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Development of a Teacher Administrative Information System Digitally-Based Inside the Classroom

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Keywords

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Abstract

The development of information technology encourages educational institutions to undergo digital transformation in administrative management, including student attendance recording. MA Syamsul Jinan is still using a manual attendance system that causes various problems, such as low efficiency, a high potential for recording errors, difficulties in data storage, and the risk of attendance data manipulation. This study aims to develop a web-based digital attendance system as part of a classroom administrative information system to improve the efficiency, accuracy, and transparency of managing student attendance data. The research method used is Research and Development (R&D) with the Waterfall development model which includes requirements analysis, design, implementation, testing, and maintenance. Data were collected through observation, questionnaires, and documentation. System quality evaluation refers to the ISO/IEC 25010 standard with a focus on six aspects, namely functionality suitability, usability, reliability, user satisfaction, maintainability, and portability. The results show that all system features function well, with a usability level of 87.6% which falls into the very good category. The system has reliability, ease of maintenance, and can run optimally on various devices and browsers. Thus, the web-based digital attendance system is declared feasible to implement and capable of improving the quality of educational administration at MA Syamsul Jinan.

1. Introduction

The rapid advancement of information technology has brought about major changes in various aspects of life, including the education sector. This development allows tasks that were previously done manually and consumed a lot of time and effort to now be completed more quickly, efficiently, and accurately. This phenomenon of digital transformation encourages educational institutions to adapt and optimally utilize information technology so they can improve the quality of administrative services and the learning process, while remaining competitive in an increasingly dynamic and competitive digital era. The use of web-based information systems in the educational environment has been proven to improve the effectiveness of data management and the delivery of integrated information.

In the context of education, classroom administration is one important aspect that supports the smoothness of the teaching and learning process. That administration includes various activities, such as recording student attendance, managing academic data, and reporting related to classroom learning activities [1], [2]. One component of administration that plays a crucial role is recording student attendance. Student attendance is an important indicator in assessing student discipline, participation, and engagement in the learning process, and it is also one aspect of school performance assessment by the government, particularly in the accreditation process[3], [4].

However, in many educational units, attendance recording is still done manually using paper or handwriting. Manual attendance systems have various weaknesses, among them requiring large storage space, being prone to damage and data loss, and requiring considerable time in the process of searching and recapitulating student attendance data. In addition, manual recording also has a relatively high error rate and is potentially subject to data manipulation, which can affect the accuracy and integrity of student attendance information[5], [6], [7].

The use of information technology in the form of digital attendance systems is a relevant solution to address these problems. Digital-based attendance systems can present attendance data accurately, store it well, and make it accessible in real time. Electronic data-based attendance recording not only increases the efficiency of teachers and administrative staff, but also supports the functions of supervision, evaluation, and school reporting continuously[8], [9]. According to, attendance is an important part of the reporting system within an organization, so good attendance data management will make it easier for relevant parties to access and utilize that information as needed.

MA Syamsul Jinan, located in Sumberejo Village, Besuki District, Situbondo Regency, East Java Province, is one educational institution that to date still implements a manual attendance system. The use of handwritten methods in recording student attendance causes various obstacles, such as data that is easily lost, time-consuming recapitulation processes, and a high potential for recording errors[10], [11]. This condition impacts low work efficiency and has the potential to reduce the quality and integrity of student attendance data, even opening up opportunities for data manipulation by certain parties. The absence of a digital attendance data storage system also makes it difficult for school operators to trace attendance data when needed[7], [12].

Several previous studies have shown that the implementation of digital attendance systems has a positive impact on the effectiveness and accuracy of attendance recording. Research conducted by concluded that digital attendance can increase recording accuracy, reduce the possibility of fraud, speed up the recapitulation process, and provide real-time access to attendance data[13], [14]. Other research by also showed that application-based integrated attendance systems can address the problems of manual attendance while increasing information transparency to relevant parties [15], [16]. This is in line with research by which asserts that web-based information systems can integrate data management processes effectively and support decision-making in the educational environment. However, a critical gap remains in the existing literature: most prior systems were developed as standalone attendance tools focused solely on recording student presence, without integration into a broader classroom administrative framework. Additionally, many of these systems lack supporting features such as automated parental notifications, exportable digital reports, and multi-device portability. From a quality assurance standpoint, most previous studies evaluated their systems using only limited dimensions, without applying a comprehensive and internationally recognized standard such as ISO/IEC 25010.

