QUALITY INSTRUMENT IS FOCUSED REUSABILITY FOR ACADEMIC INFORMATION SYSTEMS SOFTWARE

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ABSTRACT

The usability-focused IS quality instrument is a conceptual model of a quality instrument that implements and focuses on standardizing usability behavior in a website software-based academic information system. Quality Structure along with Quality Factors and Quality Model Questionnaire Method which consists of the Basic Quality Questionnaire Method for AISS, Basic Quality Model Questionnaire Method and Usability Questionnaire Method are the research methods used. The purpose of this study is to propose an IS quality instrument that focuses on usability as a quality instrument that determines usability behavior in academic information system software, namely understandability, learnability, operability, attractiveness, and usability compliance. The usability-focused IS quality instrument is one of the quality assurance software quality instruments that has a high level of reliability and is required in every academic information system (AISS) software. So that a quality instrument is needed as a determinant of the quality of academic information system software that implements the quality model as an instrument system.

Keywords: IS quality instruments focused on usability, quality instruments, quality models, academic information system software.

1. INTRODUCTION

Academic Information System Software (AISS) or also known as Academic Information System is a type of software or software that functions to assist educational institutions in managing various academic information (Raewf & Jasim, 2020). AISS provides various modules related to the management and management of information such as student data, class schedules, class and lecture halls, exam schedules, grades, and so on. Educational institutions can optimize the efficiency of administrative processes, avoid data errors and defects, simplify information search, and accelerate decision making (Al-Hawari et al., 2019). Apart from that, AISS can also be used by students to access information such as class schedules, assessments, and campus announcements (Adha et al., 2020).

There are several main features provided by AISS, including student data management modules, class schedule management modules, class and lecture room management modules, exam schedule management modules, grades management modules, and announcement modules. The student data management module is used to collect, store, and disclose

information about students' personal data, including their academic history. The course schedule-management module, on the other hand, allows campuses to create and track class schedules that suit the needs of each class and faculty (Slade et al., 2019).

Classroom and lecture hall-management modules enable campuses to assign classes to spaces and inform faculty and students of space availability. The exam schedule management module makes it easy to manage exam schedules on campus, including the room, time, and type of exam. The grade-management module assists teachers in calculating student grades quickly and easily, including reporting deficiencies in grades that students must correct (Bhute et al., 2020). In its development, AISS has developed into a more comprehensive and user-friendly software (Dandil, 2020). Various technologies and the latest breakthroughs are used to make AISS more effective and efficient in managing academic information. Several additional features have also been added to provide an online teaching and learning process (e-learning) as was done during the current Covid-19 pandemic.

E-Learning is an education system that utilizes information technology (Suppa et al., 2023), namely using electronics or computers that support the learning and teaching process (Mustapa et al., 2022); . Academic information system software (AISS) is an information system built using a web-based application. The advantage of web-based AISS lies in its ability to manage centralized data (Cheraghi et al., 2023). AISS has a scope similar to other web-based applications used for public services such as health care services, government services, and banking services. Some of the similarities that exist between these systems include the number of users, providing services with availability, high accuracy, reliability, and interoperability (Girela-López et al., 2020).

AISS is distinguished from other information systems in terms of content and type of content as well as its main business processes (Setyowati et al., 2021). AISS must provide a reliable and real-time system so that it can safely manage academic results such as study results cards, student attendance, teacher/staff attendance, student graduation, student payments, and so on. However, the currently available AISS has not fully implemented the quality model as a system tool. Each quality model has different quality tools. Currently, academic information systems (AIS) are often built using web-based applications. Standard utilities, such as security and reusability, can be provided through web-based applications (Al Nawaiseh et al., 2020).

IS quality instruments that focus on usability are tools used to evaluate the usability behavior of academic information systems (AISS). There are five usability behaviors that must be owned by AISS according to the IS quality instrument, namely first, "understandability" or ease of understanding by users. Second, "learnability" or efficient ease of use with complete user documents and assistance. Third, "operability" or easy to operate and control the use of software. Fourth, "interesting interaction" and attractive user interface adjustments are usability behaviors that focus on attractiveness. Finally, "usability compliance" or AISS's ability to comply with rules related to software usability.

