APPLICATION OF AUGMENTED REALITY IN FOOD ORDERING SYSTEM

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ABSTRACT

Current digital trends put the need for information at the forefront, making information processing between authorities and organizations a priority. Information is a collection of data that has been processed for use in future decision-making processes. When combined, they form an information system. In the economic world, several food-related businesses have implemented information systems in their business fields related to data processing systems to carry out computerized commercial transactions. However, there are still many businesses that perform traditional services with pencil and paper and have not been able to implement innovative ordering systems based on technological developments. One of the businesses experiencing this problem is Dapoer Widya Restaurant. This study aims to form an ordering system with the PHP programming language and is designed using UML models and Augmented Reality (AR)-based menu innovations using Vuporia and Unity3D. System design is built by the SDLC (System Development Life Cycle) method. The result of this study is an ordering information system that includes table determination, integrated transaction reports for Dapoer Widya Restaurant staff, and AR-based menus that display 3D views of the menu served.
Keywords: ordering system, menu, augmented reality, SDLC

1. INTRODUCTION

Current digital trends put the need for information at the forefront, making information processing between authorities and organizations a priority. Connectivity to computers enables government agencies and organizations to use computerized information systems to perform tasks quickly and accurately. The system itself is a series of interconnected steps that work together to achieve a certain goal[1]. Information is a collection of data that has been processed for use in future decision-making processes. When combined, they form an information system. It is a combination of connected components or components combined into a single unit to process and distribute information[2]. With the rapid development of technology, the need for information is increasing, especially when the information provided contains precise and accurate data and values. Thus, those who have access to information can quickly solve various problems that have arisen.

In the economic world, several food-related businesses have implemented information systems in their business fields related to data processing systems to carry out computerized commercial transactions. However, the number of businesses that have carried out this kind of technological revolution is still minimal. Not infrequently, we find businesses that still use paper and pencil to record orders, which provides room for problems such as recording orders that sometimes experience errors in writing and calculations, customer difficulties finding empty tables, the absence of a system that is able to integrate kitchen parts and financial reports, as well as the content of sales reports that experience errors due to sales calculations that are still based manually[3].

In addition to the lack of use of technology in these technical problems, the absence of technology in an effort to increase business attractiveness in the ordering process is also still rarely witnessed. In fact, the existence of a variety of the latest technology can be used as a means to increase competitiveness in the culinary business, which is currently mushrooming. One of the uses of technology in ordering systems is augmented reality. Augmented reality is a combination of real and virtual objects that are interactive, real-time, and in the form of 3D animations. (Koui, 2017)

Dapoer Widya Restaurant is one of the culinary businesses that still does not utilize technology in its ordering system, where visiting customers often experience problems taking a long time and sometimes experience technical errors such as writing errors in ordered orders. Dapoer Widya Restaurant also realizes that their competitiveness towards similar businesses has begun to erode because they have not been able to find a competitive advantage to exceed the innovations made by their competitors. Therefore, it is hoped that there will be an order information system that provides innovation through the use of augmented reality in the display of menus in 3D form along with information and the existence of a system that integrates cashiers, financial report makers, and chefs so that the service provided to customers is more excellent.

2. METHODOLOGY

This research uses the SDLC (System Development Life Cycle) method, which refers to the process of creating and processing systems, including the development model needed to form the system. The steps contained in the SLDC are:

1. The requirement analysis phase is where the programmer analyzes user needs and develops user requirements based on the documents that have been collected.
2. The design phase is where the programmer designs the requirements that have been collected into the information system to be created.
3. The implementation phase is where the system that has been designed is realized.
4. The testing phase is where the user tests the information system and provides suggestions for improvements regarding the system created.
5. The evolution phase is where the system is continuously updated according to future user demands.

3. RESULTS AND DISCUSSION

3.1 Requirement Analysis

Dapoer Widya Restaurant faces a series of problems due to a lack of application of technology in its business operations. This problem is related to the traditional ordering system and the lack of technological innovation, thus reducing competitiveness against competitors. The ordering system at Dapoer Widya Restaurant is still done manually by the waiter, so sometimes there are typos and calculations, difficulty finding an empty table, and differences in recording by waiters, kitchen staff, and cashiers.

Based on the data that has been collected, the researchers have designed a booking system that is able to integrate recording between internal staff, facilitate the ordering process and table search, and present AR technology for customers so that they can see the menu of Dapoer Widya Restaurant with a more attractive appearance.

