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Design of Teacher Management Information System Using Design Thinking at SDN 101827 Based on Mobile

Muhamad Alda [1], Sasgia Sinta Putri [1*], Tiara Arzhety Lubis [1], Rani Jumiannisa Sinaga [1]
[1] Universitas Islam Negeri Sumatera Utara Medan

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ABSTRACT
The use of mobile technology is increasingly important for schools in improving the smoothness of teacher administration, making it faster and more accessible. At SDN 101827, various processes such as attendance recording, leave requests, and teacher data management are still carried out manually, often resulting in delays, data inaccuracies, and low efficiency. This study designed a mobile-based Teacher Management Information System (SIMAGUR) as a solution to streamline and accelerate the administrative process. The Design Thinking method was applied through five stages, starting from identifying needs, formulating problems, developing ideas, creating prototypes, and testing the system. In the testing phase, the System Usability Scale (SUS) was used to measure user perceptions of the application's ease of use. The score was calculated based on the SUS rules with a value conversion using a factor of 2.5 to obtain the final score. The test results on five respondents produced an average score of 80.00, which is classified as Excellent (B) . These findings indicate that the SIMAGUR design has a good level of usability, is easy to understand, and provides a positive experience for users. Overall, the designed system has the potential to support schools in managing teacher administration in a more organized and efficient manner.

Corresponding Author:
Sasgia Sinta Putri | Universitas Islam Negeri Sumatera Utara Medan
Email: sasgiasintap@gmail.com

1. Introduction

The development of the world of technology is taking place very quickly, not only in terms of years, months, weeks, days or hours but also minutes and even seconds (Febrianti, 2024). In this digital era, changing work patterns in educational settings are encouraging schools to begin utilizing technology as part of their administrative activities. In many elementary schools, including SDN 101827, teacher administration activities are still carried out in a fairly traditional manner. Attendance is recorded manually, leave requests must be submitted in writing, and teacher data is updated through a lengthy process. This work pattern not only

takes more time but also has the potential to lead to data inaccuracies because the recording process is not properly digitized (Yaasiin & Hanif, 2025).

The use of mobile applications opens up opportunities for schools to simplify their work processes. Using devices they use daily, teachers can manage various administrative needs without relying on physical forms. With a mobile approach, various processes such as attendance recording, leave requests, and updating personal information can be done directly through the app. Besides being practical, this approach also gives schools access to more structured data that is automatically stored in a digital system (Mambu et al., 2024).

In the context of SDN 101827, the need for an application that can handle teacher administration is evident from the activities that appear in the SIMAGUR prototype. Currently, the need for a computerized system is unavoidable, as it can facilitate the access to necessary information (Rizki & Pasaribu, 2021). The system includes attendance recording features, including location checks, automatic leave requests and their statuses, and activity documentation that teachers can report to the school. Furthermore, there's a teacher data update mechanism with verification to ensure the accuracy of any information changes. All of these features demonstrate that the mobile app can replace manual systems with a more organized and user-friendly workflow (Widodo & Santoso, 2023).

In designing this mobile-based system, the Design Thinking methodology was applied to ensure the resulting system aligns with user needs. This approach also helped create a more user-friendly interface, allowing teachers with varying levels of digital experience to operate it without significant difficulty .

The use of mobile technology is becoming increasingly relevant because it can support a more accurate attendance process. Time and location information are automatically recorded, making attendance data more valid and eliminating the need for re-registration by school staff. Furthermore, managing leave through the app provides clarity for teachers, as each request has a status record that can be monitored independently without having to consult with administrative staff (Alkhalifi et al., 2023).

Digitization also supports schools' efforts to manage teacher activities more effectively. Every activity can be recorded in the system and reviewed as needed for school reporting or performance evaluations. Thus, applications serve not only as recording tools but also as data sources that aid decision-making. Various studies have shown that using mobile applications designed with sound principles can provide a better understanding of administrative workflows (Ansori et al., 2023).

