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DESIGNING AN ANDROID-BASED TEACHER ATTENDANCE SYSTEM TO IMPROVE THE QUALITY OF LEARNING IN VOCATIONAL HIGH SCHOOLS

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Abstrak

Pengabdian ini bertujuan untuk mengatasi masalah dalam manajemen presensi di SMK PGRI Sumber Pucung, yang saat ini masih menggunakan sistem manual, sehingga berpotensi menimbulkan kesalahan pencatatan, ketidakefisienan waktu, dan risiko kehilangan data selama proses pengarsipan. Oleh sebab itu, sebagai solusi untuk mengatasi masalah yang ada, dikembangkan suatu sistem presensi yang berbasis Android, dimana metode yang diterapkan adalah metode waterfall, dengan pelaksanakan dilakukan secara bertahap mulai dari identifikasi masalah sampai dengan evaluasi sistem. Hasil pengabdian menunjukkan sistem berhasil meningkatkan efisiensi waktu pencatatan presensi harian hingga 66,67%, dan meningkatkan akurasi pencatatan hingga 80%, sehingga sistem presensi berbasis android ini mampu mengatasi permasalahan dalam manajemen presensi manual di SMK PGRI Sumber Pucung, serta dapat diimplementasikan sebagai solusi untuk membantu proses administrasi sekolah. Pengujian sistem absensi menunjukkan kinerja efektif dan berjalan dengan baik di berbagai platform. Pada pengujian dashboard admin, pengujian pada aplikasi absensi siswa dari 3 skenario pengujian berhasil dilakukan sesuai harapan, kemudian dengan pengujian pada aplikasi absensi siswa yang terdiri dari 6 skenario juga berhasil dijalankan sesuai dengan harapan. Pengujian fungsional pada web browser dashboard admin dan pengujian fungsional pada aplikasi absensi guru yang memiliki skenario sama yaitu berjumlah 14 berhasil dilakukan sesuai dengan harapan. Pengujian pada aplikasi absensi siswa yang memiliki 4 skenario berhasil dilakukan sesuai dengan harapan.

Kata Kunci: *administrasi sekolah, manajemen absensi guru, transformasi digital, metode waterfall, sistem absensi berbasis Android.*

Abstract

This service aims to overcome problems in attendance management at SMK PGRI Sumber Pucung, which is currently still using a manual system, so it can potentially cause recording errors, time inefficiencies, and the risk of data loss during the archiving process. Therefore, as a solution to the existing problem, an Android-based attendance system was developed, where the method applied is the waterfall method, with the implementation carried out in stages starting from problem identification to system evaluation. The results of the service show that the system has succeeded in increasing the efficiency of daily attendance recording time by 66.67% and increasing the recording accuracy by up to 80%, so that this android-based attendance system can overcome problems in manual attendance management at SMK PGRI Sumber Pucung, and can be implemented as a solution to help the school administration process. Attendance system testing shows effective performance

and runs well across various platforms. In the admin dashboard test, the test on the student attendance application from 3 test scenarios was successfully carried out as expected, then the test on the student attendance application consisting of 6 scenarios was also successfully carried out according to expectations. Functional testing on the web browser, admin dashboard, and functional testing on the teacher attendance application which has the same scenario, totaling 14, was successfully carried out according to expectations. Testing on the student attendance application that has 4 scenarios was successfully carried out according to expectations.

Keywords: school administration, teacher attendance management, digital transformation, waterfall method, android-based attendance system.

INTRODUCTION

With the continuous advancement of technology, innovation in education is becoming increasingly important and must be planned in depth (Ambarwati et al., 2022). One way to improve the performance of the education system is to improve the quality of learning at the school level as a whole (Rifky et al., 2024). SMK PGRI Sumber Pucung, as an institution providing vocational education, needs to always adapt and follow technological developments. Efficient teacher and student attendance management is a support in creating a productive and organized learning environment.

The attendance process at SMK PGRI Sumber Pucung is still carried out manually, where this is at risk of errors in the attendance process, and takes a lot of time. This manual system also risks data loss during the archiving process, so it can cause problems in the school administration process. To overcome this problem, an Android-based teacher and student attendance system was developed that functions to store data digitally, improve accuracy, and provide information quickly and accurately (Taulani et al., 2022). This system is expected to be a solution and optimize the attendance process, as well as significantly improve the quality of learning (Utomo, 2023).

