

Design of an Interactive E-Menu Information System Based on QR Code at Kopi Tuku

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Abstract: The development of information technology and internet-based services has encouraged digital transformation in the culinary industry, particularly in improving operational efficiency and customer experience. One of the challenges faced by Kopi Tuku is the occurrence of long queues during peak hours due to the conventional ordering process, which requires customers to view the menu and place orders directly through the cashier. This study aims to design an interactive QR Code-based E-Menu information system integrated with digital ordering and payment processes to support service efficiency at Kopi Tuku. The research employed the Prototyping Development Model, consisting of problem identification and data collection, requirements analysis, object-oriented system design using Unified Modeling Language (UML), and user interface prototyping using Figma. The results of the study include a system design consisting of a Use Case Diagram, Activity Diagrams, Sequence Diagrams, a Class Diagram, and an interactive user interface prototype. The proposed system enables customers to access digital menus by scanning a QR Code, select a branch and table number, choose products, manage shopping carts and favorite items, monitor order status, and make digital payments using mobile devices. The system also provides functions for cashiers to verify transactions and for baristas to receive and process orders in an integrated workflow. Based on the design results, the proposed system can serve as an alternative solution to support a more structured ordering process, reduce dependence on cashier-based ordering, and improve customer access to services. Further implementation and testing are required to evaluate the system's effectiveness, usability, and user acceptance under Kopi Tuku's actual operational conditions.

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Introduction

The development of information technology and the internet has brought significant changes to various business sectors, including the culinary industry, which is required to provide fast, efficient, and customer-experience-oriented service. Service digitization has become a widely implemented strategy to improve operational effectiveness and meet consumer needs, which increasingly prioritize ease of transaction. One widely utilized technology is the Quick Response Code (QR Code), a two-dimensional identification technology capable of storing and conveying information quickly via mobile devices. The use of QR Codes in food and beverage ordering systems allows customers to independently access digital menus without having to interact directly with cashiers, thereby speeding up the service process and increasing customer satisfaction (Suryadi, 2023).

The phenomenon at Tuku Coffee Shop shows that the high number of customers during rush hour often results in long queues at the ordering area. The ordering system, which still relies on printed menus and direct transaction processing at the cashier, results in a buildup of customers, lengthened waiting times, and increased workload for service staff. This situation has the potential to degrade service quality and reduce customer convenience, especially amidst increasing public expectations for fast, digital-based services (Permana & Sarif, 2025). On the other hand, the increasing use of smartphones among the public opens up opportunities for the implementation of a more effective digital ordering system through the integration of QR Codes and interactive E-Menu (Pratama & Wijaya, 2025).

The urgency of this research is based on the need for Tuku Coffee Shop to improve service process efficiency while optimizing the customer experience. The implementation of a QR Code-based E-Menu allows customers to access real-time product information, place orders, and complete digital payments without having to queue at the cashier. In addition to speeding up the service flow, this system can also minimize order recording errors, reduce the use of print media, and support digital transformation in the increasingly competitive culinary business sector (Sakti & Hamidi, 2023). Therefore, a structured and integrated system is needed to effectively meet business operational needs.

Although various previous studies have discussed the application of QR Codes in digital services and the development of E-Menu systems in the restaurant and cafe sector, most studies have focused solely on the ease of access to menu information or digital payment systems. Research integrating QR Code technology, interactive E-Menu features, ordering features, shopping carts, and digital payments into a single system designed using an Object-Oriented approach and Unified Modeling Language (UML) is still relatively limited. Furthermore, there are few studies specifically examining the implementation of such systems in the operational context of Tuku Coffee Shop, which has high customer base and high visitor numbers. This research gap is the basis for conducting research on designing a QR Code-based E-Menu using



an Object-Oriented approach to improve service efficiency and the quality of the customer experience at Tuku Coffee Shop (Akbar et al., 2023).

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Research Methods

Research Stages

To design an interactive QR Code-based E-Menu information system that is adaptive to the operational needs of the Tuku Coffee Shop, the stages of this research are structured using the Prototyping Development Model approach.

Explanation of Research Stages

1. Problem Identification & Data Collection

The initial stage of the research began by exploring and formulating real-world problems encountered in the conventional ordering system at Tuku Coffee Shop outlets, such as customer queues at the cashier during rush hour and the risk of menu entry errors. After the problems were mapped, primary data collection was conducted through indirect observation, primarily through social media and the Tuku Coffee website. Furthermore, secondary data was collected through literature searches from scientific journals and related textbooks to obtain supporting theories regarding QR Code technology and information system modeling (Suryadi, 2023).

