIRA) –
Ali Bersaudara Sejahtera Foundation
This is an open access article under the CC BY-SA license
(<http://creativecommons.org/licenses/by-sa/4.0/>).



Corresponding Author:

Hasna Anggun Nafisa,
Informatics, Faculty of Information Technology, Universitas Teknologi Digital Indonesia, Yogyakarta
Jl. Raya Janti Jl. Majapahit No.143, Jaranan, Banguntapan, Kec. Banguntapan, Kabupaten Bantul, Daerah Istimewa Yogyakarta 55198.
Email: hasna.anggun25@students.utdi.ac.id

1. INTRODUCTION

The development of information technology has driven digital transformation in various service sectors, including the culinary industry. One form of technology utilization that has been increasingly applied in cafes is a Quick Response Code (QR Code)-based ordering system. This technology allows customers to access menus directly through mobile devices without requiring physical media, making the ordering process more efficient and flexible. Research by Falah [1] shows that the implementation of QR Code-based ordering systems can improve service effectiveness in food court areas, particularly in reducing queues and order recording errors.

Several previous studies have developed QR Code-based digital transaction systems focusing on reducing physical contact and improving payment efficiency. Studies emphasizing the development of QR Code-based electronic receipts generally aim to minimize the use of physical receipts and support contact-less services, especially in post-pandemic conditions. Saxena et al. [2] proposed an automated ordering system integrated with order and billing management, while mobile web-based cafe ordering research by A. Sagaf and Ibrahim [3] emphasized ease of menu access for customers. In

addition, the application of QR Code technology in web-based systems has also been implemented in other contexts, such as attendance systems [4], demonstrating that QR Code technology is effective for digital identification and data recording.

However, most previous studies still position e-receipt systems merely as replacements for physical receipts and do not directly integrate them with the ordering workflow, cashier confirmation, and Point of Sale systems in a unified process. In many cases, customers act only as recipients of transaction information without having independent access to review order details and billing information after payment is completed. [5]

From a system development perspective, several studies have adopted the agile method to support flexibility in accommodating changing requirements during development. This approach is suitable for systems that require continuous evolution; however, it is less appropriate for research focusing on system design with clearly defined functional requirements from the outset. Therefore, this study adopts the waterfall method as the system development approach, as it provides structured and well-documented stages suitable for developing web-based ordering systems within a controlled scope. [6]

This research aims to implement a QR Code-based cafe ordering system integrated with a Point of Sale (POS) system and electronic receipts. Unlike previous studies that focus primarily on contact-less transaction aspects, this study emphasizes the active role of customers in accessing and downloading digital payment receipts after the payment process has been confirmed by the cashier. As a result, customers can independently verify order details and billing records stored in the system. The system development in this study is limited to the functional testing stage to ensure that the system meets the predefined requirements.

Several studies have also highlighted the use of web-based electronic receipts as an effort to minimize physical contact during transaction processes, particularly in cafe and retail services [7]. However, these studies generally focus on replacing physical receipts without integrating customer ordering systems and Point of Sale systems into a single, cohesive transaction workflow.

2. RESEARCH METHOD

This study employed a software engineering approach using the Waterfall development model to develop a QR Code-based café ordering system integrated with a Point of Sale (POS) system and electronic receipt (e-receipt). The selection of the Waterfall method was based on the characteristics of system requirements that were clearly defined from the beginning, as well as the limited scope of the research, which focused only on the functional testing stage.

According to Aceng Abdul Wahid [8], the Waterfall method is a sequential and systematic system development model in which each phase must be completed before proceeding to the next stage. This approach is considered suitable for information system development that requires comprehensive documentation and a well-structured workflow.

2.1 System Development Model (Waterfall)

The Waterfall model applied in this research consists of several main phases, as described below.

