

Effectiveness of an Expert System for Facilities Management in Vocational High Schools

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ABSTRACT

Data-driven decision-making regarding school facilities is a crucial element of effective school governance, particularly in vocational high schools (SMK), which require efficiency and accurate information. This study aims to analyze the effectiveness of an expert system for managing facilities in vocational high schools, developed as a web-based management information system. This study employs a mixed-methods approach—combining quantitative and qualitative methods—to empirically measure the practicality of the developed product. The study subjects consist of 14 SMK principals in the city of Padang. The quantitative approach was conducted using a questionnaire as the instrument, followed by statistical analysis. Meanwhile, the qualitative approach was conducted through observation and interviews. Based on the results of the quantitative study regarding the effectiveness test, it was found that all indicators—namely usability, technical performance, security, content and information effectiveness, usage efficiency, and user satisfaction—achieved maximum scores. These findings indicate that the Expert System Platform is highly effective; however, this does not imply that the product requires no further development. Qualitative research through interviews revealed that school principals desire the addition of news channels and alumni-specific data, even though the current model has been deemed effective.

Keywords: Expert System Sarana, Information Systems Management, School Management, Effectiveness, Vocational High School

INTRODUCTION

Advances in information technology have brought about significant changes in educational management, including at the school level. In vocational high schools (SMK), principals serve as strategic decision-makers who must respond to infrastructure dynamics quickly and in a data-driven manner. However, the reality on the ground shows that many principals still face difficulties in obtaining integrated, accurate, and easily accessible data to support comprehensive decision-making. Several previous studies have developed digital school information systems (e.g., LMS, financial management systems, and e-Report applications), but these are generally partial and not integrated into a single central system. Furthermore, few systems have been specifically designed to support comprehensive decision-making by school principals, particularly those that combine all managerial functions into a single integrated dashboard. Traditional school management systems still tend to store data manually or in fragmented digital systems, making them prone to errors and inefficiencies and unable to meet the need for real-time data for school leaders in decision-making (Afriansyah et al., 2025).

In response to this gap, the Expert System Sarana was developed—a web-based management information system specifically designed to integrate various aspects of school management (academic, human resources, financial, facilities, etc.) into a single structured and responsive dashboard. Expert System Sarana aims to provide real-time access to strategic data, present informative visualizations, and support rapid analysis to aid the principal's decision-making. The state-of-the-art aspect of this research lies in its system development approach based on the real needs of school principals, combining principles of educational management, software engineering, and the Borg and Gall Research and Development (R&D) model. Unlike previous studies that focused more on technical aspects, this study not only builds the system but also directly measures the system's effectiveness from the end-user's perspective—that of vocational high school principals. Meanwhile, the novelty of this study lies in the development and testing of the Sarana Expert System model as an integrated information system that supports school principals' decision-making in the context of vocational education in Indonesia—an area that has not been systematically explored in previous research. Based on this, this study aims to analyze the effectiveness of the Sarana Expert System model through direct testing by vocational high school principals, with the hope of producing a system that is adaptive, relevant, and applicable in supporting data-driven school management.

Study Theory

Management Information Systems (MIS) Theory

Management Information Systems (MIS) theory views information as a primary resource for supporting managerial functions within an organization. According to Laudon and Laudon (2020), MIS is a computerized system that provides information to support decision-making, coordination, analysis, and visualization within an organization. In the school context, MIS is used to manage data from various areas such as academics, finance, and administration, which is then processed into strategic information. Expert System Sarana adopts MIS principles by designing a web-based dashboard system capable of displaying integrated data from various school components. The MIS concept from Laudon and Laudon (2020) supports Expert System Sarana in managing data flow, starting from input by operators, automatic processing by the system, to the visualization of information for the

school principal. By adopting MIS, Expert System Sarana functions not only as a data storage tool but also as a managerial decision-making aid.

The Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) was developed by Davis (1989) to explain the factors that influence users' acceptance of technology. The two main constructs of TAM are perceived usefulness and perceived ease of use. If users feel that a technology will improve their performance and is easy to use, they are more likely to adopt it (Davis, 1989). In the development of the Sarana Expert System, Davis's (1989) TAM principles were used to design a system interface that is simple, easy to operate, and tailored to the needs of school principals. Accessibility and acceptability tests conducted during development demonstrated that perceived usefulness and ease of use are key factors in the model's acceptance by school principals. Therefore, TAM serves as a crucial framework for supporting the acceptance and sustainability of the Expert System Sarana's implementation in schools.

The Theory of Technological Pedagogical Content Knowledge (TPACK)

The TPACK model was developed by Mishra and Koehler (2006) to describe the integration of three forms of knowledge: technological, pedagogical, and content. All three must be effectively integrated so that technology can be optimally utilized in an educational context. Although the Sarana Expert System is not a learning system, TPACK principles are applied to balance the use of information technology with the educational management context. In the Sarana Expert System, technology is used to present data and information directly related to the curriculum, teacher performance, student services, and school programs. The TPACK principle from Mishra and Koehler (2006) ensures that the dashboard not only presents statistical data but also supports the principal's decision-making focused on the quality of learning. In other words, the Expert System Sarana positions technology as a strategic tool that supports educational leadership.

Organizational Decision-Making Theory

Decision-making theory is an important foundation in the development of systems designed to support managerial roles, including school principals. One of the key figures in this field is Herbert A. Simon, who introduced the concept of bounded rationality. According to Simon (1997), decision-makers do not have the capacity to process all information perfectly; therefore, they make decisions based on limited information and constrained rationality. In this context, systems such as the Facilities Expert System play an important role in expanding this rational capacity by providing structured, relevant, and real-time information. In addition, the rational decision-making model describes a systematic process starting from problem identification, searching for alternative solutions, evaluating alternatives, selecting decisions, and implementation. Robbins and Coulter (2018) also emphasize the importance of information at each of these stages to ensure that decisions are objective and have a positive impact. Therefore, the Facilities Expert System is designed to provide comprehensive data so that school principals can carry out the decision-making process more effectively.

ADDIE Theory

The Research and Development (R&D) method by Borg and Gall (1983) was used as the framework in the development process of the Facilities Expert System model. This method consists of ten main steps, including preliminary study, planning, initial product development, limited trials, revisions, and product dissemination. However, in this study, these steps were modified into four main stages: needs identification, planning and development, testing and revision, and final product development. By applying the Borg and Gall (1983) approach, the Facilities Expert System was developed systematically, based on real problems in the field, and tested in stages to ensure its validity, practicality, and effectiveness. This approach not only strengthens the academic aspects of model development but also ensures the model's acceptability and functionality within the school environment.

METHOD

This study employs a mixed-methods approach, combining both quantitative and qualitative methods to empirically measure the practicality of the developed product. The steps of the quantitative approach are as follows:

1. Drafting the research instrument

The initial step in this study was to draft the research instrument, specifically the effectiveness questionnaire. The development of this instrument aims to comprehensively measure the effectiveness of the Expert System Sarana information system as the product developed in this study. The effectiveness instrument is based on six indicators: usability, technical performance, security, content and information effectiveness, usage efficiency, and user satisfaction, comprising a total of 30 items.

Table 1
Effectiveness Instrument

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	Efficiency of Use	5	21,22,23,24,25
6	User Satisfaction	5	26,27,28,29,30
Total			30

2. Expert validation

Before being used in data collection, the developed instrument must first be validated by experts. The steps in this stage include:

a. Developing a validation instrument

The validation instrument is designed to assess the validity of the research instrument to determine whether it is suitable for use in the study. The validation instrument is developed based on content validity, construct validity, face validity, and criterion validity, comprising a total of 11 items.

