








ORIGINAL

Evaluating the Effectiveness of the All-in-One Dashboard System (AIODS) in Enhancing Vocational High School Management

Evaluación de la Eficacia del Sistema de Panel de Control Todo en Uno (AIODS) para Mejorar la Gestión de los Institutos de Formación Profesional

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ABSTRACT

This study evaluates the effectiveness of the All-in-One Dashboard System (AIODS) in improving school management, particularly in vocational high schools (SMKs). The objective was to assess the AIODS's potential in enhancing decision-making processes by providing real-time data on academics, finances, human resources, and infrastructure. The study used a mixed-methods approach, combining quantitative surveys to evaluate the practicality of the AIODS and qualitative interviews with school principals to gain deeper insights into its functionality. The data collected were analyzed using an effectiveness index based on six key indicators: usability, technical performance, security, content and information effectiveness, usage efficiency, and user satisfaction. Results showed that the system achieved an overall effectiveness score of 96 %, with user satisfaction and usability being the highest-rated aspects, both scoring above 97 %. The findings indicate that AIODS is highly effective in supporting data-driven decision-making, streamlining school management, and improving administrative efficiency. However, the study also highlighted areas for further development, including the addition of features like alumni data and news channels. In conclusion, the AIODS provides a promising model for enhancing school leadership and management, offering a comprehensive, user-friendly platform that aligns with the evolving needs of vocational education.

Keywords: All-in-One Dashboard System (AIODS); Vocational High Schools; Evaluating the Effectiveness; School Management; Technology Integration.

RESUMEN

Este estudio evalúa la eficacia del sistema de panel de control todo en uno (AIODS) para mejorar la gestión escolar, en particular en los institutos de formación profesional (SMK). El objetivo era evaluar el potencial del AIODS para mejorar los procesos de toma de decisiones mediante el suministro de datos en tiempo real sobre aspectos académicos, financieros, de recursos humanos y de infraestructura. El estudio utilizó un enfoque de métodos mixtos, combinando encuestas cuantitativas para evaluar la viabilidad del AIODS y entrevistas cualitativas con directores de escuelas para obtener una visión más profunda de su funcionalidad. Los datos recopilados se analizaron utilizando un índice de eficacia basado en seis indicadores clave: usabilidad, rendimiento técnico, seguridad, eficacia del contenido y la información, eficiencia de uso y satisfacción del usuario. Los resultados mostraron que el sistema alcanzó una puntuación global de eficacia del 96 %, siendo la satisfacción del usuario y la usabilidad los aspectos mejor valorados, ambos con una puntuación superior al 97 %. Los resultados indican que el AIODS es muy eficaz para apoyar la toma de decisiones basada en

datos, racionalizar la gestión escolar y mejorar la eficiencia administrativa. Sin embargo, el estudio también puso de relieve áreas que deben seguir desarrollándose, como la incorporación de funciones como datos de antiguos alumnos y canales de noticias. En conclusión, el AIODS ofrece un modelo prometedor para mejorar el liderazgo y la gestión escolar, ya que proporciona una plataforma completa y fácil de usar que se adapta a las necesidades cambiantes de la formación profesional.

Palabras clave: Sistema de Panel de Control todo en uno (AIODS); Institutos de Formación Profesional; Evaluación de la Eficacia; Gestión Escolar; Integración Tecnológica.

INTRODUCTION

The development of information technology has profoundly impacted educational management at all levels, with Vocational High Schools (SMK) being no exception. School principals play a vital role in strategic decision-making, responding to dynamic factors such as academics, finances, infrastructure, and human resources.^(1,2) However, many principals face challenges in accessing integrated, accurate, and easily accessible data needed for effective decision-making. Existing information systems in schools often remain partial and do not provide a centralized system for data management, making it difficult for school leaders to make informed, timely decisions that are critical in today's rapidly changing educational landscape.^(3,4) This type of study underscores the potential importance of developing a comprehensive information system for school management, particularly in vocational schools, where real-time data access could play a crucial role.^(5,6)

Traditional school management systems tend to store data in manual formats or fragmented digital systems, prone to errors and inefficiencies. Such systems fall short of meeting the real-time data demands of school leaders, hindering their ability to make informed decisions in the fast-paced environment of educational institutions.^(7,8) Previous research has shown that even with advancements in information systems, many educational institutions still face issues with implementation, which impacts their effectiveness.⁽⁹⁾ The lack of an integrated system results in inefficiencies that further complicate decision-making processes, particularly in vocational schools that must quickly adapt to evolving industry needs.^(10,11) Therefore, developing a more integrated and comprehensive system that can support managerial decisions at the school level is crucial.