2. THEORY

2.1. Software Quality Assurance

Software quality assurance refers to the conformity between functions and requirements, software quality standards, and the characteristics expected of professional software developers. According to IEEE (Mishra & Otaiwi, 2020), software quality assurance is an organized plan and system needed to produce a product that meets requirements, as well as a series of activities carried out to evaluate the product development process. The objectives of software quality assurance in software development are as follows:

1) Ensuring trust in the software based on predefined requirements.
2) Guarantee that the software will be within the specified time and cost to meet the requirements.
3) Improve software development efficiency and quality assurance through management initiatives and activities.

3.2. IS Quality Models

The conceptual IS quality model is an instrument quality model that is based on a software quality model. The quality model is a benchmark in measuring product quality (Akanmu et al., 2020). The IS quality model is a quality instrument model proposed to implement and focus security and usability behavior standards on a website application-based academic information system (Da Costa et al., 2019). The implementation of the IS quality model in web-based applications is carried out because web applications have quality standards that must be considered, namely security and reusability. In addition, WBAQM is the main framework of AISS.

3.3. ISO/IEC 9126

ISO/IEC 9126 is an international standard that focuses on software development and measurement of its quality (Perdomo & Zapata, 2021); (Ronchieri & Canaparo, 2023). This standard is divided into six main attributes, namely functionality, efficiency, reliability, ease of maintenance, portability, and regularity (Auda et al., 2021). The functionality attribute is the ability of the software to meet predefined functional requirements. Efficiency attributes include performance and optimal use of resources in the software. The reliability attribute refers to the ability of the software to operate under various conditions and produce accurate and consistent results.

The ease of maintenance attribute is the ability of the software to be understood, changed and corrected by the developer without causing side effects to other parts. The portability attribute is the ability of the software to be installed and used on a variety of different platforms. Finally, regularity refers to the use of standards and consistency in software development and documentation. These standards are very important because they help ensure that the software developed by organizations meets internationally defined quality standards, and can provide more optimal benefits to end users (Al-Saqqa et al., 2020). These standards are very important because they help ensure that the software developed by organizations meets internationally defined quality standards, and can provide more optimal benefits to end users.

Compliance with software quality is important because the software will be used in various business fields. A software must meet the requirements, have minimal errors, a small defect

rate, and have high reliability. If the quality of a software is not guaranteed, business activities carried out with the software can be disrupted. There are several quality models used, such as McCall, Boehm, FURP, and ISO 9126. Among these models, ISO/IEC 9126 is the most complete quality model that is easy to use, with three measurement metrics: internal, external, and usage. ISO/IEC 9126 is designed to improve product quality, as well as provide an evaluation of a software product that has been measured. Internal metrics in ISO/IEC 9126 have six characteristics, namely functionality, reliability, usability,

3.4. Web Based Application Quality Model (WBAQM)

WBAQM (Web Based Application Quality Model) is a framework specifically designed for measuring the quality of web-based software (Muhammad et al., 2020). Some of the factors included in WBAQM are the system's ability to maintain data security, access speed, ease of use, and more. By implementing the WBAQM framework, the AISS system is ensured to be of good quality and able to meet user needs effectively (Zeng et al., 2021). In addition, using the WBAQM framework also allows developers to carry out quality measurements regularly and with predefined standards. Thus, the quality of the AISS system can be continuously improved so that it always meets the needs of its users.

3. METHODS

3.1 Quality Model Questionnaire Method

Quality Model Questionnaire Method or Quality Model Questionnaire Method is a research method that uses questions in the form of choices (Newman & Gough, 2020). This method consists of three types of questionnaires, namely the Basic Quality Questionnaire Method for AISS, the Basic Quality Model Questionnaire Method, and the Usability Questionnaire Method. The purpose of using this method is to determine the most appropriate parameters as a description of a quality model. The model is based on the ISO/IEC 9126 quality model theory, which consists of six aspects, namely Attractiveness, Efficiency, Clarity, Reliability, Stimulation and Novelty (Sulistiyani & others, 2021). By using this method, researchers can determine the most important parameters to determine the quality of a product or service.

