UI/UX Design of a QR Code and Geolocation-Based Attendance System Using Design Thinking and Prototyping Methods

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Abstract. Student attendance is an important element in ensuring proper presence and participation in the academic environment. However, in the Information Technology Department of Padang State Polytechnic, the attendance process is still conducted manually, which leads to various issues such as the potential for cheating, inaccuracies in record-keeping, and paper waste. This research aims to address the issue by designing and developing a QR code and geolocation-based attendance system using the Design Thinking and Prototype methods. The Design Thinking method is used to explore and understand user needs, while the Prototype method is employed to develop and test solutions iteratively. The system produced is expected to improve the accuracy of attendance recording, reduce fraud, and minimize resource waste. In addition, this research contributes to creating a more efficient, reliable, and user-friendly attendance system, particularly in academic settings.

Keywords: Design Thinking, Student Attendance, UI/UX

INTRODUCTION

Student attendance is an important aspect of higher education administration, including at Padang State Polytechnic. (PNP). Currently, the attendance-taking process at PNP, particularly in the Information Technology Department, still uses a manual method with signatures on an attendance book. In addition to ensuring the attendance and participation of students, attendance also serves as a reference for academic assessment. By monitoring student attendance, lecturers can assess their level of engagement in the learning process. Until now, the method of taking attendance that is still commonly used is manual signatures on attendance sheets. However, this method has proven to have a number of limitations and risks that can affect the accuracy and security of the process.

Taking attendance with manual signatures can lead to the risk of human error. This manual process is prone to carelessness or negligence in recording attendance, which in turn can result in inaccurate attendance data. In addition, inaccuracy is not the only problem faced by this manual attendance-taking method. The sustainability of manipulation risks by students is also a serious concern. Students have the ability to manipulate signatures or present their friends unlawfully, which can result in attendance records that do not reflect the truth [2] [3].

In addition to the risks of errors and manipulation, this manual process also consumes significant time and resources. The collection, recording, and processing of attendance sheets manually can consume the time of lecturers and administrative staff that could be used more efficiently for other academic activities. To address this challenge, several solutions have been implemented by previous researchers, including an attendance system using facial recognition, which can expedite the attendance-taking process and provide protection against fraudulent attendance [1]. Then, there is the attendance system using SMS Gateway, designed to make it easier for parents to monitor their children's attendance [4]. Furthermore, there is the QR Code-based attendance system, created to minimize errors and issues that often arise during the attendance process [5].

In this study, the Design Thinking method serves as the framework used to design an effective user interface (UI/UX) based on the complexities of attendance collection and the complicated administrative processes. This

approach allows researchers to gain a deep understanding of the needs and challenges users face in using the attendance system, as well as to generate innovative solutions that meet those needs.

The steps in the Design Thinking method, such as empathy, definition, ideation, prototyping, and testing, will be used sequentially to develop a user-friendly UI/UX. Next, the researchers will use the prototype method to develop a UI/UX prototype that can be tested by users in response to the challenges of inefficient attendance collection and complicated administrative processes. This prototype will provide a concrete illustration of how the attendance system will function and how users will interact with it.

During the testing phase, the UI/UX prototype will be examined by users to evaluate usability, effectiveness, and user satisfaction. Based on the feedback received, the researchers will make the necessary design iterations to improve the prototype and ensure that the UI/UX meets users' expectations and needs effectively. By integrating Design Thinking methods for UI/UX design and prototype methods for system development, this research is expected to produce innovative and effective solutions to address the challenges in managing student attendance in higher education environments.

