



Article

Electronic Attendance with Android-Based QR Code at STMIK Pringsewu to Improve Student and Lecturer Discipline in Lectures

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A B S T R A C T

Technology can be used in various fields. One of them is in the field of Education. In this case, it can be done to process databases, and process academic information data, for example: lecture systems, assessment systems, curriculum information, education management or learning materials. It can also implement the system gradually starting from a smaller scope to expanding, making it easier to manage the use of IT in the process of providing education. Electronic Attendance with an Android-based QR code is an application which is able to read the QR code from each user or student scanned by the lecturer in the attendance list process for a course. The development of the Electronic Attendance system with QR code based on Android uses the Software Development Life Cycle (SDLC) system and is described by the Data Flow Diagram (DFD), Entity Relationship Diagram (ERD) and Flowchart models followed by web design using Hypertext Preprocessor (PHP) programming, and My Structured Query Language (MySQL), Javascript, and Cascading Style Sheet (CSS) which produces responsive websites and is converted with android studio into applications.

I. INTRODUCTION

The development of technology in the era of globalization of information and telecommunications is widely known in all circles of Indonesian society as a means of seeking information in an actual, fast, and easy way, both with smartphones, laptops, and tablets anytime and anywhere. Not only from the community but also in the world of education, information technology is very much needed to find information, especially for teachers, lecturers, and students to facilitate teaching and learning. The existence of rapid technological advances requires Human Resources (HR) to be qualified and competent in all fields. Until in the end, communication technology will

become closely related to humans. The role of technology will affect human resources in carrying out activities and making technology an infrastructure of all fields including the field of education. In this case as a whole, humans and technology can no longer be separated from each other[1].

The government realizes that Indonesian students are very familiar with technology, as in Cambridge International's research through the 2018 Global Education Census that many students use technology not only to interact on social media but also to use it in learning. The results of the study even stated that Indonesian students were ranked the highest globally as users of IT/computer rooms in schools (40%). More than two

thirds (67%) use smartphones in class and 81% use to do homework [2]. Technology can be used in various fields. One of them is in the field of Education. In this case, it can be done to process databases, and process academic information data, for example: lecture systems, assessment systems, curriculum information, education management, or learning materials. It also implements the system gradually starting from a smaller scope to expanding, making it easier to manage the use of IT in the process of providing education[3].

Information technology and telecommunications have been used in various fields, both in the field of business and in the field of education, such as in STMIK Pringsewu which has used application and website which can be accessed by lecturers and students. It is also used to see semester grades or data needed by students, for example looking at Study Results Card, Study Plan Card, Study Results Summary, and Transcripts. However, even though they have used this method, the obstacles can still be felt by lecturers and students. In recording attendance and lecture attendance for each course, lecturers still use the manual method, with an attendance book so that at the end of the semester, the attendance book is submitted to the campus and then inputted into the STMIK Pringsewu Siakad. Thus, students have to wait for inputting grades and attendance to finish. The input process took a very long time because the total number of STMIK Pringsewu students in 2016-2017 was 1,046. There are 902 S1 majors and 142 D3 majors[4].

The development of an Android QR Code-based attendance application provides convenience for attendance administration for lecturers and students so that the system will be on time in presenting data for lecturers or for class administrative staff. The QR attendance system is built with the concept of Scanning QR codes on lecturers using various brands of smart phones with a camera with a minimum capacity of 4 MP. In this way, there are no more students arguing

that they did not enter but it was signed by a friend and forgot to bring a QR code card because every student attends with their own smart phone with a unique code in the student QR Code. With the construction of Electronic Attendance with QR Code, it is expected to be able to improve attendance services faster so that learning time at STMIK Pringsewu is more effective and efficient.