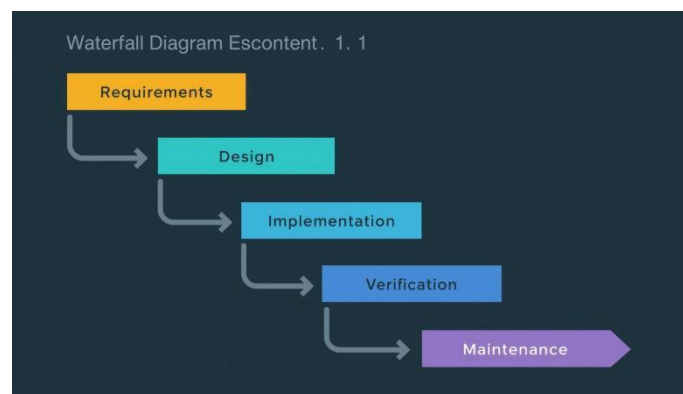


Figure 1. System Development Model Waterfall
Data Taken From Author 2026

2.1.1 System Requirements Analysis

The system requirements analysis phase was conducted to identify both functional and non-functional requirements based on the cafe case study. System requirements were obtained through an analysis of conventional ordering business processes and commonly encountered issues, such as long customer queues, order recording errors, and limited customer access to payment receipts.

At this stage, system actors were identified, including customers, cashiers, and administrators, along with their respective access rights and functionalities. This approach is consistent with the research conducted by Suharianto et al. [9],

which emphasizes the importance of requirements analysis in QR Code-based ordering systems to improve service efficiency.

2.1.2 System Design

The system design phase aimed to model the analyzed requirements into UML diagrams and database diagrams. This design process provides a comprehensive overview of the system structure and the interaction flow among system components.

a. Use Case Diagram

The Use Case Diagram was used to describe the interactions between system actors and the system itself. This diagram models key system functions such as QR Code scanning, menu selection, payment confirmation, order management, and e-receipt downloading. This approach refers to the study by M. F. A. Nasution and L. Hanum [4], which demonstrated that Use Case Diagrams are effective in mapping functional requirements in QR Code-based systems.

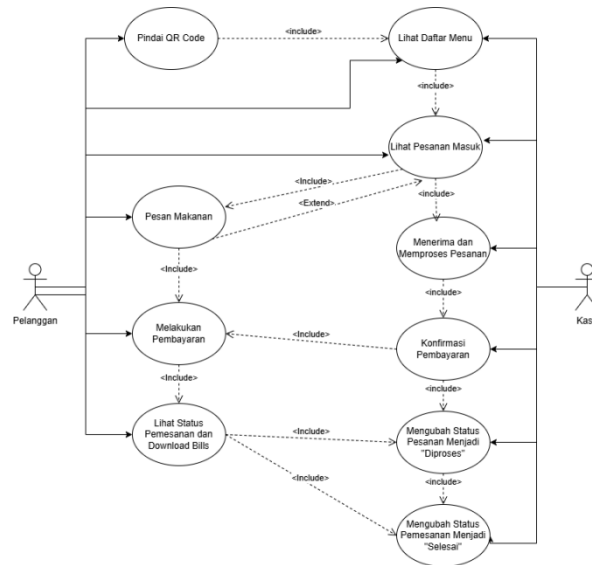


Figure 2. Use Case Diagram Pelanggan – Kasir
Data Taken From Author 2026

Overall, the workflow depicted in this diagram demonstrates a well-integrated interaction between the Customer and the Cashier, where each activity is interconnected and supported by the system to ensure that the ordering, payment, and order completion processes operate efficiently, transparently, and are fully controlled end-to-end.

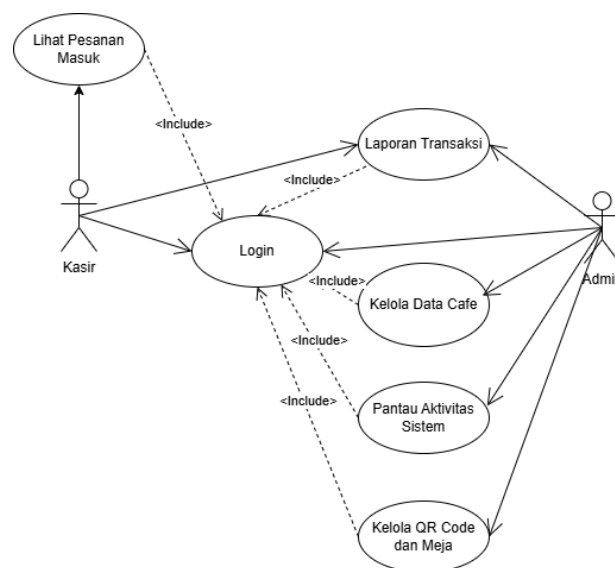


Figure 3. Use Case Diagram Kasir – Admin
Data Taken From Author 2026

The workflow presented in this diagram demonstrates that the login process serves as the central control point for all system functions, both for the Cashier and the Admin. Once authentication is successful, each actor performs their respective roles and responsibilities according to operational requirements, allowing the system to support transaction management, activity monitoring, and data configuration in a structured, secure, and well-controlled manner.