2. Needs Analysis

At this stage, an in-depth analysis of the system requirements to be built is conducted to address the identified problems. This analysis is divided into two aspects: functional requirements (what features the application must include, such as table number scanning, coffee menu selection, shopping cart, and payment gateway integration) and non-functional requirements (such as menu access speed, transaction security, and device display responsiveness) (Rahman et al., 2025).

3. Object Oriented Modeling (UML)

After the system requirements specifications are mapped, an object-oriented software architecture design is carried out using the Unified Modeling Language (UML) (Purnomo & Sanjaya, 2024). This visual design includes a Use Case Diagram to define actor access rights (Customer, Barista, and Cashier), an Activity Diagram to illustrate the flow of self-ordering activities, a Sequence Diagram to track the sequence of interactions between data objects, and a Class Diagram to structure the interrelated database (Akbar et al., 2023).

4. Interface Prototyping (UI)

The object-oriented design of the system logic, modeled in UML, was then implemented into an interactive visual design or user interface prototype. This prototype was created using the Figma application. The main focus of this stage was to create a user-friendly menu catalog layout, navigation buttons, and color scheme consistent with Toko Kopi Tuku's distinctive visual identity (branding) (Wiwesa, 2021).

5. Results and Conclusions

The final stage of this research was to document all the validated designs for the QR Code-based E-Menu information system. At this stage, conclusions were drawn regarding the extent to which the new system design addresses the challenges of operational time efficiency and shortening the cashier queue at Tuku Coffee Shop.

Results and Discussion

Use Case Diagram

Use Case Diagrams are used to illustrate the interactions between users and the system and its available functions. This diagram provides an overview of the Kopi Tuku E-Menu System usage flow and the roles of each actor in carrying out the system's processes.

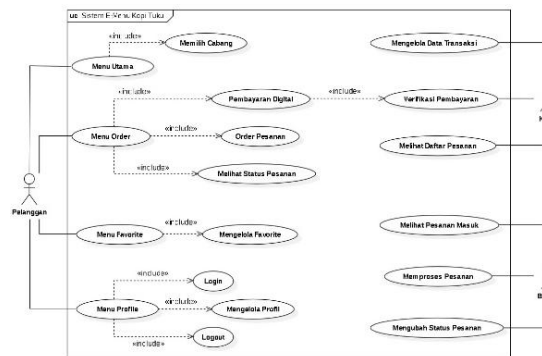


Figure 1. Use Case Diagram

The E-Menu Kopi Tuku use case diagram illustrates the interactions between customers, cashiers, and baristas in the digital coffee ordering process. Customers can select a branch, place an order, make digital payments, view order status, manage favorite menus, and access their account profiles. Furthermore, the cashier is responsible for managing transactions, verifying payments, and viewing the order list, while the barista receives incoming orders, processes them, and updates the order status. This diagram shows the integrated system workflow from ordering to completion.

Activity Diagram

An Activity Diagram is a UML diagram that depicts the sequential flow of activities or work processes in a system from start to finish. This diagram shows how a process operates, the possible decisions that occur, and the activities performed by both users and the system. Activity diagrams help developers understand the system flow more clearly and in a structured manner. (Sutiyono & Ramadan, 2025).

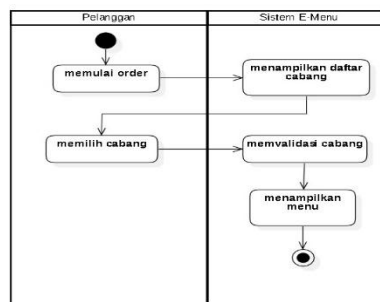


Figure 2. Activity Diagram Selecting a Branch

The branch selection activity diagram illustrates the process when a customer initiates an order on the E-Menu system. The process begins with the customer opening the order page, after which the system displays a list of available branches. The customer can then select the desired branch, and the system validates the branch. If the branch is valid, the system displays a list of available menu items, allowing the customer to continue the ordering process.

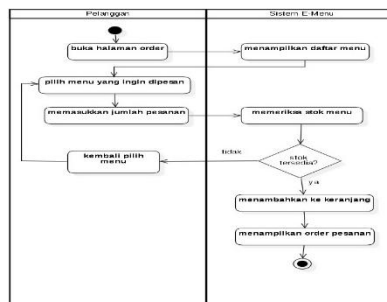


Figure 3. Order Activity Diagram

The order activity diagram explains the customer flow when ordering a menu item on the E-Menu system. The process begins when the customer opens the order page and the system displays a list of available menu items. The customer then selects a menu item and enters the order quantity. The system then checks the menu item's stock availability. If the item is unavailable, the customer is prompted to select another item. If the item is available, the item is added to the cart, and the system displays the order details for the item selected.