This system was designed as part of community service activities at SMK PGRI Sumber Pucung. The goal is to support digital transformation in school administration management, especially in recording teacher attendance (Wijaya et al., 2023). By utilizing Android-based applications, through this system, teachers can perform attendance easily, quickly, and accurately using their mobile devices (Feni, 2021). Community service activities carried out through the implementation of this technology aim to assist the school in improving administrative efficiency, reducing recording errors, and providing real-time attendance data to support evaluation and decision-making (Ananda, 2021).

The advantages of this system are that it can provide real-time attendance data, utilize mobile devices owned by teachers, and support digital transformation in the educational environment (Sari, 2021). In addition, the advantage of this system is that it is based on Android which has a user-friendly appearance and there is location detection. Through this approach, the system can simplify the process of

recording attendance, and also contribute as a driver of the digitalization process of education, especially at the secondary education level. This program is a tangible manifestation of community service oriented towards practical and sustainable solutions for educational institutions.

Although various previous studies have developed digital-based attendance systems, the majority of implementations are still focused on web-based platforms or simple mobile applications that are less flexible and do not provide an optimal user experience, especially for teachers at the vocational high school level (Ifanda et al., 2023). In addition, many of the existing systems do not have the ability to provide real-time attendance data or be integrated with additional features such as location detection and automatic notifications, which are indispensable in supporting digital transformation in the education environment (Muhajir et al., 2022). The Android-based system developed in this service fills this gap by presenting practical, efficient, and integrated solutions, which are specifically designed to support school administration needs and improve the quality of learning at SMK PGRI Sumber Pucung.

The novelty of this community service activity lies in the development and implementation of an Android-based attendance system that not only provides convenience in recording attendance, but also utilizes automation technology to improve the efficiency and accuracy of school administration. Unlike conventional attendance systems that are limited to basic functions, this system offers excellent features such as GPS-based location detection, automatic notifications, and integration with academic calendars, which are designed to meet the needs of users more comprehensively. Thus, the purpose of this service is to update the system that not only solves technical problems in recording attendance, but also makes a significant contribution to digital transformation in the world of education, especially at SMK PGRI Sumber Pucung.

MATERIALS AND METHODS

The waterfall method is one of the approaches to software development known as the Software Development Life Cycle (SDLC) (Guntoro, 2020). The development model of this method is similar to a waterfall flow, where each stage is carried out sequentially from top to bottom. (Fandy, 2023). The stages of the waterfall method, namely requirements analysis, include analyzing what needs will be developed into features and information in the application, design includes designing an interface for users, developments contain application development plans, testing as the application testing stage, and the maintenance stage as the application maintenance stage which is carried out periodically (Meilinaeka, 2023). The stages of the waterfall method will be illustrated in figure 1.