b. Sequence Diagram

The Sequence Diagram was used to illustrate the dynamic interaction flow among system objects based on time sequence. This diagram shows the process starting from the customer scanning the QR Code, the system validating the table, the customer placing an order, the cashier confirming the payment through the POS system, and finally the system generating the electronic receipt. The use of Sequence Diagrams helps ensure that the system runtime flow operates consistently and in an integrated manner. This is aligned with the automated system approach proposed by Richa Saxena et al. [2].

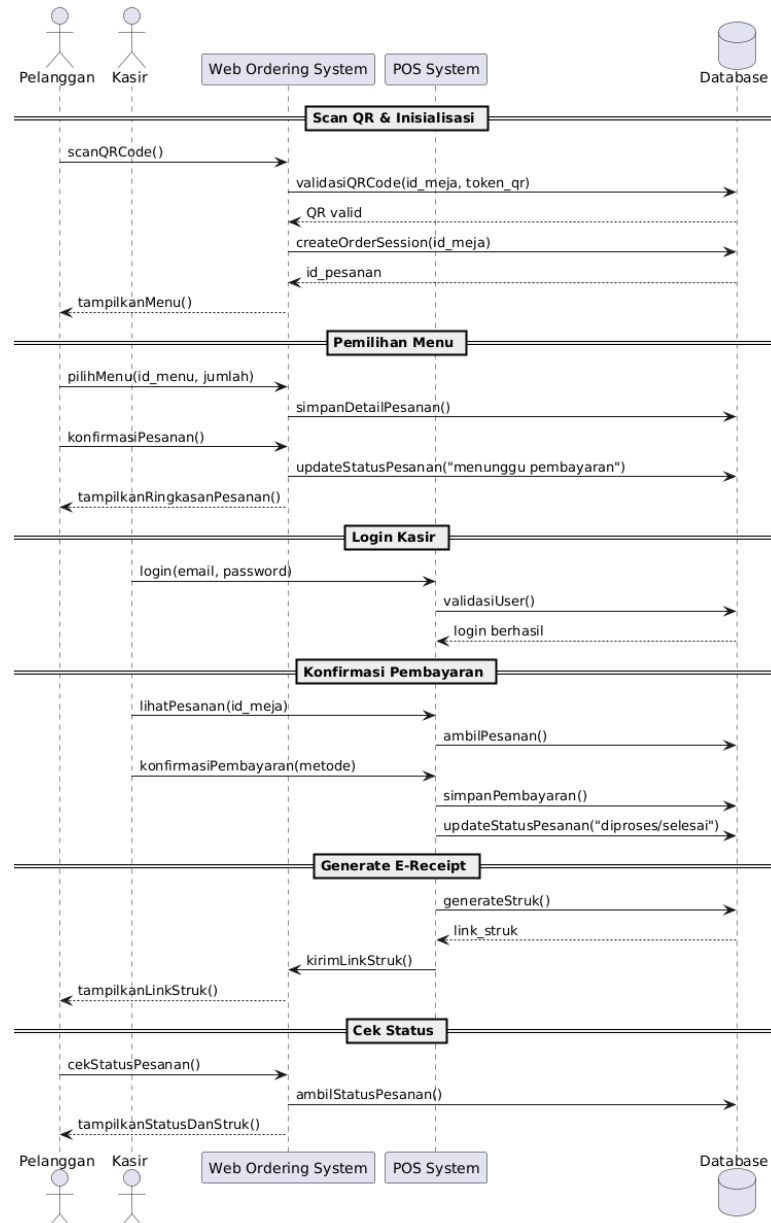


Figure 4. Ordering and Payment Sequence Diagram
Data Taken From Author 2026

c. Activity Diagram

The Activity Diagram was used to model the overall flow of user and system activities. This diagram illustrates the business process of ordering, starting from QR Code scanning, menu selection, payment, to allowing customers to view order status and download digital payment receipts. This approach supports the research conducted by Falah [1], which emphasizes the importance of process flow visualization in web-based ordering systems.