METHODS

The result of the proposed solution is a qr code and geolocation-based attendance system, designed with UI/UX using the Design Thinking and Prototype methods. There are several main features of the provided solution, there are :

1. The QR Code for Attendance. Taking with several points, such as every time a learning session begins, the lecturer will activate a specific QR code for that class. This QR Code will be displayed in the classroom, and students will use their devices to scan the QR Code as proof of attendance. This QR Code is only valid during the class session, thus reducing the risk of cheating.
2. Geolocation for Attendance Verification, allowing the admin to monitor students' attendance locations in real-time through this system. With the geolocation feature, the admin can see whether students are actually on campus or not when they check in. This location information will be displayed on the admin dashboard, enabling more accurate and transparent monitoring.
3. An intuitive User Interface (UI) designed to be easy to use for both lecturers and students. The empathy and definition processes in Design Thinking enable developers to understand user needs and create a friendly and intuitive UI.
4. Prototype Development, where the Prototype Method is used to develop an initial model of the UI/UX for the attendance system. This prototype allows for early testing by users to gather feedback. Based on that feedback, the design will be iterated and refined to ensure that the system effectively meets user needs.

Design thinking is a creative approach method used to solve complex problems and develop innovative solutions [9]. This method is not limited to the design of physical products but can also be applied in the context of service development, processes, or user experiences.

Design thinking emphasizes a deep understanding of the end user and promotes an empathy-based approach to finding solutions that meet their needs and expectations. Design thinking has five process, there is empathize, define, ideate, prototype and testing.

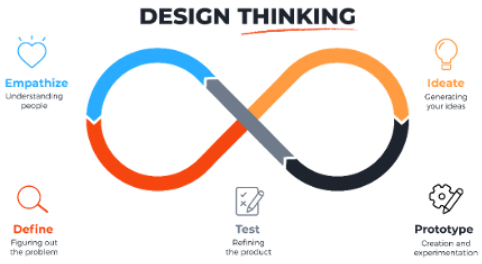

Figure 1. Design Thinking Method

1. Initial Requirement

First phase in design thinking is searching for initial program requirements. In this phase is to focus deep understanding requirements and user perspective or stakeholders with the systems. Initial requirements including 3 important step there is empathize, define and ideate.

At this stage, data collection is conducted to sense and understand the experiences, needs, and challenges faced by users or relevant stakeholders. This is done through interviews, observations, and direct interactions with them.

The main goal is to gain a holistic view of the issues and to build empathy towards the users. To collect data, two data collection methods were used, namely quantitative and qualitative. The quantitative data collection method utilized questionnaires, while the qualitative method involved direct interviews.

Define (analyzing needs) Data is collected from the Empathize stage and then analyzed to identify the main problems faced by users. These problems are formulated into clear and specific problem statements that will be the focus in the development of solutions.

Ideate (determining solutions) By understanding the needs and establishing an initial framework, the next step is to generate creative ideas to solve problems and meet those needs. This step involves a brainstorming process and exploration of various solutions. The ideas generated serve as the foundation for designing solutions that will be implemented in the next stage, which is prototyping.

The questionnaire data uses a Likert scale, which is a measurement tool used to assess the attitudes, opinions, and perceptions of individuals or groups towards a social phenomenon. This scale allows for the measurement of a person's attitude by asking them to express their level of agreement or disagreement with a specific subject, object, or event [11].

On a Likert scale, responses are provided through several options that indicate the intensity of agreement or disagreement, such as "strongly agree," "agree," "neutral," "disagree," and "strongly disagree." "Strongly Agree" signifies full agreement with the given statement, while "Strongly Disagree" indicates total rejection. This scale helps to explore the nuances of respondents' attitudes towards the issues being questioned.

Table 1. Quesioner Questions

No	Questions	Score
1	Do you think it's important for a campus to have an online attendance system?	1-5
2	Do you feel that manual attendance data (paper) is often inaccurate or lost?	1-5
3	Do you often have difficulties with the manual attendance system using paper?	1-5
4	Do you feel that the current manual attendance system takes a long time?	1-5
5	Do you agree that an online attendance system will improve efficiency?	1-5
6	How important do you think ease of use is in a new attendance system (online)?	1-5
7	I support the implementation of this online attendance system on campus.	1-5

2. Prototyping

At the prototype stage in system development using the design thinking method, developers create an initial model or representation of the system known as a prototype. This process generally involves several stages that form an iterative cycle. In this context, the cycle includes use case diagrams, class diagrams, activity diagrams, and sequence diagrams.