4. RESULTS AND DISCUSSION

In the world of academic information systems, there is a conceptual quality instrument called the Usability-Focused IS Quality Instrument. This conceptual uses standardized usability behavior to implement an academic information system on a website application. Therefore, to improve the quality of these quality instruments, it is necessary to propose a quality structure and quality factors that can ensure the effectiveness and efficiency of these instruments. Thus, Usability-Focused IS Quality Instruments can function optimally and provide greater benefits to users (Mondragón Bernal et al., 2022). The proposed quality structure and quality factors for IS quality instruments focused on usability can be seen in Figure 1.

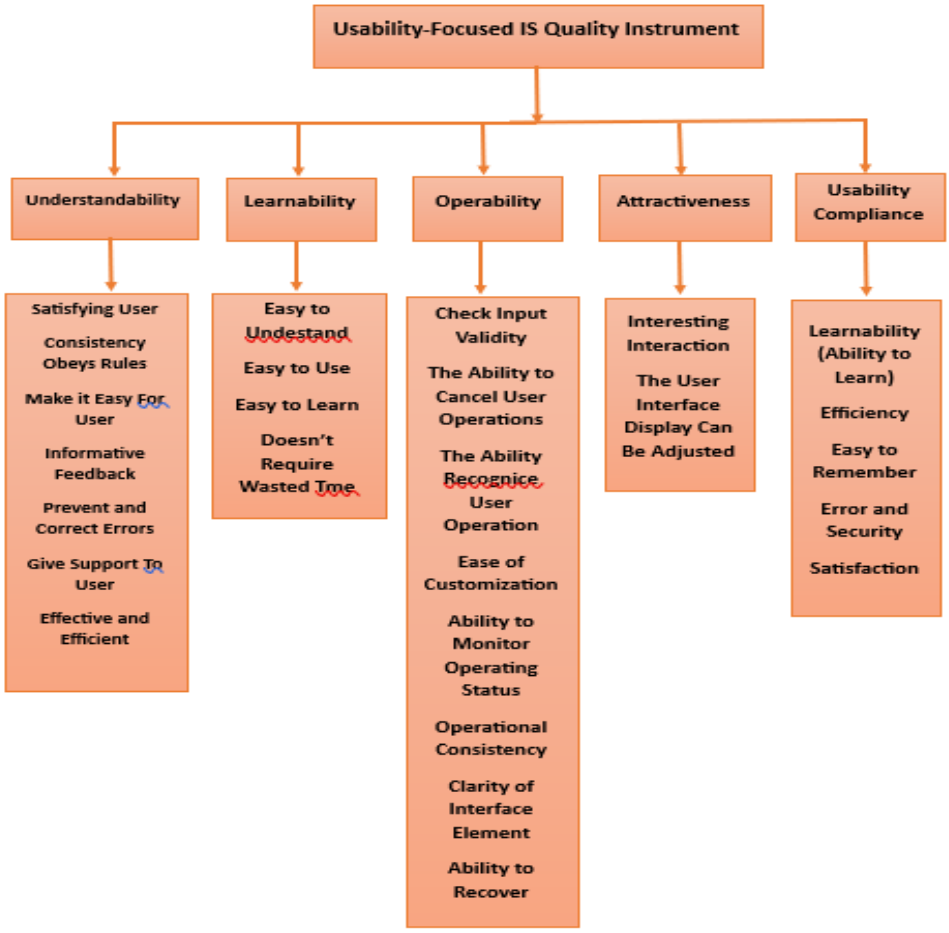

Figure 1. IS Instrument Quality Structure and Quality Factors Focus on Usability

Quality models often begin with the identification of a quality instrument perspective, which is the first stage of the quality structure. The IS quality instrument perspective focuses on usability and is an important perspective in the development of quality models. The second level of this structure includes five types of quality contained in IS quality instruments focused on usability, namely understanding, learnability, ease of use, attractiveness and compliance with usage rules (Ka et al., 2023).