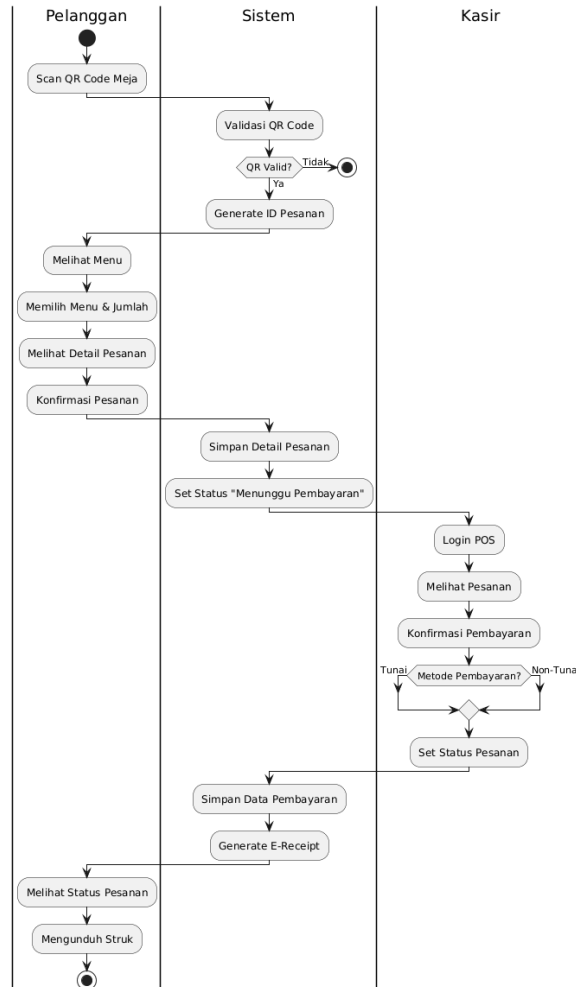


Figure 5. Cafe Ordering System Activity Diagram
Data Taken From Author 2026

The activity diagram illustrates the food ordering workflow involving the Customer, the System, and the Cashier within an interconnected process. The workflow begins when the Customer scans the QR Code available at the table. After the QR Code is scanned, the System performs a validation process to ensure that the QR Code is valid and usable. If the QR Code is invalid, the process is immediately terminated. If the QR Code is declared valid, the System generates an order ID as the identity of the ongoing transaction.

Once the order ID is generated, the Customer is able to view the list of available menu items. The Customer then selects the desired menu items along with their quantities, followed by reviewing the order details as a verification step before submitting the order. After the Customer confirms the order, the System stores all order details and automatically sets the order status to “waiting for payment,” indicating that the order has been recorded but not yet paid.

In the next stage, the Cashier logs into the POS system to manage the transaction. After successfully logging in, the Cashier can view the list of incoming orders from customer tables. The Cashier then confirms the payment based on the payment method selected by the Customer, either cash or cashless. Once the payment method is processed, the Cashier updates the order status according to the payment result.

The System subsequently stores the confirmed payment data and proceeds with the generation of an electronic receipt (e-receipt). After the e-receipt is successfully generated, the Customer can view the updated order status through the system. As the final step of the workflow, the Customer is also able to download the receipt as official proof of payment.

d. Entity Relationship Diagram (ERD)

The Entity Relationship Diagram (ERD) was used to design the system database structure. The ERD illustrates relationships among entities such as user, role, table, menu, order, order detail, payment, and receipt. This database design aims to ensure data integrity and consistency among tables within the system.

A well-structured database design is crucial in digital transaction systems, as explained by Akbar and Haryanti [10].