II. LITERATURE REVIEW

In a previous research by (Anantassa Fitri Andini 2017) The research aims for students to be absent online to produce time output and so that when doing attendance, lecturers can monitor and control the student attendance process through an android application. Most of the lecturers monitor student attendance by appointing one of the students as the person in charge of the class, because calling the names of students one by one will be quite time-consuming. In addition, the absent form can be lost, damaged or forgotten to be carried. In addition, attendance by using the manual method is not efficient. The purpose of this research is that the attendance process can run quickly and does not hinder the teaching and learning process of lecturers' lectures so that online attendance can make students more disciplined because attendance is more active. The working of this application design is to make the admin as a resource in user requirements. The department admin only makes a predetermined schedule and manages classes. The department admin can see. If the class is full, the admin can open another class. The admin holds full student data with the aim of seeing the list of absenteeism in the online attendance system. Then, the data can be input and output to the system.

In another research conducted by [6], it was conducted at Gorontalo Polytechnic campus when the lecturers were still using attendance papers which were signed by the students who were present during lectures. Of course, this method makes writers and other students feel inefficient when the

lecture begins. Different from previous research, this research has used a QR code (Quick Response) and a card which has been made with different QR codes. In this way, lecturers no longer have to bring attendance and distribute them to students during lectures to ask for signatures. This method makes lectures more efficient.

Previous research conducted by [7] implemented an attendance system with a QR code for website-based student tutoring. Attendance Assessment is a website containing student lists. This research aims to facilitate the process of absenteeism tutoring and improve student discipline. Attendance Assessment design uses Yii Framework in a website. Yii Framework is a PHP-based framework which can make it easier for developers to create a website. This Attendance Assessment system is by logging in to SSO (Single Sign On/Out) with Rinfo, meaning that it only uses one key, the Rinfo account which has 2 users including students and supervisors. This activity can be done by the user in using the Attendance Assessment. By scanning the QR code then the lecturer will get a recap of student attendance so that it is easier for lecturers to monitor student discipline.

Subsequent research conducted by [8] utilizes QR codes and Android to run a mobile web-based attendance process system which supports paperless office. This research was conducted at STMIK Ichsan Gorontalo. The purpose of this research is to make it easier for lecturers and students to make attendance, to reduce the use of paperless, and to prevent the occurrence of missing attendance papers or scattered if the attendance is still using manually with paper. This research produces a mobile web in which there is an attendance feature using a QR code which can be found in the schedule and attendance menu. Attendance meetings will automatically follow the number of meetings which have been held. Next, the lecturer scans the QR Code belonging to each student's account as a substitute for manual attendance using paper. Automatically the information on the

STMIK Mobile Student Application will change to present after the scanning process is successful.

Based on the researches above regarding the attendance system in making attendance reports, there has been no research which specifically makes an application or electronic attendance with an android-based QR code. Therefore, this time the authors make an attendance application with a QR code which can scan and be scanned in one application at once. The design of this application displays an attractive interface using a dynamic display. In addition, menu options are also buttons which can be accessed according to the choice to be addressed, for example going to the attendance menu, the user just presses the attendance button. Electronic Attendance with Android-Based QR Code at STMIK Pringsewu has a positive impact on lecturers and students regarding discipline in conducting lectures both face-to-face and online.

a. Definition of Attendance

According to [9], Attendance is a routine carried out by a lecturer to prove that students are present or not in a class or meeting. Attendance is a data collection of attendance, part of reporting on the activities of an institution, or a component of the institution itself which contains attendance data which is compiled and arranged in such a way that it is easy to find and use if at any time it is needed by interested parties [10]. Attendance is a list of attendance of employees, students, lecturers which contains the hours of arrival and departure times as well as the reasons or descriptions of their attendance. This absence is related to the application of discipline found by each company or institution [11].