Table II
Validation Instrument

No	Indicator	Number of Items	Item Numbers
1	Content Validity	2	1,2
2	Construct Validity	2	3,4
3	Display Validity	4	5,6,7,8
4	Criteria Validity	3	9,10,11
Total		11	

b. Determining Experts

The stage of selecting experts who will validate the research instrument aims to obtain expert validity for the questionnaire used. In this study, there were three experts: two experts in information systems management and one expert in the field of language.

c. Validation of Research Instrument

The experts were asked to provide assessments for each item of the instrument. The validation results were analyzed using descriptive analysis, Aiken's V, ICC, and Cronbach's Alpha to examine the content validity of each statement item. Items with low validity values were revised or removed based on expert recommendations.

Table III
Descriptive Analysis Results

Item	Validator 1	Validator 2	Validator 3	Mean	SD	Conclusion
1	5	5	5	5.000000	0.00000	valid
2	4	4	5	4.333333	0.57735	valid
3	4	4	4	4.000000	0.00000	valid
4	4	5	4	4.333333	0.57735	valid
5	4	4	4	4.000000	0.00000	valid
6	4	4	4	4.000000	0.00000	valid
7	4	4	4	4.000000	0.00000	valid
8	5	5	5	5.000000	0.00000	valid
9	4	4	4	4.000000	0.00000	valid
10	4	4	5	4.333333	0.57735	valid
11	4	4	4	4.000000	0.00000	valid

Based on the table above, it can be concluded that all items in the instrument are valid, since the standard deviation (SD) score for each item is less than one (<1).

Table IV
Aiken's V Analysis Results

Item	Validator 1	Validator 2	Validator 3	Aiken V	Conclusion
1	5	5	5	1.000000	very valid
2	4	4	5	0.833333	valid
3	4	4	4	0.750000	valid
4	4	5	4	0.833333	valid
5	4	4	4	0.750000	valid
6	4	4	4	0.750000	valid
7	4	4	4	0.750000	valid
8	5	5	5	1.000000	very valid

9	4	4	4	0.750000	valid
10	4	4	5	0.833333	valid
11	4	4	4	0.750000	valid

Based on the table above, it can be concluded that the V-Aiken analysis indicates that all items are valid or highly valid, as their V scores fall within the ranges $0.75 \leq V < 0.90$ and $V \geq 0.90$. Therefore, the effectiveness assessment instrument can be used for this study.

Table V
ICC Analysis Results

Type	Description	ICC	f	df1	df2	pval
ICC3k	Average fixed raters	0.8	5.0	10	20	0.001097

Based on the table above, it can be concluded that, according to the ICC analysis, the model effectiveness test instrument is considered to have high reliability, as the ICC score is 0.8, which falls within the range of 0.75 to 0.90.

Table VI
Cronbach's Alpha Results

Cronbach's Alpha:	0.8000000000000002
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Based on the results of the data analysis, it can be concluded that the model effectiveness test instrument is reliable, as the Cronbach's alpha score is 0.800000, which falls within the range of 0.75 to 0.90.

Table VII
Conclusion of Instrument Validity and Reliability Test Results

Instrument Name	Descriptive Analysis	Aiken's V Analysis	ICC	Cronbach's Alpha	Conclusion
Facilities Expert System Sarana	all items valid	All items valid	Good reliability	reliable	valid dan reliable

Based on the table above, it is evident that the research instruments, which were evaluated using descriptive statistics, V Aiken, ICC, and Cronbach's Alpha, were found to be valid and reliable by the experts.

Meanwhile, the qualitative approach employs observation and interviews

1) Observation

Observations were conducted at 14 public vocational high schools in Padang City to gather firsthand information supporting the research findings through on-site visits. Observations can also help clarify the research findings. Information obtained from observations will be documented in the form of photographs accompanied by textual descriptions.

2) Interviews:

Interviews were conducted with the principals of the 14 public vocational high schools in Padang to obtain additional information supporting the research findings. Interviews can also be used to clarify the research findings. All information obtained from the interviews with the principals was documented in the form of audio recordings and interview notes.

