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Development of an Android-Based Food Ordering Application Using the Bubble Sort Algorithm with Database Integration and Electronic Payment Methods

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ABSTRACT

In the era of rapidly advancing technology, mobile applications have become an essential need for modern society, including in the restaurant sector, which heavily relies on speed and service efficiency. This research aims to design an Android-based application using the Kotlin method to simplify the process of ordering food and beverages in restaurants. Currently, many restaurants lack an easily accessible queue system, resulting in orders being served based on processing convenience rather than queue order, which negatively impacts service evaluations. This application is designed to enable customers to place orders quickly and efficiently, monitor order statuses, and assist restaurants in optimizing service processes. With the features offered, this application is expected to enhance customer satisfaction while supporting increased business profitability through more structured and customer-oriented service.

Keywords: *Restaurant, efficiency, ordering, Kotlin, and mobile*

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INTRODUCTION

In this era of rapidly advancing technology, the use of mobile applications has become widespread and an indispensable need for modern society**.** Mobile applications are utilized by various groups to simplify and accelerate business processes and other activities, including ordering food and beverages in restaurants. Restaurants, as one of the business sectors, heavily rely on speed and service efficiency. In this context, technology can be optimized to enhance efficiency and streamline the ordering process.

The study conducted by Yahya et al. (2023) concluded that there are significant differences in the dimensions of differentiation and preference, but not in the dimension of credibility, regarding the positioning effectiveness of fast-food fried chicken restaurants, Rocket Chicken and Olive Fried Chicken. Both brands are advised to focus on the dimensions of positioning effectiveness to strengthen their marketing strategies, thereby enhancing competitive advantage and building consumer trust.

Furthermore, future research is recommended to delve deeper into the factors influencing positioning effectiveness, address the limitations of linking results to performance indicators such as sales or market share, and explore the role of other factors, such as pricing and distribution channels, in the marketing mix.

This study aims to design an Android-based application to facilitate the ordering process for food and beverages. The success of a restaurant business is influenced by several factors, including the quality of the menu offered, cleanliness and comfort of the dining area, and the quality of service provided. Fast and orderly service, aligned with the sequence of customer queues, is a critical factor in customer satisfaction. However, many restaurants still lack an accessible queue system for customers. As a result, orders are often served based on the ease of preparation rather than the queue sequence, leading to negative assessments of the service.

Additionally, customers are often unable to check the restaurant's capacity before arriving, such as whether the restaurant is full or has long queues. This study introduces an application called Food Ordering with Online Queue System using Kotlin. This application is designed to make it easier for customers to order menus quickly and efficiently. Restaurants can use this application to monitor incoming orders in real time, facilitate customer needs, and optimize service processes. With these features, the application is expected to enhance customer satisfaction and boost restaurant business profits.

In addition to its main function, this research integrates a payment gateway system to provide further convenience for customers. The application provides information regarding restaurant capacity and queues, enabling customers to choose their desired location and menu without waiting in line. By allowing customers to monitor queue conditions, the application helps them make better decisions before visiting the restaurant. This study also aims to evaluate system performance and customer satisfaction with the developed application

LITERATURE REVIEW

The following is the implementation phase or results developed by the author, which can be seen in the image below.

The study titled "Designing a Web-Based Admission Information System for New Students at SDN 205 Kota Jambi" draws several conclusions. The current New Student Admission (PPDB) system at SDN 205 Kota Jambi is still conducted manually, requiring prospective students to visit the school to obtain, fill out, and return registration forms, complete required documents, and participate in admission tests. This process is deemed inefficient in terms of time, cost, and effort. Additionally, PPDB information dissemination is limited to contact persons, brochures, and banners.

The web-based PPDB information system is designed using PHP programming language and MySQL database. This system facilitates prospective students in registering online, including filling out forms, uploading documents, and taking tests without visiting the school. Furthermore, it assists the school in validating data,

generating reports, and managing PPDB-related information. This system also allows the school to promote registration information online to enhance its competitiveness. By implementing this web-based system, the registration process becomes more effective, efficient, and modern [Ekarsih et al,2023].