3.2 Design

3.2.1 Sequence Diagram (Ordering System)

A sequence diagram is an overview of the activity of objects in the use case that provides information about the life of objects and messages exchanged between objects. The sequence diagram in Dapoer Widya involves users, namely owners, waiters, cashiers, and kitchen staff. The user logs in by inputting login data in the form of an email and password in the login view. Furthermore, data processing occurs where, if the user incorrectly inputs the email and password, the login fails, and if it is correct, the user will be directed to the main page.
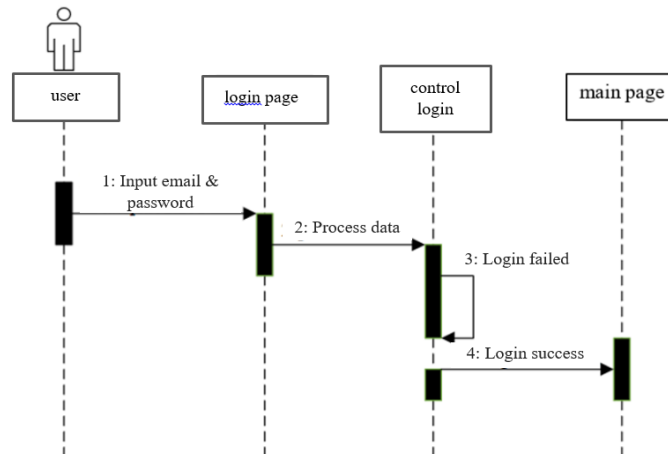
Figure 3.1 Sequence Diagram of Dapoer Widya Ordering System

3.2.2 *Augmented Reality's Use Case Diagram*

A use case diagram is a graphical depiction of the possibilities of user interaction with the system. The use case diagram shows the different use cases and types of users that the system has and will often be accompanied by other types of diagrams as well.
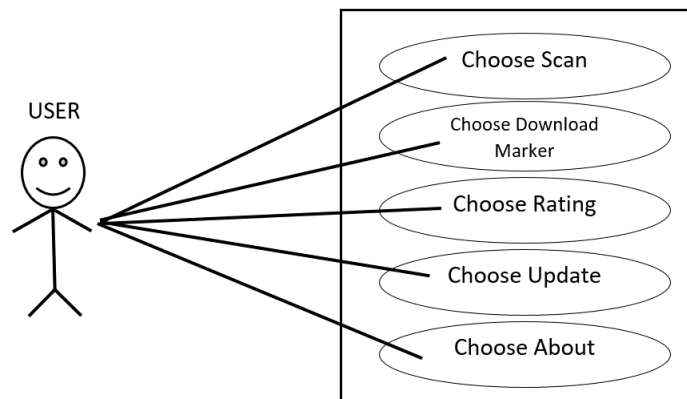

Figure 3.2 Dapoer Widya Use Case Augmented reality menu diagram

3.2.3 *Class Diagram*

A class diagram describes the interactions between classes that occur within a system. Classes have information and behaviors related to that information. Here is the class diagram that will be used in the Dapoer Widya order information system.
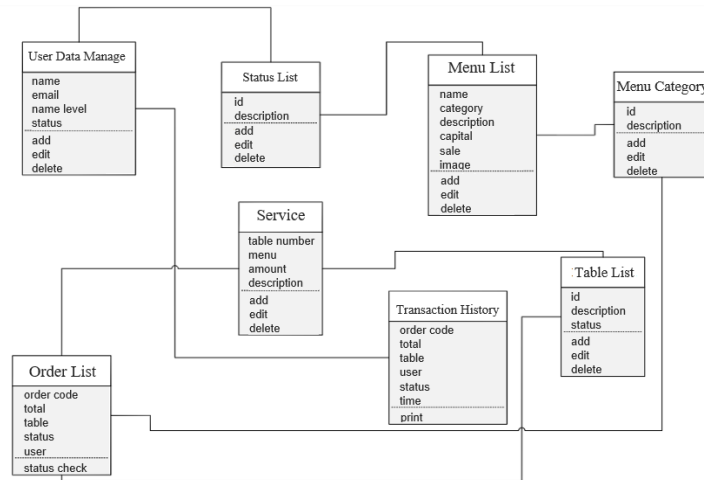
Figure 3.3 Class Diagram of Dapoer Widya Ordering System