There are three levels of information system structure and quality factors. The first level is the identification of the quality instrument model perspective. Then, at the second level, quality categorization is carried out based on the perspective of quality instrument models. Finally, at the third level, quality factor mapping is carried out based on the perspective of quality instrument models (Ramadhan et al., 2022).

The use-focused IS instrument quality perspective is the second stage of the use-focused IS instrument quality structure. This second stage consists of five types of quality, namely understanding, learning ability, ease of operation, attractiveness, and compliance in use. The third stage is mapping the quality factors to the perspective of the instrument quality model, namely the quality factors that become requirements, considerations, and the characteristics of each quality instrument.

The proposed IS quality model includes a variety of quality instruments that primarily focus on usability. This instrument helps in determining the usability behavior of academic information system software. Software usability is evaluated based on several factors, including understandability, erudition, operability, attractiveness, and usability suitability. It is important to note that there is a correlation between the usability of the software and the quality of the user experience.

Satisfaction of users when using academic information system software (AISS) is achieved through the quality instrument of understandability in the IS quality model. The fulfillment of Shneiderman's eight rules, which include consistency, fast key facilities, informative feedback, dialogue design that leads to closure, error prevention and error handling, reversal of easy actions, support for internal locus of control, and reduction of short-term memory load, provides a satisfying interaction for users with the AISS.

Table 1. Quality of Understandability

	Quality Factor	**Description**
Understandability Quality	User satisfaction	The utilization and understanding of the system's ability to overcome latency and software reliability are integral processes.
	Consistently obey the rules	The rules continue
	Informative feedback	User Feedback
	Prevent and correct errors	Actions taken to prevent and correct user errors.
	Make it easy for users	The tools used to help users
	Effective and efficient	Software aimed at decreasing the burden on short-term memory

The ease of learning and usability are essential qualities for every AI Support System (AISS). Learnability serves as a crucial aspect that must be incorporated into the design, as users prefer systems that are intuitive and require minimal time and effort to understand and operate.

Table 2. Quality of Learnability

	Quality Factor	Description
Learnability Quality	Easy to understand	The ability of AISS is understood
	Easy to use	AISS capability is used
	Easy to learn	The ability of AISS is understood
	Does not require wasteful time in its use	The ability of AISS saves time in its use.

Operability is a crucial quality factor in AI Support Systems (AISS), emphasizing usability. It emphasizes the need for software designers and developers to create highly usable systems. Operability serves as an instrumental factor aimed at addressing user challenges, including content confusion, lengthy learning curves, and difficulties encountered while using the software.

Table 3. Quality of Operation

Quality Factor	Description
Check input validity	AISS ability check data
The ability to cancel user operations	The capability of AISS to revoke or disable user-implemented functions

	Ability to recover operational errors	Implementation with user error tolerance
Operability Quality	The ability to negotiate user operations	AISS ability to download implemented functions
	Ease of customize	The operational flexibility allows for customizable functions with ease
	Ability to monitor operating status	Status monitoring capability
	operational consistency	Operations exhibiting varied or inconsistent behavior
	Clarity of Message	The message is implemented with a clear explanation
	Clarity of interface elements	Interface elements that have their own explanation

Attractiveness serves as a dynamic and versatile design element that addresses existing challenges in the development of digital products, particularly in the realm of AI Support Systems (AISS). The development of a product encounters difficulties due to the ever-changing and insatiable nature of users. Thus, the notion of a 'completed' product is not definitive, as further stages of development follow. To tackle these challenges, the IS quality model proposes solutions for AISS products, including:

1. Engaging interactions that prioritize color attributes and graphic design.
2. Customizable user interface displays.

Both of the aforementioned solutions cater to the dynamic and ever-changing nature of users, allowing the AISS interface to be tailored to their preferences and emphasizing the importance of color and graphic design.

