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Extreme Programming Method Utilization to Develop a Mobile-Based Reservation Application

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Abstract−Several factors, such as the surge in the number of customers during the weekends, pose a considerable challenge for the staff when it comes to reservation management. Gravito Coffee still provides conventional reservation services, including the requirement for customers to physically visit Gravito Coffee to make a reservation, and the crowded environment often makes it difficult for customers to do so. Moreover, the absence of information media results in a lack of information available to the customers, and the reservation process is still reliant on manual bookkeeping. Therefore, a system is needed to enhance the efficiency of the reservation process. The reservation system at Gravito Coffee is a mobile-based system, utilizing mobile technology to simplify information retrieval. In the development process, this system employs the Extreme Programming (XP) method with an Object-Oriented approach. The stages of this method begin with planning, coding, and testing stage using black box testing. Additionally, this system can have a significant impact on the advancement of the field of computer science. Based on the results of the implemented method and system testing, the created mobile-based reservation system can help customers make reservation, thereby increasing time efficiency and assisting waiters in taking notes. It is hoped that this application will make the process of ordering at the cafe more convenient for customers, and it is expected that this ease of ordering will also contribute to increasing customer satisfaction.

Keywords: Extreme Programming; Reservation; Mobile-Based; Object-Oriented Programming; Black Box Testing

1. INTRODUCTION

The development of technology is currently advancing so rapidly, this can be seen from technological advances in information systems accompanied by the development of hardware and software in the age of information technology and human needs that want easy facilities that support humans in efforts to complete work. Mobile technology is one of the technologies that can help speed up human work. Mobile have become a widely owned technology among people, serving as a means of communication, thus rapidly advancing their development[1].

With the abundance of available media today, it is only natural to maximize the use of one of them, such as mobile-based informational media. In this current era, where mobile technology is rapidly advancing, supported by increasingly improved features and more affordable prices, the public widely opts for using mobile devices to fulfill their daily needs. The utilization of technology in various fields has now felt its impact, without exception to the culinary field, namely cafes that want to take advantage of this technology for customer satisfaction and cafe profits. One example of a mobile-based application is a reservation service, where reservation involves a series of actions carried out by prospective guests to book a facility. All requests will be handled by attendants responsible for serving these customers. Reservation is the act of booking a place or item. Reservations and restaurants are often linked because booking a spot and selecting a menu facilitate the restaurant experience for customers. Therefore, making a reservation becomes the right choice for customers who wish to pre-order and plan to visit afterward[2]. Humans generally want everything that is easy to do, as well as cafe customers who want to order menus easily in the sense that they are not complicated and do not take a long time. Easy to order the menu in question is without having to queue and without having to wait for waiters who are busy with other customers. A booking process like this is expected to result in longer waiting times for customers who have not yet been served, especially during peak periods such as holidays or lunch breaks[3].

Gravito Coffee is one of the cafes in Pekanbaru city that offers a variety of menus that can be served to customers. The increasing number of customers on weekends makes it difficult for waiters to record reservations from customers. Not only do the waiters face difficulties, but the customers intending to place orders also encounter challenges due to the inadequate recording of orders by the waiters. The reservation system at Gravito Coffee is still done manually which causes errors when recording reservations made by customers. In this era of technology, such an approach is certainly less effective and significantly impacts businesses. Most cafes have utilized technology to facilitate the ordering and service process[4]. This is certainly less effective in today's technological era and has a big impact on business people. With the android which is currently being widely used by the public, making several companies update the system using android smartphones[5]. Therefore, business actors must have the ability to quickly adapt to technological advances.

In addressing the aforementioned issues, the author proposed a solution by developing a mobile-based reservation system. This system aims to facilitate customers in making reservations and obtaining reservation information effortlessly. Moreover, Gravito Coffee staff can conduct service activities more smoothly, thereby achieving their desired goals. Within this mobile-based reservation system, the author incorporated features for ordering food and reserving seats. These features allow users to explore menu options, check prices, and identify available seating within the café. Additionally, customers can conveniently place orders online, eliminating the need for physical presence, ultimately fostering a comfortable cafe experience and boosting sales for Gravito Coffee. With a digital system, customers are no longer limited to space and time. Customers can make transactions electronically anywhere and anytime[6]. Digital presentation of

information will make the reservation system more effective and efficient. With the construction of this application, it can facilitate Gravito Coffee waiters in solving problems in making reservations.