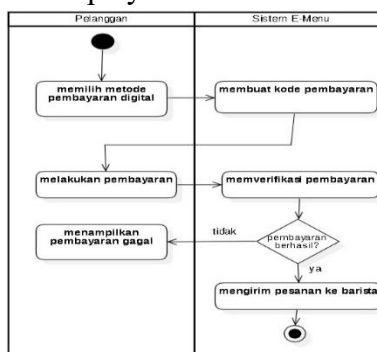


Figure 4. Digital Payment Activity Diagram

The digital payment activity diagram illustrates the payment transaction process carried out by customers using digital payment methods. The process begins when the customer selects a digital payment method, and the system then generates a payment code. Once the code is generated, the customer can make the payment, and the system will verify the payment status. If the payment is successful, the system will send the order data to the barista for processing. If the payment fails, the system will display a message indicating that the payment was unsuccessful.

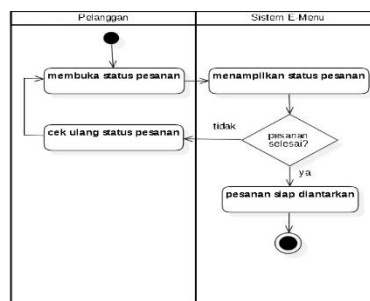


Figure 5. Activity Diagram Viewing Order Status

This order status activity diagram illustrates the customer's process of monitoring the progress of an order on the E-Menu system. The process begins when the customer opens the order status page, and the system displays the current order status. The system then checks whether the order has been completed. If the order is incomplete, the customer can recheck the

order status. If the order is complete, the system displays information that the order is ready for delivery.

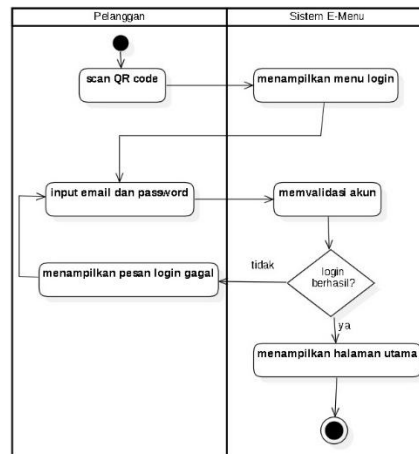


Figure 6. Login Activity Diagram

The login activity diagram explains the process of a customer logging into the E-Menu system. The process begins when the customer scans a QR code, displaying the login page. The customer then enters their email address and password, which are then validated. If the login information is incorrect, the system displays a login failure message, prompting the customer to re-enter the information. If the login is successful, the system displays the main page, allowing the customer to continue the ordering process.

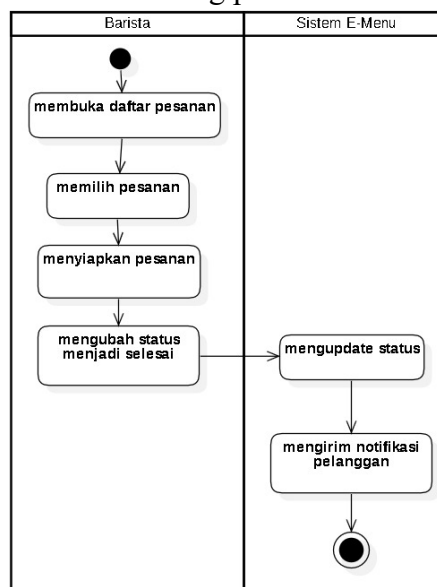


Figure 7. Activity Diagram for Barista Processing Orders

The barista processing order activity diagram illustrates the barista's workflow in handling customer orders in the E-Menu system. The process begins when the barista opens the list of incoming orders and selects the order to be processed. The barista then prepares the order according to the customer's request and changes the order status to completed. The system then automatically updates the order status and sends a notification to the customer that the order has been processed.

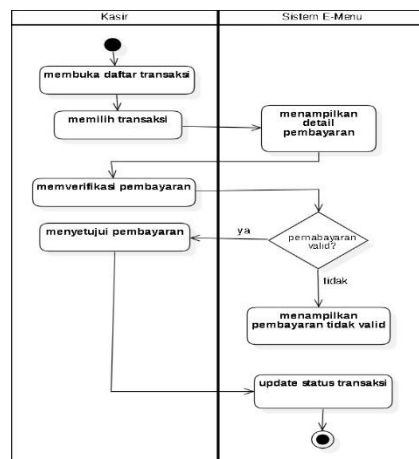


Figure 8. Payment Verification Activity Diagram

The payment verification activity diagram explains the system's process for verifying a customer's digital payment. The process begins when a customer makes a payment using the selected digital method. The system then checks and verifies the payment status. If the payment fails, the system displays a failed payment notification to the customer. However, if the payment is successful, the system continues the order process and sends the order data for further processing by the barista.