Table 4. Quality of Attractiveness

	Quality Factor	Description
Attractive Quality	Interesting interactions	Color attributes and color design make interactions interesting
	The user interface can be adjusted	The elastic nature of the user who changes frequently and is never satisfied is the reason that the interface design is tailored to the user's wishes.

Usability compliance refers to the quality of software in assisting users to successfully accomplish tasks. The achievement of task completion success in a system depends on the alignment of three essential aspects, collectively referred to as the "use" factors:

1. Usefulness: The system fulfills the desired functions and purposes of its users.
2. Usability: The system is easy to navigate and operate.
3. User engagement: The system motivates users to actively engage with it, offering an enjoyable and captivating experience.

Table 5. Quality of Usability Compliance

Quality Factor	Description
Learnability	AISS must be easy to learn and use
Efficiency	Methods employed by AISS to assist users in performing their tasks efficiently

Usability Compliance	Memorability	The capability of AISS to retain information and knowledge even during periods of inactivity
	Errors and security	The capacity of AISS to safeguard users from undesirable circumstances and situations
	Satisfaction	The ability of AISS to deliver user satisfaction through its convenient features

5. CONCLUSIONS AND SUGGESTIONS

This quality instrument is used to evaluate the usability level of academic information system software, which includes elements such as understandability, learnability, operability, attractiveness, and adherence to usability standards. (usability compliance). Use of Usability-Focused IS Quality Instruments will indicate the extent to which an academic information system software is easy to use and understand. In addition, this instrument also shows the ease of navigation in academic information system applications. The main framework model for this academic information system is web-based technology or the Web-Based Application Quality Model (WBAQM). By leveraging the Usability-Focused IS Quality Instrument.

REFERENCES

Adha, M. A., Ariyanti, N. S., Bafadal, I., & others. (2020). Analysis of success factors implementation of computer-based management information system in higher education. *1st International Conference on Information Technology and Education (ICITE 2020)*, 80–85.

Akanmu, M. D., Hassan, M. G., & Bahaudin, A. Y. Bin. (2020). A preliminary analysis modeling of the relationship between quality management practices and sustainable performance. *Quality Management Journal*, *27*(1), 37–61.

Al-Hawari, F., Alshawabkeh, M., Althawbih, H., & Abu Nawas, O. (2019). Integrated and secure web-based examination management system. *Computer Applications in Engineering Education*, *27*(4), 994–1014.

Al-Saqqa, S., Sawalha, S., & AbdelNabi, H. (2020). Agile software development: Methodologies and trends. *International Journal of Interactive Mobile Technologies*, *14*(11).

Al Nawaiseh, A. J., Helmy, Y., & Khalil, E. (2020). A New Software Quality Model For Academic Information Systems Case Study E-Learning System. *Int. J. Sci. Technol. Res*, *9*(1), 3822–3833.

Auda, R. A., Subriadi, A. P., Tjahyanto, A., Wulandari, A. D., & others. (2021). Measuring software quality with usability, efficiency, and portability characteristics. *IOP Conference Series: Earth and Environmental Science*, *704*(1), 12039.

Bhute, V. J., Campbell, J., Kogelbauer, A., Shah, U. V, & Brechtelsbauer, C. (2020). Moving to timed remote assessments: the impact of COVID-19 on year end exams in chemical engineering at imperial college london. *Journal of Chemical Education*, *97*(9), 2760–2767.

Cheraghi, S., Chalechale, A., & Safari, F. (2023). Towards Web-Based Automation: A Comparative Analysis of Feature Extraction Approaches and Applications for Quality Control. *2023 9th International Conference on Web Research (ICWR)*, 322–329.

Da Costa, R. P., Canedo, E. D., De Sousa, R. T., Albuquerque, R. D. O., & Villalba, L. J. G. (2019). Set of usability heuristics for quality assessment of mobile applications on smartphones. *IEEE Access*, *7*, 116145–116161.