3. Test

Testing is a crucial stage in the system development cycle using the design thinking method. At this stage, the prototype that has been designed and tested by potential users is thoroughly evaluated to ensure that the system meets the established quality standards and requirements. This process involves three main stages: development, testing, and maintenance. The test stage uses usability testing methods with the calculation of the System Usability Scale (SUS) to provide a quantitative score that can represent the user experience when using the prototype.

The collection of questionnaire data using the Slovin method to obtain a sample from the total existing population. The Slovin's formula is a method used to calculate the minimum sample size when the behavior of a population is not known for certain. This formula was first introduced by Slovin in 1960. It is very useful in survey research, especially when the required sample size is very large, necessitating a method to obtain a smaller sample that can still represent the entire population [8].

The testing process uses the usability testing method to determine whether the functionality of the application or design meets the users' expectations. Usability testing is a method used to evaluate the user experience of a product, whether it is in the form of a website or an application. The purpose of usability testing is to identify problems, discover development opportunities, and study user behavior patterns. This method can be applied as input in the design process or as an evaluation at the final stage of the project. In usability testing practice, there are three entities involved: the facilitator, the respondent, and the tasks. A usability testing session involves respondents who receive tasks from the facilitator, who then observes the respondents' behavior while they carry out those tasks [10].

The System Usability Scale (SUS) is a method for measuring the quality of user experience with a system or product. SUS uses a questionnaire to evaluate the usability of computer systems from the user's subjective perspective. There are several questions in the SUS questionnaire that are suitable for testing a prototype. The results from the questionnaire filled out by respondents will be calculated into a final score using the formula established in the System Usability Scale method. (SUS). Here are picture of the stages of SUS [9].

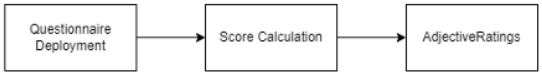

Figure 2. System usability scale stage

RESULTS AND DISCUSSION

Empathize

At this stage, data collection will be carried out using two methods: quantitative and qualitative, in order to understand the issues and needs for the attendance system that will be developed. The interview process was conducted with lecturers from the State Polytechnic of Padang, consisting of a total of 6 people, including an administrator, structural lecturers, and non-structural lecturers.

a b c

Figure 3a. Interview with admin; Figure 3b Interview with structural lecturer; Figure 3c Interview with non structural lecturer

The interview process with the admin depicted in the image above aims to identify what the admin will need and what challenges are faced with manual attendance. Meanwhile, the interview with the structural lecturer as a high-ranking official of the campus, depicted in the image above, aims to understand the perspectives of campus leaders regarding the geolocation and QR code-based online attendance application. The last step is to conduct interviews with non-structural lecturers, as depicted in the image above, with the aim of understanding the challenges faced by lecturers with manual attendance.

After conducting the interview, it is followed by creating an empathy map that refers to the results of the interview. The empathy map process requires 4 quadrants, such as What do they hear? what do they see? what do they say and do ? and what do they think and feel. Some explanations for the 4 quadrants of the important processes before creating a user persona are What do they hear? This section explains what users hear regarding the attendance application, What do they see? This section explains what users observe regarding the current attendance conditions, What do they say and do? This section explains what the user has said and the actions taken regarding the creation of an attendance application, and What do they think and feel? This section explains what the user thinks about the attendance application that will be created.

Here are some results from the empathy map based on the interviews that have been conducted.

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Figure 4a. Non structural empathy map; Figure 4b Admin empathy map; Figure 4c Herni empathy map

In the quantitative method, a Likert scale is used to measure the level of agreement of respondents to various statements presented. The survey data collection was conducted using Google Forms. The questions posed in the survey have been tested for validity and reliability using IBM SPSS Statistics software. In this study, a total of 46 respondents were used to conduct validity and reliability testing.