The development of classroom administrative information systems based on websites offers various advantages, such as ease of accessing data anytime and anywhere, improved recording accuracy, and efficiency in data processing and reporting. Website-based systems also allow attendance data to be exported into digital formats such as PDF and Microsoft Excel, thereby facilitating documentation, printing, and systematic report preparation. With the support of this technology, teachers and administrative staff can speed up the attendance and reporting processes without having to perform repetitive manual recording.

Addressing these gaps, this study develops a web-based Teacher Administrative Information System at MA Syamsul Jinan that goes beyond simple attendance recording. The novelty of this research lies in three key contributions that distinguish it from prior works. First, the system is developed as an integrated classroom administrative platform that consolidates attendance recording, digital report generation, and automated WhatsApp notifications to parents into a single unified system, offering a more comprehensive solution than existing standalone tools. Second, the system undergoes a rigorous and multi-dimensional quality evaluation based on six aspects of the ISO/IEC 25010 standard — namely functionality suitability, usability, reliability, user satisfaction, maintainability, and portability — providing a more systematic and standardized quality assessment than most comparable studies. Third, the system is designed for high portability, verified to operate seamlessly across multiple devices, operating systems, and browsers, thereby overcoming a common limitation of context-specific systems reported in the literature. This study is expected to improve the efficiency, accuracy, and transparency of managing student attendance data, as well as serve as a replicable and standards-compliant model for digital classroom administration that can benefit other educational institutions facing similar challenges[17], [18].

2. Research Method

The type of research used in this study is Research and Development (R&D). The R&D method is a series of research activities aimed at producing new products or refining existing products through a systematic process so that the results can be practically utilized in a specific context [19]. In the context of scientific research in the field of education, R&D plays an important role as an approach that can connect basic research with applied applications for the development of more effective and valid educational products. This approach enables the acceleration of innovation in the development of technologies, products, and services that are beneficial to the wider educational community. R&D was selected over other research approaches — such as pure experimental research or descriptive survey — because this study does not merely seek to describe or test existing phenomena, but rather to produce a tangible functional product, namely a web-based classroom administrative information system. Unlike experimental designs that focus on controlling variables to measure causal effects, R&D allows the researcher to iteratively design, develop, and validate a system artifact in its real educational context. This makes R&D the most appropriate methodology when the primary goal is the creation of a practically usable product that addresses a specific, contextualized problem[19].

In the field of education, R&D has a strategic role in presenting innovative solutions to improve the quality of learning and address educational problems faced contextually. In this study, the development carried out includes the addition of location recording features and attendance recap on a web-based student attendance system implemented at MA Syamsul Jinan, Sumberejo Village, Besuki District, Situbondo Regency. The research was conducted from November to December 2025 at MA Syamsul Jinan.

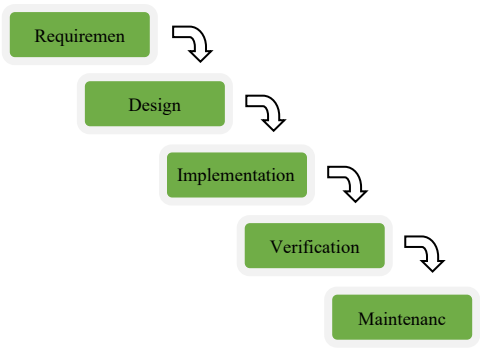

Figure 1. Waterfall Development Model

The system development model used is the Waterfall method. The Waterfall method is a linear and systematic software development approach, where each development stage — including requirements analysis, system design, implementation, testing, and maintenance — must be completed sequentially before proceeding to the next stage[20]. The Waterfall model was chosen over iterative or agile alternatives, such as Scrum or Rapid Application Development (RAD), for several specific reasons. First, the system requirements for this study had been clearly and completely identified at the outset through preliminary observation and analysis of the existing manual attendance process at MA Syamsul Jinan, making the iterative re-scoping characteristic of agile methods unnecessary. Second, the Waterfall model's strict sequential structure ensures that each phase — from requirements analysis through to maintenance — is fully documented and verified before proceeding, which is particularly important in an educational context where system handover to non-technical school operators requires clear and traceable development documentation. Third, given the relatively well-defined scope of the system and the constrained research timeline of two months (November to December 2025), the Waterfall model offers a more predictable and manageable development process compared to iterative models that rely on multiple sprint cycles. These characteristics make the Waterfall model the most suitable choice for the structured, single-cycle development carried out in this study[20].

