

Design of QR Code Technology in MC Swimming Pool Website Design to Improve User Experience and Operational Efficiency

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Abstract— QR Code which is an abbreviation of Quick Response Code, QR Code is in the form of a square box, similar to a barcode, but with a more detailed appearance. The use of QR Code Technology in this research serves to facilitate identification and confirmation of entrance tickets for swimming pool visitors increase the speed and easy to buy a ticket. The research methodology used in system design is waterfall method. The waterfall method displays simple processes that do not overlap with the SDLC (system development life cycle) model. The programming language used is PHP, with the implementation of the CodeIgniter 3 Framework, and MySQL as the Database management system. The problem that often occurs is when the queue of visitors enters on holidays or days when there are lots of visitors causing long queues and less efficiency in ticket sales operations and the process of entering visitors to the swimming pool. This research aims to improve the user's operational system in ordering tickets which must initially be done come directly to the swimming pool location and in the new system visitors can purchase tickets online and operational efficiency of the MC Swimming Pool through the application of QR Code technology on the website, it makes the process of checking ticket data easier so that visitors can enter the swimming pool area. The result of this research is to create an information system plan that allows users to order tickets online and visitors can enter the swimming pool area quickly and easily using a QR code as a visitor entry ticket.

Keywords : Swimming Pool Website, QR Code, Entrance Ticket, Waterfall, CodeIgniter

I. INTRODUCTION

In the current information era, one of the main challenges is how to organize and manage data to produce information that is useful and easily accessible to users. The urgent need in information technology today is the implementation of information systems. Swimming pools have become a popular place for people to spend recreation and sports time. However, efficient swimming pool management and satisfactory user experience are important aspects in maintaining and increasing the popularity of such facilities. Web project management faces new challenges due to the unstable situation in the market that business actors are facing. As a result, research on system design in web project management becomes very necessary. Given the increasing complexity and interconnectivity of the project web, addressing these risks is critical to ensuring successful project implementation. [1]

This research is very important because it aims to develop and integrate QR Code technology on the MC Swimming Pool website, which is currently the MC Swimming Pool requires development of the system that is currently running with new innovations in the development of information systems with QR codes. The importance of this research lies in increasing user comfort by simplifying the process of ordering tickets online, reducing waiting time, and speeding up visitor access to the swimming pool area. Apart from that, this research also plays a role in increasing efficiency swimming pool operations by introducing new systems that can overcome operational obstacles, especially when visitor visits increase. By implementing QR Code technology, MC Swimming Pools can improve service quality, increase competitiveness and provide a better

experience for visitors. Therefore, this research is very important and urgent in improving it user experience and operational efficiency of MC Swimming Pools. In this context, the use of QR Code (Quick Response Code) technology emerged as a potential solution to optimize user experience and operational efficiency in MC swimming pools. In the current era, where everything is done quickly and accurately, and where administration and distribution processes must take place efficiently, the use of technology is becoming increasingly important. One way to achieve this efficiency is through supporting applications or programs that can be easily accessed by users. For example, this research topic focuses on the Marelan City (MC) Swimming Pool case study.

An information system is a system within an organization that functions to manage daily transactions, provide operational support, support managerial and strategic activities in business activities. This system is also used to provide information to certain external parties by providing reports as needed [2]. The waterfall method, in this research, refers to an approach that relies on a series of stages that must be carried out sequentially and systematically. This process moves from one stage to the next, where each stage must be completed before moving on to the next stage.

In designing this information system the author uses the CodeIgniter framework as a framework for a website, as well as using the programming languages HTML, PHP and several other supporting programming languages. In this research the author also uses a database and in its implementation the database that the author uses is MySQL.

The implementation of the website that will be designed is the implementation of several features such as users being able to access the website online, as well as enabling users to

be able to view information regarding swimming pools, ongoing discounts or promotions, order tickets online, and use QR Codes as access. enter the swimming pool area. This research also sets out several main objectives that need to be achieved in designing QR Code technology on the MC Swimming Pool website with a focus on improving user experience and operational efficiency. These objectives are the basis for the guidelines and steps that will be taken in this research.