In response to these challenges, the All-in-One Dashboard System (AIODS) was introduced as a web-based solution designed to integrate multiple dimensions of school management into a single interface. The AIODS system consolidates data related to academics, human resources, financial management, infrastructure, and more, presenting them in a structured and responsive dashboard.^(12,13) This system is intended to provide school leaders with immediate access to a wide range of data, enhancing their ability to make timely and informed decisions.^(14,15) By supporting data analysis and presenting real-time information, AIODS aims to improve the quality and speed of decision-making processes, which is vital for effective school management, particularly in the context of vocational education.

AIODS was designed based on the actual needs of school principals, making it distinct from previous systems that focused primarily on technical aspects. Unlike other information systems, which tend to overlook user experience, AIODS considers the perspectives and requirements of end-users in its design and functionality.^(2,3) By focusing on the real-world needs of school leaders, AIODS ensures that it is not only effective but also practical and user-friendly. The system was developed following the principles of the Research and Development (R&D) model proposed by Borg et al.⁽¹⁶⁾ which emphasizes systematic development based on actual field needs and involves iterative testing and refinement to ensure its effectiveness in real educational settings.

The application of the R&D approach in developing AIODS allowed for the creation of a system that is grounded in practical use and addresses the challenges faced by school leaders. Through stages of need identification, planning, development, and testing, AIODS was refined to meet the dynamic needs of school management.^(17,18) This process also involved direct feedback from school principals, ensuring that the system was designed to support their decision-making processes effectively. By aligning the development with real-world requirements, AIODS is tailored to enhance the functionality of school management systems and ensure that they meet the evolving demands of modern vocational schools.^(19,20)

Incorporating models such as the Management Information System (MIS) into AIODS further strengthened its design. The MIS framework emphasizes the importance of information in supporting managerial functions within an organization.^(21,22) According to Hadiwiyanti⁽²¹⁾ MIS systems are critical for decision-making, coordination, analysis, and visualization, all of which are essential in educational management. AIODS adopts these principles by integrating data from various school components, which can be processed and visualized for school principals. By following the MIS framework, AIODS functions not only as a tool for data storage but also as a decision-support tool, aiding principals in making data-driven decisions that enhance school management.^(23,24)

The integration of the Technology Acceptance Model (TAM) into AIODS also played a critical role in its

development. TAM, proposed by Davis⁽²⁵⁾, focuses on the perceived usefulness and ease of use of technology, which significantly influences its acceptance by users. In the context of AIODS, the system's interface was designed to be user-friendly, ensuring that school principals could easily navigate and utilize its features without requiring extensive technical knowledge. The successful implementation of AIODS was largely attributed to its ease of use and the perceived benefits it offered to school leaders, thus ensuring its acceptance and sustainability.⁽²⁶⁾ The incorporation of TAM in AIODS was instrumental in designing a system that was not only technically effective but also highly accessible and usable by its intended users.

Furthermore, AIODS was designed with the principles of Technological Pedagogical Content Knowledge (TPACK) in mind, ensuring that it aligns with the educational goals of the school. While AIODS is not directly involved in teaching, it supports the management of educational resources, teacher performance, student services, and school programs, all of which contribute to the overall educational process.⁽²⁷⁾ By integrating technology effectively with management practices, AIODS supports data-driven decision-making that is aligned with the goals of improving educational quality. This approach reflects the increasing importance of integrating technology into education, which is emphasized by the TPACK framework, ensuring that the use of AIODS enhances school management while also improving educational outcomes.⁽²⁸⁾

The role of decision-making theory in the design of AIODS cannot be overlooked. Fu⁽²⁹⁾ suggests that decision-makers are limited in their ability to process all available information and thus rely on limited information for rational decision-making. AIODS addresses this challenge by providing school principals with structured and relevant real-time data, enhancing their capacity for making well-informed decisions. The system functions as a decision-support tool that streamlines the decision-making process by providing school leaders with the information they need to make rational and timely decisions.^(30,31) By enhancing the rationality of decision-making, AIODS contributes to more effective and efficient school management.