The study titled "Designing a Restaurant Management System with a Mobile-Based Restaurant Ordering Application within a Local Network" aims to develop a web-based application capable of managing various operational aspects of a restaurant. This application is designed to process customer order data, manage inventory, food and beverage menus, and handle billing information. Additionally, it manages users based on predefined access rights. Other functionalities include systematically recording customer orders and providing information about available seating in the restaurant [Perkasa et al,2019]

The study titled "Web and Mobile Android-Based Restaurant Menu Reservation Application at Cowek Ireng" aims to develop a web-based system built using PHP programming language and MySQL database. This system is then converted into a mobile Android application using Website 2 APK Builder, allowing it to be installed on Android devices. The application is expected to enhance restaurant management efficiency and address various operational challenges. The main features of the system include user data management for roles such as managers, cashiers, chefs, and customers; menu ordering management; menu and table reservations by customers managed by chefs; menu availability management by chefs; payment processing by cashiers; and sales reporting to restaurant managers[Rapid rt al, 2018].

A. Theory

1. Elektronic menu (E-Menu)

Menu is derived from two words: "electronic" and "menu" a menu is a list of food and drink options presented to guest in a dining area. Meanwhile. "electronic" refers to tools created based on electronic priciples, utilizing computer networks for their impelementation. Therefore, E-Menu (Electronic menu) refers to the utilization of computer networsk to facilitatet menu ordering transactions, including food and beverages, at a restaurant or dining establishment conducted electronically[Hendri, 2019].

2. Restaurant

A restaurant is a commercial establishment that operates to provide food and beverages to the general public. A restaurant is also defined as a place that serves food or drinks to small groups of guests with the aim of generating profit [Diatmika 2022]

3. Android

A restaurant is a commercial establishment that operates by providing food and beverages to the general public. A restaurant is also defined as a place that serves food or drinks to guests in small groups, with the aim of making a profit [Tompah et al, 2019].

a. Complete Platform

Providing tools that are useful for building an application, which can then be further developed by developers.

b. Open Source Platform
   Easy to be developed by developers because it is open-source.
c. Free Platform
   Developers are free to develop, distribute, and trade the Android operating system without having to pay royalties to obtain a license.

4. Algorithm Bubble sort

Bubble sort algorithm **is** one of the sorting algorithms used to arrange data in order. The way this algorithm works is by repeatedly performing a process that compares each element of the array and swaps their positions if the order is incorrect. The comparison of each element in the array will continue until the specified condition is met. This type of algorithm falls under the category of comparison sort, as it involves comparing elements during the operation on the provided array.[Gunawan, 2019]

5. Database

The database is a collection of information stored in a computer systematically, allowing it to be accessed through a computer program to retrieve information from the database. A database is a collection of data formed from related files. In a computer, the database is stored in storage hardware and manipulated for a specific purpose [Chairane, 2023.]

6. Web

A website is a page that consists of several interconnected pages, typically containing a combination of data provided by individuals, groups, or organizations. A website is usually hosted on a web server that can be accessed through the internet. It also contains a collection of pages that hold various types of information in digital form, such as text, images, videos, audio, or animations, presented through the internet [Khonaza et.al 2024].

7. Application

An application is a subclass of computer software that utilizes the capabilities of a computer in its implementation. An application functions as a storage medium for data, problems, and tasks into a platform or container that can be used for the application and implementation of the related issues. Therefore, an application can transform these elements into a new form without altering the fundamental points of the data, problems, and requirements themselves. Additionally, an application is a ready-to-use computer tool for users, allowing them to complete tasks that are inputted [Khonaza et.al 2024].