The system development aims to ensure that visitors to the MC Swimming Pool website can experience greater comfort and efficiency in the ticket purchasing process, gain quick access to relevant information, and interact effectively with the various facilities offered by the swimming pool including in terms of ticket reservations. create a positive impression.

The use of QR Code technology aims to minimize the queues that visitors usually face when they want to get entry tickets to the swimming pool. In this way, significant improvements will be created in terms of efficiency and comfort while at the MC Swimming Pool location.

The integration of QR Code technology aims to provide assistance to MC Swimming Pool management in its efforts to manage swimming pool visitor data and daily operations with a higher level of efficiency.

In this research, application design is also needed to provide aesthetic value in terms of design that includes the application system interface. The design includes aspects of choosing the right color palette, the shape of the design elements, as well as an efficient layout in determining the function of the website-based system at the MC swimming pool.

II. RESEARCH METHODS

In the research process, steps or work stages are needed as a guide to achieving research objectives. This research began with structured steps to ensure the smoothness and success of the research process. In each stage, the author focuses on important aspects, such as identification of research problems, data collection and analysis, as well as implementation of the system being designed. In this research phase, system implementation is carried out using use case diagrams, class diagrams, and diagrams. sequences [3]. This research provides important benefits in improving the user experience and operational efficiency of MC Swimming Pools. By implementing QR Code technology on the website, users can easily and quickly order tickets online, reducing queues and waiting times at locations. Other things that are important considerations for this research that must be implemented are as follows Using QR Codes as entrance tickets also speeds up the process of entering the swimming pool area, increasing operational efficiency in entrance ticket services. This research also provides solutions to operational problems that often occur, such as long queues during holidays or when visitor visits increase. Besides that,

This research also presents the application of the latest technology to improve the services and competitiveness of MC Swimming Pools in the recreational market. Therefore, this research is not only beneficial for Pool MC, but also opens up opportunities to apply more advanced technology efficient in various other fields. In the Waterfall method, each

stage in system development must wait for the completion of the previous stage and is carried out sequentially. For example, the design stage will wait for the completion of the previous requirements stage.

The Waterfall model provides a sequential or ordered approach to the software life cycle, starting from analysis, design, coding, testing, to the support stage. This approach is, described by. In the development process, the author utilized the Waterfall method. The Waterfall SDLC model, which is often referred to as a linear sequential model or classic life flow, offers a sequential or ordered software life flow approach, starting from the analysis, design, coding, testing, to support stages [4].

In this research, the author utilizes a study to support the implementation of a system that is in the design and development process. The research stages carried out using the Waterfall method are described as follows.

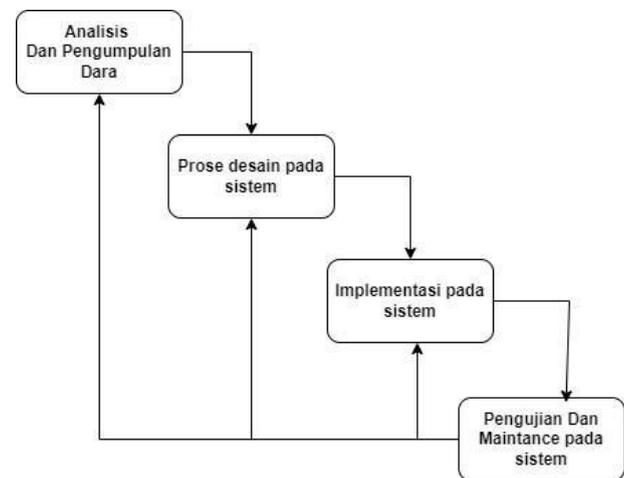


Figure 1. Research Stages

This research applies a qualitative research approach, which includes the process of collecting data through observation, interviews and literature study methods. Below, the author will provide a more detailed explanation of the aspects related to the stages of the research method mentioned previously.