3. Data Collection

Data collection for this study was conducted through questionnaires, observations, interviews, and document analysis. An explanation of each method is provided below.

a. Questionnaire

The questionnaire was distributed to all principals of public vocational high schools (SMK Negeri) in the city of Padang. The questionnaire had been validated by experts. It was used to measure the practicality of using the Expert System Sarana model. The practicality questionnaire was structured based on four indicators: ease of use, time efficiency, ease of maintenance, and ease of integration. The model whose effectiveness was measured is the website model named the Sarana Expert System.

b. Observations were conducted to obtain real-world information supporting the research data through direct school visits. Additionally, observations can be used to confirm the research data. Information obtained from observations will be documented in the form of photographs with written descriptions, then combined with other data that has been collected.

Picture 1

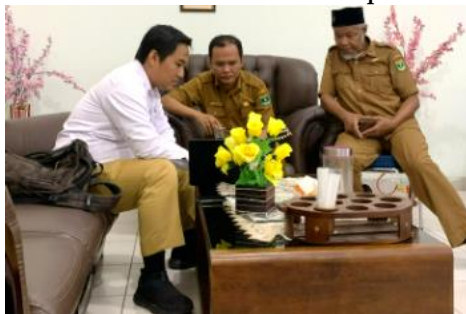
Photo of an Observation and Discussion Session with the Head of the Asset Division at One of the Schools



c. Interviews were used in this study to gather additional information to support the research findings and to help explain them. Audio recordings were made to preserve the information obtained from the interviews.

Picture 2

Photo of an Interview with a School Principal and Their Deputy



Based on interviews between the researcher and the school principal during the model presentation session, two key pieces of feedback were obtained regarding the development of the Facility Expert System currently being designed. First, the school principal expressed the hope that the system could be equipped with a feature for periodically monitoring the condition of facilities, thereby making it easier for the school to determine the level of serviceability, maintenance needs, and replacement priorities for facilities. This feature is considered crucial for supporting more planned, effective, and data-driven school asset management. Second, the School Principal suggested that information regarding the condition, maintenance, and updates of facilities be included. The researcher responded positively to both pieces of feedback and expressed willingness to incorporate these suggestions into the model's further development.

Thus, the interview results indicate an additional need from school principals to expand the features of the Facilities Expert System, particularly regarding the regular monitoring of facility conditions and the dissemination of facility information to stakeholders. These findings further reinforce the system's utility, relevance, and applicability to the actual needs of facility management within the school environment.

- d. Documentation study, conducted to collect research documents and data, both printed and electronic. This data is used as authentic evidence of the research results. For the documentation study, official decrees (SK), assignment letters, and various types of lists can be utilized.

4. Data Analysis Techniques

The analysis used to process the data is the effectiveness index analysis

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

Explanation:

P = Percentage of achievement

$\sum X$ = Total score of all items

N = Number of items in the questionnaire

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

Calculations using this formula are performed using Microsoft Excel as a data processing tool, as it allows for straightforward implementation. 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

The above interpretation is supported by the views of Nieveen (1999), Plomp (2013), Sugiyono (2017), and Akker (1999).

DISCUSSION

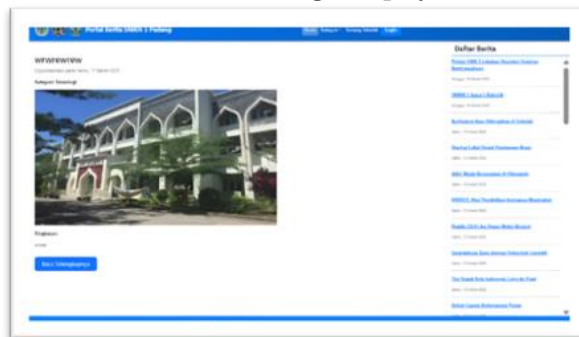
A. Product Under Evaluation

The product being evaluated for its practicality is the Sarana Expert System. The following is a description of the interface and features of the Sarana Expert System.