METHOD

1. Research Methodology

The steps undertaken in the implementation of the research can be seen in the diagram below:

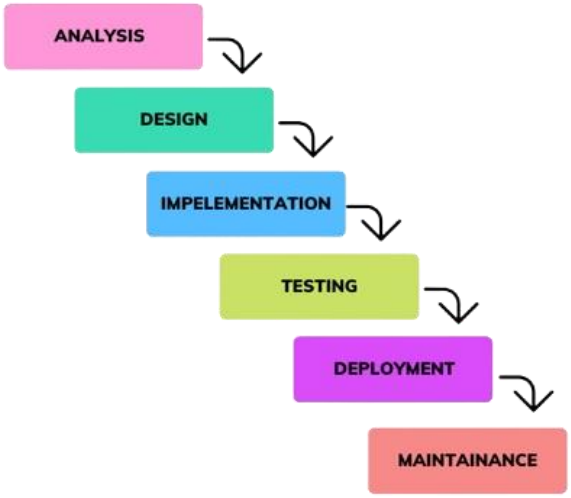

Figure 1. Research Stages

The software development methodology is an approach used to design, plan, and manage the stages involved in creating an information system (Badrul, 2021). The method used by the author in this research is the waterfall method. The author chose this method because in application development, the waterfall model provides a structured and systematic approach, where each phase is completed in its entirety before moving on to the next stage. The stages of the waterfall model are as follows:

1. Analysis

   The goal of the requirements analysis is to analyze the needs required in the design, including documents or other sources that can assist in determining solutions to the existing problems from both the user and admin perspectives (Silvi Purnia et al., 2019)

2. Design

   Design involves the activity of illustrating, planning, and arranging several separate elements within the system into a unified structure that functions well (Nurhayati & Yanti Kemala Sari Siregar, 2023). In the software development design of this research, the ERD (Entity Relationship Diagram) is used.

3. Implementation

   At this stage, the system is first developed in small programs called units, which are integrated into the next phase. Each unit is developed and tested for functionality, known as unit testing.

4. Testing
   At this stage, a series of tests are conducted on the application that was developed during the implementation phase (Samudra & Umniati, 2023). The testing method used in this research development is black box testing for testing the application's feature functionality.
5. Deployment
   At this stage, the application is launched into the production environment after successful testing and is made available for public use (Choldun & Rahmadewi, 2023).
6. Maintenance
   This is the final stage of the waterfall model. The software that has been completed is run and maintained. Maintenance includes fixing errors that were not discovered in earlier stages (Abdul Wahid., 2020).

FINDING AND DISCUSSION

1. Analysis

Analysis is necessary to examine the existing system in order to identify the requirements for the system to be developed. These requirements include functional and non-functional requirements.

a. Fungtional
   1. Admin
      The admin has access rights to manage incoming data, such as food and beverage order data and revenue data from payments using the QRIS method. The admin can also cancel orders if the food or beverages ordered by the customer are unavailable or out of stock at the restaurant. Additionally, the admin can generate a comprehensive data summary
   2. User
      The user, as the customer, has access rights to log in to the application, make food and beverage purchases, delete orders before payment is made, and add food and beverage items to the order

b. processrequirements
   - Handle login data management
   - Handle order data management
   - Handle payment data management
   - Handle order cancellation data management
   - Handle data summary management

c. Output requirements
   - Master customer
   - Master admin

- Product data
- Transaction confirmation and order cancellation
- Sales data

b. System design

a. Software requirements

1. SQL Server
   Functions as a Database Management System (DBMS).
2. Windows
   Functions as the operating system for building applications and software.
3. Android studio
   Functions as a platform for implementing applications.

b. Hardware Requirements

1. Smartphone : a toll used for recording conversations, the puspose of using this device is to record ongoing interviews.
2. Camera : a device ued to capture images of objects, the camera is used to document research activities being conducted at the research object site
3. Laptop: a device used to search for various information, particularly relevant journals

2. System Design

This research discusses the methods used in developing a food ordering application model based on Android, utilizing the Bubble Sort algorithm, database integration, and electronic payment methods. The application is designed to be used by users and administrators, as shown in the following diagram.

