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Development of a Web-Based Educational Management System for a Technology Vocational High School in Banda Aceh, Indonesia

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Abstract

This study explores developing and implementing a web-based Management Information System (MIS) tailored for SMK Negeri 2 Banda Aceh, a vocational school in Indonesia. To enhance administrative efficiency and address unique challenges in vocational education, the system centralizes tasks such as attendance tracking, academic record management, and internship coordination. Employing the waterfall model, this project proceeded through structured phases, including requirements analysis, system design, development, and usability testing. A sample of 50 users, comprising students, teachers, and school operators, evaluated the system based on usability, interface design, and information clarity through a questionnaire, yielding high satisfaction scores. Reliability testing and correlation analysis revealed strong internal consistency across questionnaire items and identified critical factors influencing user satisfaction, such as interface appeal and effective error resolution. The results indicate that the system meets core user needs and contributes to a streamlined, user-friendly school management process. With implementation planning, user training, and ongoing maintenance, this MIS offers a sustainable solution that can serve as a model for vocational schools across Indonesia, showcasing the potential of digital solutions in advancing educational administration and supporting career readiness in vocational education.

1. Introduction

Digital technology has significantly reshaped the field of education, extending beyond classrooms to influence the way schools manage and organize their operations [1, 2]. From simplifying administrative tasks to enhancing communication, technology enables schools to run more efficiently and address the demands of modern educational environments [3–5]. This shift is especially important for vocational schools, which require streamlined processes for general school administration and for handling specific needs related to skill-based

training and career preparation [6, 7]. By adopting digital tools, educational institutions can improve their operational efficiency, making it easier for teachers, students, and staff to focus on educational outcomes.

Globally, education systems are increasingly embracing digital transformation to enhance school management. Countries with advanced technological infrastructures have successfully implemented Management Information Systems (MIS) that have led to measurable improvements in efficiency and educational quality [8]. These international best practices offer valuable insights that can guide similar efforts in Indonesia, especially for vocational schools that must align closely with industry requirements to ensure workforce readiness.

Unfortunately, many vocational schools still rely on manual management practices [9]. In Indonesia, schools in less urbanized regions face challenges in adopting technology due to limited resources, access, and infrastructure [10]. As a result, tasks such as administrative coordination are often done by hand, leading to inefficiencies, data inaccuracies, and unnecessary workloads for teachers and administrative staff [11, 12]. Cultural and behavioral resistance to new technologies also adds to these challenges, underscoring the need for effective strategies to promote digital adoption [13]. Without modern tools, vocational schools may struggle to meet administrative demands and vocational education's unique requirements, ultimately impacting their ability to prepare students effectively for the workforce.

Integrating technology into school administration offers numerous benefits, particularly for vocational institutions. A web-based management system can centralize and simplify routine tasks, improve data accuracy, and provide easy access to information [14, 15]. For vocational schools, where managing industry partnerships, internships, and skill assessments is essential, technology can enable smoother coordination with external partners and offer real-time access to student progress [16]. Additionally, digital tools allow students, teachers, and administrators to communicate more effectively, creating an environment where everyone has the information needed to make informed decisions and support student learning and career readiness [17].

While there is extensive research on MIS implementation in general education settings, there is limited research focusing specifically on vocational schools, which have distinct administrative needs and workflows. These unique needs include managing skill-based assessments, coordinating internships, and maintaining partnerships with industry stakeholders, all of which require specialized features within a digital system. Previous studies have shown that implementing MIS in schools improves academic records management, and communication among staff, students, and teacher. However, a tailored approach is needed for vocational schools to fully leverage the potential of technology in meeting their educational and administrative demands [18, 19].

A well-designed MIS can address these challenges by providing a comprehensive, web-based platform tailored to a school's specific needs [20]. For State Vocational High School (SMKN) 2, in Banda Aceh, a city in the province of Aceh, Indonesia, this type of system can transform day-to-day operations, making them easier to manage while also supporting the specialized tasks unique to vocational education. An MIS can also help organize data securely and ensure it is accessible to authorized users, fostering a structured and efficient management system that enhances the school's educational mission.

This study aims to develop a customized MIS specifically designed for SMKN 2 Banda Aceh. It further seeks to evaluate the system's effectiveness in enhancing school management practices and assessing user satisfaction, identifying key areas for improvement. By focusing on these goals, the study aspires to create a model for other vocational schools in Indonesia, offering practical insights into how digital solutions can effectively support vocational education and contribute to the field of educational technology.