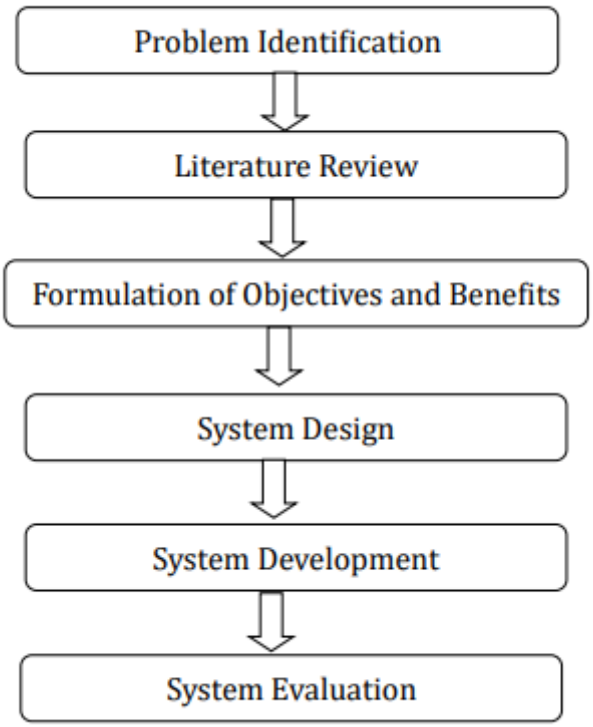

Figure 1. Waterfall Method

Community service activities, especially at SMK PGRI Sumber Pucung lasted for 8 months starting from March to September 2024. On March 12, 2024. The stage needed in solving the existing problems is to carry out Problem Identification, namely identifying problems and needs related to teacher and student attendance management at SMK PGRI Sumber Pucung. At this stage, an interview process was carried out with the principal as the leader and was carried out directly at SMK PGRI Sumber Pucung on March 12, 2024. The interview process begins by exploring the background of problems in schools related to attendance, both from the side of teachers or students. Furthermore, literature studies and research related to the implementation of Android-based attendance systems and teacher and student attendance management were carried out. Formulation of research objectives and benefits, by determining the specific objectives of the research and the expected benefits of the implementation of the Android-based teacher attendance system.

Implementation of the design of the attendance system by designing the attendance system to be implemented, including key features, application architecture, and workflow. Android Application Development by developing and implementing Android applications based on the design of the attendance system that has been designed. The process of testing and evaluating the system involves testing applications that have been developed to ensure their functionality as well as gathering feedback from users (Yonata, 2023). By following these steps, it is hoped that the Android-based teacher attendance system can be successfully

designed, developed, and implemented effectively to improve the quality of learning at SMK PGRI Sumber Pucung.

RESULTS AND DISCUSSION

This service activity began with an interview process with the principal, then ended with an activity in the form of socialization for teachers and students held on September 19, 2024.

Admin Dashboard

The admin dashboard page is designed to facilitate data management on the teacher and student attendance application. The important features contained in it are Home, Position Master, Teacher, Class, Student, Monitoring, Student Absence Recap, Monitoring, Student Absence Recap, Absence Report, and Settings. The initial dashboard image will be depicted in figure 2 and figure 3.