2.1 Analysis and Data Collection

Analysis of the System Currently Running at the MC Swimming Pool, namely the use of a direct ticket sales system. This evaluation includes an in-depth understanding of the ticket sales process, user information management, and operational effectiveness being implemented. Within the existing system framework, it is given to identifying potential limitations in operational efficiency and user experience. In relation to the system to be built, the aim is to improve user experience and operational efficiency through the integration of QR Code technology. In this new design, users have the ability to purchase tickets online via the MC Swimming Pool website platform, and later, they can access the swimming pool facilities using a QR Code. In the data collection process in this website-based information system design research, the author used 3 methods for data collection, namely as follows:

1. Literature review

Involves searching and analyzing various literature sources related to the implementation of QR Codes in swimming pool services. The information found from the literature will provide in-depth insight into the best practices that have been implemented, the benefits that can be accessed, and the potential obstacles and challenges that may arise during the QR Code implementation process.

2. Observation

The author made direct observations of ticket sales operations at the MC Swimming Pool. By directly observing the ticket sales process, interactions between officers and users, and the swimming pool environment, this research aims to understand in depth the intricacies of the on process.

3. Interview

This step involves direct interaction with related parties, including swimming pool managers and potential users. Through interviews, the author will get perspectives and images related to the implementation of the new system. The experiences and views of the parties involved will provide valuable context for crafting a solution that meets their needs and expectations. Interviews can also provide important constructive feedback to detail key aspects that should be considered in the development of a new system.

2.2 System Design Process

The system design process is an important stage in designing a website using QR Code technology for the MC Swimming Pool website. In this process, the authors contributed to the design of a responsive and intuitive user interface (UI/UX), ensuring an optimal user experience from ticket purchase to use of the QR Code. The QR Code functionality design is the main focus, this QR Code is to convey information quickly and also get a response or response quickly considering speed, security and availability of relevant information. Software design is a series of steps that involve planning and creating a software program, including aspects such as data structures, software architecture, interface representation and coding procedures.

2.3 Implementation in the System

The system implementation process begins with the software preparation stage which includes website elements and QR Code technology. Configuration adjustments are carried out thoroughly to ensure harmonious interaction between all software components. After that, the QR Code that has been designed will be integrated into the structure of the MC Swimming Pool website. Next is the system design process, namely the author begins the process of writing and applying code to the system that will be built, especially using the code igniter framework. System implementation is carried out in accordance with the design plan and application interface to be developed. At this stage, a coding or program creation process is carried out to ensure that the system that has been designed can be used by users [5]

After the steps above, the next stage is for the author to start implementing the previously designed design into a system that will be integrated later, the next stage also

includes database design and data adjustments as well as stages for bringing the website online so that it can be accessed by visitors/users. website from anywhere and at any time when the user is connected to the public internet network.

2.4 System Testing and Maintenance

System testing is an important step carried out to verify that each element and function in the system implementation runs as expected. This process involves thorough testing of QR Code technology performance, website functionality, and overall system integration. Testing includes evaluation of speed, security, sustainability, as well as responsiveness to user interactions.

2.5 System Design

In designing the system, the author chose to use Unified Modeling Language (UML) as a modeling tool. UML is used to explain in detail how the system works, by including several types of diagrams, including use case diagrams, activity diagrams, class diagrams, and sequence diagrams. Overall, UML can be described as a language that uses graphical representations or images to describe, detail, build and document the development of software systems based on Object Oriented Programming [6]

2.6 Build Design

Design is the process of describing, planning and sketching or arranging separate elements into a complete and functioning unit [7]. This involves the process of drawing, planning, as well as sketching or arranging separate elements so that they can form a unified and functioning whole. Apart from that, this process also involves configuring the hardware and software components of a system [8].

2.7 System planning

In this process, QR Code integration with the swimming pool management system is an important part of increasing operational efficiency. Data such as number of visitors, use of facilities, and other activities are recorded automatically, reducing the potential for human error and speeding up administration. The system design stages involve three key aspects, namely input design, process design, and output design.

1. Input Design

The input design stage focuses on developing elements related to inputting data into the system. In this stage, the author carries out an analysis of the needs needed to create a web-based information system. The analysis starts from functional requirements analysis (system function requirements obtained from each user), non-functional requirements analysis (system support requirements, such as the hardware used and supporting software) using data collection techniques [9].