This study contributes to educational technology in several practical ways. First, it introduces a tailored approach to school management specifically for vocational schools, focusing on the unique needs of managing internships, skill assessments, and partnerships with industry. This customized solution differs from general school management systems and can be helpful for other schools that also prepare students for specific careers. Second, the study emphasizes designing the system with the end users in mind, including students, teachers, and administrators, highlighting the importance of usability, ease of access, and user satisfaction. Finally, by showing how a web-based system can improve the day-to-day operations of a vocational school, the study provides a model that other schools in Indonesia and beyond can use as a guide for applying technology to make their management processes smoother and more effective.

2. Materials and Methods

2.1. Development Framework

The waterfall model, a linear and sequential development process, was chosen due to its structured design, which allows each phase to build directly on the preceding stage [21]. This model suited the project's goals by creating a clear direction and reducing the likelihood of oversight. The structured nature of the waterfall approach facilitated precise development, ensuring that the final system would be both stable and robust for the school's administrative and educational needs.

2.2. Study Location

The study was conducted at SMK Negeri 2 Banda Aceh, a vocational high school located in Banda Aceh, Indonesia. As a prominent vocational institution, SMK Negeri 2 Banda Aceh offers a variety of skill-based programs designed to prepare students for specific industries, including automotive, electronics, hospitality, and information technology. The school serves a diverse student population from the Aceh region, many of whom rely on the institution for both academic learning and practical skill development.

The choice of SMK Negeri 2 Banda Aceh as the study location was influenced by its established vocational programs, which present unique administrative demands, such as internship coordination, industry partnership management, and specialized skill assessments. Given the school's focus on hands-on learning and career preparation, this setting provided an ideal environment for testing a digital management system aimed at streamlining both general administrative processes and the specific tasks associated with vocational education. The physical and operational context of SMK Negeri 2 Banda Aceh, particularly its infrastructure and resource availability, were essential factors considered in designing and deploying the web-based management system.

2.3. Requirements Analysis

An initial requirements analysis phase involved examining the information needs and management requirements specific to SMKN 2 Banda Aceh. This analysis identified the types of data essential to the school's operations, including student enrollment details, attendance, academic records, and specific needs for vocational education, such as managing internships, assessments, and industry partnerships. The analysis was conducted to ensure that the system would fully address the school's administrative challenges while enhancing its ability to manage specialized vocational activities [22].

2.4. System Design

With the requirements defined, the system design phase focused on developing a user-centered, web-based architecture that would align with SMKN 2 Banda Aceh's operational environment. The system design included defining a structured database to manage data securely and efficiently, alongside developing an intuitive user interface (UI) to enable ease of use for teachers, administrators, and students. Key functional features were also incorporated, all of which integrated seamlessly with the school's existing workflows [23].

2.5. System Development

During the development phase, the design prototype was transformed into a fully functional web application. The team focused on security and quick response times to allow users to access student and teacher data in real time. The programming languages used were PHP, which is popular for creating dynamic web applications, and JavaScript, which enables interactive features on web pages. CodeIgniter 4, a framework that simplifies the coding process and enhances efficiency, was employed to build the application structure.

For database management, MySQL was used as it is a reliable system for storing and retrieving data. The visual design of the user interface incorporated Metronic templates along with Tailwind CSS, combining pre-designed layouts with flexible styling to create a modern and responsive user experience. Development tools included Visual Studio Code, an editor used to write and manage code, and DBeaver and phpMyAdmin, which are tools that help developers manage the database more easily. GitHub was utilized for version control, ensuring that different team members could collaborate and keep track of changes in the code. This well-rounded development approach ensured compatibility across various devices and web browsers, enhancing accessibility and a smooth user experience [24].

2.6. Participant Selection and Sampling Strategy

A stratified purposive sampling method was employed to evaluate the system's usability and user satisfaction [25]. This method was chosen to ensure the inclusion of specific user groups, each with distinct interactions and requirements from the system. By targeting these groups, we aimed to obtain a representative understanding of the system's performance across all primary users within the school environment.

Table 1. Statements in the usability and satisfaction questionnaire are categorized by assessment area.