1. Public Page

The public page displays the homepage of the SMKN 5 Padang News Portal, which serves as the main homepage of the Sarana Expert System information system. At the top of the page is a blue navigation bar featuring the school's official logo on the left, followed by the text "SMKN 5 Padang News Portal" as the portal's identifier. This navigation bar also includes navigation menus such as Home, Categories, About the School, and a Login button located in the top right corner, highlighted in bright blue for easy visibility. The page's design aims to be informative, engaging, and user-friendly, serving as a platform for disseminating relevant, up-to-date information for the school community.

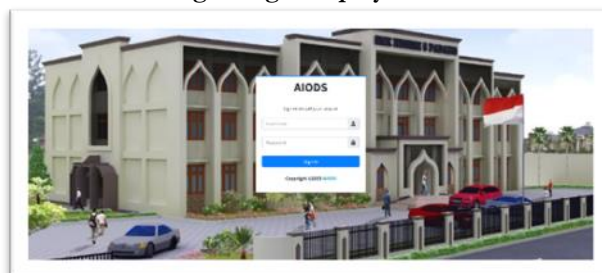
Picture 3
Public Page Display



2. Login Page

The login page features a simple interface for entering a username and password before accessing the system. The login form consists of two input fields, each accompanied by an icon: the username field and the password field. After entering the required information, users can click the Sign In button to log in to the system. This login interface is designed to ensure security and convenience during the user authentication process.

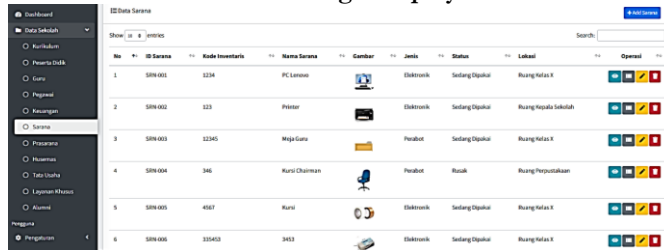
Picture 4
Login Page Display



























3. Admin Page

On the operator page, there is a table displaying facility data along with an operations column consisting of three buttons: View, Edit, and Delete. At the top of the table, there is an Add Facility button used to add new facility data to the system. The View button is used to view facility information in more detail, while the Edit button is used to modify or update existing facility data. The Delete button is used to remove unnecessary facility data. All these features are designed to help operators manage facility data efficiently, quickly, and in an organized manner. The admin also has additional access to manage user data, such as adding, editing, or deleting registered user accounts.

Picture 5
Admin Page Display

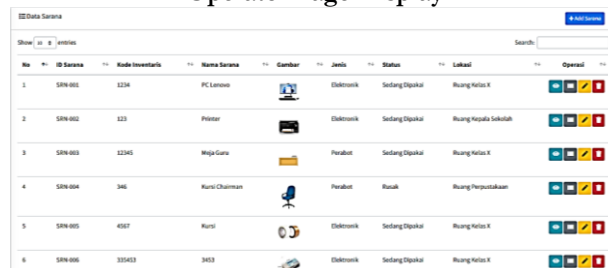


























No	ID Sarana	Kode Inventaris	Nama Sarana	Gambar	Jenis	Status	Lokasi	Operasi
1	SDN-001	1234	PC Lesson		Elektronik	Sedang Dipakai	Ruang Kelas X	  
2	SDN-002	123	Printer		Elektronik	Sedang Dipakai	Ruang Kepala Sekolah	  
3	SDN-003	12345	Meja Guru		Perabot	Sedang Dipakai	Ruang Kelas X	  
4	SDN-004	345	Kursi Chairman		Perabot	Rusak	Ruang Perputakaan	  
5	SDN-005	4567	Kursi		Elektronik	Sedang Dipakai	Ruang Kelas X	  
6	SDN-006	123456	3453		Elektronik	Sedang Dipakai	Ruang Kelas X	  

4. Operator Page

On the operator page, there is a table displaying facility data along with an operations column consisting of three buttons: View, Edit, and Delete. At the top of the table, there is an Add Facility button used to add new facility data to the system. The View button is used to view facility information in more detail, while the Edit button is used to modify or update existing facility data. The Delete button is used to remove unnecessary facility data. All these features are designed to help operators manage facility data efficiently, quickly, and in an organized manner.