Attendance or attendance card is a document which records the attendance hours of each employee in the company. The attendance record of the employee can be in the form of a regular attendance list, or it can also be in the form of an attendance card filled in with a timekeeping machine. The

job of recording time can basically be separated into 2 (two) parts, attendance time keeping and shop time keeping. The recording of attendance hours on the attendance card made by each employee or worker can affect the net salary or take home pay which will be received by the employee or worker every month. Because if employees or workers forget or do not record their attendance hours on the attendance card, it will be able to affect the components in the salary, especially in the allowance post, because the benefits provided by the company to each employee or worker depend on several employees or workers are present during working hours such as meal allowances and also transportation. If the employee or worker does not record the hours of attendance on the attendance card, the meal and transportation allowance received by the employee or worker every month will be reduced and will also affect the net salary received by the employee or worker. The recording of attendance is intended to collect data on the number of hours an employee or worker attended in a pay period and sometimes also on the rate of wages for the work performed. The recording of working time is intended to be able to record the actual working hours used by employees or workers in each job or department. The working time records can be used to check attendance records and to obtain production data needed to obtain the distribution of wages, salaries and intensive calculations.

b. Fingerprint Attendance (*Finger Scan*)

Usually this fingerprint attendance is used by medium to high-end companies. The way work of the finger scan system is by sticking one finger on the machine after entering the worker's identity number.

c. QR Code Definition

In this study, the QR code is the main thing needed to run an application to be built. QR code is a type of matrix code or two-dimensional barcode developed by Denso Wave. QR code is a form of barcode

evolution from one dimension to two dimensions. The use of QR codes is very common in Japan. This is due to its ability to store data larger than barcodes so that it is able to encode information in Japanese because it can accommodate Kanji letters [12].

QR Code is a type of two-dimensional barcode or matrix code. The code is the result of the development of the Danso Wave Company, a division of the Japanese company, Denso Cooperation. QR codes were first introduced to the public in 1994. To read a barcode or QR code, a QR Scanner is needed. QR (Quick Response) is used to convey information in the form of a code quickly. QR Code is a revolution of Barcode, from one-dimensional to two-dimensional. The difference between QR codes and barcodes is that barcodes only store data horizontally, while QR codes can store information both horizontally and vertically. Therefore QR codes have larger storage than barcodes. QR codes can store all types of data such as numeric data, alphabetis, kanji, hana, symbols, hiragana, even binary codes (Mastekno, n.d.,2018).

The information contained in a QR code varies depends on the wishes of the user. On sites on the internet, usually a QR code contains a download a link to a particular site. Cell phones which have a QR code scanning feature can directly download or visit the site easily without having to be complicated like searching and typing in keywords. Users only need to direct the scan on their cellphone to the existing QR code because the QR Code is a two-dimensional symbol. It was invented in 1994 by Denso, one of the major Toyota Group Companies, and was approved as an ISO International Standard (ISO/IEC18004) in June 2000. This two-dimensional symbol was originally intended for use in the production control of automotive parts, but has become widespread in other fields. Now QR Codes are seen and used every day everywhere in Japan for the following reasons:

1. Some characteristics are superior to linear barcodes, are much higher data

density, support for Kanji or Chinese characters.

2. It can be used by anyone for free because Denso has released a patent into the public domain.
3. Standard data structure is not a prerequisite for current use.
4. Most mobile phones in Japan are equipped with cameras which allow reading of QR Codes accessible Internet addresses automatically by simply reading the URL encoded in QR Code.

In 1970, IBM developed the UPC symbol consisting of a 13-digit number to allow automatic input to a computer. The UPC symbol is still widely used for Point-Of-Sale (POS) systems. In 1974, Code 39 which could encode (symbolize) about 30 digits of alphanumeric characters was developed. In the early 1980s, about 100 character digits could be stored as Code 16K and Code 49 were developed. As informatization has grown rapidly in recent years, a demand is mounted for symbols which can store more information and represent languages other than English. To enable this, symbols with a higher density than multistage symbols are required. As a result, the QR Code, which contains a maximum of 7,000 characters including Kanji characters, Chinese characters used by Japanese was developed in 1994.