Sequence Diagram

Sequence diagrams are used to depict interactions between objects or actors in a system based on a chronological order. These diagrams show the message transfer process between objects, allowing for a detailed and systematic view of the communication sequence within the system (Sutiyo & Ramadan, 2025).

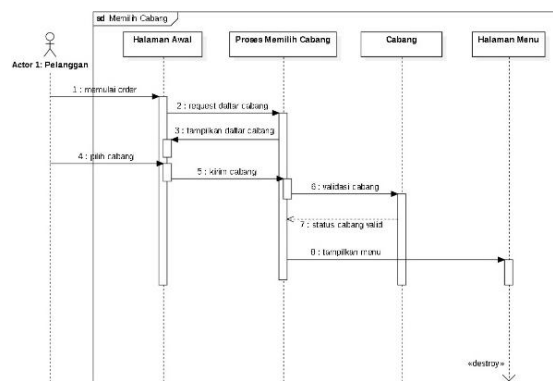


Figure 9. Sequence Diagram Selecting a Branch

The branch selection sequence diagram illustrates the customer process of selecting a branch before placing an order. The process begins when the customer selects the "Start Order" menu on the home page. The home page then requests a list of branches from the branch selection process, and the system displays a list of available branches. The customer then selects the desired branch, and the system sends the branch data for validation. If the branch is valid, the system displays the menu page so the customer can proceed with the order.

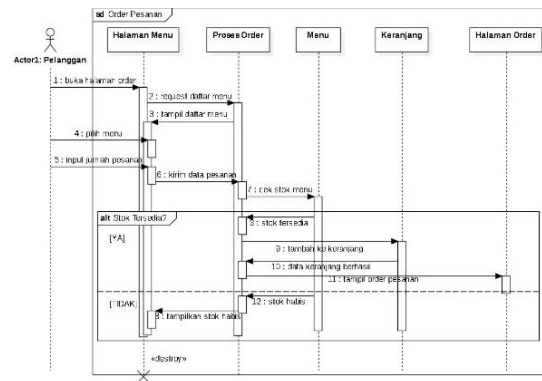


Figure 10. Order Sequence Diagram

The order sequence diagram explains the customer's flow when ordering a menu item on the E-Menu system. The process begins when the customer opens the order page and the system displays a list of available menu items. The customer then selects a menu item and enters the order quantity. The order data is then sent to the order process to check the menu item's stock availability. If the item is available, the system adds the item to the cart and displays the order to the customer. However, if the item is out of stock, the system displays a message indicating that the item is out of stock.

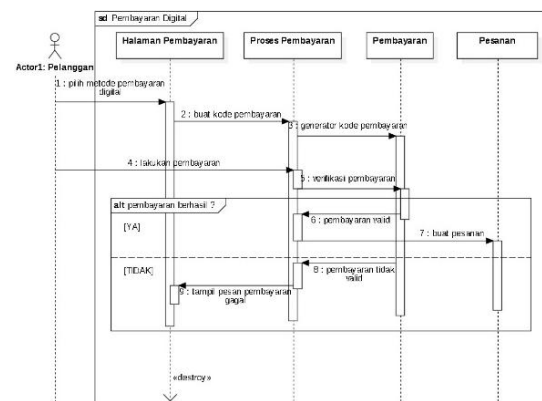


Figure 11. Sequence Diagram of Digital Payments

The digital payment sequence diagram illustrates the digital payment process for an order. The process begins when a customer selects a digital payment method on the payment page. The system then generates a payment code and proceeds through the payment process. The customer then makes the payment, and the system verifies the payment status. If the payment is valid, the system creates the order for further processing. If the payment is invalid, the system displays a payment failure message to the customer.

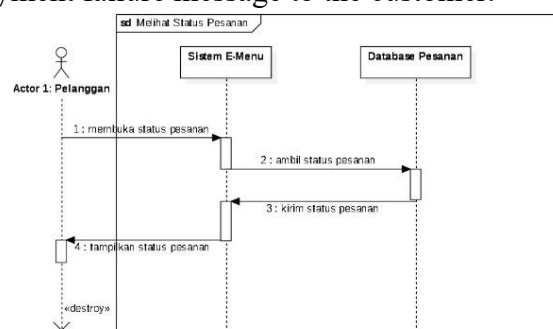


Figure 12. Sequence Diagram Viewing Order Status

This sequence diagram shows the order status and explains the customer's process for monitoring the progress of an order on the E-Menu system. The process begins when the customer opens the order status page. The page then requests the order status data from the order status process. The system then checks the order data. If the order is complete, it displays a message indicating it is ready. If the order is still being processed, the system displays a status message, allowing the customer to recheck the order status until it is complete.