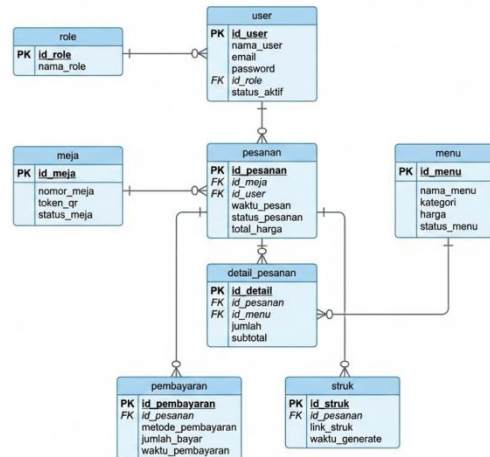


Figure 6. Cafe Ordering System Entity Relationship Diagram
Data Taken From Author 2026

The ERD represents the core data structure of a QR Code-based ordering system that is integrated among customers, cashiers, and the back-end system. The data flow begins with the role entity, which functions to define user access rights within the system. Each role can be assigned to multiple users, while each user is associated with a single specific role. The user entity stores identity information such as name, email, password, and active status, which are later used for authentication and authorization processes when users access the website, either as cashiers or administrators.

The table entity serves as the initial link between customers and the ordering system. Each table contains a table number, QR token, and table status indicating whether the table is available or currently in use. When a customer scans a QR Code, the system identifies the table based on this data and then creates an order entity as the core transaction record. The order is associated with the table and the user responsible for handling the transaction, and it stores the order time, order status, and total price, which are continuously updated as the process progresses.

The order entity is further related to the order detail entity, which stores detailed information about the ordered items. Each order detail links an order to a specific menu item, including the quantity and subtotal price. The menu entity stores information about the available food and beverage items, including menu name, category, price, and menu status. This relationship allows a single order to consist of multiple menu items while ensuring that menu data remains separately managed and consistent.

Once the order is confirmed, the process continues to the payment entity, which records the payment method, payment amount, and payment time. The payment entity is directly linked to the order, enabling each financial transaction to be clearly traced back to its corresponding order. From this payment process, the system subsequently generates a receipt entity that stores the digital receipt link and receipt generation time as official proof of transaction that can be accessed by the customer.

If this ERD is implemented within a website, the data structure strongly supports an integrated and scalable system workflow. The website can leverage the relationships among entities to display menus in real time, manage order statuses, and process payments efficiently. User- and role-based authentication enables clear access separation between administrators, cashiers, and other roles, thereby maintaining system security and control. In addition, the integration of tables and QR Codes simplifies the customer experience by allowing orders to be placed directly without login, while all activities are still systematically recorded in the backend. Overall, this ERD reflects a solid foundation for developing a modern, structured, and extensible ordering website capable of supporting café operations in an end-to-end manner.

2.1.3 System Implementation

The implementation phase involved translating the system design into a web-based application. The system was developed based on a self-service ordering concept, where customers place orders by scanning QR Codes available on each table. After the customer completes the order, the cashier confirms the payment through the POS system, and the system

automatically generates an electronic receipt that can be accessed and downloaded by the customer. This integrated ordering system implementation extends the e-receipt concept previously developed by Alfian Badarul Tamam et al. [7].

2.1.4 System Testing

The system testing phase was conducted using functional testing to ensure that all system functions operated according to the defined requirements. Testing covered QR Code scanning, menu ordering, payment confirmation, order status updates, and the generation and downloading of electronic receipts.

This research was limited to the functional testing stage without proceeding to the maintenance phase, in accordance with the research objective of system validation. This approach is consistent with the comparative study of the Waterfall method conducted by Aries Widyantoro et al. [11].

3. RESULTS AND DISCUSSION

3.1 Results of System Prototype Implementation

The result of this study is a prototype of a QR Code-based cafe ordering website designed for academic purposes and system flow testing. This prototype functions to visualize the cafe ordering business process in a digital form without direct implementation of a back-end system or database.

The system usage flow begins when customers scan the QR Code available at each table. The QR Code directs customers to the ordering website page, which displays the table number information along with an order ID that is automatically generated by the system. This approach is consistent with the study conducted by Suharianto, Pambudi, Rahagiyanto, and Suyoso [9], which states that the implementation of QR Codes can improve ordering time efficiency in restaurants and cafes.

After accessing the ordering page, customers can view the list of available food and beverage menu items, select the desired order quantities, and view the total price in real time. The user interface is designed to be simple and intuitive to ensure ease of use for first-time users. This design aligns with the findings of Fitriani et al. [12], which emphasize the importance of accessibility and clarity of information in QR Code-based ordering systems.