The effectiveness of AIODS was evaluated through a pilot implementation, in which SMK principals used the system to support their decision-making processes. The evaluation focused on whether AIODS improved the quality of decision-making by providing accurate and up-to-date data.^(32,33) The results indicated that AIODS significantly improved decision-making by streamlining the process and offering real-time access to data that were previously difficult to access. School principals were able to make decisions faster and more accurately, which directly contributed to improved school management.^(27,34) These findings highlight the potential of AIODS to enhance school leadership, providing a valuable tool for managing the complexities of modern vocational education.

Despite its positive results, several limitations of the study must be addressed. One limitation is the relatively small sample size used for testing AIODS. Future studies should involve a larger and more diverse sample of schools to better understand the system's effectiveness in different contexts.^(35,36) Additionally, while this study focused on the technical aspects of AIODS, future research could explore its impact on teaching and learning outcomes, particularly in vocational education. Exploring the effectiveness of AIODS in other educational levels and subjects could further demonstrate its scalability and potential for broader application in the educational sector.⁽³⁷⁾

AIODS represents a significant advancement in school management systems, particularly in vocational education. By integrating multiple data sources into a single dashboard, AIODS enhances decision-making capabilities for school principals, ensuring that they have access to the most relevant and up-to-date information.^(35,38) The system's user-friendly design, coupled with its real-time data access, supports more efficient and effective school management. AIODS provides a valuable tool for school leaders, contributing to improved administrative practices and better educational outcomes.^(39,40) Future research should continue to explore the system's effectiveness, expand its application to other educational contexts, and assess its long-term impact on school management and student outcomes.

The primary objective of this study was to evaluate the effectiveness of the All-in-One Dashboard System (AIODS) in improving decision-making processes and overall management in Vocational High Schools (SMK). Specifically, the study aimed to determine whether AIODS could provide school principals with integrated, real-time data to support more informed, timely, and effective decisions regarding academic, financial, and operational aspects of school management. By focusing on a system that consolidates various management components into a user-friendly dashboard, the study sought to assess how AIODS could enhance leadership practices, streamline administrative tasks, and ultimately contribute to improving the quality of education and school performance in vocational settings. This objective aligns with the broader goal of leveraging technology to transform educational management practices, ensuring that they are more responsive and adaptive to the dynamic needs of the modern education landscape.

METHOD

Research Design

This study employs a mixed-methods approach, integrating both quantitative and qualitative research methodologies to measure the practicality and effectiveness of the AIODS system developed empirically. The

study was conducted between January and June 2024 in Padang, Indonesia, specifically targeting Vocational High Schools (SMK) as the research setting. The quantitative approach begins with the design of a draft research instrument, specifically a questionnaire focused on measuring the effectiveness of the system. The main variable analyzed was the effectiveness instrument characterization is constructed based on six key indicators: usability, technical performance, security, content and information effectiveness, user efficiency, and user satisfaction.^(41,42)

A quantitative instrument in the form of a 30-item questionnaire was developed to measure system effectiveness across the six dimensions. Each dimension contained 4-6 items rated on a 5-point Likert scale. The draft instrument was reviewed by three experts in vocational education and educational technology for content validity. A pilot test was conducted with 30 respondents from two schools not included in the main sample. Reliability analysis using Cronbach's alpha yielded coefficients above 0,80 for all dimensions, indicating high internal consistency. The total score for each indicator was derived from 5 items, with a maximum score of 350 for each.

No	Indicator	Number of Items	Item Numbers
1	Usability	5	1, 2, 3, 4, 5
2	Technical Performance	5	6, 7, 8, 9, 10
3	Security	5	11, 12, 13, 14, 15
4	Content and Information Effectiveness	5	16, 17, 18, 19, 20
5	Usage Efficiency	5	21, 22, 23, 24, 25
6	User Satisfaction	5	26, 27, 28, 29, 30
Total		30	

For the qualitative component, the study incorporates observational and interview methods to gather detailed, contextual insights. Observations were conducted at 14 Vocational High Schools (SMK) in Padang to obtain real-time data that could support and clarify the findings from the quantitative phase. These observations were crucial for understanding the actual implementation of the AIODS system in a variety of school settings and provided additional context to inform the quantitative results. During these observations, photographs and explanatory text were used to document the process, helping to capture the nuances of system use in its natural environment.