The previous research conducted by Dwi Yuny Sylfania, Fransiskus Panca Juniawan, and Desri Yulanda[4] in their journal titled "Implementation Of Food And Beverage Ordering Application At Cafe La Banca Based On Android" discusses an application designed using Java programming language and Android Studio tools. The aim was to assist the public in accessing information and to aid cafes in efficiently managing menu and venue-related information.

Based on the issues outlined earlier, the author developed a system, as described above, in the form of a journal titled "Utilization of Extreme Programming Methodology in Developing a Mobile-Based Reservation Application". The method used to design the system is extreme programming (XP), a software development method based on the principles of simplicity, communication, and good feedback. Extreme Programming is designed for use with small teams that need to develop software quickly in a fast-changing environment[7]. In addition, this method is the simplest method in the design and coding process and prioritizes the most urgent needs at that time[8]. The author hopes that this system can assist both customers and servers in the reservation process, as well as contribute to the broader marketing of Gravito Coffee, especially in the Pekanbaru area.

2. RESEARCH METHODOLOGY

2.1 Research Method

The development of a mobile-based reservation system at Gravito Coffee, designed for cafe customers and employees, facilitates the cafe reservation process, making it easier for both employees and customers. With this mobile-based system, employees can efficiently record customer reservations and orders in advance, streamlining the cafe's operations. The following is an outline of the research framework for the Mobile-Based Reservation System at Gravito Coffee.

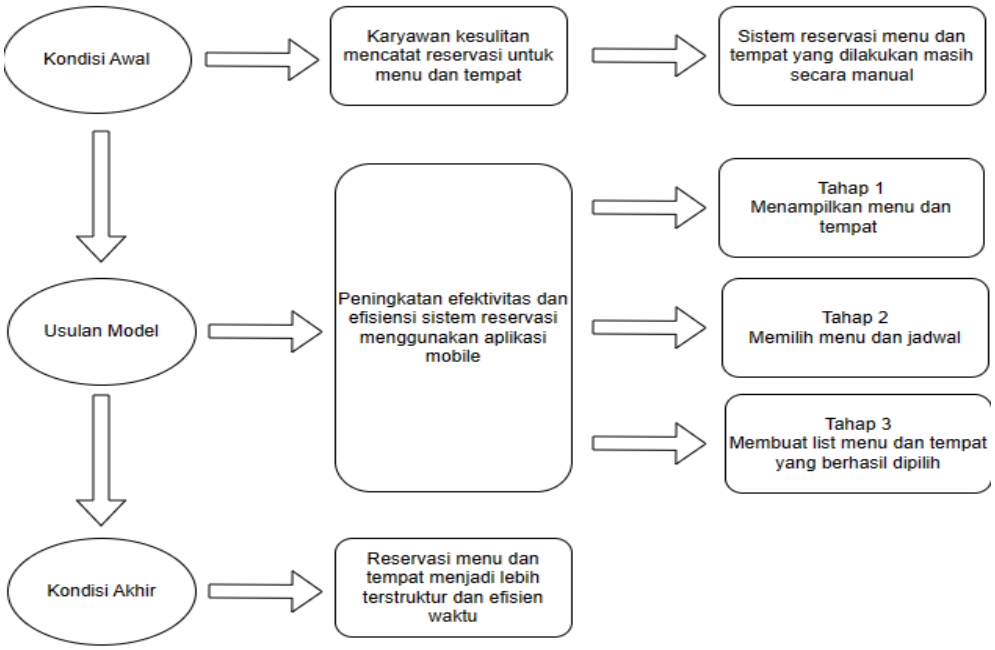

Figure 1. Research Framework

In the research framework, it's evident that the initial condition of the cafe's reservation and menu system was manual, causing challenges for the staff in recording customer orders. The manual system, coupled with a surge in customers during weekends, led to potential errors in order management.

The proposed model, as outlined in the research framework, aims to enhance the effectiveness and efficiency of the reservation system for both seating and menu options. This initiative seeks to facilitate easier advance bookings for customers while allowing staff to manage customer orders for seating and menu selections in a more organized manner through a mobile-based system.

Considering the initial conditions and proposed model, the Mobile-Based Reservation System at Gravito Coffee is expected to enable structured and more efficient management of menu and seating reservations.

2.2 Research Data

Data collection techniques and data analysis techniques are carried out simultaneously and the analysis process is carried out at the same time. Research results can change at any time according to the development of data and analysis conducted by researchers[9]. In the Mobile-Based Reservation System at Gravito Coffee, certain data such as the cafe’s seating

layout and menu listings are required. These data requirements fall under the realm of qualitative data processing techniques.