2. Process Design

At the process design stage, it is emphasized how the entered data will be processed in the system. This involves modeling algorithms, creating work flow diagrams, and determining the logic that governs the system's workflow.

The main focus is to create efficient and effective processes in accordance with the system's functional requirements.

3. Output Design

Output design focuses on determining the appearance and format of the output produced by the system. This involves designing reports, graphics, or user interfaces that can convey system process results information clearly and easily understood by users.

2.8 Supporting Programs and Applications

Some of the supporting programs and applications that the author uses are, XAMPP is an Apache web server software package that has been integrated with the MySQL database server and supports development using the PHP programming language. Another advantage is that XAMPP can be downloaded and used at no additional cost [10]. Visual Studio Code (VS Code) is a source code editing software presented by Microsoft. As open source software, VS Code has the advantage of being lightweight and was created with the aim of meeting the needs of cross-platform software development, Mozilla Firefox browser. As open source software, Firefox allows users to access and modify its source code, encouraging active participation from the community developers around the world [11].

A database is a collection of logically related data and traffic in a particular language. In this context, these fields are connected to each other, creating a data framework that facilitates the storage and management of information. This creates an organized structure to store information efficiently. In this research, the author uses MySQL as a database, MySQL itself is MySQL, which is a database system that is available for free and is open source. One of the main factors that made MySQL so popular at that time was the lack of alternative databases that could compete in terms of speed and stability. and functionality that supports applications[12].

In designing QR Code technology on the MC Swimming Pool website, the PHP programming language and HTML markup played a role in creating an optimal user experience and increasing operational efficiency. The PHP programming language is used to process and manage the required data. Programming language is a means of communication between humans and computers [13]. Nowadays, with the advancement of technology, programming languages have become very important. This language can be divided into three levels, namely low-level programming language, middle-level programming language, and high-level programming language [14].

In this research the author uses a framework for designing the website that will be built, the framework is codeigniter. Framework, which can be interpreted as 'framework', basically provides a framework for system construction, so that system developers do not need to design the system as a whole [15].

CodeIgniter is a framework for building web-based applications using the PHP language. In other words, CodeIgniter helps speed up the project development process by providing ready-to-use tools, so developers can focus more on the application logic and specific features they want to implement.

III. RESULT AND ANALYSIS

3.1 System analysis

In designing this website-based information system, the author used a tool, namely Unified Modeling Language (UML), which is a standard language used to illustrate, design and document software. As an application of this concept, the web is described as an entity that contains multimedia documents, including text, images, sound, animation and video, which are accessed via the HTTP protocol (Hypertext Transfer Protocol) using software known as a browser [16].

3.2 Weaknesses In The Current System

In the current swimming pool system, there is a deficiency that causes long queues on holidays due to the absence of an online ticket purchase system. The main cause of these long queues is the slow ticket purchasing process, where visitors have to queue at the counter to buy tickets manually. This results in a longer ticket purchasing time, especially during busy holidays. Additionally, the limited ticket counter also contributes to the long queues, as the limited number of counters causes visitors to crowd together to buy tickets. Uncertainty about ticket availability is also a problem because visitors cannot ensure ticket availability before coming to the swimming pool without an online ticket purchase system. This can lead to disappointment if tickets are sold out when visitors arrive. Furthermore, inefficient queue management can also occur due to the lack of a structured system. Swimming pool managers may have difficulty managing queues properly, especially on busy holidays. Recognizing these deficiencies, the implementation of an online ticket purchase system can be an effective solution to reduce long queues on holidays. This system will not only speed up the ticket purchasing process but also provide convenience for visitors in planning their visits and improve the overall operational efficiency of the swimming pool.

3.3 Proposed System Design

The planned system aims to enhance user experience and operational efficiency of the MC Swimming Pool by implementing QR Code technology on their website. This system will enable users to purchase tickets online, reducing long queues, especially during holidays. The website will be equipped with a user-friendly interface, allowing users to easily make ticket purchases. Users can select the date and time of their visit, choose the type and quantity of tickets, and make payment securely through the website. After a successful purchase, users will receive a QR Code upon payment confirmation from the admin, which can be scanned for entry to the swimming pool without having to queue at the counter. For operational efficiency, the system will provide a backend management interface for staff to monitor ticket sales. This will help staff anticipate and manage crowds more effectively, ensuring a smooth experience for visitors.