Here are the results of the validity and reliability tests :

Correlations

		item_1	item_2	item_3	item_4	item_5	item_6	item_7	total
item_1	Pearson Correlation	1	.068	.451**	.279	.539**	.602**	.522**	.667**
	Sig. (2-tailed)		.654	.002	.061	<.001	<.001	<.001	<.001
	N	46	46	46	46	46	46	46	46
item_2	Pearson Correlation	.068	1	.270	.496**	.396**	.323*	.429**	.589**
	Sig. (2-tailed)	.654		.069	<.001	.006	.029	.003	<.001
	N	46	46	46	46	46	46	46	46
item_3	Pearson Correlation	.451**	.270	1	.387**	.388**	.308*	.368*	.649**
	Sig. (2-tailed)	.002	.069		.008	.008	.038	.012	<.001
	N	46	46	46	46	46	46	46	46
item_4	Pearson Correlation	.279	.496**	.387**	1	.537**	.508**	.446**	.744**
	Sig. (2-tailed)	.061	<.001	.008		<.001	<.001	.002	<.001
	N	46	46	46	46	46	46	46	46
item_5	Pearson Correlation	.539**	.396**	.388**	.537**	1	.678**	.730**	.826**
	Sig. (2-tailed)	<.001	.006	.008	<.001		<.001	<.001	<.001
	N	46	46	46	46	46	46	46	46
item_6	Pearson Correlation	.602**	.323*	.308*	.508**	.678**	1	.732**	.792**
	Sig. (2-tailed)	<.001	.029	.038	<.001	<.001		<.001	<.001
	N	46	46	46	46	46	46	46	46
item_7	Pearson Correlation	.522**	.429**	.368*	.446**	.730**	.732**	1	.805**
	Sig. (2-tailed)	<.001	.003	.012	.002	<.001	<.001		<.001
	N	46	46	46	46	46	46	46	46
total	Pearson Correlation	.667**	.589**	.649**	.744**	.826**	.792**	.805**	1
	Sig. (2-tailed)	<.001	<.001	<.001	<.001	<.001	<.001	<.001	
	N	46	46	46	46	46	46	46	46

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Figure 5 Results of the Validity Test of the Student Questionnaire

The results of the validity test show that all items have a significant Pearson Correlation at the significance level of 0.05 or 0.01. This means that each item has a strong enough correlation with the total score, thus it can be considered valid. The table value of r r for 46 respondents is 0.291, and all items have a calculated r r value greater than 0.291, indicating good validity.

Here are some results from the questioner with data total 278 people based on the survei that have been conducted.

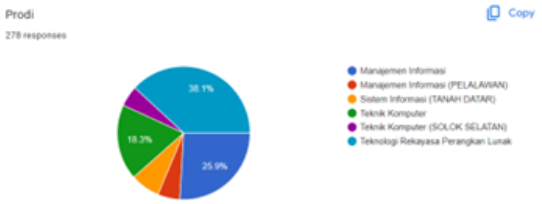

Figure 6. Data responses from quesioner

In figure 6, data collected from students who filled questioner from google form.

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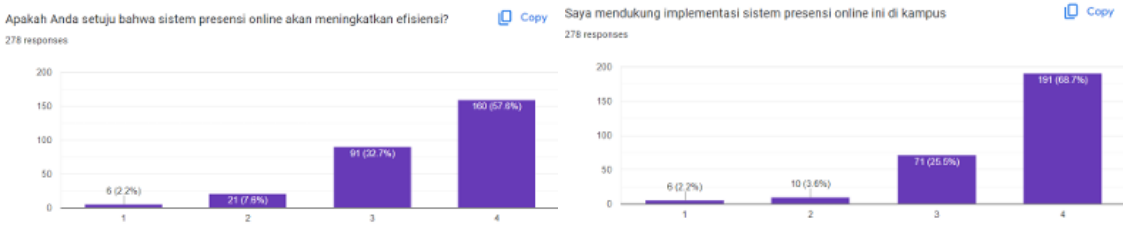

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Figure 7a Respondents Who Agree with the Creation of Attendance Application; Figure 7b Respondents Who Agree That Manual Attendance Is Inaccurate; Figure 7c Respondents Who Agree That Online Attendance Increases Efficiency; Figure 7d Responses from Those in Favor of Implementing Attendance Applications on Campus

The data from respondents above who were asked whether the campus has an online attendance system shows that a total of 60.8% agree that there should be the development of an attendance application system. The data from the respondents above indicated that when asked if manual attendance is often inaccurate, a total of 60.8% of respondents agreed that manual attendance is not accurate. From the data of the respondents above who were asked whether the online attendance system would improve efficiency, a total of 57.6% of respondents agreed that the online attendance system would enhance efficiency. The data from the respondents above indicates that when asked if they support the implementation of an online attendance system on campus, a total of 68.7% of respondents agreed with the implementation of online attendance on campus.