Documentation techniques are employed to gather qualitative data at Gravito Coffee. Through documentation methods, data in the form of menu listings and cafe seating layouts are acquired. The data required to complete the development of the Mobile-Based Reservation System for Gravito Coffee will be collected over a one-month period, starting from September 25, 2022, until October 25, 2022.

2.3 Development Method

The Extreme Programming (XP) method is one of the software engineering processes that refers to the object-oriented approach[10]. This methodology emphasizes a development process that is more responsive to customer needs[11]. In addition, this method is more efficient, adaptive and flexible in the system development process, and the core values of extreme programming include communication, courage, feedback, and hard work. Stages in Extreme Programming[12]:

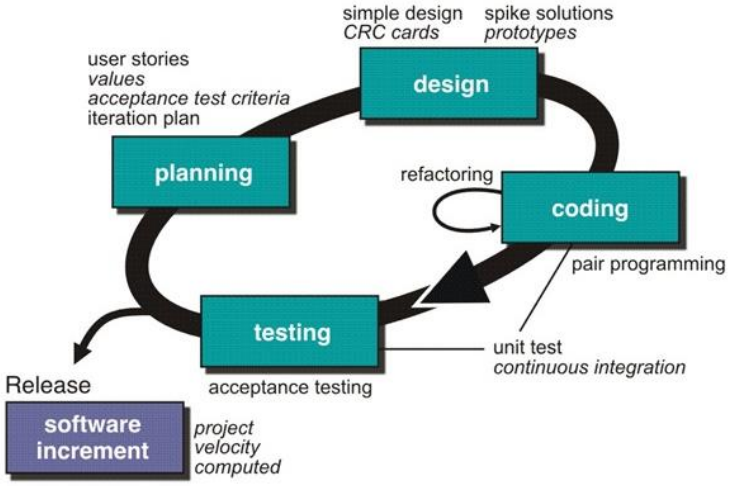

Figure 2. Extreme Programming Stages

Based on Figure 2, the stages in the Extreme Programming (XP) method are planning, design, coding, and testing. The following is an explanation of each stage in the Extreme Programming method:

a. Planning

This stage begins with listening to the activity requirements of a system that allows users to understand the business processes for the system and get a clear picture of the main features, functionality and desired output[13]. It can be said that this stage determines the overall functionality that will be developed in the system. The results of this stage are based on data collection by conducting interviews and observations[14].

b. Design

Extreme Programming design strictly follows the keep it simple principle. A simple design result is always preferable to more complex drawings[15]. At the design stage, system modeling and data modeling are made. The system modeling used is the Unified Modeling Language (UML) which consists of several diagrams including Use-Case Diagrams and Activity Diagrams. Use-Case Diagrams are used to describe the interaction between actors and the system itself[16]. Meanwhile, for database modeling using Entity Relationship Diagram based on the results of the needs analysis obtained.

c. Coding

At this stage, writing program code is carried out, referring to the design that has been described and formed into several classes that describe the functionality of the system to be created[17]. Coding is the stage of implementing the design process using a programming language[18]. In the development of the reservation system using Kotlin language. Meanwhile, the database implementation uses MySQL.

d. Testing

System testing is the final stage in this method, where the results of the implementation will be tested to determine the feasibility of the system built whether it is in accordance with client needs[19]. And in this final stage, using a black box testing method that focuses on the functionality of the system.

2.4 Black Box Testing

Blackbox testing is a software quality test that focuses on software functionality[20]. The Black box Testing method is one method that is easy to use because it only requires the lower limit and upper limit of the expected data. And with this method it can be seen if the functionality can still accept input data that is not expected, causing the data stored to be less valid[21]. The black box testing method is to enter data on a form so that the output results match the input[22].

3. RESULT AND DISCUSSION

The results of this study can be seen from the research framework to the system testing stage using black box testing. At the data collection stage based on the results of observations and interviews then, continued with the system development stage which starts from planning in the form of needs analysis, so that it can be continued with the design stage in the form of system modeling and data modeling, after the design stage is continued with the implementation stage which implements the results of the previous stage into the coding stage for testing using black box testing.

3.1 Model Architecture

The architectural model illustrates the structural relationships pertaining to the reservation system for both seating and menu at Gravito Coffee. In the development of the Mobile-Based Reservation System at Gravito Coffee, two architectural models are employed, each corresponding to a different system: the current manual system in use and the upcoming system to be implemented. The attached documentation outlines the architectural models for the reservation system encompassing both seating and menu.