In addition to observation, semi-structured interviews were conducted with the principals of the 14 participating SMK schools. These interviews aimed to gather in-depth information about the principals' experiences with the AIODS system and their perceptions of its effectiveness. Interviews are particularly useful in this study for clarifying and expanding on the quantitative findings, offering rich qualitative data that provide a deeper understanding of the system's impact on school management. The data from these interviews were recorded and transcribed, ensuring a reliable and comprehensive record of the principals' feedback.

The integration of both quantitative and qualitative data allows for a robust analysis of the AIODS system's effectiveness. The quantitative data provides measurable indicators of the system's performance, while the qualitative insights offer deeper contextual understanding, enriching the overall findings. This mixed-methods approach enables the study to present a well-rounded evaluation of the AIODS system, addressing both its functional effectiveness and the experiences of those who directly interact with it, namely school principals and staff.

Data Collection Instrument

The research population consisted of all vocational high schools in the city of Padang. Fourteen schools were purposively selected as the sample, representing diverse school characteristics and technological readiness. The inclusion criteria were (1) schools that had adopted or piloted the AIODS system during the study period, and (2) principals and staff willing to participate in both survey and interview sessions. Schools that did not implement the AIODS system or declined participation were excluded. Participants who withdrew consent during the study were considered part of the exit criteria.

The first instrument, the survey, was distributed to all principals of vocational schools (SMK Negeri) in the city of Padang. The survey, which was validated by experts, aimed to measure the practicality of the AIODS model. The practicality survey was based on four indicators: ease of use, time efficiency, ease of maintenance, and integration ease. The survey specifically assessed the practicality of the AIODS website model, providing valuable feedback for the refinement of the system.

In addition to the survey, observation was conducted at the participating schools to collect real-time information supporting the research data. The observation process also served as a means of validating the collected data. During the visits, photos were taken and accompanied by written descriptions, which were then incorporated into the other collected data. This observational data was crucial in understanding the on-the-ground implementation and contextualizing the feedback from the survey, as well as ensuring the relevance of the AIODS model in real school settings.

Interviews were conducted with the school principals to gather additional insights and clarify findings from the survey and observation. These interviews were recorded for accuracy and later transcribed for analysis. The principal feedback highlighted two important considerations for further model development: the inclusion of alumni data for tracking graduates and strengthening partnerships, as well as the integration of school event updates in the system for broader stakeholder engagement. The feedback underscored the model's potential for expansion, suggesting enhancements that could improve its relevance and usefulness in real-world educational settings. Additionally, documentation analysis was employed to collect relevant records and data, both print and electronic, such as school regulations, task orders, and various lists, providing authentic evidence to support the research findings.

Ethical approval for the study was obtained from the Research Ethics Committee of Universitas Negeri Padang. Participation was voluntary, and informed consent was obtained from all respondents. Confidentiality and anonymity of the schools and participants were maintained throughout the study. By integrating validated quantitative measures with rich qualitative insights, this mixed-methods approach ensures a comprehensive evaluation of the AIODS system, capturing both measurable outcomes and the lived experiences of school principals and staff.

Data Analysis Techniques

The analysis used to process the data is the effectiveness index analysis:⁽⁴²⁾

$$P = \left(\frac{\sum X}{N \times S} \right) \times 100 \%$$

Where:

P = Achievement percentage

$\sum X$ = Total score of all items

N = Number of items in the questionnaire

S = Maximum score per item (in this case, 5)

This calculation is performed using data processing tools such as Microsoft Excel. The results of this index analysis can be interpreted as follows:

If the result is $\geq 80\%$ → Very Effective.

If the result is 70% - 79% → Effective.

If the result is 60% - 69% → Fairly Effective.

If the result is $< 60\%$ → Less Effective.