Additionally, the system will provide real-time updates on ticket availability, helping users plan their visits in advance. Overall, the implementation of QR Code

technology on the MC Swimming Pool website will enhance user experience by providing a convenient and efficient ticket purchasing process, as well as improve operational efficiency for management.

3.4 Use Case Diagram

Use case diagram is a concise representation of the relationship between systems and actors. In this design, in order to improve the quality of user experience and operational efficiency.

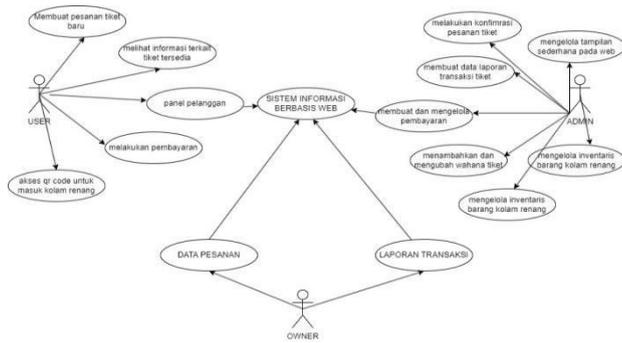


Figure 2. Use Case Diagram

Use case diagrams are used as a visualization tool to describe interactions between three main parties, namely Admin, User, and Owner [17].

3.5 Activity Diagram

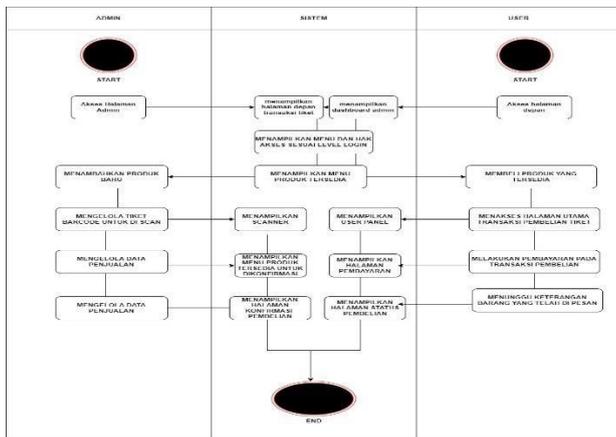


Figure 3. Activity Diagram

The Admin Activity Diagram describes a series of steps to manage users and monitor operational efficiency at the MC Swimming Pool. The User Activity Diagram shows user steps on the MC Swimming Pool website and the Activity Diagram visualizes the sequence of activities in a system that is being planned [18].

3.6 Sequence Diagram

Sequence Diagram for Admin in designing QR code technology on the MC Swimming Pool website describes in

detail the step-by-step interaction between Admin and the system.

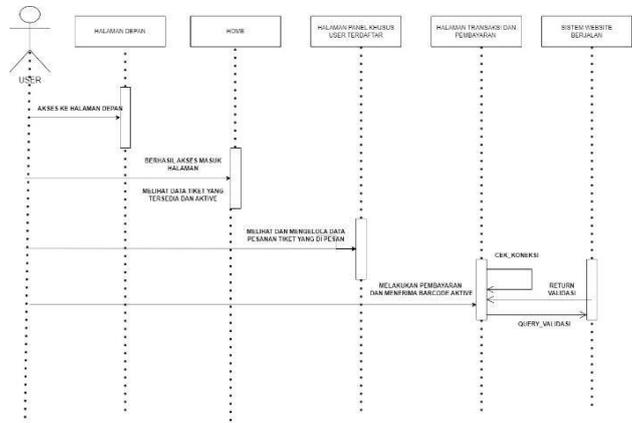


Figure 4. User sequence diagram

Meanwhile, sequence diagrams in research describe how objects interact with each other and are arranged in a time sequence that reflects the sequence of events carried out by an actor in running a system.