Group	Statement	Description
Ease of Use and Interface	S1	I am pleased with the experience of using this system.
	S2	The system is easy to use.
	S3	I can complete tasks and scenarios quickly using this system.
	S4	I feel comfortable using this system.
	S5	The system's interface is very easy to learn.
	S6	I believe I can become productive quickly using this system.
	S7	The system interface is visually appealing.
	S8	I enjoy interacting with the system interface.
	S9	The system includes all the tools I need to manage data and navigate efficiently.
	S10	I find this system meets my needs effectively.
Information and Support	S11	The system's error messages provide clear instructions to fix mistakes.
	S12	Every time I encounter an error while using the system, I can resolve it easily and quickly.
	S13	The information provided by the system is clear.
	S14	It's easy to find the information I need.
	S15	This information is effective in helping me complete tasks and scenarios.
	S16	The order of information displayed is clear.

The sample included 30 students, 10 teachers, and 10 school operators, totaling 50 respondents. As primary users, students provided insights into the system's accessibility and ease of use, particularly in areas like academic tracking and attendance monitoring. Teachers who regularly interact with the system for data entry and instructional support tasks assessed its functionality in facilitating efficient teaching-related workflows. School operators, responsible for overarching administrative management, evaluated the system's effectiveness in supporting operational processes and data management tasks. Although this sample size may appear modest, it aligns with recommendations in usability research, which suggest that small, well-defined samples can provide reliable insights into user satisfaction and usability concerns.

Participants were selected based on predetermined criteria to ensure they accurately represented the system's primary user groups. For students, inclusion criteria required active enrollment and regular engagement with academic tracking and attendance monitoring features. Teachers were selected based on their regular use of the system for data entry and instructional support, while school operators had to be involved in daily administrative management tasks to provide relevant feedback. We excluded participants who had minimal or infrequent interactions with the system to avoid skewed or unrepresentative results. This approach ensured that each group's feedback was informed by meaningful and practical experiences with the system.

2.7. Usability Testing Procedures and Environment

The assessment was conducted using a self-administered questionnaire developed in Google Forms [26] over a testing period from September 30 to October 19, 2024. During this time, respondents were asked to complete a series of specific tasks designed to simulate real-world use of the system. These tasks included accessing the system, inputting data, and navigating various features related to administrative management.

The usability testing was conducted in two distinct environments: using school computers and personal smartphones. This dual-environment approach ensured we could evaluate the system's performance across different devices commonly used by the target user groups. To ensure participants had a sufficient understanding of the system before testing, we provided them with a manual book and a video tutorial. This preparatory training aimed to mitigate any learning curve issues and allowed respondents to focus on evaluating the system's usability rather than struggling with unfamiliarity.

The structured feedback collected from the questionnaire, which consisted of 16 statements categorized into ease of use, interface design, information clarity, and system support and rated on a Likert scale, provided a comprehensive analysis of user satisfaction. This detailed feedback helped identify specific areas for improvement and optimization of the system [27]. Table 1 provides an overview of these statements, organized by assessment area.

2.8. Data Analysis

The collected data from the usability and satisfaction questionnaire were analyzed using reliability testing, descriptive statistics, and correlation analysis to ensure the robustness and interpretability of the results. To assess the internal consistency of the questionnaire, a reliability test was conducted using Cronbach's alpha [28]. This measure was chosen due to its effectiveness in evaluating the reliability of Likert-scale-based surveys.

Table 2. Reliability analysis results.

No.	Category	Number of Items	Cronbach's Alpha		Conclusion
			Estimation Value	Minimum Value	
1	Ease of Use and Interface	10	0.951	0.700	Reliable
2	Information and Support	6	0.933		Reliable

For this study, a minimum threshold of 0.700 was set for Cronbach's alpha, aligning with widely accepted standards for internal consistency in survey research [29]. A Cronbach's alpha value above this threshold indicates that the items within each category consistently measure the intended constructs, supporting the reliability of the findings. The formula for Cronbach's alpha, denoted as α, can be seen in Equation 1 [30]:

$$\alpha = \frac{N}{N-1}\left(1 - \frac{\sum_{i=1}^{N} \sigma_i^2}{\sigma_T^2}\right) \quad (1)$$

where N is the number of items, σ_i^2 is the variance of each item, and σ_T^2 is the total variance of the sum of all items. This calculation helps determine the internal consistency, or reliability, of a set of items, with an α value above 0.700 generally indicating good reliability in survey research.