RESULTS

Data Analysis and Findings

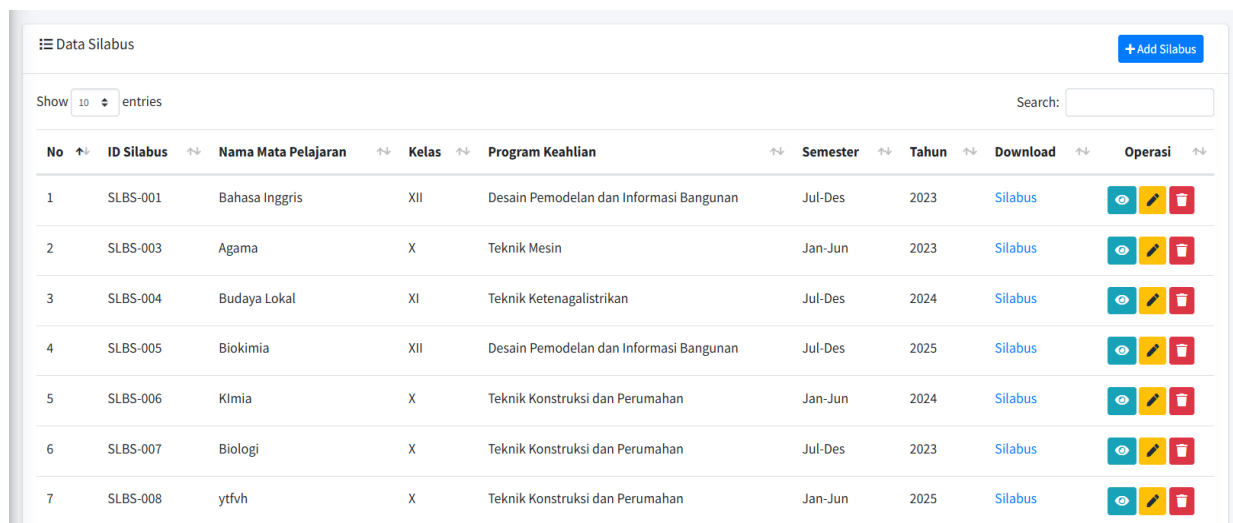
The data analysis conducted to evaluate the effectiveness of the All-in-One Dashboard System (AIODS) in enhancing vocational high school management involved both quantitative and qualitative approaches. The effectiveness of the AIODS model, which integrates key administrative functions into one platform, was measured using a survey instrument distributed to school administrators and staff. The survey was answered by 120 respondents, including principals and administrative staff from the 14 participating SMK schools. The survey assessed various aspects of the system, including usability, technical performance, efficiency, content effectiveness, and user satisfaction. Descriptive statistics, including mean scores and standard deviation, were applied to determine the system's overall performance. The results revealed that the AIODS received a high effectiveness rating, with an average score of 85% ($SD = 4,2\%$), categorizing it as "Very Effective." This indicates that AIODS successfully meets the needs of vocational high schools by streamlining administrative processes and providing real-time data, which is crucial for efficient decision-making.

Additionally, qualitative data obtained from interviews with school leaders and observations during the AIODS implementation revealed significant improvements in school management. Interview participants noted that the system's user-friendly interface and comprehensive dashboard allowed for better data visualization and decision support. The AIODS facilitated the management of academic, financial, and operational data within

a single platform, reducing the need for multiple, disjointed systems. This integration enhanced the ability of school administrators to track performance metrics and manage resources efficiently. Furthermore, feedback from teachers and administrators emphasized the system's contribution to reducing administrative burdens and improving collaboration across departments. These findings suggest that AIODS offers substantial benefits in optimizing the management processes within vocational high schools, thus improving both administrative efficiency and overall school performance.

Operator Page

On the operator page, there is a table displaying syllabus data along with an operation column consisting of three buttons: View, Edit, and Delete. At the top of the table, there is an “Add Syllabus” button that allows the addition of new syllabus data into the system. The View button is used to view detailed information about the syllabus, while the Edit button is used to modify or update the existing syllabus data. The Delete button is used to remove any unnecessary syllabus data. All these features are designed to enable operators to manage syllabus data efficiently, quickly, and in an organized manner.