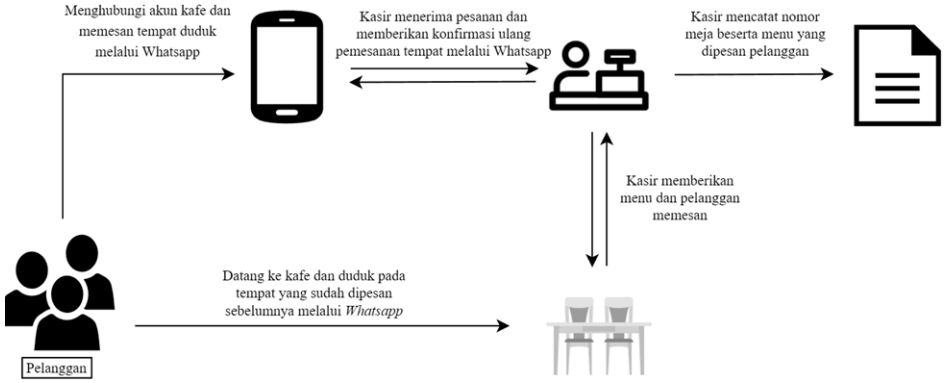

Figure 3. Gravito Coffee's Current Reservation System

Figure 3 illustrates the manual cafe reservation system, wherein customers contact the cafe's WhatsApp account to place a reservation. The process involves the cashier receiving and double-confirming the reservation details, allowing customers to occupy their pre-booked seats. Subsequently, the cashier provides the menu, and customers place their orders. The cashier records both the table number and the ordered items. The complexity of these reservation and ordering procedures poses challenges for both customers and cafe staff, as it consumes significant time and is prone to errors in data recording.

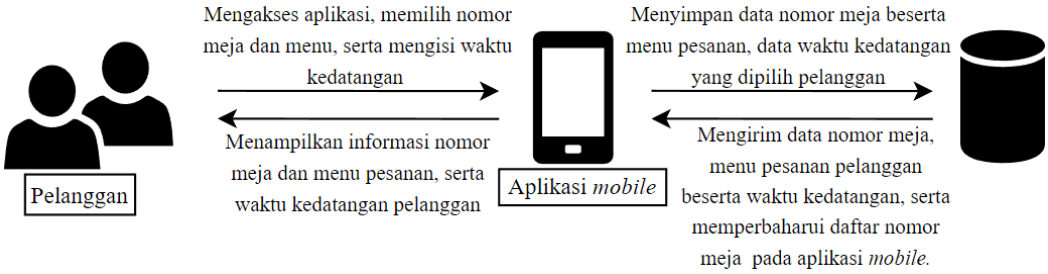

Figure 4. The System Overview to be Created

The system depicted in Figure 4 features a more streamlined process as it operates on a mobile-based platform. This system facilitates reservations that can be made from any location with good internet access, and at any time during the cafe's operating hours. Additionally, the data recording process is simplified, reducing errors. The Mobile-Based Reservation System at Gravito Coffee presents information on the cafe layout, table numbers, the menu available, and stores customer order information.

3.2 Planning

The planning stage is the stage for analyzing what is needed in building a reservation application and designing the system to be built. In this stage, planning is carried out by analyzing user needs and system requirements.

3.2.1 User Requirements

In developing this reservation application, the needs that can connect and interact with each other in the desired system environment have been obtained, namely user needs which include customer and admin needs scenarios. Each user has different information needs, namely:

a. Customer
   1. Be able to view food and beverage menu information

2. Be able to view table information
3. Be able to do reservation

b. Admin

1. Be able to manage Food Data
2. Be able to manage Beverage Data
3. Be able to manage Table Data
4. Be able to manage Reservation Data
5. Be able to manage Customer Data

3.2.2 System Requirements

The reservation application certainly requires a system that is used to process all the needs needed to control the application. Each system has its own uses, namely:

a. The system restricts customers to login first to enter the main menu
b. The system can store reservation data from customers
c. The system can display the reservation receipt to the customer

3.3 Design

The design stage is carried out modeling the system using the Unified Modeling Language to visualize the system to be built as follows:

a. Use Case Diagram

The Use Case Diagram design produces a description of the interaction between customers and the reservation system which can be seen in Figure 5. Customers can see the home page, menu page to see a list of food and drinks, choose a place and fill in order data on the order page to make a reservation.