Descriptive statistics were then used to summarize and describe the responses to each questionnaire item, providing an overview of central tendencies, such as mean scores, and measures of variability, such as standard deviation. This analysis helped identify general patterns within the data, highlighting areas where users expressed high satisfaction or noted challenges with the system [31]. Mean scores allowed for a straightforward interpretation of the responses, giving insight into the overall user experience and satisfaction across different user groups, while standard deviations highlighted the degree of consensus among respondents for each statement.

Finally, Pearson correlation analysis was performed to explore the relationships between different questionnaire items and to assess how various usability aspects may be interrelated [32]. Pearson's correlation coefficient was chosen to measure the linear relationships between interval-level variables, such as Likert-scale responses. This analysis revealed correlations between factors like ease of use and user satisfaction, helping to understand how improvements in one area, such as interface design, might positively impact user satisfaction and system adoption overall. The correlation findings provided insights into the most strongly connected user experience dimensions, guiding recommendations for targeted enhancements in system design and functionality. The formula for Pearson's correlation coefficient can be seen in Equation 2:

$$r = \frac{\sum_{i=1}^{n}(X_i - \bar{X})(Y_i - \bar{Y})}{\sqrt{\sum_{i=1}^{n}(X_i - \bar{X})^2}\sqrt{\sum_{i=1}^{n}(Y_i - \bar{Y})^2}} \quad (2)$$

where X_i and Y_i are the individual sample points for variables X and Y, $\bar{X}$ and $\bar{Y}$ are the means of X and Y, and n is the number of paired observations. Pearson's r measures the strength and direction of a linear relationship between two variables, with values ranging from -1 (perfect negative correlation) to +1 (perfect positive correlation).

3. Results and Discussion

3.1. Reliability Analysis

Table 2 presents the reliability analysis results for the two primary categories in the usability and satisfaction questionnaire: "Ease of Use and Interface" and "Information and Support." Each category was evaluated using Cronbach's alpha to assess the internal consistency of the questionnaire items.

The results indicate that both categories achieved Cronbach's alpha values well above the minimum threshold of 0.700, with "Ease of Use and Interface" scoring 0.951 and "Information and Support" scoring 0.933. These high alpha values suggest a strong internal consistency among the items within each category, meaning that the items consistently measure related constructs of usability and satisfaction. The "Ease of Use and Interface" category, comprising ten items, yielded the highest Cronbach's alpha, indicating a particularly cohesive set of statements that effectively captured the participants' experience with the system's interface design, functionality, and ease of navigation.

Similarly, with six items, the "Information and Support" category achieved a high Cronbach's alpha of 0.933. This result confirms that respondents reliably interpreted statements regarding information clarity, error resolution, and support resources as cohesive indicators of system support. High internal consistency in this category suggests that users found the system's information and support elements to be well-defined and easy to assess, further supporting the validity of responses gathered on system information and troubleshooting features.

Table 3. Summary statistics of the questionnaire statement.

Statement	Mean	Std Dev	Min	25%	50% (Median)	75%	Max
S1	4.52	0.614	3	4	5	5	5
S2	4.48	0.580	3	4	5	5	5
S3	4.46	0.613	3	4	5	5	5
S4	4.46	0.579	3	4	4.5	5	5
S5	4.46	0.676	3	4	5	5	5
S6	4.44	0.611	3	4	4.5	5	5
S7	4.48	0.614	3	4	5	5	5
S8	4.4	0.606	3	4	4	5	5
S9	4.4	0.606	3	4	4	5	5
S10	4.52	0.544	3	4	5	5	5
S11	4.42	0.609	3	4	4	5	5
S12	4.34	0.688	3	4	4	5	5
S13	4.46	0.579	3	4	4.5	5	5
S14	4.48	0.614	3	4	5	5	5
S15	4.46	0.613	3	4	5	5	5
S16	4.46	0.579	3	4	4.5	5	5