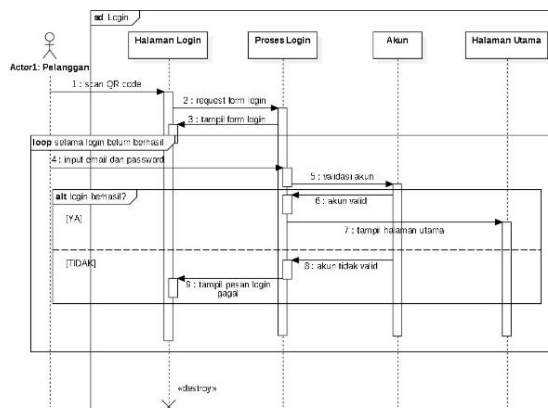


Figure 13. Login Sequence Diagram

The login sequence diagram illustrates the customer process when logging into the E-Menu system. The process begins when the customer scans a QR code, then the system displays a login form. The customer then enters their email address and password, which are validated by the system through the login and account details process. If the account details are valid, the system displays the main page. However, if the account is invalid, the system displays a login failure message, allowing the customer to try again.

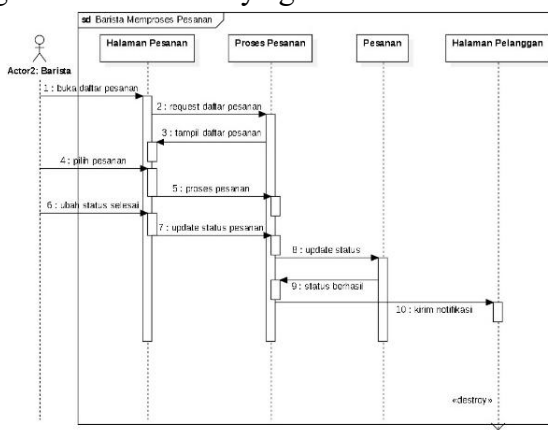


Figure 14. Sequence Diagram of Barista Processing Orders

The barista order processing sequence diagram explains the barista's process in managing customer orders. The process begins when the barista opens the order list on the order page. The system then requests and displays a list of incoming orders. The barista then selects the order to be processed, and the system executes the order processing. When the order is completed, the barista changes the order status to completed, and the system updates the order status. After a successful update, the system sends a notification to the customer that the order has been processed.

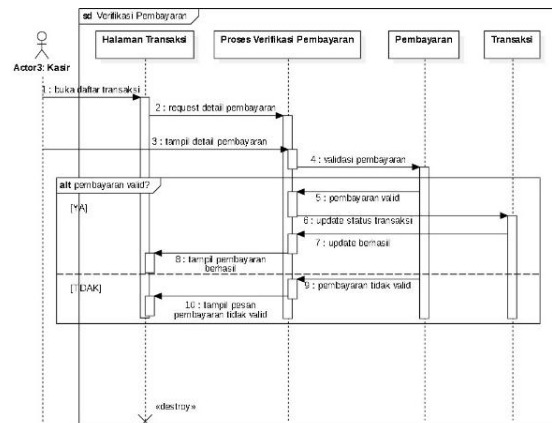


Figure 15. Payment Verification Sequence Diagram

The payment verification sequence diagram illustrates the cashier's process of verifying a customer's payment. The process begins when the cashier opens the transaction list on the transaction page. The system then requests payment details and displays the payment information to the cashier. The payment verification process then validates the payment data. If the payment is valid, the system updates the transaction status and displays a successful payment. If the payment is invalid, the system displays an invalid payment message to the cashier.

Class Diagram

A class diagram depicts the structure of a system through a collection of classes and the relationships between them. This diagram shows the attributes, methods, and responsibilities of each class in supporting the system's operation. Furthermore, class diagrams help visualize database structures and serve as the basis for designing object-oriented systems.

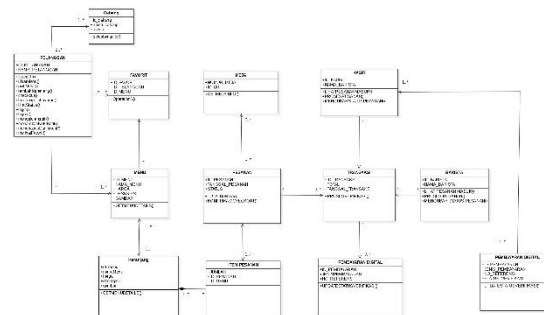


Figure 16. Class Diagram

The class diagram in this image illustrates the flow of a digital ordering system centered on the interaction between the CUSTOMER and the Menu. The process begins when the customer selects a BRANCH location, then begins to browse the available Menu list. Customers can add their chosen menu to the Shopping Cart or save it to the FAVORITES list if there is a food or drink they like. After the customer selects a TABLE number and checks out, the menu list in the cart will be immediately integrated into an Order.