3.7 Class Diagram

Class diagrams are a very significant and commonly used representation in object-based systems. The class diagram depicts the static structure of the core classes that make up the system and in addition, there is the QRCodeGenerator class which generates QR codes, transaction classes which represent user transaction data [19]

3.8 Website Interface Design Design

The website interface design in this research combines aesthetics and functionality to improve the experience and in designing a web-based interface which includes two components, namely (hardware) hardware and (software)

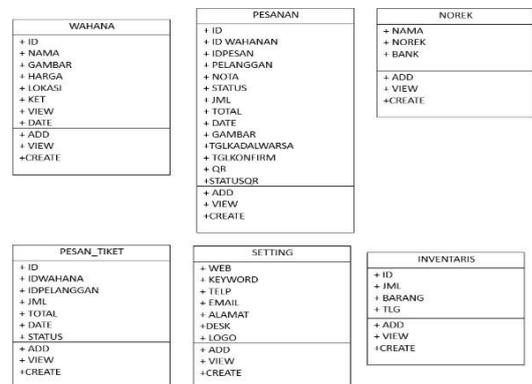


Figure 5. Class Diagram

software for design tools [20]. This design includes QR code elements, a front page for the user, and a page for the admin panel. User Interface (User Interface) in a design refers to the system and interaction between users and other users through commands, inputting data, and utilizing content [21].

An information system refers to a system within an organization that integrates processing needs. Where visitors

initially access the front page then the system will give instructions to access the next website [22]. System design is considered as a process in which a system that does not yet exist is processed or replaced in such a way that it becomes a new system that undergoes changes in a better and more useful direction.

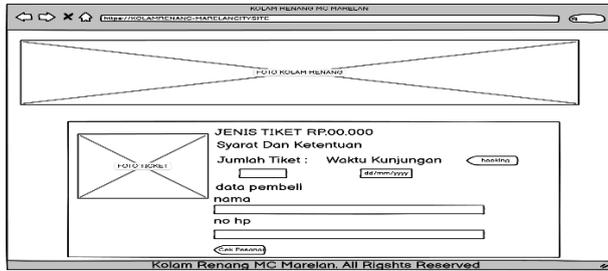


Figure 6. Front page design

The design on the admin page will contain several main features and access that are used as an admin, namely that they can be operated by employees or related people who are trusted to manage this website. In the admin page design there are several descriptions of the features available on this website page. The following is an overview of the admin page design.

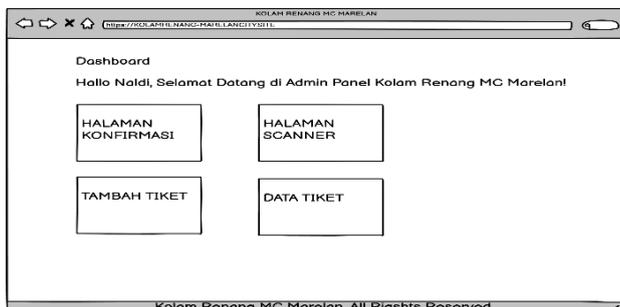


Figure 7. Admin Page Design

The administrator page uses a web base that can be accessed via a web browser, making it possible to enter the administrator's homepage [23]. Thus, system design is not just a technical transformation of an old or currently running system, but is also a strategic step to improve the performance and responsiveness of an organization or business that is the case study site in this research.

3.9 System Testing and Discussion

At this stage, system testing is carried out by testing the MC Swimming Pool system with the aim of validating the overall functionality and conducting experiments regarding the findings and test results obtained. Testing the display on the front page of the MC Swimming Pool system is a step to ensure the user interface (UI) provides an optimal and responsive experience. The User Interface (UI) plays a vital role in the functionality of many applications. At present, there are three primary types of UIs: Graphical User Interface (GUI), predominantly found in desktop applications; Web User Interface (WUI), commonly seen in web applications; and Handheld User Interface (HUI), specifically designed for use in mobile devices. These interfaces serve as the bridge

between users and the underlying functionalities of the applications, enhancing user experience and accessibility. [24] At this stage, every element on the Front Page, such as buttons, images, and the ticket purchasing process, is tested to assess readability, design, and suitability for its function. The author displays the results of this test in the image below.