Picture 6
Operator Page Display

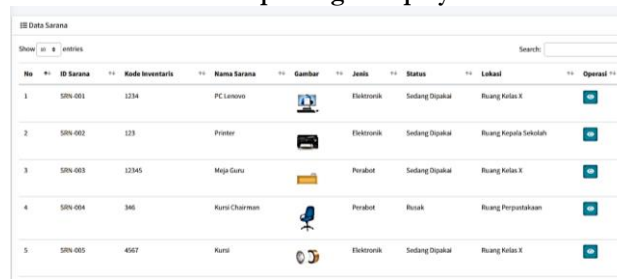


No	ID Sarana	Kode Inventaris	Nama Sarana	Gambar	Jenis	Status	Lokasi	Operasi
1	SDN-001	1234	PC Lesson		Elektronik	Sedang Dipakai	Ruang Kelas X	  
2	SDN-002	123	Printer		Elektronik	Sedang Dipakai	Ruang Kepala Sekolah	  
3	SDN-003	12345	Meja Guru		Perabot	Sedang Dipakai	Ruang Kelas X	  
4	SDN-004	345	Kursi Chairman		Perabot	Rusak	Ruang Perputakaan	  
5	SDN-005	4567	Kursi		Elektronik	Sedang Dipakai	Ruang Kelas X	  
6	SDN-006	123456	3453		Elektronik	Sedang Dipakai	Ruang Kelas X	  

5. Principal's Page

The Principal's page displays a table containing facility data that has been entered by the operator. Unlike the operator's page, this page does not include buttons to add, edit, or delete data. The principal can only use the View button in the operations column to view facility details in greater detail. This view is designed to allow the principal to monitor, review, and evaluate existing facility data without altering the data itself.

Picture 7
 Principal Page Display



B. Results

In the effectiveness test of the Sarana Expert System, the researcher used several measured indicators, namely usability, technical performance, security, content and information effectiveness, efficiency of use, and user satisfaction. The analysis used to process the data was the effectiveness index analysis. The results of the effectiveness test of the Sarana Expert System model are presented in the following table:

Table VIII
 Effectiveness Test Results

No	Indicator	Number of Items	Total Score	Max Score	Percentage	Conclusion
1	Usability	5	334	350	95,4%	Very Effective
2	Technical Performance	5	339	350	96,8%	
3	Security	5	331	350	94,5%	
4	Content & Information Effectiveness	5	330	350	94,2%	
5	Efficiency of Use	5	336	350	96%	
6	User Satisfaction	5	333	350	95%	
Total		30	2.003	2.100	95,3%	

Based on the table above, it is evident that the effectiveness index of the Sarana Expert System is 95.3%, which is interpreted as highly effective. Therefore, it can be concluded that the Sarana Expert System is highly effective for use by school principals in terms of usability, technical performance, security, content and information effectiveness, efficiency of use, and user satisfaction.

C. Discussion

In the effectiveness test of the Sarana Expert System, the author used six measured indicators: 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 Nielsen (1993), usability encompasses the aspects of learnability, efficiency, memorability, error handling, and user satisfaction, all of which contribute to the comfort of user interaction with the system. This indicator received a score of 95.4%, indicating that the Sarana Expert System is very easy to understand and use, and is capable of helping users complete tasks without difficulty. Technical performance encompasses access speed, response time, and system stability during use,