DEFINE

The issue faced by the respondents or informants is that most of them want an application that can be used to control, record, and monitor the attendance of lecturers and students. Respondents also want the application to be designed in a way that is not confusing for users, with not too many buttons, user-friendly, and capable of solving the issues present in the still manual attendance system.

Table 2. Problem analysis and user requirements

Problems	Needs	Insights
Student attendance is often carried out during the learning process, thus disrupting the course of classes.	An attendance system that does not disrupt the learning process.	The attendance application will be designed to make the attendance-taking process more efficient, so it does not disrupt the learning process.
Lecturers often forget to fill in the lecture journal after each lesson, so that it accumulates at the end of the semester.	A system that facilitates lecturers in filling out course journals with quick access after each learning session.	The application is equipped with features that make it easier for lecturers to view the journal data that has been filled out, allowing them to ensure that all lecture sessions have been recorded.
Attendance data is still manually recapped	A system that can automatically store data without the need to recap	The application will be created to automatically save and summarize.
Sometimes there is a recording error, where students who attend are recorded as absent.	A system that can ensure students' attendance is recorded accurately.	The application will be equipped with a system that automatically records attendance when students check in, as well as providing a feature to view students' attendance history to ensure that attendance is accurately recorded.
Students can leave absences with their friends, so attendance is inaccurate.	A system that can ensure that only students who are present at the location can attend	The application will be created with geolocation features to allow lecturers and administrators to see the location of attendance taking.

IDEATE

At this stage, initial ideas are obtained through users who have been interviewed as support in creating an attendance application, as well as data from student questionnaires that align with the principles of design thinking. After going through the define stage, the next step is to analyze the existing ideas and then connect them with user

needs and user problems. These ideas are expected to meet the desires of student respondents and the academic community on campus in enhancing efficiency and effectiveness through features that can facilitate online attendance.

Table 3. Solutions and ideas

How Might We	Solutions/Ideas
How to create a system that simplifies the attendance process so that it is no longer done manually?	Designing an online attendance application that automates the recording of attendance without the need for manual processes.
How to ensure that the attendance system does not disrupt the learning process?	Designing an application with an attendance feature that can only be done at specific times before or after classes, so that the learning process is not disrupted.
How to create a system that is easy for the admin to use, with minimal data input?	Designing a simple and intuitive application interface, with a minimalist input form to facilitate the admin in managing attendance.
How to create a user-friendly and not overly complicated application interface?	Creating a display with non-contrasting colors and avoiding excessive ornaments in the design.
How can an application generate systematic and easily accessible data reports?	Providing an automatic attendance data recap feature, with the option to download reports in PDF format.

PROTOTYPE

At this stage, the design of the geolocation attendance application with QR code will be created based on the results of interviews regarding the features that will be included in the application. The prototype display consists of both low-fidelity and high-fidelity views of the website designed for access on mobile or smartphones for students, as well as the website view for administrators.

1. Low Fidelity Prototype

Low Fidelity Prototype or design with a low level of detail. This can be in the form of a hand-drawn sketch, a rough drawing, or a wireframe that only shows the basic layout, key elements, and general features of the application.