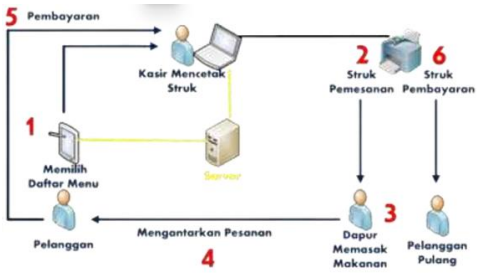

Figure 2. System architecture

3. Implementation

The following is the implementation phase or results developed by the author, which can be seen in the image below.

1. Webite

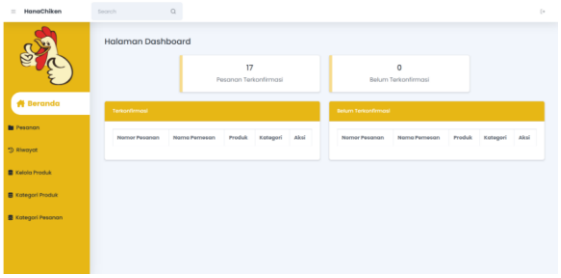

Figure 3. Dashboard page

This dashboard page is designed to simplify store management with key features, including Orders to view and manage incoming orders, History to display a list of completed or canceled orders, Manage Products to add, edit, or delete products, Product Categories to group products by type, and Order Categories to organize orders such as dine-in, takeaway, or delivery. All features are arranged on a single page for efficiency and easy access.

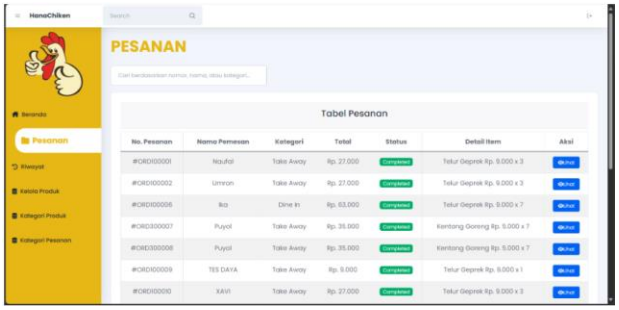

Figure 4. Order Page

On the Orders page, there is a table displaying detailed information about each order, including the Order Number, Customer Name, Order Category (such as dine-in, takeaway, or delivery), Total order amount, Status of processing (e.g., new, in progress, completed), Item Details outlining the products ordered, and Actions allowing the admin to change the order status, view more details, or cancel the order. This table helps streamline the management and monitoring of orders efficiently.

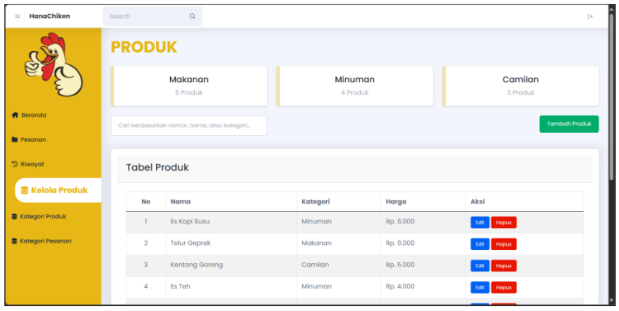

Figure 5. Product page

On the Product Categories page, there is a table displaying a list of products grouped into Food, Drinks, and Snacks categories. The table includes columns such as No (product number), Name (product name), Category (product category like food, drinks, or snacks), Price (product price), and Actions (buttons to edit, delete, or add new products). This table makes it easier to manage products based on their categories and pricing.