3.2.4 *Deployment Diagram*

The deployment diagram identifies the physical view of a system and gives an idea of its implementation on a real device. This diagram depicts each node in a network and the relationships between them.
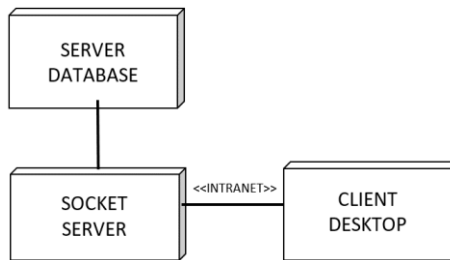
Figure 3.4 Deployment diagram of Dapoer Widya Ordering System

3.2.5 *Component Diagram*

A component diagram is part of the UML diagram and provides an overview of the components in the system and the relationships between these components. The following is a component diagram of the Dapoer Widya ordering system.
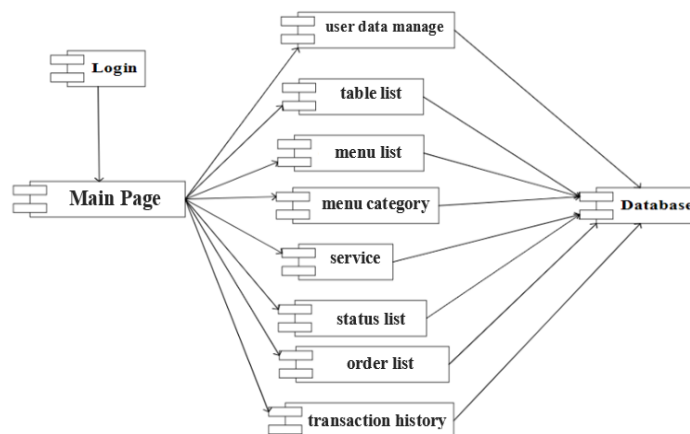
Figure 3.5 Component Diagram of Dapoer Widya Ordering System

3.2.6 *ERD (Entity Relational Diagram)*

ERD (Entity Relational Diagram) is a diagram that provides information about relationships between tables in a system. The following is a table used in the Dapoer Widya order information system.
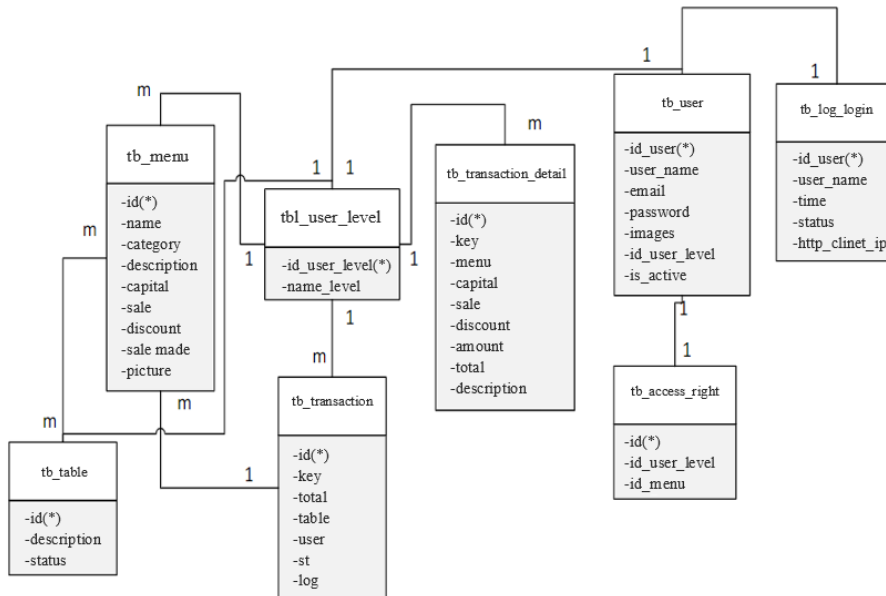