Once an order is successfully placed, the system immediately connects it to the operational and payment processes. This order data generates a transaction document, which the cashier manages for verification, especially if the customer chooses a digital payment method. Simultaneously, the ordered menu details are forwarded to the barista for immediate

processing and preparation. Overall, the diagram in image.png shows how each component is interconnected to ensure the entire ordering process is automated and seamless.

User Interface

A user interface is a visual representation that allows users to see and interact with an application, acting as a medium connecting them to the system. The following is a visual representation of a user interface created using Figma.



Figure 17. UI UX Main Page

Based on the interface display in Figure 17, the UI/UX design of the "Home Page" of the Tuku Coffee Shop application carries a minimalist and intuitive concept that focuses on easy user navigation (user journey). Through a combination of aesthetic warm cream colors, appetizing coffee product visuals, and warmly welcoming copywriting such as "Your coffee journey starts here", this page successfully builds emotional closeness before the user makes a transaction. From a user experience (UX) perspective, the Call-to-Action (CTA) button structure is made very clear and hierarchical; if new users do not have an account to order through the main "LOGIN TO ORDER" button, the next logical step provided in contrast below it is the "SIGN UP" button, which functions to direct users to the registration page to create a new account before they can finally enjoy the local premium coffee ordering service.

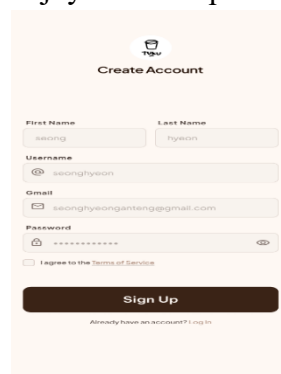


Figure 18. UI UX Sign Up

Based on the interface in Figure 18, the "Sign Up" page is designed to provide a clean, structured, and user-friendly account registration experience for new users. The UI design maintains the visual consistency of the previous page by using a soft cream background combined with the minimalist Tuku logo and a clear title that reads "Create Account". In terms of UX functionality, this page provides an essential data entry form including first name, last name, username, email (Gmail), and password. It is equipped with a visibility icon and a "Terms of Service" agreement checkbox to ensure the legal aspects of the application's operation. This

registration process ends with a contrasting dark brown Call-to-Action (CTA) button that predominantly reads "Sign Up", plus an alternative navigation option at the very bottom ("Already have an account? Log In") for users who accidentally enter the wrong page to return to the login menu without any obstacles.



Figure 19. UI UX Start Order

Based on the interface display in Figure 19, the "Start Order" page is designed as the main gateway for users who have successfully logged in or registered to start the coffee ordering experience. The UI design emphasizes friendly personalization at the top by displaying a profile photo and a direct greeting to the user ("Hello, Seonghyeon"), supported by the minimalist tagline "Your daily ritual, simplified" which reinforces the essence of the application's ease. In terms of UX functionality, the main focus of this page is entirely focused on a large, contrasting circular Call-to-Action (CTA) button in the center of the screen that says "START ORDER" complete with a coffee machine icon, thus minimizing the user's cognitive barriers to immediately transacting. In addition, this page is also equipped with a navigation bar at the bottom (Home, Orders, Favorites, Profile) to provide flexible access to other secondary features consistently and easily reached by the thumb.



Figure 20. UI UX Selecting Tuku Branch

Based on the interface in Figure 20, the "Select Tuku Branch" page is designed to make it easy for users to find and locate the nearest coffee shop to order. The UI design maintains strong visual consistency through the personal greeting "Hello, Seonghyeon", a warm cream color scheme, and a navigation bar at the bottom for smooth accessibility. From a UX perspective, this page uses a clean and efficient two-column card-based layout approach, where each card informatively separates the city name (such as Jakarta, Surabaya, Depok, Tangerang) with the specific name of its branch (such as BP-Bintaro, Bukit Duri, Cibubur Point). The presence of the main visual banner reading "JAKARTA & SEKITARNYA" at the top also

serves as a quick location marker to minimize users' cognitive load, allowing them to instantly select the desired Tuku branch before moving on to the main ordering menu.