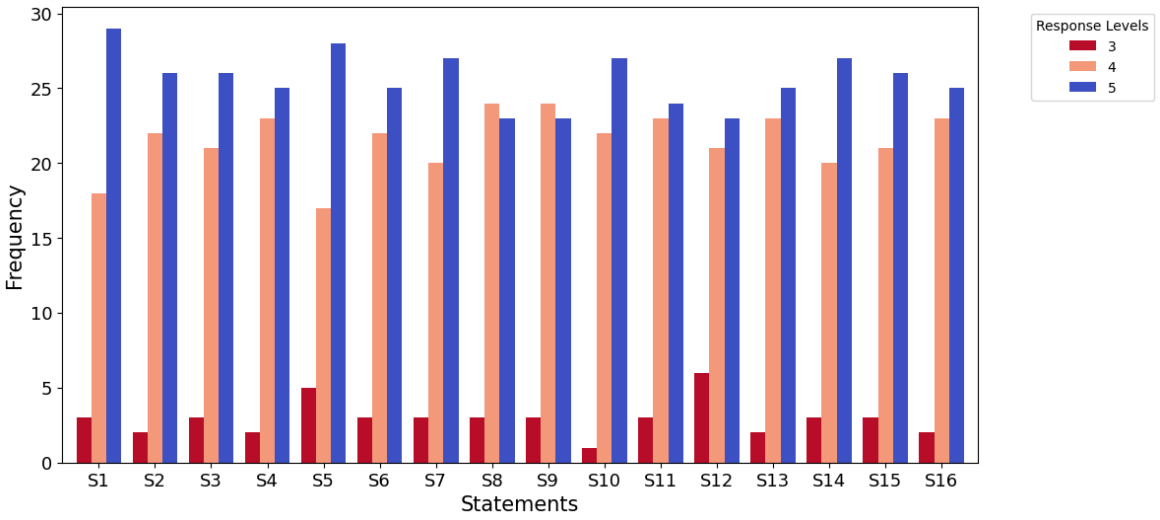

Figure 1. Distribution of user responses for each statement.

The reliability analysis thus confirms that the questionnaire items effectively captured distinct aspects of user satisfaction and system usability. The items' strong reliability provides a robust foundation for interpreting subsequent analyses on user satisfaction, ease of use, and support, which will be explored in the following sections.

3.2. Descriptive Statistics Analysis

The descriptive statistics analysis of user responses provides detailed insights into user satisfaction, ease of use, and the system's overall performance. Table 3 presents the results for each questionnaire statement in terms of mean scores, standard deviations, and quartiles, allowing us to interpret the central tendencies and variability in user perceptions of the system.

The mean scores across statements range from 4.34 to 4.52, indicating generally high user satisfaction. Statements S1 ("I am pleased with the experience of using this system") and S10 ("I find this system meets my needs effectively") achieved the highest mean scores (4.52), reflecting positive user experiences and alignment with user needs. Low standard deviations in these responses further indicate consistency in users' positive perceptions across these areas.

Ease of use was also rated favorably, as evidenced by high mean scores for statements such as S2 ("The system is easy to use") and S7 ("The system interface is visually appealing"), both with mean scores of 4.48. This suggests that users found the system's interface intuitive and visually engaging, crucial factors in ensuring usability within an educational environment.

Statements related to information clarity and support, such as S13 ("The information provided by the system is clear") and S14 ("It's easy to find the information I need"), also received high mean scores (4.46 and 4.48,