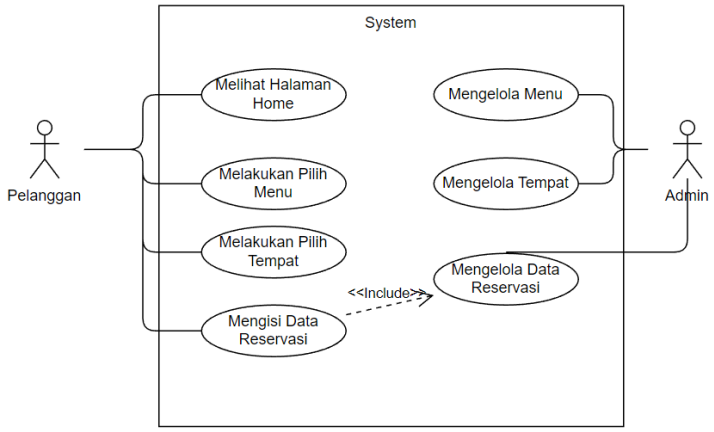

Figure 5. Use Case Diagram

Meanwhile, the admin can manage the menu list and places that can be ordered through the system, as well as receive and manage cafe reservation data. Managing reservation data through the system will make it easier for admins to record, because reservation data is more structured.

b. Class Diagram

The design of the class diagram produces the relationship of each object in the Mobile-Based Reservation system at Gravito Coffee explained through the structure image and description using the following class diagram:

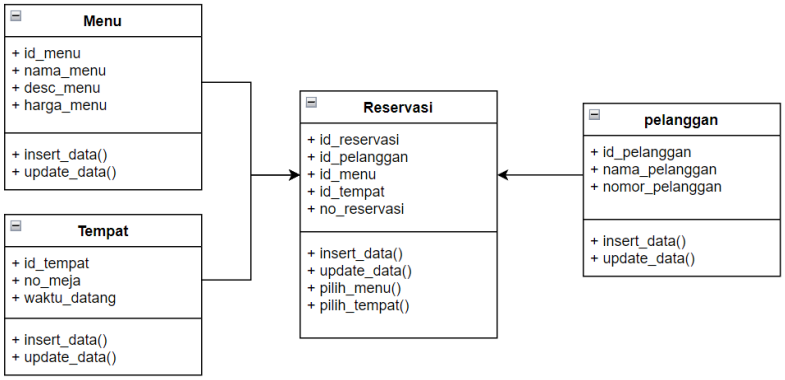

Figure 6. Class Diagram

The relationship between objects in the reservation system can be seen in Figure 6. Using the concept of inheritance relationship. The menu class and place class are derived classes, while the reservation class is the parent class.

c. Activity Diagram

The design of the activity diagram produces a process that occurs in the reservation system, described downward with sequential activity diagrams.

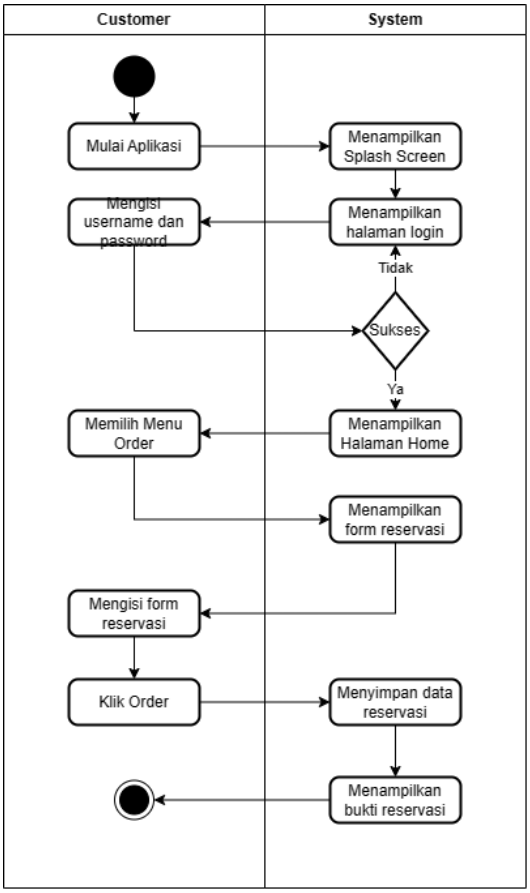

Figure 7. Order Activity Diagram

The process that occurs in the mobile-based reservation system at gravito coffee can be seen in Figure 7. Stages after the application starts, the user will be shown a splash screen followed by a login page, if the user does not have an account it will be directed to the registration page, if the user already has an account then the user can access the home page. Users can select the menu page to see a list of food and drinks available at gravito coffee. Users can make reservations on the order page, after completing the reservation, the system will store the reservation data and display proof of the successful booking.

d. Entity Relationship Diagram

Database design produces a mapping of tables described by Entity Relationship Diagram (ERD).