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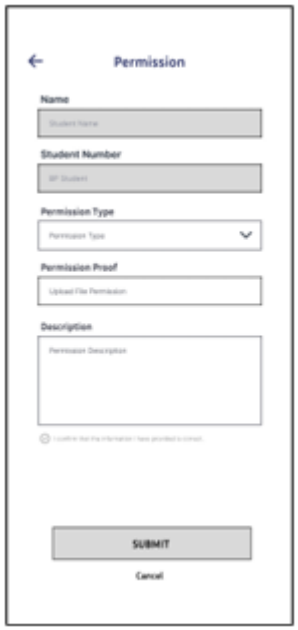


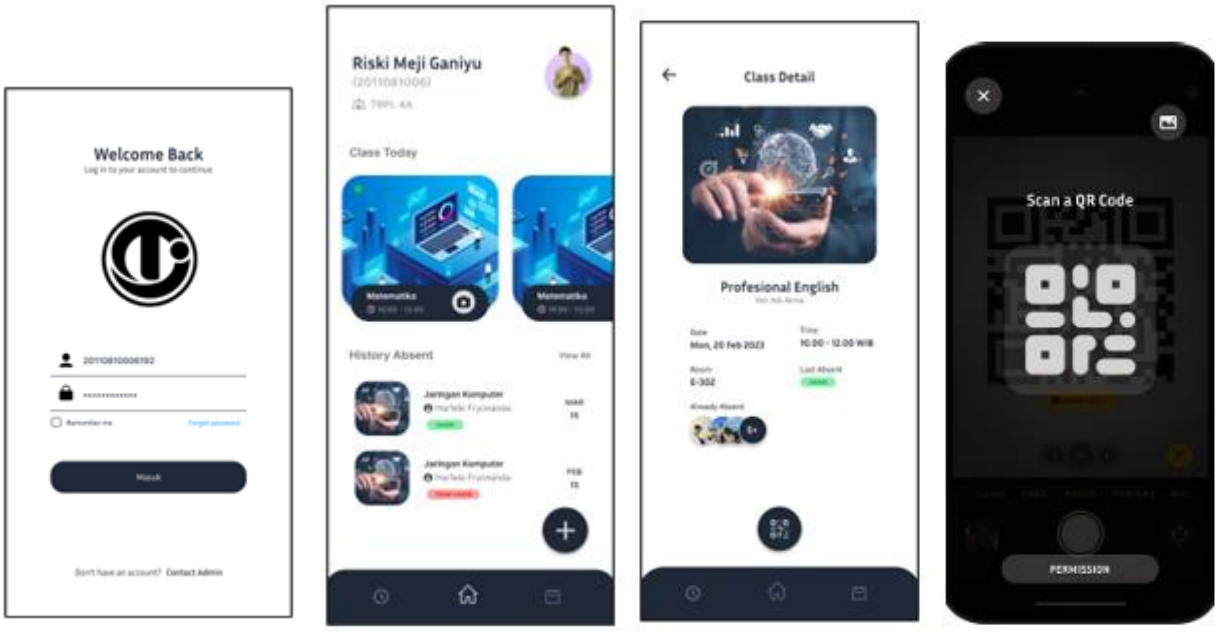
Figure 8a Login Page Results; Figure 8b Dashboard User Results;
Figure 8c Class Detail Results; Figure 8d Attendance Scan;
Figure 8e Permission Form Results; Figure 8f Admin Dashboard Results

The Figure 8a Login Page Results is the high fidelity prototype display page of the login page in the application. The Figure 8b is a high fidelity prototype view of the dashboard page in the application. This page can be accessed once the user has logged in. The Figure 8c is the high fidelity prototype display page of the login screen in the application. This page contains information about the course, date, room, time, students who have already checked in, and a button to display the QR code. The Figure 8e is a high fidelity prototype display page of the attendance scan page in the application. This page contains a QR code for students to mark their attendance. The Figure 8f is the high fidelity prototype display page of the permission form found in the application. This page contains the student absence permission along with supporting evidence and explanations.

The image above is the high fidelity prototype display page of the admin dashboard in the application.

2. High Fidelity Prototype

High Fidelity Prototype or a design that includes more detailed visuals, including colors, textures, typography, and more accurate interactive details. Creating a high fidelity prototype provides a representation of the final product.