Based on these needs, this study developed a mobile-based Teacher Management Information System using the Design Thinking method at SDN 101827. The aim of the integrated information system is to reduce variations that occur during the system development process (Marwiyah & Ophelia, 2023). The design was carried out to produce a system that can simplify administrative processes, provide more accurate data, and provide a comfortable user experience for teachers. This system is expected to be the first step towards more efficient school administration and support the sustainable implementation of technology.

2. Research Methods

The research will use research methods to solve the problem. The methods explain the steps or processes that will be taken during the research to ensure the research runs smoothly and answers to the problem are found. Therefore, this research uses the Design Thinking method (Dani et al., 2023). This method uses analysis, practical skills, and innovative thinking to create creative solutions (Wahyudi & Muarie, 2023).

Design Thinking is a method that involves collaborating with users to find solutions. The ultimate goal is to create innovative services that meet users' needs and address their current problems.

Design Thinking generates ideas that are useful and valuable to users in the long term. There are five steps in Design Thinking : empathize, define, ideate, prototyping, and testing (Maulana et al., 2024).

There are 5 steps in Design Thinking, namely empathize, define, ideate, prototyping, testing in Figure 1.

Figure 1. Design Thinking Stages

Empathize

The initial stage in the Design Thinking process is called empathize . The goal of this stage is to understand and identify the problem being faced (Harlim & Setiyawati, 2022). At this stage, we need to delve deeper into the situation and conditions faced, including complaints, challenges, hopes, needs, behaviors, limitations, and aspirations. Empathize includes three main components: Observe , Engage , and Immerse (Alkhalifi et al., 2023).

Define

At this stage, understanding and analyzing the results of the empathize process is useful. This process begins after the problem is identified in the previous process by defining the problem (Purbaningrum & Mustika, 2023). After defining the problem well, the author proceeds to identify the main problem, which places the user as the object. The author can change the user interface design by providing solutions to the main problem after identifying the main problem.

Ideate

Ideate is the process of developing ideas and solutions based on identified problems. At this stage, designers are expected to generate innovative ideas or solutions by applying creative methods (Sakti & Paputungan, 2023).In addition, designers can also include the user's perspective or look at the problem from a different perspective.

Prototype

The prototype stage , which originates from a solution idea and is transformed into a user interface design, is the next stage (Mursyidah et al., 2019). The goal of this stage is to find the best solution for each problem that arose during the first three stages (Fariyanto & Ulum, 2021).

Test (trial)

To find out how customers think about the various final prototypes created during the previous prototyping process (Designing the SOL-MATH Application…, n.d.), testing is done If an error occurs, this process is the final stage of the life cycle.

3. Results and Discussion

The results of this study describe the design process of a mobile-based Teacher Management Information System (SIMAGUR) developed using the *Design Thinking method.* All stages were carried out to ensure that the system design truly meets the needs of teachers at SDN 101827, who previously still carried out most of the administrative processes manually. This section explains the relationship between field findings, the design process flow, and the implementation of the results in the form of a SIMAGUR prototype as shown in the *prototype* document .

Empathize

The empathy phase is crucial for understanding the real-world conditions within the school environment. Observing the teacher administration workflow revealed that the attendance process still relies on manual recording, which is prone to errors and requires additional time for administrative staff to recap. Furthermore, leave requests are still made in writing, often resulting in verification delays and difficulties in tracking records. The manual process for updating teacher data, such as personal information or email changes, also requires multiple procedures, making it prone to inaccuracies. Documentation of teacher activities is also poorly managed, even though activities such as meetings, preparing materials, and creating school agendas are part of teachers' formal responsibilities. These findings demonstrate the urgent need for a digital system that can streamline workflows and improve data consistency.