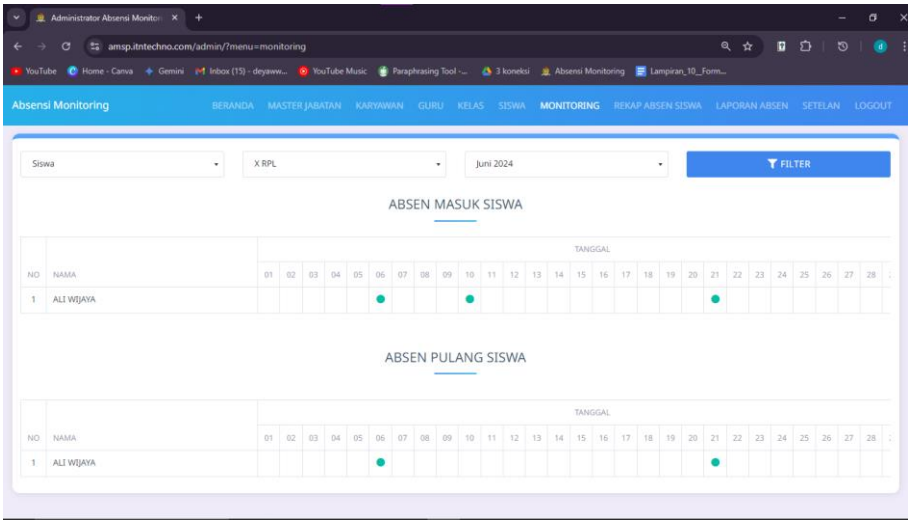

Figure 2. Student Monitoring Page Layout

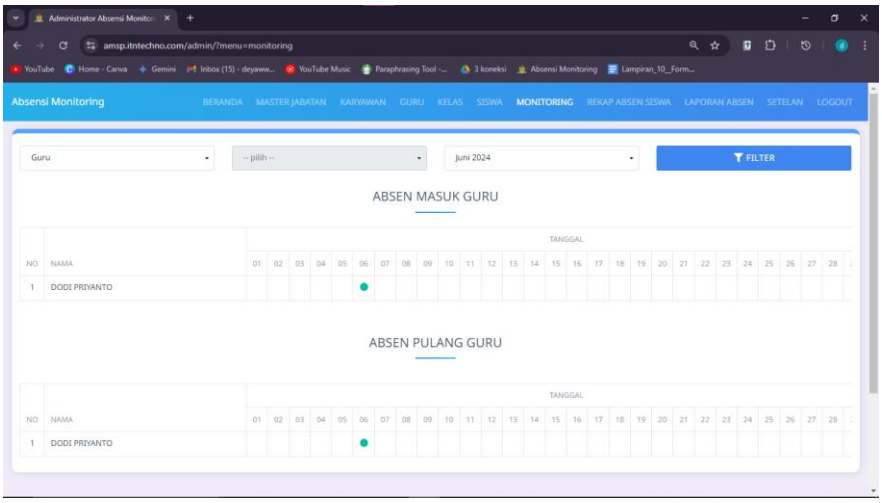

Figure 3. Teacher Monitoring Page Layout

Teacher Attendance

Teacher attendance apps make the process of attendance and student monitoring easier with key features such as attendance recording, real-time reports,

and notifications. Teachers can view student attendance status, manage attendance data, and use analytics tools to monitor attendance. The app is integrated with the academic calendar and comes with security features to protect student data. The layout of the teacher's attendance page before and after carrying out the absence is illustrated in figure 4 and figure 5.

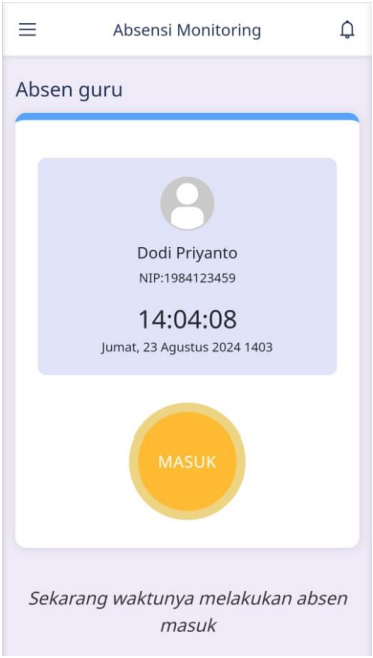

Figure 4. Page Layout Before Teacher Attendance

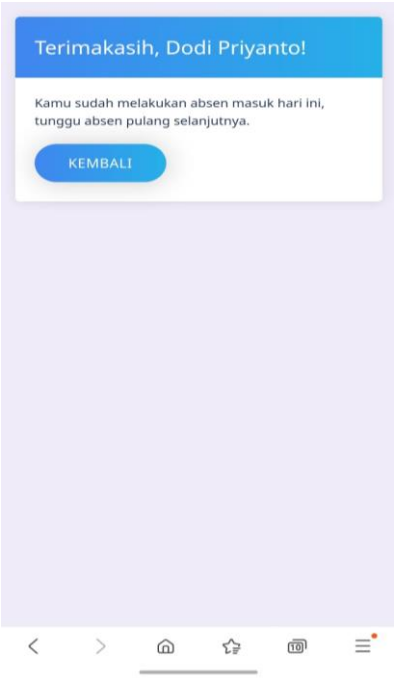

Figure 5. Page Layout After Teacher Attendance

Student Attendance

The student attendance application makes it easier for students to attend independently and provides additional features to improve ease of use. In addition

to recording attendance, the app sends reminder notifications, which are integrated with personal calendars to match attendance schedules, and provides access to attendance history and attendance reports. These features are designed to ensure students attend easily and organically. The layout of the student attendance page before and after carrying out the absence is illustrated in figure 6 and figure 7.

Figure 6. Page Layout Before Student Attendance

Figure 7. Page Layout After Student Attendance

Testing

The analysis was carried out through the results of testing the output results from the admin web browser system and the teacher and student attendance application at SMK PGRI Sumberpucung. The accuracy of the information provided

by the program is determined through the results of this analysis. The following analysis is the result of blackbox testing conducted with the ECP method.

Admin dashboard testing for teacher and student attendance demonstrates the ability to automatically adjust for illogical time input errors. When the time of absence is set incorrectly, the system automatically corrects it to match the correct order. All the settings tested worked as expected, showing that the correction feature of this system was reliable and effective, so in Table 1 3 test scenarios were carried out and the results of the feature worked as expected. Admin dashboard testing is described in table 1.