Figure 8. Entity Relationship Diagram

The Entity Relationship Diagram (ERD) depicts the relational structure among three key entities: Customer, Reservation, and Menu. The diagram illustrates the following relationships: Firstly, there exists a One-to-One relationship between Customer and Reservation, indicating that each customer is associated with only one reservation, and conversely, each reservation is linked to a single customer. This signifies a strict correspondence between customers and their respective reservations, allowing for a clear and singular connection. Secondly, the Reservation entity establishes a One-to-Many relationship with Menu, highlighting that a single reservation has the capacity to encompass multiple menus. This suggests that a reservation may be associated with a variety of menu options, emphasizing a flexible and extendable linkage between reservations and menus. In summary, the ERD offers a visual representation of these relationships, providing a comprehensive understanding of the associations and dependencies within the Customer, Reservation, and Menu entities.

3.4 Coding

The coding stage is the implementation of the system that has been designed using the Kotlin programming language. Splash Screen, Figure 9, is the initial display of the application When run, the system will display the splash screen logo of gravito coffee.

Figure 9. Splash Screen

The home page, Figure 10, is the view after the splash screen has successfully run, displaying a table plan to make it easier for customers to choose a table in making a reservation.

Figure 10. Home Page

The menu page, Figure 11, is a display of the reservation system that displays food and beverage information and prices to make it easier for customers to choose a menu in making a reservation.

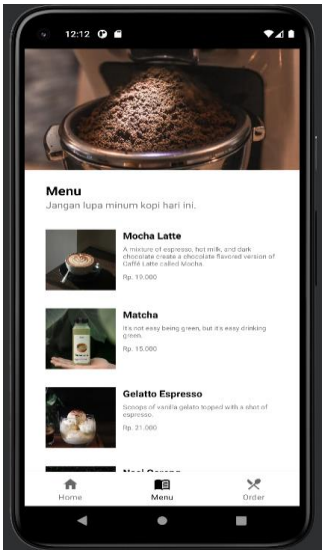

Figure 11. Menu Page

The order page, Figure 12, is a display for making reservations, on this page users can enter reservation data containing customer data, table data, arrival time and menu to be ordered. When the customer finishes filling in all the forms and clicks order, the system will display a successful reservation output in the form of reservation data, in Figure 13.

Figure 12. Order Page

Figure 13 Order Success

3.5 Testing

Testing of the program created using black box testing which focuses on the input and output processes of the program.

Table 1. Black Box Testing

No	Scenario	Expected Result	Testing Result	Conclusion
1	Login	The system displays the message "Login Successful" and displays the home page.	As Expected	Valid
2	Register	The system displays the message "Registration Successful, Please Login!" and displays the login page.	As Expected	Valid
3	Home Page	The system displays a home page containing table information	As Expected	Valid
4	Menu Page	The system displays a menu page containing a list of food and beverages	As Expected	Valid
5	Order Page	The system displays the order page to make a reservation	As Expected	Valid
6	Make a reservation	Displays output in the form of a reservation code along with reservation data	As Expected	Valid

In the final results of testing using black box testing, no errors were found in each functional testing process of the reservation application.

4. CONCLUSION

The reservation system at Gravito Coffee is still done manually which causes errors when recording reservations made by customers. Seeing the shortcomings that occur in the reservation process at Gravito Coffee, it is better if the manual system is developed into a digital system. With a digital system, customers are no longer limited to space and time. Customers can make transactions electronically anywhere and anytime. Digital presentation of information will make the reservation system more effective and efficient. With the construction of this application, it can facilitate Gravito Coffee waiters in solving problems in making reservations. Based on the results of implementing the method and making a mobile-based reservation application. It can be concluded as follows: This research applies the extreme programming (XP) method to produce a mobile-based reservation application that can assist customers in making reservations to increase time efficiency and assist waiters in making records. And the results of testing this reservation system using blackbox testing get the expected results.

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