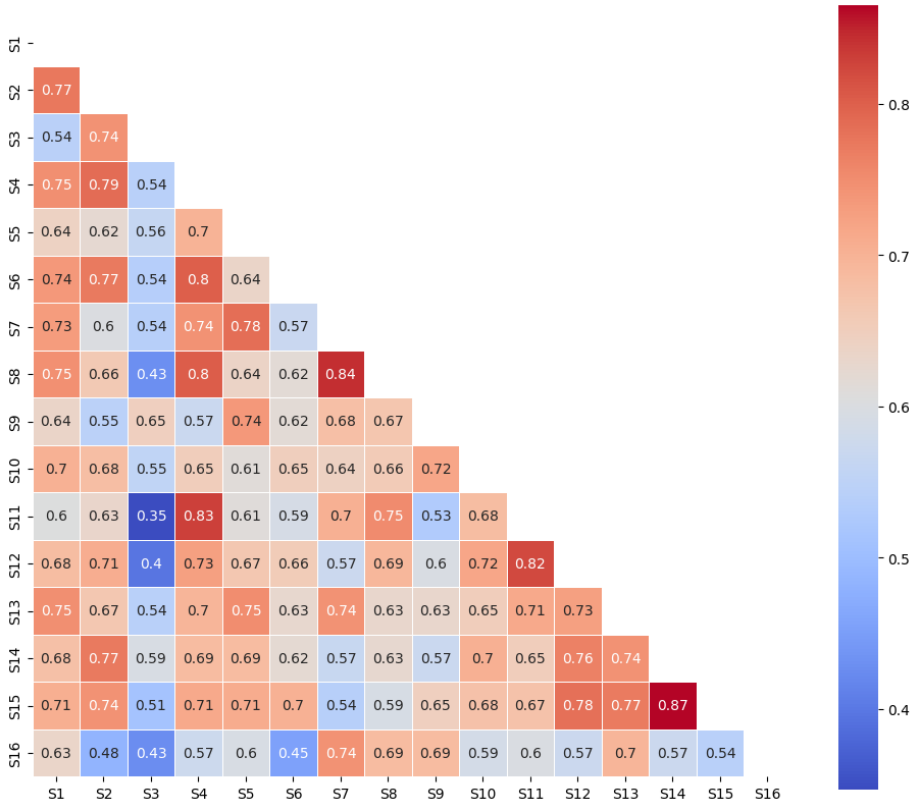

Figure 2. Correlation matrix of user responses across statements.

respectively). These results underscore the system's effective organization and presentation of information, enabling users to access and understand critical data quickly.

However, statements related to error handling, such as S12 ("Every time I encounter an error while using the system, I can resolve it easily and quickly"), received a slightly lower mean score of 4.34 and exhibited a higher standard deviation (0.68839). This suggests variability in user experiences with error resolution, indicating that while some users found errors easy to manage, others may have faced challenges.

Figure 1 visualizes the distribution of responses for each statement, showing the frequency of each response level (3, 4, and 5) across the statements. The high frequency of scores at levels 4 and 5 further illustrates the generally positive reception of the system, with most users rating their experience as favorable. Nonetheless, the occasional level 3 responses suggest areas where the system could be enhanced, particularly in supporting users who encounter technical difficulties or errors.

The overall descriptive statistics confirm high user satisfaction and consistent positive feedback across usability and support dimensions. Lower scores on certain items, such as error resolution, provide insights into potential areas for improvement to enhance the system's reliability and user experience further.

3.3. Correlation Analysis

The correlation analysis was conducted to explore the relationships between the different aspects of usability and satisfaction in the system. Pearson's correlation coefficient was calculated for each pair of statements, revealing the strength and direction of the associations between various usability factors. Figure 2 displays the correlation matrix, where higher correlation values indicate stronger relationships between paired items.

A strong correlation is evident between users' overall satisfaction, captured by the statement "I am pleased with the experience of using this system" (S1), and their perception of the system's ease of use (S2), with a Pearson correlation of 0.774. This high correlation suggests that users' general contentment with the system is closely tied to how intuitive they find it. Satisfaction with the system also correlates strongly with users' comfort while using it, as shown by the high correlation between S1 and statements like "I feel comfortable using this system" (S4) and "The system interface is visually appealing" (S7). These correlations imply that both ease of use and interface appeal are critical components of a satisfying user experience.

The visual appeal of the interface, specifically, plays an influential role in users' perceptions of its functionality and learnability. Statements about interface appeal, such as "The system's interface is very easy to learn" (S5) and "The system interface is visually appealing" (S7), show a high correlation of 0.784. This relationship suggests that a visually engaging design may enhance the perceived intuitiveness of the system, making it easier for users to learn and navigate. This finding aligns with user-centered design principles, where an appealing interface often contributes to overall usability and positively influences users' learning curve.

Error resolution also emerged as an important factor associated with user satisfaction. Statements related to users' ability to resolve errors quickly, like "Every time I encounter an error while using the system, I can resolve it easily and quickly" (S12), are positively correlated with overall satisfaction and users' sense that the system meets their needs (S10). This indicates that effective error handling plays a crucial role in user satisfaction, as users who can resolve issues quickly tend to have a more favorable view of the system's reliability and functionality.

Clarity of information within the system significantly impacts task efficiency, as indicated by the high correlation between "The information provided by the system is clear" (S13) and "This information is effective in helping me complete tasks and scenarios" (S15). This relationship highlights the importance of clear, well-organized information in supporting users' ability to complete tasks quickly and effectively. Users who find information clear and accessible are better able to perform their tasks, underscoring the need for well-structured information within the system.

Support features also play a vital role in overall usability. The strong correlation between "It's easy to find the information I need" (S14) and other statements related to task completion and information effectiveness, such as S15, underscores the importance of a system that allows users to locate information quickly. Users who can easily find the information they need tend to report higher satisfaction with the system's support features, suggesting that an organized structure for information and support resources enhances usability.