Figure 3.6 ERD of Dapoer Widya Ordering System

3.2.7 *Interface Design*

Interface design is a guide when creating an application that presents forecasts of views and flow needs in an application system. The interface design in the Dapoer Widya order information system is described in the following sitemap.
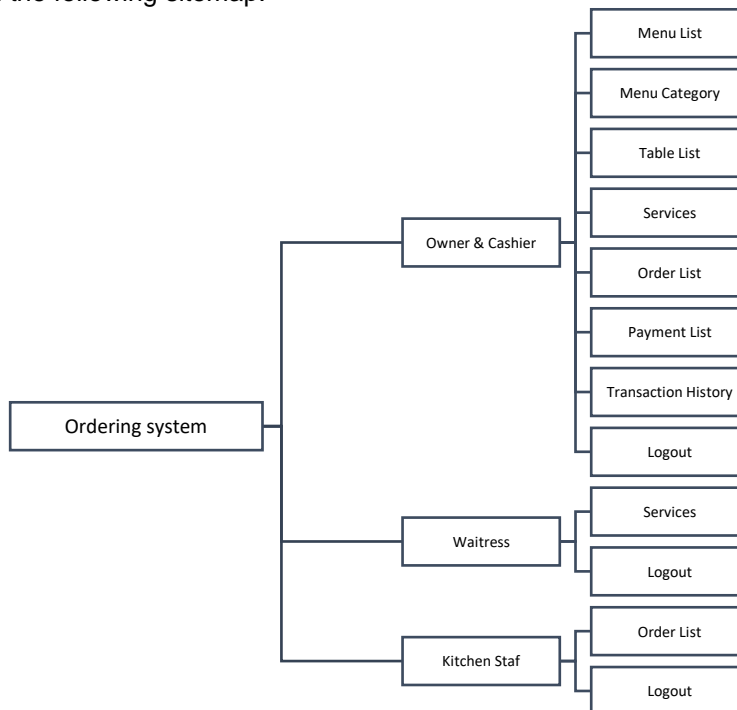
Figure 3.7 Dapoer Widya Ordering System Interface Design

3.2.8 *Flowchart Augmented Reality App*

The flowchart describes the flow of the process when the user uses the AR program to access the menu at Dapoer Widya Restaurant. The flowchart is presented to illustrate the overall use of the application and the flowchart for the marker scan process used to display 3D AR.
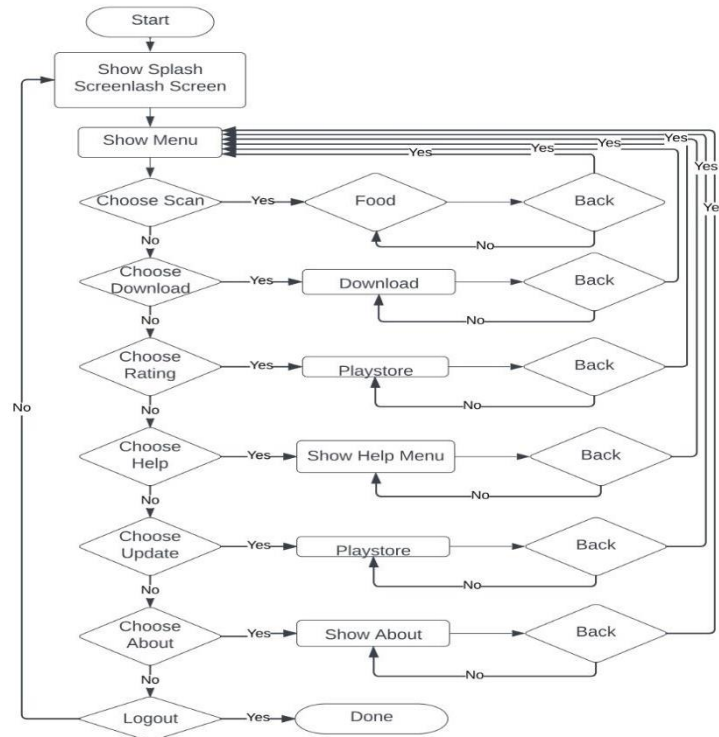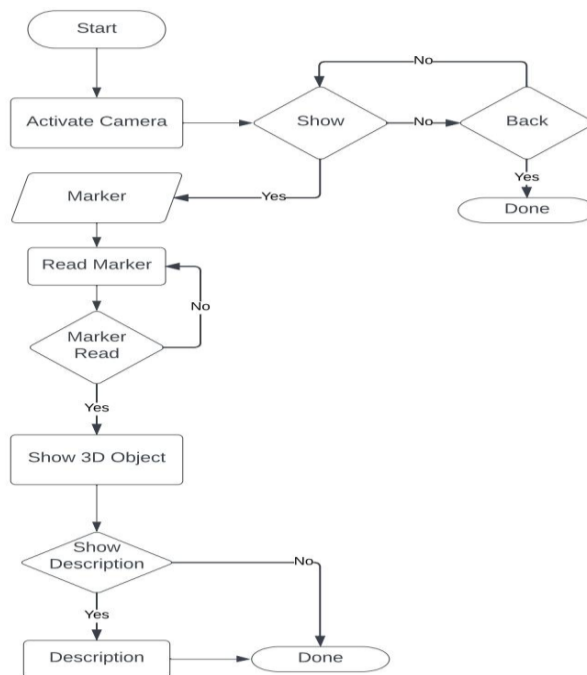