Figure 7. QR-Code Ordering System
Data Taken From Author 2026

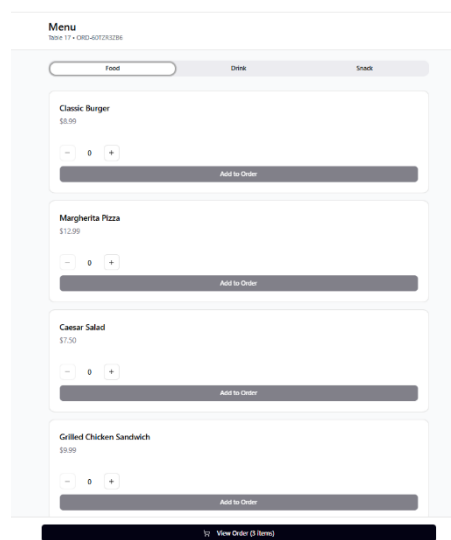


Figure 8. Menu Ordering Café
Data Taken From Author 2026

3.2 Payment Process and Order Confirmation

After the customer completes the ordering process, the system displays the order status page with the status “Waiting for Payment.” At this stage, the customer is directed to complete the payment through the cashier. The cashier then performs payment confirmation via the cashier page provided in the system prototype.

The role of the cashier in validating payments and updating order statuses reflects the concept of a Point of Sale (POS) system. This is consistent with the study by Putri et al. [13], which states that POS systems play a crucial role in improving the effectiveness of transaction management and café operations. In addition, research by Alexander and Husufa [14] also emphasizes that web-based POS systems provide convenience in centralized transaction management.

Once the payment is confirmed by the cashier, the customer’s order status changes to “Payment Successful” or “Order Completed.” This status update provides assurance to the customer that the transaction has been successfully processed by the system.

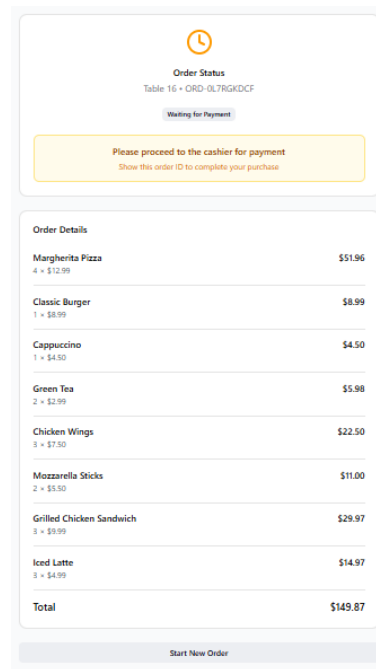


Figure 9. Waiting-list and Confirm Cashier
Data Taken From Author 2026

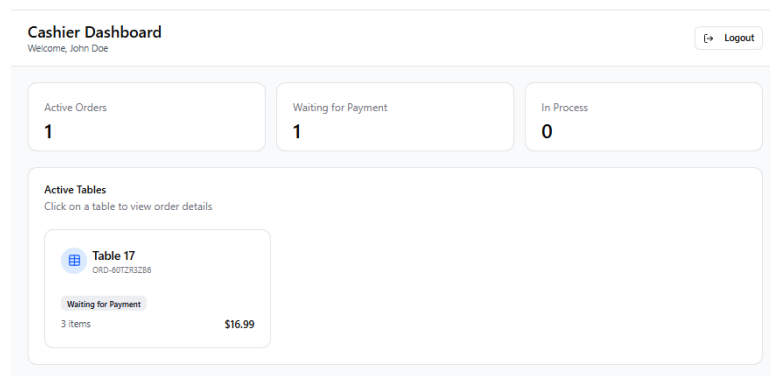


Figure 10. Cashier Dashboard

← Back to Dashboard

Order Detail
Table 17 • ORD-6072R3ZB6 Completed

Order Items	
Classic Burger 1 × \$8.99	\$8.99
Cappuccino 1 × \$4.50	\$4.50
French Fries 1 × \$3.50	\$3.50
Total Payment	\$16.99

Update Order Status

Payment received via Cash

Order Completed

Figure 11. Payment Confirm and Order Completed
Data Taken From Author 2026

3.3 Purchase Detail Display and Digital Receipt

As the final outcome of the ordering process, the system displays a purchase detail page containing transaction information such as the total payment amount, transaction ID, payment method, transaction date, and merchant identity. This page also provides a “Download Receipt” button that allows customers to independently download the receipt or proof of payment.