The data collection techniques used in this study include observation, questionnaires, and documentation. Observations were conducted directly to assess the feasibility of implementing a website-based attendance system, which encompassed aspects of site selection, equipment readiness, user training, and system performance evaluation. Questionnaires were used to obtain structured data from students regarding their experience and ease of use of the system. Documentation was used as supporting data to complement the results of observations and interviews, so that the research could be compiled more comprehensively.

Research instruments are tools used to collect data in accordance with the research objectives. In this study, the instruments used included interview techniques, with data validity testing carried out through expert agreement based on five assessment criteria.

Table 1. Instrument Assessment Criteria by Validators

Score	Description
1	Not Relevant
2	Less Relevant
3	Fair
4	Relevant
5	Very Relevant

System feasibility testing was carried out using indicators referring to the ISO/IEC 25010 standard as a reference for assessing software quality. The ISO/IEC 25010 standard includes eight main characteristics, namely functionality suitability, usability, performance efficiency, compatibility, reliability, security, maintainability, and portability. However, in this study the system evaluation focused only on six aspects, namely functionality suitability, usability, reliability, user satisfaction, maintainability, and portability. The selection of these six aspects was based on their direct relevance to the system's primary users — teachers and school operators — and the operational context of a school-based web system. Aspects such as security and performance efficiency, while important, were considered beyond the current scope given the limited scale of deployment and the single-institution context; these are recommended as areas for further evaluation in future research.

3. Result and Discussions

The research results show that the web-based digital attendance system developed for MA Syamsul Jinan successfully addressed the student attendance administration problems that were previously done manually. Based on functionality suitability testing, all system features worked according to user requirements. Evaluation by two system expert validators confirmed that the 15 main functions of the system operated smoothly without issues, so it can be concluded that the system has a very high level of functional suitability.

This confirms that the needs analysis and system design were carried out appropriately and in accordance with the classroom administration conditions at the school.

In addition to functionality, the usability aspect showed a high level of user acceptance. The system was tested by 20 respondents, consisting of school operators and students, with a satisfaction rate of 87.6%. These findings indicate that the system is easy to understand, operate, and has a user-friendly interface. This ease of use supports successful implementation because a complex system can reduce users' interest and consistency in utilizing the technology.

The reliability aspect was also proven strong. Testing using Lighthouse showed a performance score of 80%, accessibility 90%, and best practices 96%, indicating the system is responsive, easily accessible, and compliant with web development standards. This reliability is important because attendance is a daily routine activity that requires system stability. The evaluation results encouraged the development of additional features, including manual attendance, report printing, and automatic notifications to parents via WhatsApp when students are absent. These features increase system flexibility, strengthen attendance supervision, and facilitate communication between the school and parents, supporting student discipline and responsibility. In terms of maintainability, the system demonstrated ease of maintenance and development. Clear error messages make it easier to identify and fix issues, while a modular code structure using an Object-Oriented Programming (OOP) approach makes it easier for developers to understand and add features in the future. The system's portability aspect was also very good. The system can run optimally on various devices, operating systems, and browsers without errors, demonstrating high flexibility and accessibility that support administrative effectiveness.

Overall, the web-based digital attendance system is feasible to implement at MA Syamsul Jinan. The system improves the work efficiency of teachers and operators, speeds up recapitulation, and increases the accuracy and security of attendance data. Thus, the system not only resolves manual attendance problems but also supports digital transformation and improves the quality of educational services at the school.

As a follow-up to reinforce the conclusions obtained, this study carried out a series of comprehensive software quality tests. The testing aimed to ensure that the developed web-based digital attendance system met the eligibility criteria and quality standards of information systems. The evaluation was carried out on various main aspects, including functionality suitability, usability, reliability, user satisfaction with system functionality, maintainability, the system's ability to run in various environments (portability), as well as the stages of system implementation and evaluation. The results of all these tests are presented and discussed systematically in the following section.