QR Code is a matrix symbol which has been developed and allows all PDF417's high capacity, high density data matrix printing and fast reading of research maxi codes to be carried out based on its characteristics. Two-dimensional symbols generally contain much more data than linear symbols (approximately 100 times more), and this requires longer data processing time and more complex processing. Therefore, QR Code has taken a lot of consideration in its pattern finder to allow high speed reading.

QR Code has a linking function which allows a single symbol to be represented in multiple symbols by dividing them. A single symbol can be divided into 16 symbols in

maximum. The example shown in Figure 8 is a one-place QR Code which is divided into four symbols, and each symbol has an indicator which shows how many symbols the original symbol has divided into and in the order in which a particular symbol will be among all the splits. This enables all data to be edited and submitted to the computer regardless of what order the symbols have been read by the reader. With this linking function, QR Code can be printed even if the printing space is not wide enough to print one QR code.

The QR code is in the form of a black square line shaped like a barcode but with a more compact appearance. An example of a QR code is as below:



Figure 1. Example of a QR Code

QR code contains some information in it such as URL address, text, and phone number. QR codes are usually placed on various products to show additional information about the product. You can put it on your business card as additional information. To read a QR code, you need a smartphone with a camera and a code reader app QR(Ir et al., 2015:1)

d. Definition of Android

At this time, Android is the king of smartphones because Android is growing very rapidly in the technological era and provides an open platform (basic architecture) for Android developers to create their own unique applications. Here are the definitions of android by some experts:(ANDI, 2018:1). "Android is the name of one of the operating system variants based on the Linux kernel which is

specifically intended for mobile phone devices with touch screen features (tucscreen)". The term Android comes from English which means "robot which resembles a human" according to the icon which has a pair of hands and feet. As an operating system, Android functions as an operating system (device) between the user and the hardware on a smartphone or certain electronic device(Firly, 2018:2).

Android was originally under the auspices of Android Inc, a company founded in 2003 by Andi Rubin, Rice Winer, Nick Search, and Chris White. Initially, Android was made not for mobile phones, but for digital cameras. The Android operating system was developed by the Android Inc Company in 2003. Android Inc. is a startup company and was discovered by the search engine giant Google, which then agreed to provide financial support and bought it in August 2005 until it became a wholly owned subsidiary of Google. This operating system was officially released in 2007. At the same time, a consortium called the Open Handset Alliance was formed which consists of 34 companies engaged in hardware, software, and telecommunications whose members include Google, HTC, Intel, Motorola, Qualcomm, T-Mobile, and Nvidia are working together to advance open source standards (Open Source), including the Android operating system itself. Precisely in November 2007, Android together with the Open Handset Alliance declared its support for the development of open standards on mobile devices. In the end, the first Smartphone which uses the Android operating system was released. On October 22, 2008, a Smartphone with the Android operating system from HTC Corporation was launched, named HTC Dera(ANDI, 2018:2).

III. RESEARCH METHODS

a. System Development Life Cycle

System Development Life Cycle (SDLC) is a method used in developing a system. SDLC has a logical process which is used by a system analyst to develop an information system which involves requirements,

validation, training and system owners (Sri Mulyani, 2016:24).

Development of information systems with a traditional approach is SDLC (System Development Life Cycle). SDLC is a development which serves as a mechanism to identify software. The stages in system development are called the System Development Life Cycle because each stage is carried out sequentially from planning, analysis, design, implementation and maintenance. The following is an overview of the System Development Life Cycle:

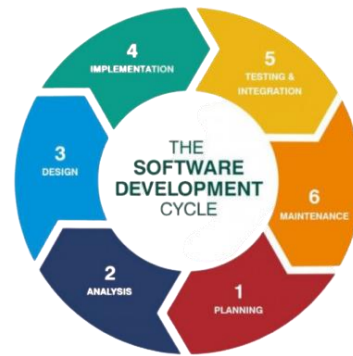


Figure 3. Chart of System Development Life Cycle

The description according to the SDLC image above is:

1. System Planning
System planning is the initial stage where at this stage the authors identify the system used and developed, and they determine the targets to be achieved.
2. System Analysis
System analysis is the second stage where researchers identify problem, propose problem solving and analysis of system requirements which are focused on making software. At this stage, the authors describe a complete information system into its component parts which aims to identify and evaluate the problems and expected needs.
3. System Design
At this stage, the authors describe the design of the system which was built as a guide for making applications. The purpose of making this model is to obtain a good understanding of data flow and control, functional processes,

operating behavior and the information contained therein.