Figure 8. Front page view



Figure 9. Front Page View 1

After the customer makes an order and purchase, the customer will then be directed to a page where the customer will get a ticket in the form of a QR code to scan and gain access to enter the swimming pool.



Figure 10. Confirmation page display



Figure 11. Order Page Display

The image above shows the barcode and order data that has been created by the user. The data and barcode received

by the customer is after going through the inspection stage by the admin and previous confirmation by the admin.

In the image below, it can be seen that all the functions and all the access buttons used by the admin to manage the running of the website appear well and as they should, as seen from the arrangement and amount of data that appears in accordance with the transaction data on the order.

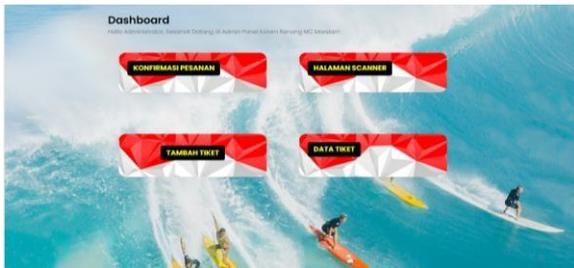


Figure 13. Admin page display

3.10 Testing on Website-Based Sales Systems

Testing on the Website-Based Sales System in this research was carried out by the author using the approach. One of the Blackbox method testing techniques is Equivalence Partitions, which is a stage in ensuring the readiness and optimal performance of this system. The Equivalence Partitioning approach involves dividing input data or conditions into equivalent groups, and allows more efficient and detailed testing [25].

Table 1. Testing on the Running System

No	Kelas Uji	Daftar Pengujian	Skenario Uji	Hasil Yang Diharapkan
1	Add New ticket	Enter Data	Login to the admin menu Username: admin Password: Swimming Pool1 Click the login button	Displays and successfully enters the admin dashboard menu, can create and add tickets that appear on the user's front page for ordering
2	Transaction menu and ticket purchases	Testing ticket messages on the website	Click order My ordered menu	Order data entered into my order Save data and send it to the server and display it on the admin page for

Testing of the Website-Based Sales System using the Equivalence Partitioning approach aims to ensure that the system operates efficiently, provides a good user experience, and can be relied on to support the sales process and ticket transactions when implemented in the actual system. In the following table, there is detailed information regarding the tests that the author has carried out in this research. This testing includes a list of tests that have been specifically designed to test critical components in an information system and verify that the system operates according to predetermined expectations.

VI. CONCLUSION

Based on the results of making QR Code Technology Design on MC Swimming Pool Website Design to Improve User Experience and Operational Efficiency, the author came to several conclusions such as, From this research, it can be concluded that an important aspect in improving user experience and operational efficiency is related to user management, integration of QR Code technology, and management of ticket sales transactions then on Increasing Ways to Increase Ticket Sales on Websites and with the existence of an information system for purchasing tickets online The author can conclude that the existence of this system will reduce queue for ticket purchases during holidays or when purchasing tickets It's busy in person, with this ticket purchasing system then visitors can choose two options to buy tickets online especially offline. in the process of entering the swimming pool which is usually an officer You have to check tickets one by one now for visitors and swimming pool staff It will be helpful if officers can check tickets quickly and It's easy to use the integrated barcode scanner tool

websites that have been implemented and with this system are several Benefits will be obtained by visitors and business owners who are business owners This system will be greatly helped by the convenience it provides operational and also besides the media purchasing system this information system can also become an online marketing system where this will provide benefits to business owners to be able to increase sales and become business competitive with other competitors. The benefit that visitors get is efficiency and the convenience that can be obtained when visiting the swimming pool so this also increases loyal customers and new visitors due to viewing and Remembering the ease that can be obtained when visiting the swimming pool The benefit and convenience is purchasing tickets online, which is rarely found at other swimming pools in the Medan city area, especially Marelan. Conclusions from the research show that increasing ticket sales on websites can be achieved through implementing QR Codes as an efficient ticket purchasing method as well as on Website System Design and Development Swimming Pools that Have Integrated QR Codes can be concluded that the design and development of Swimming Pool website systems that have been integrated with QR Codes have a positive impact on user experience.

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