Table 1. Admin Dashboard Testing for Teachers and Students Attendance

No	Test Scenarios	Test Case	Expected Results	Test Results
1	Set the time for the login absence to end earlier than the time the login absence starts	Entry start time : 07.00 Absence time ends : 06.55	The system will automatically adjust to the start of the login absence time	As expected
2	Set the time for the departure to end earlier than the time the departure time begins	Entry start time : 15.00 Absence time ends : 14.55	The system will automatically adjust to the time of departure from home	As expected
3	Set the time of absence to go home earlier than the time of absence to enter	Arrival time : 07.00-07.05 Absence time : 07.04-07.11	The system will automatically adjust to the time the login absence ends	As expected

Next, a test of the teacher attendance application was carried out. The attendance system teacher attendance application test shows that the system automatically corrects illogical timing and prevents attendance outside of the specified time. The system also denies attendance if access to the camera or GPS is not allowed. All tests ran as expected, showing an effective correction and validation mechanism, so that in Table 2 6 test scenarios were carried out and the results of the feature function as expected. The following testing of the teacher attendance application will be explained in table 2.

Table 2. Teacher Attendance Application Testing

No	Test Scenarios	Test Case	Expected Results	Test Results
1	Set the incoming absence time to end earlier than the entry absence time begins for the student	Entry start time : 07.00 Absence time ends : 06.55	The system will automatically adjust to the start of the login absence time	As expected
2	Set the time for the departure to end earlier than the time the departure time begins for the student	Entry start time : 15.00 Absence time ends : 14.55	The system will automatically adjust to the time of departure from home	As expected
3	Setting the time of absence to go home earlier than the time of absence for students	Arrival time : 07.00-07.05 Absence time : 07.04-07.11	The system will automatically adjust to the time the login absence ends	As expected
4	When going to attend outside the predetermined attendance time	Teachers press the attendance button outside of attendance time	The system will not respond and the button is not accessible	As expected
5	When doing attendance the app is not allowed to access the camera	Teachers deny camera access while attending	The system cannot detect the camera and automatic attendance cannot be done	As expected
6	When doing attendance the application is not allowed to access the location	The teacher does not turn on the GPS feature on the mobile phone	The system cannot detect the location and automatic attendance cannot be done	As expected

Subsequent testing for student attendance applications. Testing the student's attendance application that the system does not allow attendance to be done outside of the specified time as well as denying attendance if access to the camera or GPS is not allowed. All test scenarios went as expected, showing that the system has an effective mechanism to ensure that attendance is only carried out under appropriate conditions, so that in Table 3 3 test scenarios are carried out and the results of the feature function are obtained as expected. The following testing of the student attendance application will be explained in table 3.

Table 3. Student Attendance Application Testing

No	Test Scenarios	Test Case	Expected Results	Test Results
1	When going to attend outside the predetermined attendance time	Students press the absence button outside of attendance time	The system will not respond and the button is not accessible	As expected
2	When doing attendance the app is not allowed to access the camera	Students deny access to cameras while attending	The system cannot detect the camera and automatic attendance cannot be done	As expected
3	When doing attendance the application is not allowed to access the location	Students do not turn on the GPS feature on their phones	The system cannot detect the location and automatic attendance cannot be done	As expected

Based on tests conducted through Table 1, Table 2, and Table 3, the application was thoroughly tested by three main user groups, namely Admins, Teachers, and Students. The test results show that all the features in the app can function properly and meet the expectations of users. Admins can manage attendance data, add, edit, or delete necessary data, and generate detailed and real-time attendance reports. Teachers can also perform attendance quickly and accurately through their mobile devices without technical constraints, so that the time efficiency in the attendance process increases. Students can also see their attendance recordings clearly and transparently, thus motivating their attendance in class. The overall results of this test show that the designed application is able to provide an effective solution in supporting the attendance recapitulation process in the school environment, as well as improving the efficiency and quality of attendance data management.

Through this community service activity, it can be shown that the use of an Android-based attendance system will have a positive impact on the management of teacher attendance in schools, especially in vocational schools. This discussion examines aspects related to the design and implementation of this attendance system, as well as its impact on the quality of learning, namely:

First, practical, effective and transparent. The use of Android technology in the attendance system facilitates the attendance process, which was previously done manually, took longer, then with an Android-based system, attendance can be done faster and teacher attendance data is stored well in an integrated database. In addition, this system can also reduce the risk of data recording errors that often occur in manual systems. Every attendance in this system is recorded automatically and transparently, without any data manipulation.