Figure 3.8 Overall App Flowchart

Figure 3.9 Scan Marker Flowchart

3.3 *System Implementation*

System implementation is a stage where the results of the previous system design are poured into the form of software that is ready to be operated by the user. Here is the implementation of the order information system interface on Dapoer Widya.

1. Login Page: The initial display when the user opens the web-based order information system for Dapoer Widya On this page, the user is asked to enter an email and password.
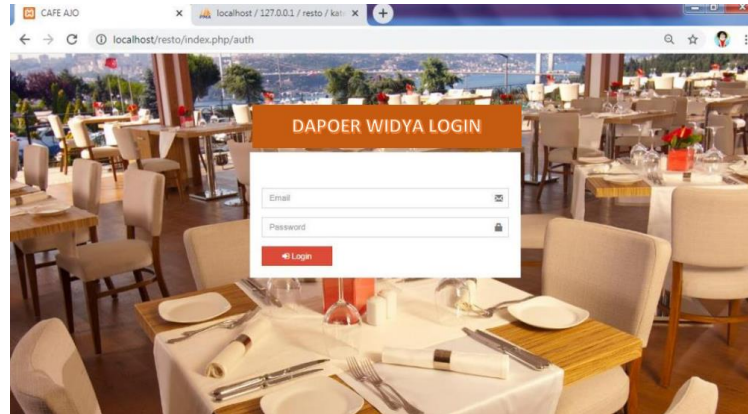

Figure 3.10 Dapoer Widya Booking System Login Page

2. Main page: a page that appears after the user has successfully logged in. The appearance for each user is different depending on the type, namely the user owner and cashier, service staff, and kitchen staff.
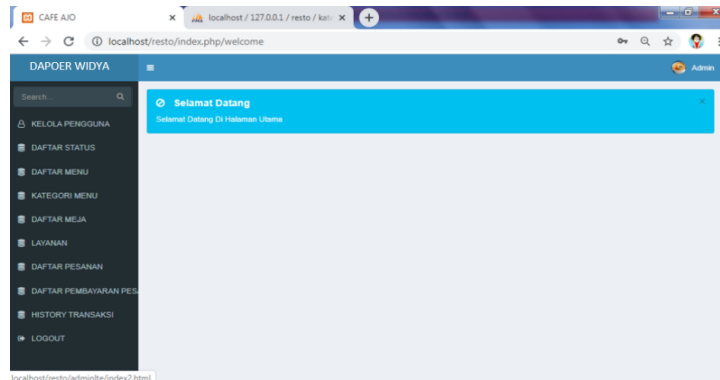

Figure 3.11 Main page of Dapoer Widya Ordering System for Owners & Cashiers
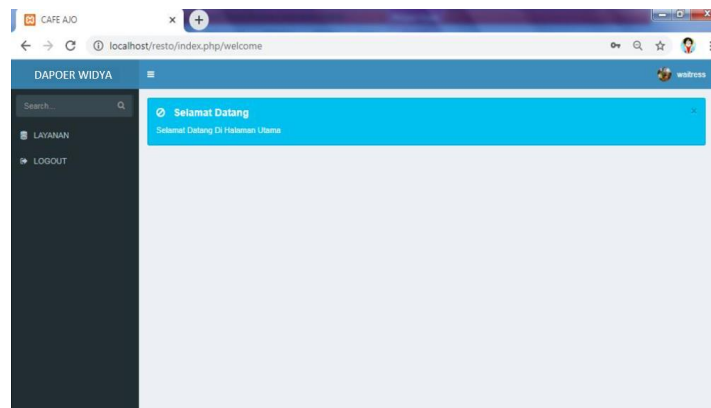