Define

The definition results indicate that the root of the problem lies in the lack of a centralized system directly accessible to teachers. The entire administrative process relies on face-to-face interactions and physical forms, resulting in longer processing times and increased potential for miscommunication. Unclear leave status, the lack of location-based attendance proof, and the lack of transparency in personal data updates are strong indicators that the existing system does not meet the primary needs of users. The problem formulation then focused on how the system could provide secure self-access, improve administrative accuracy, accelerate data processing, and provide a simple and efficient user experience.

Ideate

The ideate phase yielded various feature proposals that could address these issues. The SIMAGUR *prototype* was designed not just as an attendance application, but as a complete system encompassing teacher data management, leave requests, activity recording, and structured profile updates. The developed solution ideas emphasized ease of use, clear navigation, and data security. For example, the email change feature includes verification to prevent errors or misuse of data. The attendance feature includes location validation for more accurate attendance recording. The leave section is designed to display leave balances, application history and status, and a leave detail page that provides transparency in the process. Similarly, the teacher activities feature makes it easier for teachers to regularly document formal activities.

Prototype

Based on the prototype stage, the researchers used *Figma* as a *tool*. This tool was chosen because it is easier to use and has more extensive and comprehensive documentation. At this point, the design of the human resources information system based on existing functionality was complete, and potential application users and potential business partners were asked for their input on the design. This was done to obtain input so that the teacher information system could be designed according to the wishes of potential users.

At the *prototype* stage , all ideas are poured into an interface design that is visualized in the form of a high-resolution *(high-fidelity)* prototype .

User Flow

displays the user flow during the login and registration process on the SIMAGUR application. Users first choose whether to log in or create a new account. If they already have an account, the system will verify the login data before directing them to the main page. Conversely, for new users, the system provides a registration form that must be completed until the account is verified. After successful verification, users can log in and access all application features. This flow ensures that only users with valid identities can use the system. *The Login and Registration User Flow* feature can be seen in Figure 2.

Figure 2. *User Flow Login* and Register Features

illustrates the steps a user goes through when taking attendance. After opening the application and selecting the attendance menu, the user is asked to validate their location to ensure accurate attendance recording. Once the system confirms the user's position within the school area, they can record their attendance. The system then provides a notification confirming that attendance has been successfully recorded. This flow is designed to improve the accuracy of attendance data through the use of location technology. The Attendance *User Flow* feature can be seen in Figure 3.

Figure 3. Attendance *User Flow Feature*

shows the user's leave application process. In the leave menu, users select the option to create a new application and then fill in information such as the type of leave, date, reason, and supporting attachments. Once submitted, the system forwards the application to the administrator or school for verification. The status of the requested leave will appear in the application, allowing users to monitor whether the application has been approved, is being processed, or rejected. This process provides transparency and simplifies digital tracking of leave applications. The Leave Application *User Flow* feature can be seen in Figure 4.

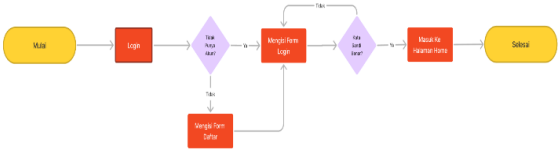


Figure 4. *User Flow* Feature for Leave Application

explains the flow of teacher activity recording. Users select the activity menu and then fill in the activity details, such as the activity name, time, date, and description. Once saved, the activity is added to the activity history and can be accessed again if needed. This process ensures that teacher activities are systematically documented and can be used as a reference in school evaluations and reporting. This activity feature can be seen in Figure 5.