The use of digital receipts is consistent with the study by Rabbani [15], which states that digital-based payment systems and transaction records can improve efficiency and reduce dependence on physical documents. In addition, research by Farhan and Shifa [16] emphasizes that the implementation of QR-based digital payment systems supports digital transformation in micro, small, and medium enterprises (MSMEs).

Payment Successful!

Your payment has been processed successfully. You will receive a confirmation email shortly.

Amount	\$149.99
Transaction ID	TXN-789123456
Payment Method	**** 4242
Date	Dec 15, 2024
Merchant	TechStore Pro

✉ Receipt sent to customer@example.com

Download Receipt

← **Return to Store**

Need help? Contact our support team at support@techstore.com

Figure 12. Detail Payment and Download Receipt
Data Taken From Author 2026

3.4 Discussion of Research Results

Based on the prototype testing results, the QR Code-based cafe ordering system developed in this study has successfully represented the system workflow in a clear and easily understandable manner. Each actor, namely the customer, cashier, and admin, has distinct roles and access rights in accordance with the system requirements.

The use of the Waterfall method in this research provides a structured and well-documented development process. This finding is consistent with the view of Aceng Abdul Wahid [8], who states that the Waterfall method is highly suitable for system development projects in which requirements are clearly defined from the beginning. Comparative studies by [10] as well as Widyantoro et al. [11] also indicate that the Waterfall method remains relevant for small- to medium-scale information system projects.

Although this prototype has not yet been directly integrated with a back-end system and database, the research results have achieved the primary objective of the study, which is to validate the system workflow and user interactions through an interface prototype. Therefore, the QR Code Cafe System prototype can serve as a foundation for further system development as well as an academic demonstration tool during thesis defense or evaluation sessions.

4. CONCLUSION

Based on the design and discussion results that have been conducted, it can be concluded that the objectives of this study, as described in the introduction chapter, have been successfully achieved. This research aimed to design a QR Code-based cafe ordering system that facilitates the ordering process, improves service efficiency, and provides a clear system workflow for customers, cashiers, and administrators.

The research results indicate that the developed QR Code Cafe System website prototype is able to represent the digital ordering workflow, starting from customers scanning the QR Code at the table, accessing the menu, placing orders, and obtaining order status and transaction details after payment confirmation by the cashier. The prototype also features a digital receipt function that allows customers to independently download their transaction receipts, thereby enhancing transparency and accessibility of transaction information.

The application of the Waterfall method in this study has proven to be effective in supporting a structured and systematic system design process. Each development phase, from requirements analysis to prototype design, was conducted clearly and well-documented. This demonstrates that the Waterfall method remains relevant for information system development research in which system requirements are clearly defined from the outset.

Although the developed system is still in the form of a prototype and has not yet been directly integrated with a back-end system and database, the research outcomes have fulfilled the primary focus of the study, namely validating system workflows and user interactions. The resulting prototype can be used as an academic demonstration medium and as a foundation for the development of more complex systems in the future.

As a prospect for further development, future research may integrate the system with a back-end and database to support real-time data management. In addition, the payment system can be enhanced by adopting digital payment methods such as QRIS, as well as adding features for automatic financial reporting and stock management. With these developments, the QR Code-based cafe ordering system has strong potential to be practically implemented in real cafe and restaurant business environments.

5. ACKNOWLEDGEMENTS

The authors would like to express their sincere gratitude to the Faculty of Information Technology, Universitas Teknologi Digital Indonesia, for the academic support, facilities, and resources provided throughout this research. The authors also extend their appreciation to lecturers, colleagues, and all parties who contributed through valuable guidance, discussions, and technical support during the development of the QR Code-based cafe ordering system prototype. The constructive feedback and suggestions received during the research process have contributed significantly to improving the quality of this study. This research was conducted independently and received no specific external funding.