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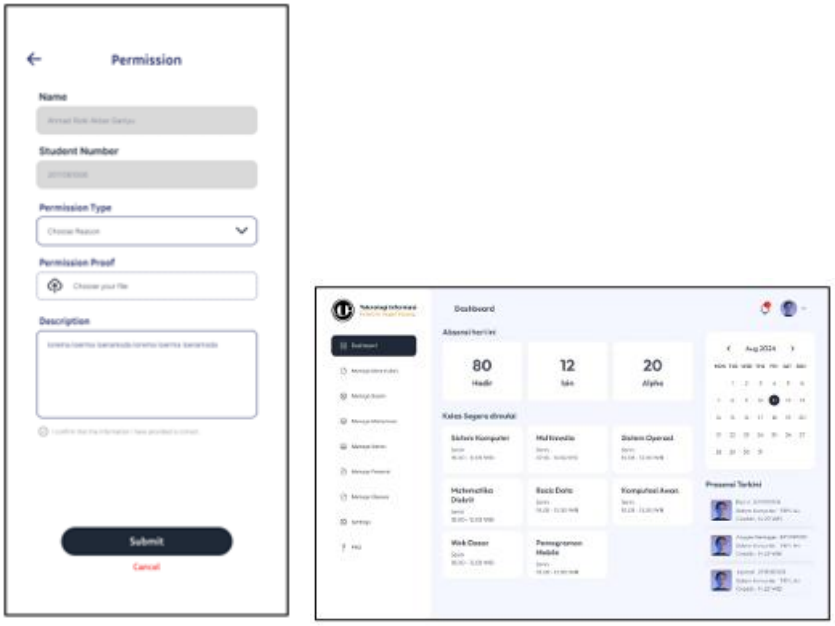

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Figure 9a Login Page Results; Figure 9b Dashboard User Results; Figure 9c Class Detail Results; Figure 9d Attendance Scan; Figure 9e Permission Form Results; Figure 9f Admin Dashboard Results

The Figure 9a is the high fidelity prototype display page of the login page in the application. The Figure 9b is a high fidelity prototype view of the dashboard page in the application. This page can be accessed once the user has logged in. The Figure 9c is the high fidelity prototype display page of the login screen in the application. This page contains information about the course, date, room, time, students who have already checked in, and a button to display the QR code. The Figure 9d is a high fidelity prototype display page of the attendance scan page in the application. This page contains a QR code for students to mark their attendance. The Figure 9e is the high fidelity prototype display page of the permission form found in the application. This page contains the student absence permission along with supporting evidence and explanations. The Figure 9f is the high fidelity prototype display page of the admin dashboard in the application.

TESTING

The System Usability Scale (SUS) is a tool used to evaluate the usability of a system or product. SUS consists of 10 questions with a 5-point Likert scale ranging from "Strongly Disagree" to "Strongly Agree." Each question is rated from 1 to 5. Here is the formula used to calculate the value of SUS. The formula used to calculate the SUS score is that if the questionnaire item number is odd, the score for that item is subtracted by one, while if the item number is even, five is subtracted from the score of that item.

Table 4 SUS score

R	Question Quesioner									
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
R1	4	2	4	1	5	1	5	2	4	1
R2	5	1	5	1	5	1	5	1	5	1
R3	5	1	5	1	5	1	3	2	4	2
R4	5	1	5	1	5	1	5	1	5	1
R5	5	1	4	1	5	1	5	1	5	1
R6	5	3	5	4	4	2	4	2	5	1
R7	5	5	5	5	5	5	5	5	5	5
R8	5	5	5	1	5	1	5	1	5	4
R9	4	4	4	4	4	4	4	4	4	4
R10	4	3	5	3	4	3	4	2	4	2
R11	5	5	5	2	5	1	5	1	5	1
R12	5	2	4	4	4	3	4	2	2	2
R13	4	1	5	2	5	1	5	1	5	1
R14	3	3	2	4	4	4	2	4	4	4
R15	5	3	5	2	5	1	5	1	5	1
R16	3	3	3	3	4	3	5	2	3	2
R17	5	3	4	2	4	1	4	2	4	2
R18	5	4	5	3	4	1	5	2	5	3
R19	3	3	3	5	4	3	3	3	3	5
R20	5	3	5	2	5	1	5	1	5	2
R21	5	2	5	1	5	1	5	1	4	1
R22	5	3	4	4	4	1	3	1	4	4
R23	3	3	4	3	4	2	4	3	5	3
R24	4	3	4	3	4	4	4	1	3	1
R25	4	2	3	4	4	2	4	2	4	3
R26	5	3	5	5	5	3	5	1	5	5
R27	5	4	5	3	5	1	5	1	5	1