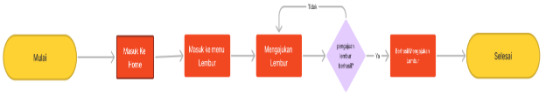


Figure 5. Activity Features

High Fidelity Prototype

a. Sign Up and Sign In Pages

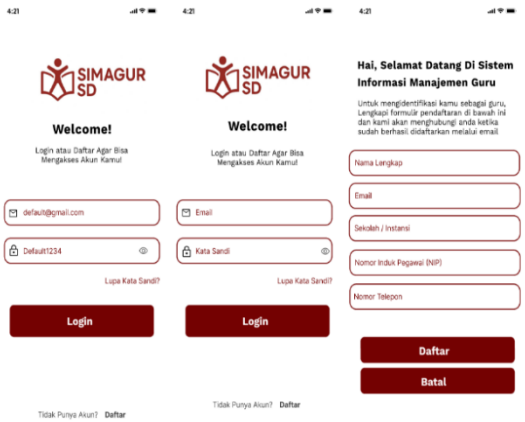


Figure 6. Login Page

The initial application display displays a login and registration page that emphasizes the importance of user identity through email, NIP, and other basic information. The login page display can be seen in Figure 6.

b. Home Page

Figure 7. Home Page

After logging in, users are directed to the homepage, which contains a summary of daily activities, such as clock-in and clock-out times, as well as quick access to three key features: Attendance, Leave, and Activities. The homepage display can be seen in Figure 7.

c. Attendance Page

Figure 8. Attendance Page

In the Attendance section, the app provides a "Record Attendance" button with location verification, requiring teachers to be present at the school when taking attendance. Upon success or failure, the app provides an informative pop-up notification . The Attendance page can be seen in Figure 8.

d. Profile Page

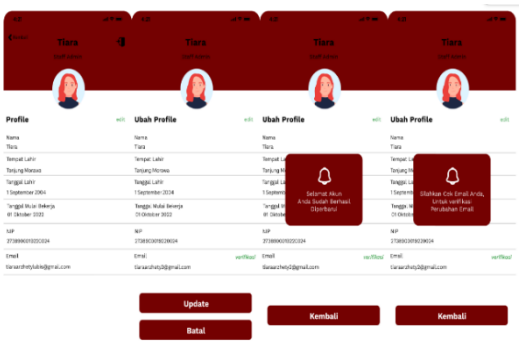
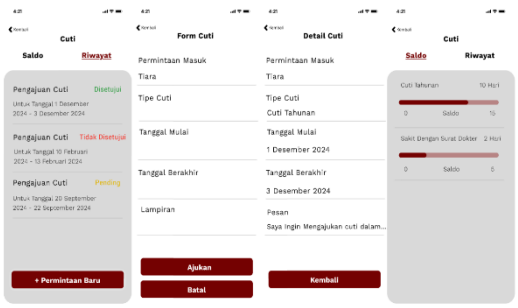


Figure 9. Profile Page

The Profile feature displays teachers' personal data and provides a profile update page with a verification button, particularly in the email change section. The presence of an "Account Updated Successfully" popup adds clarity to the user flow and demonstrates that the app's interactions have been designed responsively. The Profile page display can be seen in Figure 9.

e. Leave Page



Picture 10. Holiday Page

The Leave menu provides a view of leave balances that are automatically updated based on each request. Leave history is displayed with status labels such as "Approved," "Pending," or "Not Approved." In the leave form, teachers can upload attachments and provide additional messages explaining the request. Complete application details are displayed on a separate page, making the administrative process more transparent than manual methods. The Leave page display can be seen in Figure 10.

f. Activity Page

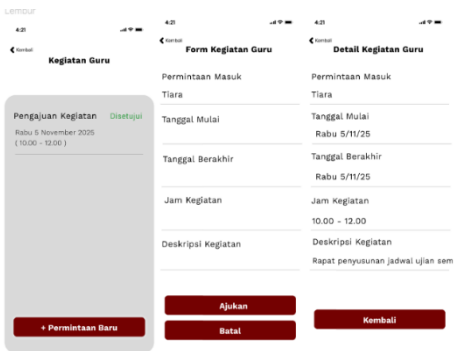


Figure 11. Activities Page

The Teacher Activities feature provides a history page with a button to submit new activities. Teachers can enter the date, time, and description of the activity, such as a meeting to schedule exams. Details of the activity can be viewed on a separate page, making it easier for schools to monitor teacher activity. The Activities page display can be seen in Figure 11.