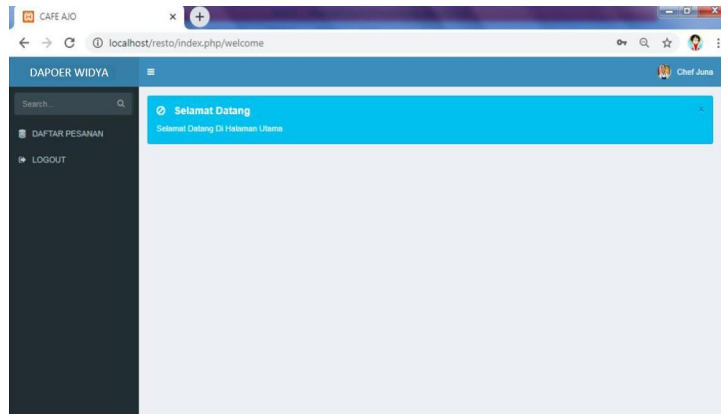Figure 3.12 Main page of Dapoer Widya Ordering System for Waiters

Figure 3.13 Dapoer Widya Booking System Main page for Kitchen Staff

3. Ordering Page : a page to display the services provided, such as services for finding empty tables, menu orders, and so on.
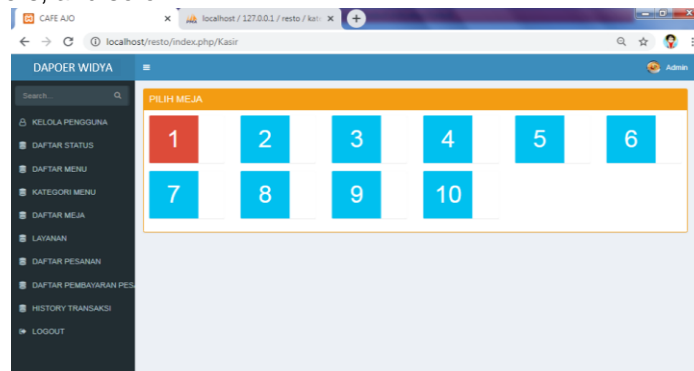

Figure 3.15 Dapoer Widya Booking System Desk Service Page
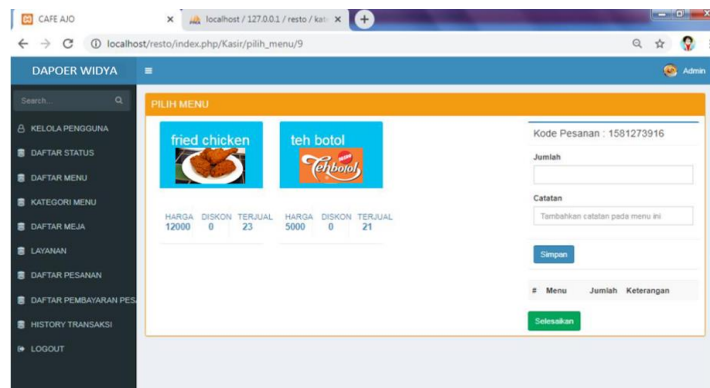

Figure 3.16 Dapoer Widya Order System Order Service Page

4. Order History page : a page that displays data on orders that occur and can be used to provide sales reports on Dapoer Widya.

Figure 3.17 Dapoer Widya Order System order history page

Figure 3.18 Sales Report Through Dapoer Widya Ordering System

The implementation of the AR system on the menu of Dapoer Widya Restaurant is a scanned-page scene screen containing 3D objects from the menu offered by Dapoer Widya. The 3D AR display will only appear when the camera sensor detects a marker. Markers are created through Vuporia, where Vuporia receives the input of user images used as markers by logging into https://developer.vuforia.com/vui/develop and creating a database to store the target image to be used. Then the saved database is downloaded so that the marker is in the Vuforia package file. This package file is then imported into Unity3D. This AR menu application can be run on Android versions 5.1 (Lollipop) and above.
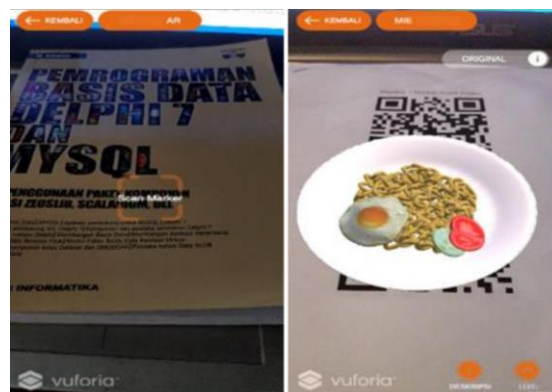