4. Coding

At this stage, the authors apply the results of the design into a form which can be read by a computer. At this stage, the results of the design begin to be translated into machine language through a programming language.

5. System Implementation

At this stage, the authors implement the system which has been planned in advance.

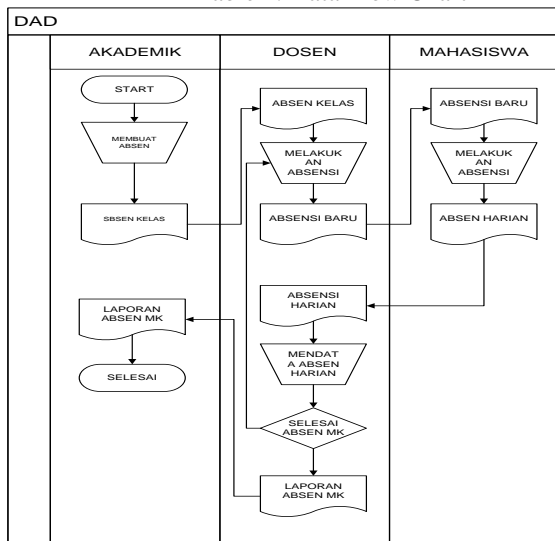
6. System Maintenance

At this stage, the researchers perform maintenance activities on the system which aims to maintain and improve the system to an acceptable condition.

b. Running System Analysis

In lecturing activities at STMIK Pringsewu, students are required to fill out a list of days for each course as a condition for having taken courses which are evaluated in the future by the lecturer as well as for recording grades. In this case, the authors have made observations to find out the assessment process at STMIK Pringsewu with a Data Flow Chart or Mapping Chart. The flowchart chart explains how to use this attendance in each class from start to finish. Here is a picture of the Data Flow Chart:

Table 1. Data Flow Chart



c. Mapping Chart

Mapping chart is a mixture of map and flow chart which shows the movement or a research process from one process to another. Mapping chart is useful in describing and simplifying a series of processes or procedures based on the sequence of steps of a process which aims to assist research in problem solving process analysis.

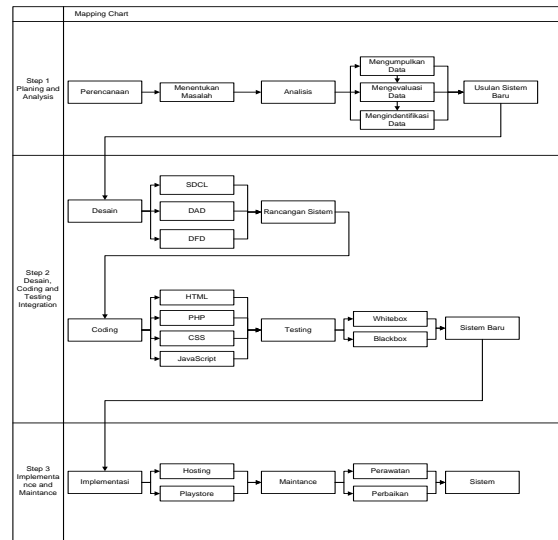


Figure 4. Mapping Chart

Mapping Chart Description:

1. Stage 1 (Planning & Analysis)

The first stage is planning where the research team determines the problem which is then applied to a title which is in accordance with the problems found. Furthermore, the analysis was carried out by collecting data using observations, interviews, documentation, literature studies and questionnaires. The result of the data is processed by evaluating and identifying the data to get accurate data and get conclusions which can be used as a new system proposal.