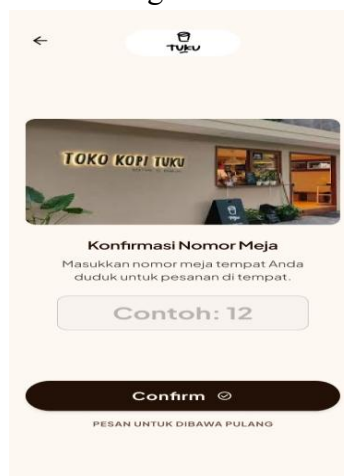


Figure 21. UI UX Confirmation of Table Number

Based on the interface in Figure 21, the "Confirm Table Number" page is designed to practically validate the customer's order service method at their chosen shop. Visually, the page's UI remains aligned with Toko Kopi Tuku's brand identity through the use of a warm beige color palette, a minimalist logo at the top, a back arrow, and a photo of the physical shop facade that provides spatial context for users. In terms of user experience (UX), the page intelligently divides the ordering path into two main scenarios: for dine-in orders, users are presented with clear guidance text accompanied by an intuitive number entry field with placeholder examples ("Example: 12") before pressing the primary dark brown "Confirm" button; while for takeaway orders, a secondary text option "ORDER TO TAKE HOME" is provided at the very bottom to minimize navigational friction for customers not seated at a table.

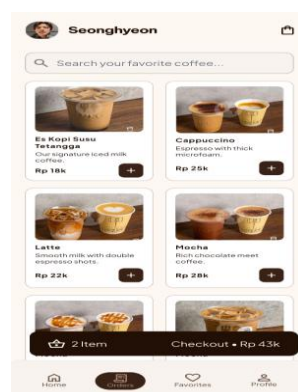


Figure 22. UI UX Selecting Menu

Based on the interface in Figure 22, the "UI UX Selecting Menu" page is designed with a clean and highly informative product catalog layout to make it easy for users to explore and select coffee variants. In terms of UI, this page presents a search element (search bar) that says "Search your favorite coffee..." at the top, followed by a consistent two-column product card layout that displays high-quality product photos, menu names (such as Es Kopi Susu Tetangga, Cappuccino, Latte, Mocha), brief descriptions of flavor components, and clear pricing information. From a UX perspective, ordering efficiency is prioritized by providing a dark "+"

shortcut button in the bottom right corner of each product card for instantly adding orders. Interestingly, this system is equipped with a floating checkout bar that appears above the bottom navigation bar, which interactively informs the order quantity and accumulated price in real-time ("2 Items | Checkout • Rp 43k"), providing reassurance and encouragement for users to proceed to the payment stage without having to change pages first.

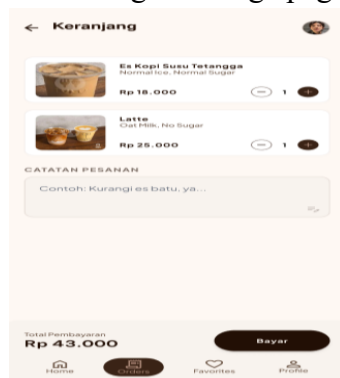


Figure 23. UI UX Cart

Based on the interface display in Figure 23, the "Cart" page is designed to provide users with full details and control over the coffee items they have previously selected. In a way UI-wise, the page features a clean, horizontal card list structure, displaying product photos, menu titles (such as Es Kopi Susu Tetangga and Latte), the price per item, and specific customization details below the menu name (such as "Normal Ice, Normal Sugar" or "Oat Milk, No Sugar"). From a UX perspective, flexibility is prioritized by providing quantity control buttons ("- and "+") on each product row to make it easy for users to instantly increase or decrease quantities. Furthermore, the presence of a text field at the bottom titled "ORDER NOTES" with contextual placeholders ("Example: Reduce the ice cubes, please...") cleverly accommodates customer preferences, while the back arrow navigation button in the top left corner ensures the navigation flow remains intuitive should users wish to return to the main menu.



Figure 24. UI UX Payment QR

Based on the interface in Figure 24, the "Payment QR" page is designed to facilitate the process of completing digital transactions quickly and securely. In terms of UI, this page highlights the payment amount details very clearly with the text "Total Paid Rp 43,000" at the top, followed by a large visual container in the center to display the quick response code. From a user experience (UX) aspect, this interface provides concise operational instructions through the text "SCAN TO PAY: Show this QR code to our barista to complete your order," so that

users immediately understand the physical action to be taken at the store. Transaction security and efficiency are also supported by a countdown timer element ("Valid for 05:00 minutes") to ensure the validity of the code, as well as a primary dark brown Call-to-Action (CTA) button that says "Save QR" that allows users to download the code to their phone gallery for easy access while waiting in line.