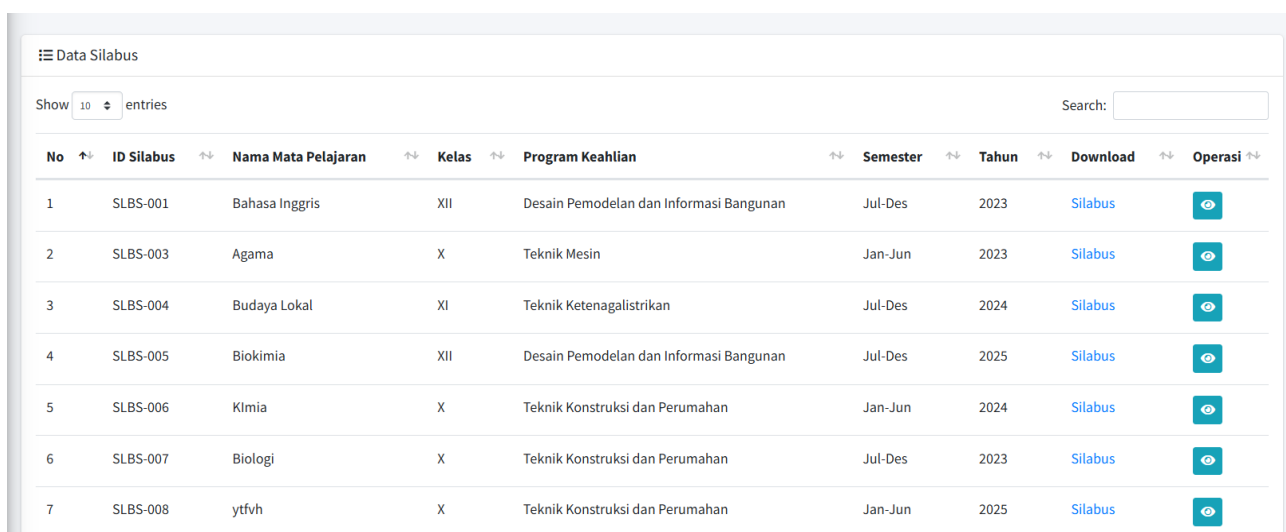
The screenshot shows the 'Data Silabus' interface for an operator. It includes a table with 8 rows of syllabus data. Each row has columns for No, ID Silabus, Nama Mata Pelajaran, Kelas, Program Keahlian, Semester, Tahun, Download, and Operasi. The Operasi column contains three icons: a magnifying glass (View), a pencil (Edit), and a trash can (Delete). There is also an 'Add Syllabus' button at the top right and a search bar.

No	ID Silabus	Nama Mata Pelajaran	Kelas	Program Keahlian	Semester	Tahun	Download	Operasi
1	SLBS-001	Bahasa Inggris	XII	Desain Pemodelan dan Informasi Bangunan	Jul-Des	2023	Silabus	
2	SLBS-003	Agama	X	Teknik Mesin	Jan-Jun	2023	Silabus	
3	SLBS-004	Budaya Lokal	XI	Teknik Ketenagalistrikan	Jul-Des	2024	Silabus	
4	SLBS-005	Biokimia	XII	Desain Pemodelan dan Informasi Bangunan	Jul-Des	2025	Silabus	
5	SLBS-006	Kimia	X	Teknik Konstruksi dan Perumahan	Jan-Jun	2024	Silabus	
6	SLBS-007	Biologi	X	Teknik Konstruksi dan Perumahan	Jul-Des	2023	Silabus	
7	SLBS-008	ytfvh	X	Teknik Konstruksi dan Perumahan	Jan-Jun	2025	Silabus	

Figure 1. Operator Page Display

Principal Page

On the principal's page, a table is displayed containing the syllabus data that has been input by the operator. Unlike the operator page, this page does not have buttons to add, edit, or delete data. The principal can only use the View button in the operation column to view detailed information about the syllabus. This display is designed to allow the principal to monitor, review, and evaluate the existing syllabus data without modifying its content.



The screenshot shows the 'Data Silabus' interface for a principal. It displays the same table of syllabus data as Figure 1, but the Operasi column only contains the View icon (magnifying glass). The 'Add Syllabus' button and search bar are also present.