2. Stage 2 (Design, Coding and Testing Integration)

In the second stage, the design using the SDLC method begins with the design of the system design which includes DAD, DFD, DFD Level 0 and DFD Level 1. The result will be determined at the stage of building the results of the design at the coding stage using HTML, PHP, CSS and Javascript programming.

The program produced was initially in the form of a mobile website which was processed using android studio and would become an android program.

3. Stage 3 (Implementance and Maintenance) The last stage is to publish to students and lecturers to use and see the shortcomings of the application. Thus, the authors can correct any mistakes or shortcomings.

d. Flow Chart of the Proposed System Application

Application Flowchart is an illustration of how the display structure contained in the application. The application process begins with the main page display containing a login form for student and lecturer users. If students already have an account, they can log in and enter on the account status page. But if they don't have an account yet, students need to register first. The account will be verified by the admin first. Next, the attendance list process is done by scanning each QR code which will be verified by the lecturer. If all stages have been completed, the student attendance list process on the Attendance Application with a QR Code is also completed.

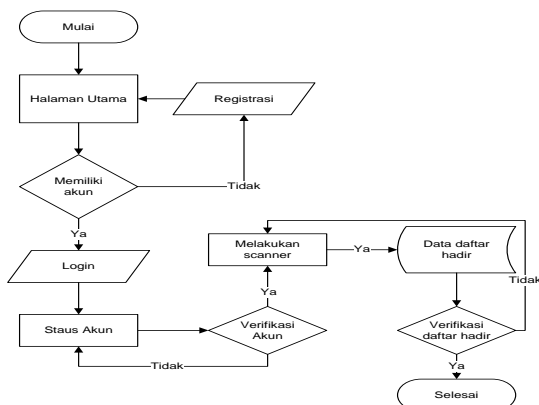


Figure 5. Flow Chart of the Proposed System Application

IV. RESEARCH RESULTS

a. Stage of New System Analysis

The main stage in making a system is to analyze and study the system which is running, then describe the system which is running and the problems which are often

faced. The next stage is to determine the scope of the system by analyzing system requirements. The purpose of the analysis of the new system is to facilitate detailed design and provide an overview for the system design produced by the proposed system or a new system which will be created to replace the old system.

1. Functional Requirements contain what information must exist and be generated by the system, how the system reacts to certain inputs and how the system behaves in certain situations. The system created must be able to enter data and display data in the form of information in the application which can be seen by the user. The system created is in the form of a mobile or android web-based application system which will be online later so that it can be used by users easily.
2. Non-functional requirements are carried out to determine the specifications of the requirements for the system to be run. Specifications involve analysis of hardware, analysis of software, and analysis of users (brainware).

b. Design Stage

Data Flow Diagrams or DFD provides an overview of the entire system process in the Context Diagram of a system description limited to one process describing the entire system which will run.

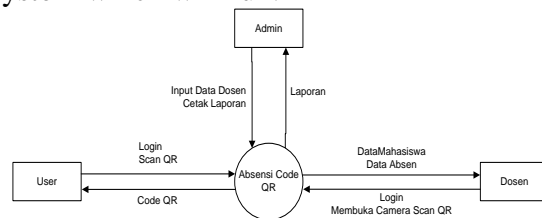


Figure 6. Context Diagram

DFD level 0 has a description of the context diagram which lists the data stores needed in the system as well as an overview of the interaction between external entities and the system.