2. Application

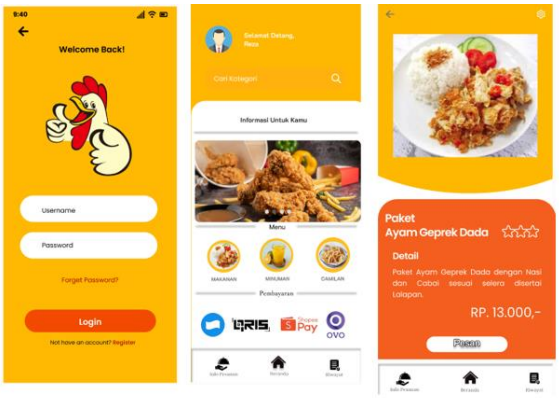

Figure 6. Login, Dashboard & order

On the Login page, users are required to enter their Username and Password to access the application. Once logged in, users are directed to the Dashboard page, which displays a list of available food items with brief details such as names and prices. On the Order page, users can view product details, including item descriptions, quantities, prices, and the total order amount. These pages are designed to ensure easy navigation and efficient order management

Figure 7. order details & status

On the Orders page, there are buyer details that include the Name of the customer, the Order Category (such as dine-in, takeaway, or delivery), and the Order Menu**,** listing the food or drink items ordered. Meanwhile, on the Status page, the order status is displayed with a message saying "Order successful**,** please wait" to inform the customer that the order is being processed. These pages are designed to provide clear information and facilitate order tracking.

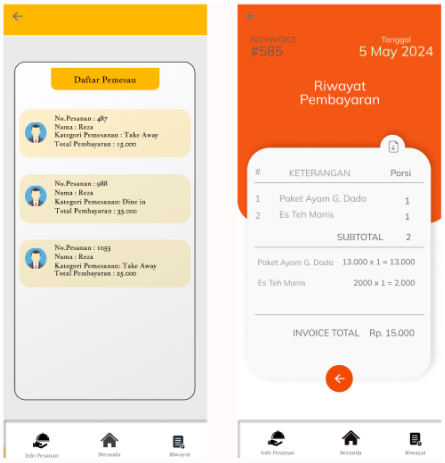

Figure 8. order details & status

On the Order List page, there are two main sections: Order List and History. The Order List displays ongoing orders with detailed purchase information such as the customer's name, ordered items, quantity, and total price. The History section contains a list of completed orders, including purchase details and payment status, allowing users to view transaction history clearly and in an organized manner.

3. Testing

Based on the discussion above, the Hanachiken food ordering application can be concluded as an effective solution to improve service efficiency, simplify customer ordering, and provide additional benefits through integrated features. [Khonza et.al 2024].

Black Box Testing is a testing process in which the internal mechanisms of a component or system are ignored, focusing instead on the execution conditions and the output values produced in response to the chosen input values [Rahmawati, 2021]

No	Testing	Test case	Expected outcumers	Result
1	Username and Password are left blank	Username: - Password: -	The system will reject the login process displaying a by message "Please fill out this field."	Valid
2	Either the Username or password field is empty	Username: n@gmail.com Password: -	The system will deny the login attempt and show a message "Please fill out this field."	Valid
3	Username and password are filled in, but the email is incorrect	Username: n@gmail.com Password: khonaza123	The system will reject the login process, displaying the message “Email or password is incorrect”	Valid
4	Username and password are filled in, but the email is incorrect	Username: n@gmail.com Password: khonaza123	Successfully logged in as admin.	Valid

Figure 9. Blackbox Testing

This study successfully developed an Android-based food ordering application with an online queue system utilizing the Kotlin algorithm. The application includes various features such as efficient menu ordering, an organized queuing system, and integration with payment methods through a payment gateway. With this system, restaurants can monitor orders in real-time, while customers enjoy the convenience of checking restaurant capacity, queue numbers, and placing orders without waiting in line

CONCLUSION

The study concludes that employing technology through an android-based application is highly effective in improving the efficiency and quality of restaurant services. The integrated queuing system not only assits restaurants in managing orders more systematically but also provides a better experience for customers. Additional features, such as the payment gatewar and queue information, make it easier for customers to make informed decisions before visiting the restaurant. Thus, this application enhances customer satisfaction while positively contributing to increased profits and the restaurant’s reputation.

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