3.1. Functionality Suitability Testing

The feasibility of the developed attendance system was evaluated through functional testing involving 15 test scenarios designed to assess various main components of the system. The evaluation process was carried out by two system experts separately to ensure that each feature functioned and was implemented according to the specified technical specifications. The evaluation results were then documented in a test checklist by marking the columns that indicate features that worked well and features that still required improvement.

Table 2. Results of Functionality Suitability Testing

No	Validator	Total Number of Functions	Number of Successfully Functioning
1	Zainuddin, M.Pd	15	15
2	Supriyatin, S.Kom	15	15

Based on Table 2 which contains the assessment results of functionality and suitability aspects, both validators stated that all 15 features in the research instrument functioned well. Thus, based on the evaluation results conducted, it can be concluded that the developed system has a very high level of relevance to user needs and is declared feasible for implementation.

3.2. Usability Testing

This test aims to obtain user feedback on the performance of the developed attendance system. The testing process involved school operators as system administrators and students of MA. Syamsul Jinan, with a total of 20 respondents. All respondents participated in the system testing. The testing instrument consisted of 15 statements, where each statement was given a maximum score of 5, resulting in a total maximum score of 75.

Table 3. Usability Assessment Results

No Respondent Assessment Score	No Respondent Assessment Score
1	66
2	69
3	62
4	68
5	65
6	67
7	64
8	64
9	65
10	67
11	66
12	68
13	64
14	65
15	65
16	65
17	67
18	64
19	66
20	67
Total	1314

$$\text{Percentage} = \frac{Total\ Score}{Maximum\ Scorel} \times 100\%$$

$$\text{Percentage} = \frac{1314}{75} \times 100\%$$

$$\text{Percentage} = 87{,}6\%$$

3.3 Reliability Testing

Reliability aspects were tested using Lighthouse on Google Chrome for 10 minutes. The test results show that the website has a good level of responsiveness with a performance score of 80%, a high level of accessibility

with an accessibility score of 90%, and has met web development best practice standards with a best practices score of 96%. These achievements indicate that the developed website has a very good level of reliability and quality.

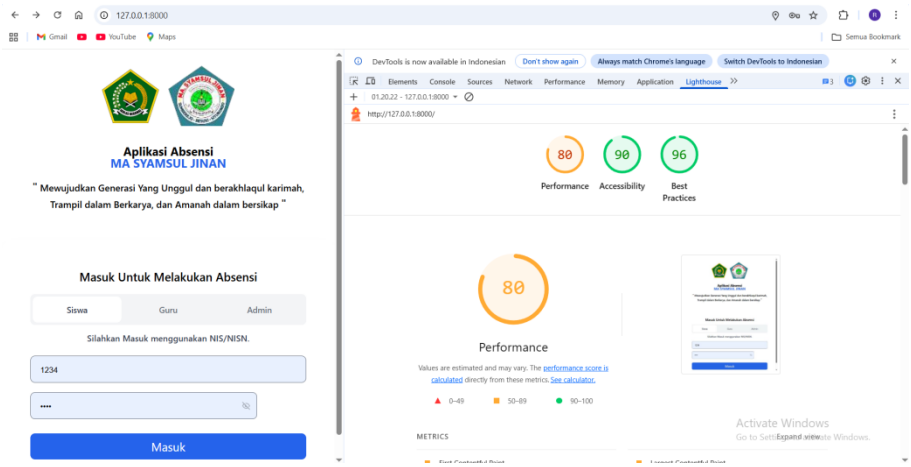

Figure 2. Testing Using Lighthouse

3.4 User Satisfaction Functionality Testing

After evaluating the reliability aspect to assess the extent to which the website-based attendance system meets user needs, the researcher followed up on the feedback obtained by adding several supporting features. These features include manual attendance, printing student attendance reports, and sending automatic messages to students' parents via WhatsApp if a student does not mark attendance. The addition of these features aims to increase the system's flexibility while strengthening the usability and reliability of the developed attendance system.

3.5 Maintainability Testing

Maintainability testing was conducted to assess the ease of system maintenance, repair, and future development. Maintainability evaluation generally covers the system's ability to handle errors (correct fault), consistency of appearance and code structure (consistency), and simplicity of system design and implementation (simplicity) as primary indicators of software quality[17]. In the correct fault aspect, the website-based attendance system is able to display clear and specific error messages when input errors occur, facilitating the identification and correction of errors by developers. This capability aligns with research stating that informative error handling positively contributes to software maintainability.