including under high-traffic conditions. Pressman (2010) states that performance is one of the key attributes of software quality, determining the extent to which a system can respond to user requests optimally and efficiently. This indicator achieved a score of 96.8%, indicating that the Sarana Expert System has been able to deliver excellent technical performance, with fast loading times and stable system responsiveness across various usage scenarios. This demonstrates that technical aspects of system development, such as database structure, system architecture, and code efficiency, have been well-designed and implemented. Security focuses on protecting user data from unauthorized access and maintaining the integrity and confidentiality of information. According to Whitman & Mattord (2010), information security encompasses three main aspects: confidentiality, integrity, and availability. These three aspects form the cornerstone of building a trustworthy information system. This indicator achieved a score of 94.5%, indicating that the Expert System Sarana has met most user expectations regarding data protection and operational security. However, this score also indicates that there is still room for improvement, such as strengthening authentication mechanisms, regularly updating security systems, and providing additional protection against potential cyber threats, so that user trust in the system increases and the risk of data breaches can be minimized.

Content and information effectiveness assesses the extent to which the information displayed by the system is relevant, accurate, and helpful to users in the decision-making process. Laudon and Laudon (2012) state that information quality is determined by the dimensions of accuracy, completeness, relevance, and timeliness. Therefore, high-quality information is a key indicator of an information system's success. This indicator achieved a score of 94.2%, indicating that the Sarana Expert System is highly aligned with user needs, both in terms of content and presentation. The available information is considered capable of providing adequate support in work processes and decision-making, thereby increasing user confidence in the system's reliability. This high score also reflects that the system has successfully presented information in a concise, clear, and easily understandable manner, consistent with its intended context. Usability efficiency, which refers to how quickly and efficiently users can complete their tasks using the system. ISO 9241-11 (1998) defines efficiency as the ratio of resources expended to the accuracy and completeness of achieving the user's goals. An efficient system minimizes the user's cognitive load and operational time. This indicator achieved a score of 96%, indicating that the Sarana Expert System has a well-structured workflow, easily accessible features, and quick responsiveness in executing user commands. User satisfaction reflects users' subjective perceptions of the comfort and benefits of using the system as a whole. Based on the Technology Acceptance Model (TAM) proposed by Davis (1989), user satisfaction is influenced by the perceived ease of use and perceived usefulness of the system. If the system can provide a positive user experience, the level of acceptance and use of the system will increase. This indicator received a score of 95%, indicating that most users are highly satisfied with the performance, appearance, and functional benefits of the Sarana Expert System.

CONCLUSION

Based on the effectiveness results, it can be concluded that the developed Facilities Expert System has met the criteria as an effective management information system for use

by vocational high school principals. The quantitative findings show that all indicators—namely usability, technical performance, security, content and information effectiveness, efficiency of use, and user satisfaction—achieved maximum scores and fall into the “very effective” category. These findings indicate that the Facilities Expert System is capable of providing accurate and relevant information, as well as supporting decision-making processes quickly and appropriately. However, qualitative findings from interviews reveal the need for further development. School principals expect the system to be equipped with a feature for periodic monitoring of facility conditions, making it easier to assess feasibility levels, maintenance needs, and priorities for facility replacement. In addition, there is a need to develop features that can present information related to the condition, maintenance, and updating of facilities in a more structured and sustainable manner. Although the Facilities Expert System has been declared highly effective, this feedback indicates that user needs are dynamic and should be accommodated in future system development. Therefore, further development is expected to enhance the system’s quality in supporting more planned, efficient, and data-driven school facilities management.