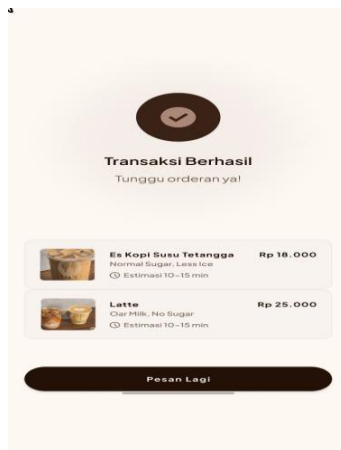


Figure 25. UI UX Order Status

Based on the interface in Figure 25, the "UI UX Order Status" page is designed to provide a calming yet informative final confirmation after the user has successfully made a payment. UI-wise, this page displays a dominant success checkmark icon at the top accompanied by the affirmative text "Transaction Successful" and the friendly communication "Wait for your order!", followed by a summary of the ordered menu and estimated preparation time (such as "Estimated 10–15 min"). From a UX perspective, the transaction flow closure is made very efficient by providing a primary dark brown Call-to-Action (CTA) button labeled "Order Again" at the bottom; this button serves as a strategic shortcut that instantly directs the user back to the main page (Home as in Figure 17), thus creating a smooth ordering cycle (user loop) without forcing the user to exit or repeat the navigation from the beginning if they want to make a new transaction.



Figure 26. UI UX Favorites

Figure 26 displays the "Favorites" page interface, which serves as a place to store a list of the user's favorite coffees, maintaining the application's visual consistency with a cream background and the title "Your Favorites." Product information is presented in a card layout

containing a menu photo, product name such as "Es Kopi Susu Tetangga," customization details, price, and a special Call to Action (CTA) button in the form of a dotted line that says "ADD YOUR FAVORITE MENU" at the bottom to facilitate navigation to the main menu. The focus of interaction on this page is centered on the dark brown heart icon (like icon) in the upper right corner of each card; where the system will automatically move the product to this list when the user clicks on the icon in the main menu, and conversely, the user can click back on the active heart icon on this page to quickly and intuitively remove (unlike) the menu.



Figure 27. UI UX Profile

Figure 27 shows the "Profile" page interface which functions to present and manage personal information and personal data of application users by maintaining overall aesthetic consistency with a cream color background, Tuku logo, profile photo in the form of a dot of the name "Seonghyeon", as well as separate card layouts for the information of first name, surname, Gmail, and registered telephone number. The focus of interaction on this page lies in the user's ability to update personal data via the arrow icon to the right (chevron) on the name information card which indicates that the field can be clicked for the editing process, while at the bottom of the information list, there is a special Call to Action (CTA) button for the "LOGOUT" function complete with a log out icon which will safely end the user's active session and direct them back to the main application page.

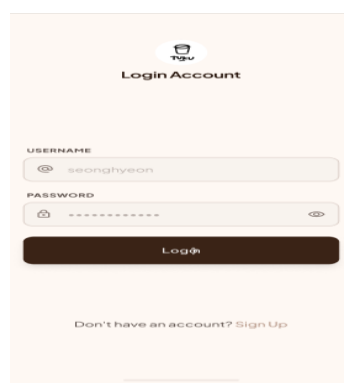


Figure 28. UI UX Log In

Figure 28 displays the "Login Account" page interface, which is the automatic navigation destination after the user clicks the "LOGOUT" Call to Action (CTA) button on the previous profile page to ensure the account session has ended safely. This page is designed in a minimalist style with a beige background and the Tuku logo at the top, which is equipped with two main input fields, namely Username and Password, with visual clue icons to facilitate the re-authentication process. The focus of interaction on this page lies in the contrasting dark brown "Login" CTA button as the primary action to re-enter the application, as well as the

secondary text "Don't have an account? Sign Up" at the very bottom for users who want to switch to the new account registration page.

Conclusion and Recommendation

Based on the research results, it can be concluded that the design of a QR Code-based Interactive E-Menu Information System at Kopi Tuku can be an alternative solution in increasing the efficiency of the ordering process and customer service. The designed system allows customers to access the menu digitally, place orders, and complete payments via smartphone without having to queue at the cashier. The use of an Object Oriented approach modeled using UML and interface design using Figma successfully provides a system overview that is structured, easy to understand, and in accordance with business operational needs. Thus, this system design has the potential to support service acceleration, reduce customer queues, improve order accuracy, and provide a more practical and modern service experience at Kopi Tuku.

Based on the research results, it is recommended that the next stage be the implementation and direct testing of the system in Kopi Tuku's operational environment to determine the level of effectiveness, ease of use, and user acceptance of the designed system. Furthermore, the development of additional features such as integration with stock management systems, customer loyalty programs, real-time order notifications, and sales analytics dashboards can be considered to increase the system's value. Further research can also evaluate user satisfaction and the impact of the use of QR Code-based E-Menu on service quality and overall business performance.

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