Testing

The final stage in design thinking is testing , which uses usability testing , or user experience testing. This testing is conducted to understand the user flow and experience when using the designed application. Furthermore, usability testing can identify if users experience any issues or difficulties in operating the application.[18]The System Usability Scale (SUS) is a questionnaire used to measure the usability of a computer system, based on the subjective views of users. The SUS was developed by John Brooke in 1986. This questionnaire is used to assess user ease of use and satisfaction with a system.

After obtaining the questionnaire results from the respondents, the author performed calculations using Microsoft Excel. For each odd-numbered statement, the score was subtracted by 1 (X-1). For each even-numbered statement, the score was subtracted from 5 (5-X).

After obtaining the raw SUS score , the author performed calculations to obtain the final score by multiplying the raw SUS score by 2.5. The final calculation results are shown in the following table.

Table 1. SUS Values

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Total	Score(Total x 2.5)
4	3	3	4	3	4	4	3	4	4	36	90
4	2	3	2	4	2	4	2	4	3	30	75
3	3	4	3	4	3	3	4	3	4	34	85
4	2	3	2	2	3	3	4	2	3	28	70
3	2	4	4	3	3	4	3	3	3	32	80
Average Score (Final Result)											80

In the final stage of testing, the average score was calculated by summing all SUS scores and dividing them by the number of respondents. The average score obtained was 80.00, which falls into the “Excellent” (B) category . These results indicate that the system design has a good level of usability and is positively received by users. This can be seen in Table 1.

The main objective of this research is to design a mobile-based teacher management system that can improve administrative efficiency, provide an easy-to-use experience, and provide more transparent access to information for teachers. The SUS score of 80.00 reflects the system's success in addressing several key issues, such as slow manual administration processes, lack of clarity in leave or data update processes, and difficulty for teachers to independently access personal information. Various features such as automatic leave requests, location-based attendance recording, and profile data management displayed in the SIMAGUR prototype were the features most appreciated by users during the testing process.

The Design Thinking method played a crucial role in this success. This approach enabled a design process that consistently focused on user needs through stages of empathy, problem definition, ideation, prototyping , and testing. The iterative cycle of prototyping and refinement based on user feedback ensured that the system was not only functional but also intuitive and easy to understand for teachers of all digital abilities.

However, the implementation of Design Thinking has several limitations. The testing was conducted on a relatively small number of respondents, so the results do not fully represent the experiences of all teachers in schools or other educational contexts. Furthermore, time constraints prevented a more in-depth testing process. Further research with a larger and more diverse number of participants is needed to obtain a more comprehensive picture of SIMAGUR's effectiveness in various school situations and environments.

4. Conclusions

The design of a mobile-based Teacher Management Information System (SIMAGUR) at SDN 101827 illustrates that school administration processes can be made more organized and easily accessible if supported by the right digital system. Through the application of the Design Thinking method , each design stage is carried out by considering the real needs of teachers, so that the resulting system concept is closer to the conditions that occur in the school. The SIMAGUR design shows that activities such as recording attendance, requesting leave, updating profiles, and reporting activities can be done more quickly and coordinated.

The designed system not only assists teachers in carrying out administrative tasks but also provides schools with more consistent and easily traceable data. The design results confirm that digital transformation in teacher administration is not only feasible in elementary schools but also provides direct benefits for both teachers and school management. Thus, SIMAGUR can serve as a basis for further development towards the implementation of a system that is actually used in daily school activities.

Thank-you note

The author would like to thank SDN 101827 for providing the opportunity and support in conducting this research. Appreciation is also extended to all teachers who willingly provided information regarding administrative requirements that served as the basis for the system design process. Thanks are also extended to family, colleagues, and all parties who provided guidance, input, and motivation, enabling the successful completion of this research.

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