Next, in the consistency aspect, the system applies a uniform interface style and consistent coding conventions across all system modules. This consistency makes it easier for developers to understand the system structure and perform long-term maintenance, as emphasized in research which states that design and code consistency are important factors in improving maintainability [17], [20]. In the simplicity aspect, the system was developed using an Object-Oriented Programming (OOP) approach that results in a modular and easy-to-understand code structure. This approach has been shown to increase system flexibility and simplify the process of changing and developing features in the future [15].Based on test results for these three aspects, it can be concluded that the website-based attendance system has a good level of maintainability and supports the sustainability of system maintenance and future development.

3.6 Portability Testing

Testing was carried out by operating the system on various computer hardware configurations. The purpose of this testing is to evaluate the software's performance level, which is detailed as follows.

Table 4. Portability Test Results

No	Browser	Device	Operating System	Result
1	Google Chrome	Desktop	Windows 11	No Errors Found
2	Microsoft Edge	Desktop	Windows 11	No Errors Found
3	Safari	Desktop	Mac OS	No Errors Found
4	Google Chrome	Mobile	Android	No Errors Found
5	Safari	Mobile	iOS	No Errors Found

3.7 System Implementation and Evaluation

After completing all development stages up to the feasibility testing process, the web-based attendance system is declared to have met the standards for implementation at MA. Syamsul Jinan. Next, an evaluation is carried out at the system implementation stage. The following documentation presents the implementation and maintenance process of the web-based attendance system at MA. Syamsul Jinan.

Figure 3. System Implementation and Evaluation

4. Conclusions and Future Works

This research focuses on the development and implementation of a website-based digital attendance system as part of the class administrative information system at MA Syamsul Jinan, Sumberejo Village, Besuki District, Situbondo Regency. The background of the research is based on the problem of student attendance recording which is still done manually, causing various obstacles such as low work efficiency, high potential for recording errors, difficulties in data storage and retrieval, as well as opportunities for manipulation of student attendance data. Through a Research and Development (R&D) approach using the Waterfall development model, this study successfully produced a digital attendance system that was designed systematically and in accordance with user needs within the school environment.

Based on testing and evaluation results referring to ISO/IEC 25010 standards, the developed website-based attendance system showed very good quality in six main aspects tested, namely functionality suitability, usability, reliability, user satisfaction, maintainability, and portability. In the aspect of functionality suitability, all system features were declared to function well and meet the needs of student attendance administration. This indicates that the requirement analysis, system design, and implementation processes were carried out correctly and were able to address the problems faced by the school.

In the aspect of usability, the system obtained a user satisfaction level of 87.6% categorized as very good. These results show that the system has an interface that is easy to understand, a clear usage flow, and can be operated easily by school operators as well as students. The high level of usability is an important factor in the success of system implementation, because an information system that is easy to use will increase user acceptance and minimize barriers to the adoption of new technology in the school environment. The reliability aspect also showed very satisfactory results. Testing using Lighthouse produced a performance score of 80%, accessibility 90%, and best practices 96%. These achievements indicate that the system has good responsiveness, is easily accessible to users, and has met best practice standards in web development. The reliability of this system is very important given that attendance is a routine activity performed daily, so the system must be able to operate stably and consistently over a long period.

In addition, evaluation of user satisfaction prompted the development of additional features, such as manual attendance, printing attendance reports, and automatic notifications to parents via WhatsApp. The addition of these features further strengthens the system's function as a flexible, adaptive, and responsive administrative tool to user needs. The notification feature to parents also has positive implications for improving monitoring of student attendance and strengthening communication between the school and parents.

From the maintainability side, the website-based attendance system shows ease in maintenance and development processes. The system is able to display informative error messages For future developers and researchers, it is recommended to further develop this attendance system by adding other supporting features, such as integration with the school's academic and financial systems, presentation of attendance data in the form of graphs and analytics, and strengthening data security aspects to protect students' personal information. Further research can also include testing other ISO/IEC 25010 aspects that have not been discussed in depth, such as security and performance efficiency, so that the system quality evaluation becomes more comprehensive. With such development and further research, it is hoped that this web-based digital attendance system will not only benefit MA Syamsul Jinan, but can also serve as a reference and model for implementing digital administration systems in other educational institutions.

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