Figure 3.19 Scan AR Menu with and without marker (QR Code)

3.4 Testing & Evolution

Application testing is carried out through alpha and beta tests with system users. Alpha testing is the initial testing performed by the programmer to determine whether the application has run in accordance with the functional requirements of the software. These test results obtain a successful status for each interface, input, and output of the created system.

While the beta test is a form of testing that involves giving a questionnaire to users and weighting the answers according to the Likert scale, The questions asked are as follows:

1. Is the menu display easy for the user to understand and use?
2. Can every facility on the system function as expected?
3. Are the 3D objects displayed by AR clearly visible?
4. Is the information on the system easy to understand?
5. Does the system provide benefits to users?

Based on the results of the questionnaire calculations collected through the five questions, it can be concluded that the ordering system and AR menu designed are in the "very good" category because the average percentage of the five answers is 82%.

3.5 Business Elements

8 Business elements of the AR based food ordering system at Dapoer Widya:

1. Value Proposition
   The AR menu presented by Dapoer Widya is an innovation that brings more value compared to its competitors. Dapoer Widya presents a more enjoyable and interactive ordering experience with a 3D-packaged menu. Ordering systems that are made using web technology also reduce ordering time and provide better transaction facilities compared to traditional ordering.
2. Revenue Model
   Dapoer Widya earns revenue based on the sales revenue model, namely selling food and beverages to consumers.
3. Market Opportunity
   The AR system run by Dapoer Widya serves customers who come from young people who are literate in technology. AR that is presented can be accessed using technology and provides added value for young people because it produces interesting technological innovations.
4. Competitive Environment
   Dapoer Widya has several direct competitors who also sell fast food with a variety of Indonesian flavors. Prices presented by competitors are also quite competitive. But most of them still lack technology implications at it services.
5. Competitive Advantage
   Dapoer Widya has a competitive advantage in the form of complementary resources, namely an AR system that allows consumers to get a unique and interesting experience when eating at Dapoer Widya compared to other places.
6. Market Strategy
   The design of Dapoer Widya AR marketing system will be carried out through promotion on social media and using local food influencers to promote a new menu model, namely the AR menu presented by Dapoer Widya as a more prominent point compared to competitors. Promotion using social media and food influencers can bring positive responses from Dapoer Widya's potential customers, namely young people.
7. Management Team
   Dapoer Widya has a management leadership background that is young and full of innovation. This causes managers to have an affinity with technology. Proximity to this technology will make it easier for managers to be able to implement AR menus in the Dapoer Widya system.
8. Organizational Development
   Dapoer Widya developed his organization by dividing employees into several functional departments that are interconnected in a system so that they can be integrated even though they are divided into different teams and different tasks. These functional departments consist of the owner, cashier, waiters, and kitchen staff.