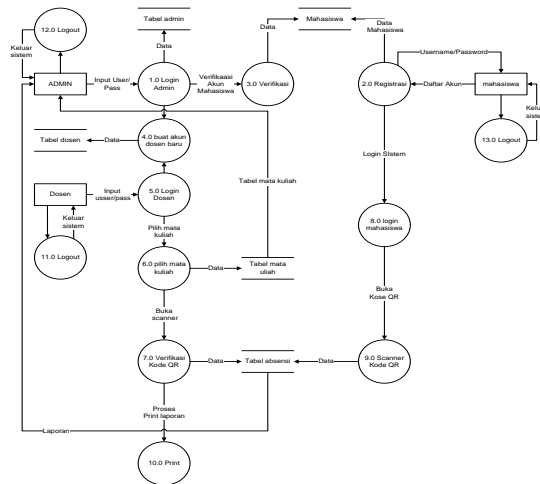


Figure 7. DFD Level 0

DFD Level 1 describes the processes in more detail than DFD level 0 so that each process in DFD Level 0 can be described in more detail and provides a more in-depth view of the whole system. DFD Level 1 in the attendance application with an android-based QR code below describes every process which is in DFD Level 0.

c. Entity Relationship Diagram

ERD is a model which explains the relationship between the data and the database based on the relationship to the basic data objects associated with it.

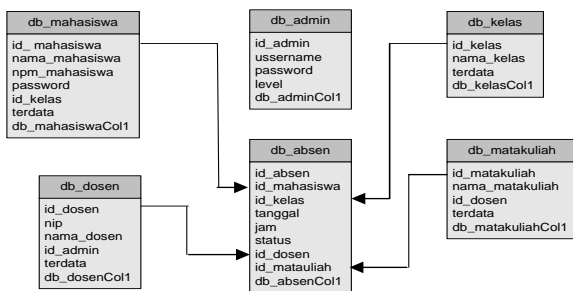


Figure 8. Entity Relationship Diagram (ERD)

d. Implementation

The system design stage is carried out after the design continues to the programming stage. This attendance application program is built using a website base and is devoted to a responsive display so that it can be used on Android devices. The main programming languages used are HTML, CSS, PHP and Java script which are

edited through the sublime text application as an editor application and xampp to run the program which has been written.

e. Interface

This application has communication management between users and the system or can be called an interface, as a liaison between users in carrying out data input easily into a system and communicating the features or menus available in the application.

f. Result Design

From the design, a program implementation has been made which can be run and used by users, both lecturers and students as an Android-based attendance application system which can be run on smartphones as an attendance list for a course.

V. IMPLEMENTATION

a. Main Page

The main display is the first view which can be seen by the user to login students and lecturers.



Figure 9. Implementation of the Main Page

b. Student Login and Register

Implementation of Student Login and Register is a page for logging in for students who already have an account and register.

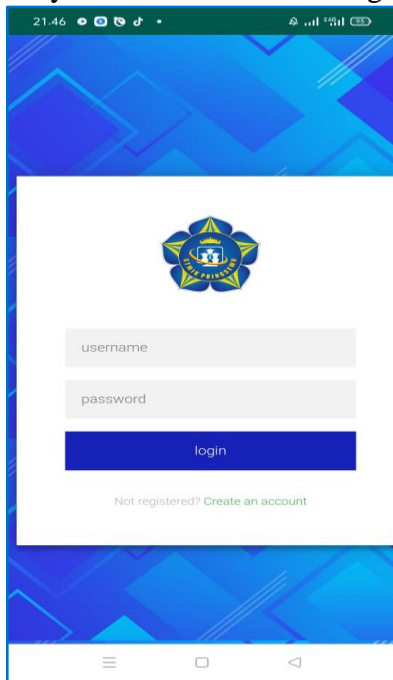


Figure 10. Implementation of Student Login and Register

c. Student Dashboard Implementation

After students enter, they are taken to a dashboard page where there are menu options, (QR codes, courses, and logout).