6. REFERENCES

- [1] M. S. Falah, "Aplikasi Web Pemesanan Makanan Berbasis QR Code untuk Area Food Court," *LogicLink*, vol. 2, no. 2, p. 179 – 197, 2025.
- [2] Manurung, R., & Sipahutar, T. (2024). IMPLEMENTASI SISTEM PEMESANAN MAKANAN BERBASIS QR CODE UNTUK USAHA MIKRO, KECIL DAN MENENGAH. *Electro Luceat*, 10(1), 11-21. <https://doi.org/10.32531/jelekn.v10i1.780>.
- [3] A. F. A.Sagaf and I. Ibrahim, "Development of a Mobile Web-Based Food and Beverage Ordering Application in a Youth Cafe With QR Code Technology," *INOVTEK Polbeng - Seri Informatika*, vol. 10, no. 1, pp. 262-271, 2025.
- [4] N. M Fahri Aditya and H. Latifah , "Meeting Attendance Design Using Web-Based Qrcode On Diskominfo Kota Tebing Tinggi," *Journal of Information Systems and Technology Research*, vol. 1, no. 2, p. 58–67, 2022.

- [5] L. K and et al, "QR Code-Based Smart Food Ordering and Payment System," *Paper published under CC license (CC BY-NC-ND 4.0)*, vol. 2, pp. 169-179, 2025.
- [6] G. B. M.T. Sitorus and et al, "Bridging the Gap: A Comparative Evaluation of Agile, Waterfall, and Hybrid Methodologies in Modern Software Projects," *Procedia Computer Science*, vol. 269, pp. 1259-1268, 2025.
- [7] T. Alfian Badarul and et al, "WEB-BASED E-RECEIPT IMPLEMENTATION FOR MINIMIZING CONTACT IN TRANSACTIONS," *PROFICIENT*, vol. 3, 2025.
- [8] Hidayattullah, M. F., & Hapsari, Y. (2020). Implementasi Metode Waterfall pada Rancang Bangun Sistem Informasi Kerja Praktik Industri: Studi Kasus: Program Studi D IV Teknik Informatika Politeknik Harapan Bersama. *Ultima InfoSys : Jurnal Ilmu Sistem Informasi*, 11(2), 85–89. <https://doi.org/10.31937/si.v11i2.1594>
- [9] Suharianto and et al, "Implementasi QR Code untuk Efisiensi Waktu Pemesanan Menu Makanan dan Minuman di Restoran maupun Kafe," *BIOS : Jurnal Teknologi Informasi Dan Rekayasa Komputer*, vol. 1, no. 1, pp. 35-39, 2020.
- [10] . A. Ilhaam Syafruddin and H. Tining , "RELATIONSHIP DIAGRAM DATABASE," *Jurnal Ilmiah Computing Insight*, vol. 3, no. 2, 2021.
- [11] W. Aries and et al, "Systematic Literature Review: Membandingkan Pendekatan Metode Agile dan Waterfall Dalam Pengembangan Perangkat Lunak," *Journal of Comprehensive Science*, vol. 4, no. 1, p. 183–193, 2025.
- [12] F. Yuni and et al, "SISTEM INFORMASI PEMESANAN MENGGUNAKAN TEKNOLOGI QUICK RESPONSE CODE (QR-CODE) PADA WARUNG KITA," *TEKNOLOGIA*, vol. 16, no. 3, 2025.
- [13] P. Ristiyani Amelia and et al, "PENGARUH PENGGUNAAN SISTEM POINT OF SALE (POS) TERHADAP KINERJA KEUANGAN DAN MANAJEMEN STOK PADA COFFE BAWA STUDIO," *Jurnal Riset Ekonomi dan Bisnis Mahasiswa*, vol. 6, no. 1, 2025.
- [14] A. Jeremia and H. Nurullah , "IMPLEMENTASI POINT OF SALES BERBASIS WEB PADA USAHA OLIVE CAFÉ," *JUSIBI-(JURNAL SISTEM INFORMASI DAN E-BISNIS)*, vol. 2, no. 4, 2020.
- [15] R. A, "Sistem Informasi Reservasi dan Pembayaran Resto Berbasis QR Code," *Electrician : Jurnal Rekayasa Dan Teknologi Elektro*, vol. 17, no. 1, pp. 77-82, 2023.
- [16] A. Farhan and A. Wardani Shifa, "Penggunaan Metode Pembayaran QRIS Pada Setiap UMKM di Era Digital," *Jurnal Pengabdian kepada Masyarakat Nusantara (JPkMN)*, vol. 4, no. 2, 2023.