Second, ease of monitoring and evaluation. Systematic attendance reports will make it easier for schools to monitor teacher attendance, thus facilitating the process of performance evaluation and subsequent policy planning. Third, improving the quality of learning. Increasing discipline and administrative efficiency of teacher attendance has a relationship with the quality of learning. Teachers who attend on time can focus more on preparing materials and carrying out learning, so that they can improve the quality of teaching at vocational schools.

The technology used to support the development of a attendance system is not only Android-based (Hermanto et al., 2019). In the process, this activity is based on previous community service that was carried out first, such as a mobile-based attendance system for teachers that can be monitored by students' parents, where parents can monitor their children's attendance according to a certain time span (Latuconsina et al., 2022). A web-based attendance system for teachers and education personnel, where attendance is carried out through a web platform and can be accessed using a computer device or mobile device through a browser (Hendrawan et al., 2020).

The implementation of the Android-based attendance system at SMK PGRI Sumber Pucung is based on the principles of digital transformation in the world of education. As stated by Oktaviani et al., (2023), digital transformation not only includes the integration of technology, but also serves to improve the efficiency, accuracy, and quality of educational services. In this context, the development of an Android-based attendance system using the waterfall method has become a relevant solution to overcome the constraints of attendance management in schools (Hidayah & Saifudin, 2023).

According to Wahid, (2020), the waterfall method is ideal for use in system development because of its systematic and structured approach, from needs identification to testing and evaluation. This process ensures that each stage runs smoothly and results in a functional system. In this service, the waterfall approach is applied to ensure that the attendance system not only meets the needs of users, but can also be implemented efficiently.

Efficiency and Accuracy of Attendance This Android-based attendance system has succeeded in increasing the efficiency of daily attendance recording by up to 66.67% and increasing recording accuracy by up to 80%. This is in line with the findings of Febriandirza, (2020), which shows that the digitization of administrative processes is able to speed up work and reduce errors due to human factors. With features such as GPS-based location detection and automatic notifications, the system provides a significant added value over manual attendance systems. As revealed by Husain et al., (2017), the main advantage of Android-based technology is its flexibility in utilizing mobile devices owned by users, making it easier to access and apply.

Contribution to Digital Transformation Furthermore, this service not only solves administrative problems, but also supports digital transformation in the educational environment as outlined by (Amelia, 2020). By providing real-time attendance reports and integrated with evaluation features, the system allows schools to transparently monitor attendance and make data-driven decisions. This transformation is important in creating a more organized learning environment, as stated by (Havivah & Fajaruddin, 2022), who emphasizes the importance of technology-based management in improving the quality of education.

Implications on Learning Quality The implementation of an Android-based attendance system also has a direct impact on improving discipline and learning quality. As conveyed by Mulyani, (2020) the timely presence of teachers provides more space for mature learning preparation, thereby increasing the effectiveness of teaching in the classroom. With an accurate and efficient system, time previously wasted on manual note-taking can be allocated to more productive learning activities.

CONCLUSIONS AND SUGGESTIONS

The development and implementation of an Android-based attendance system at SMK PGRI Sumber Pucung has succeeded in providing solutions to the problems faced in manual attendance management. This system is able to increase the efficiency of daily attendance recording by up to 66.67% and accuracy by up to 80%. With excellent features such as GPS-based location detection, automatic notifications, and integration with academic calendars, the system supports digital transformation in school administration management. Furthermore, the implementation of this system has a positive impact on improving teacher discipline and learning quality, creating a more effective, organized, and technology-based learning environment.

For further development, it is necessary to adjust the system so that it can be applied in other schools with various different needs, such as adding features to support student attendance more comprehensively. Intensive training for users, both teachers and administrative staff, also needs to be carried out to ensure maximum utilization of the system. In addition, this system can be continuously updated according to technological developments, for example with the integration of artificial intelligence (AI) for attendance pattern analysis, so that it can provide deeper insights to schools in decision-making. Periodic evaluations of the system's performance are also recommended to ensure the sustainability of its benefits in supporting digital transformation in the world of education.

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