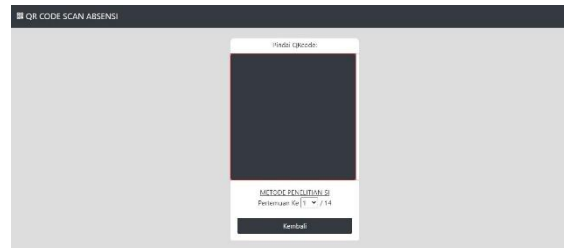


Figure 11. Student Dashboard Implementation

d. Analysis of Research Results

The new system design is expected to be able to improve and answer weaknesses and problems in the previous system by utilizing applications and internet networks. Attendance applications with Android-based QR codes can be accessed on smartphones in the form of android applications or browsers on computers. The android application has a notification function which makes it easy for students, lecturers and admins to get updated information from data processing. The application can be used anywhere and anytime with the internet network. Students by using this application can save resources on the attendance process or inputting student attendance lists.

Table 4.6. Analysis of Test Results Using Blackbox

No	System Test	Running Status	Error Status	Information
1	Front page	✓		It consists of a login menu for lecturers and students.
2	Student Login Form	✓		Students login using NPM and password.
3	Student Registration Form	✓		The student registration form consists of full name, npm, telephone number, class name, email, and password.
4	Student Account Page	✓		It displays several menus: personal data, QR code, number of courses, and logout.
5	Student QR Code	✓		It displays a student QR code to do attendance.
6	Attendance Book	✓		It displays the number of courses.
7	Logout	✓		Log out of the student account.
8	Lecturer Login Form	✓		Lecturers login using username and password.
9	Lecturer Dashboard	✓		It consists of attendance book, scanner, and logout.

10	Lecturer Attendance Book	✓	It displays the courses which are taught.
11	Add attendance book	✓	It adds a new attendance book if the lecturer teaches more than one course, semester, and number of meetings.
12	See	✓	It displays lecturer reports consisting of courses, lecturers, semesters, and the number of students in one course.
13	Edit	✓	It changes the attendance book consisting of courses, semesters, meetings.
14	Delete	✓	It removes absenteeism from a course.
15	Notifications	✓	A notification will appear for approval when deleting.
16	Lecturer scanner	✓	It opens a scanner to input student attendance from a course.
17	Logout	✓	Log out of the teacher's account.
18	Admin Login Form	✓	Admin login using username and password.
19	Admin Dashboard Page	✓	It displays lecturer accounts, student accounts and lecturer reports.
20	Lecturer Data Page	✓	It displays lecturer account data and the number of courses taught.
21	Add lecturer	✓	It adds a lecturer consisting of the lecturer's name, email, username, and password.
22	Student Data Page	✓	It displays student account data and status.
23	Lecturer report data page	✓	It displays lecturer report data with courses.
24	Add/Edit Lecturer Form	✓	It consists of inputting the lecturer's name, email, username and password.
25	Student Add/Edit Form	✓	It consists of inputting student name, email, class, npm, password, status and date of entry.
26	Attendance form	✓	It consists of input courses, semesters, number of meetings, and lecturers.
27	Logout	✓	Log out of the admin account.

From the results of the black box above, it can be concluded that the application or electronic attendance with a QR code can run smoothly when operated and ready to be used both in campuses, schools, companies, and other agencies.

VI. CONCLUSION

The construction of an Attendance Application with an Android-Based QR Code is to facilitate a related educational institution such as lecturers and students in carrying out the attendance list process for a course or lesson and to keep up with increasingly sophisticated technological developments in the current era of

globalization in order to realize higher quality human resources (HR). Therefore, the world of education also utilizes sophisticated technology such as smartphones, tablets, laptops, computers, and so on as a tool to meet the needs in the learning and teaching process. The conclusion obtained in this study is that the Attendance Application with a QR code was

built using xampp with the PHP, CSS, Javascript, and Mysql programming languages which produces a responsive website in appearance and is changed using Android Studio to be used as an Android application so that it can be accessed on both Android and iOS devices and computers. Attendance Application with QR Code Based on Android makes it easier for students and lecturers in the attendance process with QR codes.

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VII. ACKNOWLEDGEMENT

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