The table below shows the results of all SUS calculations, where if the questionnaire is odd, one point will be deducted from the score, and if the questionnaire is even, five points will be subtracted from the score. After obtaining the results, the scores from questionnaires 1 to 10 are summed up and then multiplied by 2.5 to get the final score. Once everything is completed, the total final score is summed according to the number of respondents and divided by the total number of respondents to produce the SUS scale score.

Table 5 SUS final score

Question Quesioner										**Total**	**Total x 2,5**
Q1	**Q2**	**Q3**	**Q4**	**Q5**	**Q6**	**Q7**	**Q8**	**Q9**	**Q10**		
3	3	3	4	4	4	4	3	3	4	35	87,5
4	4	4	4	4	4	4	4	4	4	40	100
4	4	4	4	4	4	2	3	3	3	35	87,5
4	4	4	4	4	4	4	4	4	4	40	100
4	4	3	4	4	4	4	4	4	4	39	97,5
4	2	4	1	3	3	3	3	4	4	31	77,5
4	0	4	0	4	0	4	0	4	0	20	50
4	0	4	4	4	4	4	4	4	1	33	82,5
3	1	3	1	3	1	3	1	3	1	20	50
3	2	4	2	3	2	3	3	3	3	28	70
4	0	4	3	4	4	4	4	4	4	35	87,5
4	3	3	1	3	2	3	3	1	3	26	65
3	4	4	3	4	4	4	4	4	4	38	95

Question Quesioner										Total	Total x 2,5
Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10		
2	2	1	1	3	1	1	1	3	1	16	40
4	2	4	3	4	4	4	4	4	4	35	87,5
2	2	2	2	3	2	4	3	2	3	37	92,5
4	2	3	3	3	4	3	3	3	3	25	62,5
4	1	4	2	3	4	4	3	4	2	31	77,5
2	2	2	0	3	2	2	2	2	0	31	77,5
4	2	4	3	4	4	4	4	4	3	17	42,5
4	3	4	4	4	4	4	4	3	4	36	90
4	2	3	1	3	4	2	4	3	1	38	95
2	2	3	2	3	3	3	2	4	2	27	67,5
3	2	3	2	3	1	3	4	2	4	26	65
3	3	2	1	3	3	3	3	3	2	27	67,5
4	2	4	0	4	2	4	4	4	0	26	65
4	1	4	2	4	4	4	4	4	4	28	70
Total										75,92	

The method of scale for value assessment uses SUS scores to determine whether the design is good, satisfactory, or not yet satisfactory according to the users. Below is the scoring range for the SUS score.

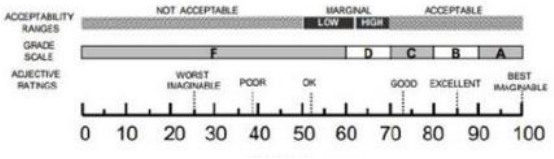

Figure 10 Score Sus

Based on the results of the Moderated Usability Testing, the assessment from the System Usability Scale shows a score of 75.92, indicating a "good" result that is acceptable to users with a grade scale of C. Some outcomes from this testing include increased efficiency in managing campus attendance and ease of use for various users, including students, faculty, and administrators.

CONCLUSIONS

The conclusion of this research is that the prototype testing resulting from the implementation of design thinking, conducted through usability testing with lecturers, administrative staff, and students of Padang State Polytechnic, yielded a score of 75.92, indicating that the prototype is acceptable according to the SUS scale. From the results of the prototype and application testing, it can be concluded that the QR Code and Geolocation-based attendance application received positive feedback from users. Testing shows that this interface and application are very easy to understand and comfortable to use.

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