Dandil, E. (2020). C-NSA: a hybrid approach based on artificial immune algorithms for anomaly detection in web traffic. *IET Information Security*, *14*(6), 683–693.

Girela-López, F., López-Jiménez, J., Jiménez-López, M., Rodr\'\iguez, R., Ros, E., & D\'\iaz, J. (2020). IEEE 1588 high accuracy default profile: Applications and challenges. *IEEE Access*, *8*, 45211–45220.

Ka, C., Juhari, M. I., Azid, N., Bagus, N. R. P. A., Rizky, E. W., Zainuddin, N. A., & others. (2023). Development of Task-Based Instructional E-Module for Data Processing Unit of Information Technology Courses. *Journal of Technology and Humanities*, *4*(1), 1–13.

Mishra, A., & Otaiwi, Z. (2020). DevOps and software quality: A systematic mapping. *Computer Science Review*, *38*, 100308.

Mondragón Bernal, I. F., Lozano-Ramirez, N. E., Puerto Cortés, J. M., Valdivia, S., Muñoz, R., Aragón, J., Garcia, R., & Hernández, G. (2022). An immersive virtual reality training game for power substations evaluated in terms of usability and engagement. *Applied Sciences*, *12*(2), 711.

Muhammad, A. H., Siddique, A., Youssef, A. E., Saleem, K., Shahzad, B., Akram, A., & Al-Thnian, A.-B. S. (2020). A hierarchical model to evaluate the quality of web-based e-learning systems. *Sustainability*, *12*(10), 4071.

Mustapa, M., Rahmah, U., & Asjart, M. (2022). Development of Learning Media for Introductory Information and Communication Technology Courses. *Ceddi Journal of Education*, *1*(1), 23–27. https://doi.org/https://doi.org/10.56134/cje.v1i1.11

Newman, M., & Gough, D. (2020). Systematic reviews in educational research: Methodology, perspectives and application. *Systematic Reviews in Educational Research: Methodology, Perspectives and Application*, 3–22.

Perdomo, W., & Zapata, C. M. (2021). Software quality measures and their relationship with the states of the software system alpha. *INGENIARE-Revista Chilena de Ingeniera*, *29*(2).

Raewf, M. B., & Jasim, Y. A. (2020). Information technology's impact on the accounting system. *Cihan University-Erbil Journal of Humanities and Social Sciences*, *4*(1), 50–57.

Ramadhan, A., Hidayanto, A. N., Salsabila, G. A., Wulandari, I., Jaury, J. A., & Anjani, N. N. (2022). The effect of usability on the intention to use the e-learning system in a sustainable way: A case study at Universitas Indonesia. *Education and Information Technologies*, 1–34.

Ronchieri, E., & Canaparo, M. (2023). Assessing the impact of software quality models in healthcare software systems. *Health Systems*, 1–13.

Setyowati, W., Widayanti, R., & Supriyanti, D. (2021). Implementation Of E-Business Information System In Indonesia: Prospects And Challenges. *International Journal of Cyber and IT Service Management*, *1*(2), 180–188.

Slade, S., Prinsloo, P., & Khalil, M. (2019). Learning analytics at the intersections of student trust, disclosure and benefit. *Proceedings of the 9th International Conference on Learning Analytics \& Knowledge*, 235–244.

Sulistiyani, E., & others. (2021). Evaluation of IBSI Education System Use ISO/IEC 9126 Quality Model: How is the Quality? *2021 International Conference on Computer Science, Information Technology, and Electrical Engineering (ICOMITEE)*, 68–73.

Suppa, R., Hasjidil, A., & others. (2023). Designing an Android-Based Educational Game for Fruit Recognition in Seruni Pertiwi Preschool. *Ceddi Journal of Education*, *2*(1), 7–16.

Zeng, Z., Yuan, X., Liang, J., & Li, Y. (2021). Designing and implementing an SWMM-based web service framework to provide decision support for real-time urban stormwater management. *Environmental Modelling & Software*, *135*, 104887.