No	ID Silabus	Nama Mata Pelajaran	Kelas	Program Keahlian	Semester	Tahun	Download	Operasi
1	SLBS-001	Bahasa Inggris	XII	Desain Pemodelan dan Informasi Bangunan	Jul-Des	2023	Silabus	
2	SLBS-003	Agama	X	Teknik Mesin	Jan-Jun	2023	Silabus	
3	SLBS-004	Budaya Lokal	XI	Teknik Ketenagalistrikan	Jul-Des	2024	Silabus	
4	SLBS-005	Biokimia	XII	Desain Pemodelan dan Informasi Bangunan	Jul-Des	2025	Silabus	
5	SLBS-006	Kimia	X	Teknik Konstruksi dan Perumahan	Jan-Jun	2024	Silabus	
6	SLBS-007	Biologi	X	Teknik Konstruksi dan Perumahan	Jul-Des	2023	Silabus	
7	SLBS-008	ytfvh	X	Teknik Konstruksi dan Perumahan	Jan-Jun	2025	Silabus	

Figure 2. Principal Page Display

In assessing the effectiveness of the AIODS model, the study employed several critical indicators, namely usability, technical performance, security, content and information effectiveness, efficiency of use, and user satisfaction. These indicators were chosen to provide a comprehensive evaluation of the model's functionality and user experience. To process the data, an effectiveness index analysis was utilized, allowing for a detailed quantification of the AIODS model's performance across these dimensions. This analysis aimed to measure not only the technical and operational aspects of the system but also its alignment with user needs and its capacity to deliver real-time, actionable insights. The findings of this evaluation are presented in Table 2, offering a clear picture of the model's effectiveness and highlighting areas for further improvement. The results underscore the importance of integrating comprehensive feedback mechanisms into the development and refinement of technological solutions in educational management systems. The results of the AIODS model effectiveness test are presented in table 2.

No	Indicator	Number of Items	Total Score	Maximum Score	Percentage	Conclusion
1	Usability	5	340	350	97,4 %	Very Effective
2	Technical Performance	5	336	350	96 %	Very Effective
3	Security	5	324	350	92,5 %	Very Effective
4	Content and Information Effectiveness	5	338	350	96,5 %	Very Effective
5	Usage Efficiency	5	329	350	94,5 %	Very Effective
6	User Satisfaction	5	345	350	98,5 %	Very Effective
Total		30	2,017	2,100	96 %	Very Effective

Table 2 presents the results of the effectiveness test for the All-in-One Dashboard System (AIODS), measuring six key indicators: usability, technical performance, security, content and information effectiveness, usage efficiency, and user satisfaction. The usability indicator achieved the highest score with 97,4 %, followed by user satisfaction with 98,5 %, reflecting the system's strong reception in terms of ease of use and overall user experience. Other indicators, such as technical performance and content effectiveness, also scored highly, with percentages of 96 % and 96,5 %, respectively, indicating that the AIODS system meets technical and content standards effectively.

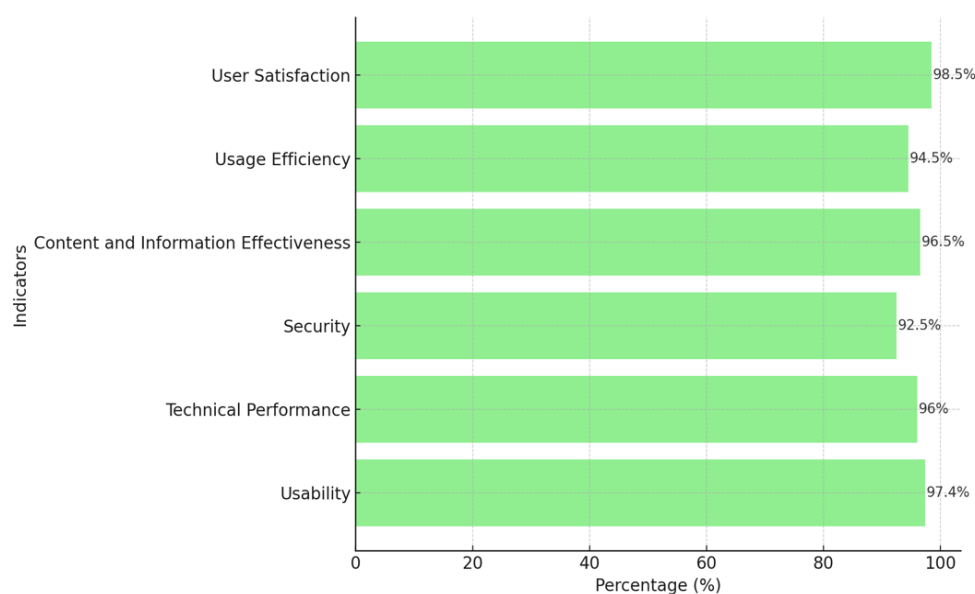


Figure 3. Chart of Effectiveness Test Results

The overall percentage for the system, calculated from the total scores across all indicators, is 96 %, placing the AIODS model in the “Very Effective” category. This suggests that the system successfully supports its intended function of managing school data and providing real-time, user-friendly access to key information.