3.4. Discussion

The development and testing of the web-based school management system for SMK Negeri 2 Banda Aceh have highlighted several key insights into the potential of digital solutions in enhancing school administration, particularly within vocational education settings. The descriptive statistics and correlation analyses confirm that the system successfully addresses core user needs, including ease of use, information clarity, interface appeal, and effective error resolution. Users, comprising students, teachers, and school operators, expressed high satisfaction with the system's functionalities, particularly in areas that directly streamline administrative and instructional tasks. The positive feedback across usability and support dimensions suggests that the system meets the expectations of a diverse user base, contributing to a more efficient and organized management process within the school.

One of the main findings of the usability testing was the critical role of interface design in influencing user satisfaction and ease of use. The high correlation between interface appeal and ease of learning demonstrates the importance of a user-centered design approach, especially in educational settings where users may have varying levels of technical expertise. An appealing and intuitive interface can ease the learning curve and make daily tasks more manageable, as shown in the high satisfaction scores related to ease of use. Additionally, clear and accessible information significantly enhanced task efficiency, underscoring the need for well-structured data presentation and navigation in systems designed for educational institutions.

Effective error handling was another area identified as essential for user satisfaction. The ability to quickly resolve errors impacts users' overall confidence in the system, as shown by the strong correlations between error resolution and satisfaction. This finding emphasizes the importance of robust support features and clear error messages in ensuring a smooth user experience, which is particularly valuable in environments where timely access to information and data accuracy are crucial for both teachers and administrators.

While the testing results are promising, successful deployment requires careful planning in several areas to ensure the system fully integrates into the school's operations. After final testing, the next stages, implementation and integration, are essential for embedding the system within the existing SMK Negeri 2 Banda Aceh infrastructure. The implementation phase will involve close collaboration with the school's staff and teachers, allowing for active involvement and adaptation. The goal is to ensure a smooth transition and effective integration with the current administrative workflows, making it easier for users to adopt the system as part of their daily tasks. This active involvement will also foster a sense of ownership among the school staff, which is essential for long-term sustainability.

User training will be a crucial component of the implementation process. Training sessions will be organized to help staff and teachers become proficient in using the web-based management system, covering areas such as data management, information access, and basic system maintenance. By equipping users with these skills, the training will enable them to maximize the benefits of the system, making it a valuable tool in their day-to-day activities. Furthermore, training will reduce the reliance on external support by empowering users to perform simple maintenance tasks, thereby promoting the system's sustainability within the school.

Once implemented, continuous maintenance and regular evaluation of the system will be necessary to ensure its long-term effectiveness and relevance. The project team will remain involved in performing routine maintenance tasks, addressing technical issues, and implementing enhancements based on user feedback. Regular evaluations will assess the system's impact and identify areas where improvements or adaptations are needed to meet evolving school requirements. These evaluations will provide data-driven insights into the system's performance, ensuring that it effectively supports SMK Negeri 2 Banda Aceh's management needs.

Sustainability is a key consideration in this project, as the goal is for the system to remain a valuable asset to the school long after its initial deployment. By involving school staff in the implementation and training process, the project fosters a sustainable environment where users are comfortable with the system and capable of managing basic issues independently. This empowerment, combined with ongoing support and periodic updates, will help ensure that the system remains relevant and fully functional over time, adapting to the future needs of SMK Negeri 2 Banda Aceh as they arise.

4. Conclusions

The development and testing of the web-based management system for SMK Negeri 2 Banda Aceh represent a significant step forward in enhancing administrative efficiency in vocational education. The system's intuitive design, effective information structure, and strong support features have resulted in high user satisfaction among students, teachers, and administrators, confirming its alignment with the unique needs of vocational schools. By streamlining key tasks such as data management, attendance tracking, and internship coordination, the system contributes to a more organized and productive school environment.

This system holds potential as a model for other vocational institutions, particularly in regions with similar educational needs and challenges. Future adaptations could explore customizable features to increase applicability across diverse school settings, allowing for broader adoption in vocational education. Additionally, sustained training, continuous user feedback, and periodic updates will be crucial to maintaining the system's relevance and effectiveness over time. This project underscores the transformative role of digital solutions in educational administration and provides practical insights into how technology can support career readiness and operational efficiency in vocational institutions across Indonesia and beyond.

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