REFERENCES

- Abre. (n.d.). *K-12 School Dashboard Examples*. Retrieved from <https://www.abre.io/>
- Afriansyah, H., Gistituati, N., Irsyad, I., Marsidin, S., Rusdinal, R., Sabandi, A., & Widya, N. (2025). *Evaluating the effectiveness of the All-in-One Dashboard System (AIODS) in enhancing vocational high school management*. *Data and Metadata*, 4, 1159. <https://doi.org/10.56294/dm20251159>
- Alkin, M. C. (2011). *Evaluation Essentials: From A to Z*. Guilford Press.
- Borg, W. R., & Gall, M. D. (1983). *Educational Research: An Introduction* (4th ed.). Longman.
- Alnuaim, A., & Khan, R. (2023). Integration of Information Dashboards for School Leadership Decision-Making. *International Journal of Educational Technology*.
- Alshammari, S., Aldhafiri, M., & Bin Suhail, S. (2021). The Role of EMIS in School Management. *Journal of Educational Technology & Society*.
- Asio, J. M. R., et al. (2022). EMIS Utilization and Administrative Decision-Making. *Journal of Educational Research and Practice*.
- Bold BI. (2021). *Education Dashboard Examples*. Retrieved from <https://www.boldbi.com/>
- Davis, F. D. (1989). *Perceived usefulness, perceived ease of use, and user acceptance of information technology*. *MIS Quarterly*, 13(3), 319–340.
- Element451. (2023). *All-in-One Admissions Dashboard*. Retrieved from <https://element451.com/>
- EvalCommunity. (n.d.). *Decision-Making in Education Management*. Retrieved from <https://www.evalcommunity.com/>
- Education to Workforce Indicator Framework. (n.d.). Retrieved from <https://www.ed2work.org/>
- Fitzpatrick, J. L., Sanders, J. R., & Worthen, B. R. (2011). *Program Evaluation: Alternative Approaches and Practical Guidelines* (4th ed.). Pearson.
- Guskey, T. R. (2000). *Evaluating Professional Development*. Corwin Press.
- InetSoft. (n.d.). *Education Dashboard Software*. Retrieved from <https://www.inetsoft.com/>
- ISO. (1998). *ISO 9241-11: Ergonomic requirements for office work with visual display terminals (VDTs) – Part 11: Guidance on usability*. International Organization for Standardization.

- Kirkpatrick, D. L., & Kirkpatrick, J. D. (2006). *Evaluating Training Programs: The Four Levels*. Berrett-Koehler.
- Laudon, K. C., & Laudon, J. P. (2012). *Management Information Systems: Managing the Digital Firm* (12th ed.). Pearson.
- Nielsen, J. (1993). *Usability Engineering*. Academic Press.
- Nieveen, N. (1999). *Prototyping to Reach Product Quality*. In J. van den Akker et al. (Eds.), *Design Approaches and Tools in Education and Training*. Springer.
- OECD. (2023). *School Leadership for Learning*. OECD Publishing.
- Patton, M. Q. (2008). *Utilization-Focused Evaluation* (4th ed.). SAGE.
- Plomp, T., & Nieveen, N. (2007). *An Introduction to Educational Design Research*. SLO.
- Pressman, R. S. (2010). *Software Engineering: A Practitioner's Approach* (7th ed.). McGraw-Hill.
- Rossi, P. H., Lipsey, M. W., & Freeman, H. E. (2018). *Evaluation: A Systematic Approach* (8th ed.). SAGE Publications.
- Scriven, M. (2007). *Key Evaluation Checklist*. Western Michigan University.
- SEAtS Software. (n.d.). *Education Management Dashboards*. Retrieved from <https://www.seatssoftware.com/>
- Sharma, S. (2021). The Role of EMIS in Strengthening School Systems. *International Journal of Educational Development*.
- Stufflebeam, D. L., & Coryn, C. L. S. (2014). *Evaluation Theory, Models, and Applications* (2nd ed.). Jossey-Bass.
- Sugiyono. (2011). *Metode Penelitian Kuantitatif, Kualitatif, dan R&D*. Alfabeta.
- Tessmer, M. (1993). *Planning and Conducting Formative Evaluations*. Psychology Press.
- UNESCO IIEP. (n.d.). *EMIS for Educational Planning*. Retrieved from <https://www.iiep.unesco.org/>
- Whitman, M. E., & Mattord, H. J. (2010). *Principles of Information Security* (3rd ed.). Cengage Learning.