3.6 Standard Operating Procedures

Procurement Of Raw Materials

1. The production field provides details of the required raw materials by sending a stock list of required raw materials to stock employees.
2. Stock employees check the availability of the requested raw materials.
3. If raw materials are available, the stock recording will be recorded out into the raw material stock data and the raw materials are given to the production field for processing.
4. If it is not available, the stock employee will make a purchase request.
5. Employees in the purchasing field will receive a purchase request and make a purchase order that is sent to the supplier. The purchase order contains the date, note number, number of raw materials needed, and the name of the required raw material.
6. Suppliers will receive purchase orders and prepare & send the desired orders.
7. The purchasing field will receive a sales note from the supplier to make payments. Payments that occur will be reported in the purchase report.
8. Stock employees will receive the ordered raw materials and then record the stock entered into the raw material stock data and the raw materials are given to the production field for processing.
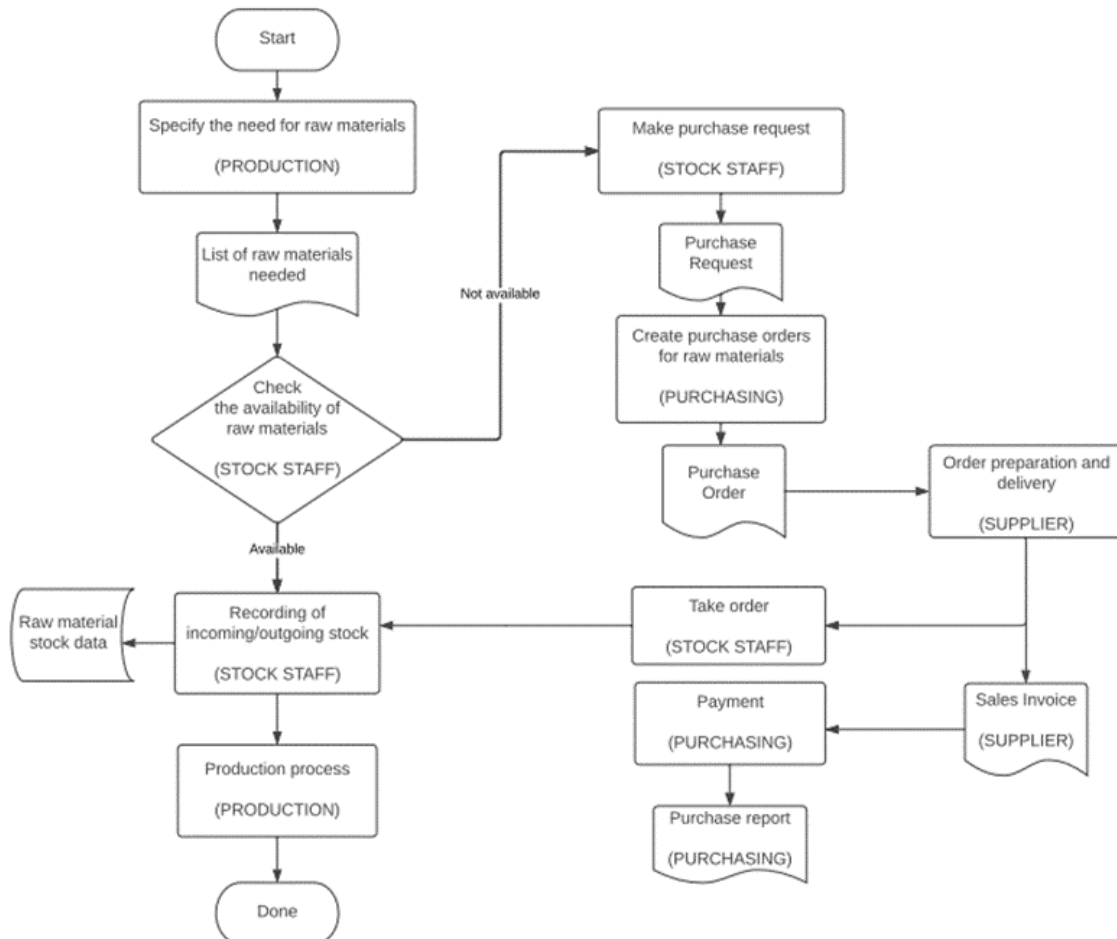
4. CONCLUSION

4.1 Conclusion

The design of the food ordering system at Dapoer Widya Restaurant is designed with the SDLC method, which displays several diagrams, namely sequence diagrams, use case diagrams, class

diagrams, deployment diagrams, component diagrams, ERDs, interface design, and flowcharts. Site menus are implemented using the PHP programming language, and AR menus are implemented using Vuforia and Unity3D. The new ordering system allows Dapoer Widya Restaurant to increase the efficiency and quality of waiters in serving orders, as well as make it easier to find empty tables for customers. This system also allows Dapoer Widya Restaurant to track order records and generate sales reports. Furthermore, the AR-based menu boosts Dapoer Widya Restaurant's competitiveness by presenting a menu that differs from competitors'. This research also examines Dapoer Widya's business value by looking at the eight aspects of business value. Based on the results, it can be seen that the implementation of augmented reality and the food ordering system can increase the value of Dapoer Widya's food business. There are also SOP stages that can be used by Dapoer Widya in running his business so that business processes can run and be well organized and efficient.

4.2 Suggestion

In the order system that is built, users are limited to owners, cashiers, waiters, and kitchen staff. In the future, it is hoped that customers can be added as users so that self-ordering can be applied. It is also hoped that in the future, AR systems can be developed by creating a more realistic 3D image model system.

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