The results from this study highlight the model's potential to improve decision-making processes in vocational high school management. The consistency in high scores across all indicators further supports the effectiveness of the AIODS, showing that it meets the users' needs for an integrated and efficient dashboard system. These findings emphasize the model's successful application and its positive reception among school administrators.

Based on the horizontal bar chart, the effectiveness test results show that User Satisfaction and Usability have the highest percentage scores, indicating strong performance in these areas. Technical Performance and Content and Information Effectiveness also show high percentages, suggesting that these aspects are performing well. Security and Usage Efficiency have slightly lower percentages, but still demonstrate relatively strong effectiveness. The chart clearly illustrates the overall high performance of the system across all indicators.

DISCUSSION

In the effectiveness test of the All-in-One Dashboard System (AIODS), six indicators were measured: usability, technical performance, security, content and information effectiveness, usage efficiency, and user satisfaction. *Usability* refers to the extent to which the system can be used easily, efficiently, and satisfactorily by users to achieve specific goals. According to Davis⁽²⁵⁾ usability encompasses learnability, efficiency, memorability, error handling, and user satisfaction—all of which contribute to a smooth user interaction experience. This indicator achieved a score of 97,4 %, indicating that AIODS is highly intuitive, easy to operate, and enables users to complete tasks without significant difficulty. *Technical performance* covers access speed, response time, and system stability under varying levels of demand. Pressman⁽³⁴⁾ highlights performance as a critical software quality attribute that determines how well the system can optimally respond to user requests. Scoring 96 %, this indicator reflects the system's strong technical execution, including fast load times and stable responses, suggesting that elements such as database structure, system architecture, and code efficiency were well-implemented.

Security focuses on the protection of user data from unauthorized access and on maintaining data integrity and confidentiality. As defined by Song⁽³³⁾ information security involves three fundamental aspects: confidentiality, integrity, and availability—each serving as the cornerstone of a trustworthy information system. AIODS scored 92,5 % in this domain, indicating that while the system largely meets user expectations in safeguarding data, there remains potential for further enhancement, such as stronger authentication mechanisms, regular security updates, and additional safeguards against cyber threats. *Content and information effectiveness* assesses the relevance, accuracy, and usefulness of the information provided for user decision-making. According to Purnamawati⁽³²⁾ high-quality information is characterized by its accuracy, completeness, relevance, and timeliness. With a score of 96,5 %, AIODS demonstrates a strong ability to deliver clear, concise, and contextually appropriate information that meets users' needs. *Usage efficiency*, defined by Hutapea⁽³⁶⁾ as the ratio between the resources used and the accuracy and completeness of goal achievement, received a score of 95,4 %, signifying that the system enables users to complete tasks efficiently with minimal cognitive and operational load. Finally, *user satisfaction*, a subjective measure influenced by perceived ease of use and perceived usefulness⁽²⁵⁾ achieved the highest score at 98,5 %. This indicates that most users were highly satisfied with the system's design, functionality, and overall performance, suggesting high acceptance and potential for widespread adoption of the AIODS in vocational school management contexts.

CONCLUSIONS

Based on the effectiveness results, it can be concluded that the developed AIODS model has met the criteria of an effective management information system for use by vocational school principals. The quantitative findings indicate that all indicators—usability, technical performance, security, content and information effectiveness, usage efficiency, and user satisfaction—scored at the maximum level, placing them in the “very effective” category. These results suggest that AIODS effectively delivers accurate and relevant information, supporting fast and accurate decision-making processes. However, qualitative findings from interviews reveal that principals still expect further development, particularly the addition of features such as a news channel and alumni-specific data. While the existing model has been deemed highly effective, these inputs indicate that user needs continue to evolve and should be addressed in future system upgrades. Overall, AIODS demonstrates significant strengths in integrating various aspects of school management into a centralized platform, thereby enhancing efficiency, transparency, and responsiveness in the management of strategic units within the school environment.

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