Design and Development of an Interactive Audit Analytics Dashboard for Higher Education Quality Assurance

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ABSTRACT

Many higher education institutions still conduct internal quality audits manually using separate spreadsheets, which leads to fragmented data management, delays in reporting, and reduced monitoring effectiveness. This study develops a web-based interactive dashboard designed to organize audit information more efficiently and clearly for stakeholders. Using the Waterfall methodology requirements analysis, system design, implementation, and black-box testing the system successfully displays quality indicators, follow-up status, and audit progress in real time. The dashboard improves data compilation efficiency, minimizes human errors, and accelerates information distribution to institutional leaders. Usability evaluation of the system using the System Usability Scale (SUS) with 30 stakeholders yielded an average score of 81.2, indicating 'Excellent' usability and high user acceptance. Quantitative results show that the dashboard reduces audit data compilation time by 75% and provides real-time information access, thereby serving as an effective tool for monitoring and evaluating internal audit activities while supporting transparency, accountability, and data-driven decision-making. Future work may include integrating the dashboard with existing campus information systems and adding advanced analytics features for continuous quality improvement.

1. INTRODUCTION

Internal Quality Audits (IQA) are essential mechanisms for maintaining academic standards and institutional governance. However, many universities still depend on manual audit practices using Excel spreadsheets and dispersed documents. This approach is not only time-consuming but also prone to inconsistencies, errors, and difficulties in tracking audit progress (Javed, 2023). highlights that data fragmentation remains one of the largest challenges in higher education quality assurance globally, as most institutions lack integrated digital tools for managing large-scale audit datasets.

The complexity of accreditation and continuous quality improvement also requires institutions to process and analyze extensive data efficiently. Without a centralized digital solution, the audit process becomes slow, less transparent, and unable to provide timely information for decision-making.

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Previous studies generally focused on dashboard implementation for business analytics, commodity prediction, and public information systems. However, most of these studies did not specifically address the problems found in internal quality audit processes within higher education institutions, particularly issues related to fragmented audit data, delayed reporting, and difficulties in monitoring follow-up actions in real time. In addition, several previous systems mainly functioned as static reporting tools rather than interactive monitoring platforms that support continuous evaluation and transparency. Therefore, this research proposes a web-based interactive dashboard specifically designed to support monitoring and evaluation of Internal Quality Audits in higher education. The proposed system focuses on centralized visualization, real-time monitoring, interactive filtering, and clearer presentation of audit indicators to improve decision-making efficiency and institutional quality assurance processes.

Dashboards, when designed based on usability and human-centered design principles, have been shown to enhance data interpretation, user engagement, and decision accuracy (Aditama et al., 2020). further emphasize that an effective dashboard must ensure clarity, intuitive navigation, and high-quality visualization. Therefore, developing an interactive dashboard tailored to IQA needs is crucial to supporting real-time monitoring, strengthening quality culture, and improving audit transparency in higher education institutions (Almasi et al., 2023).

From the perspective of Information Systems (IS) theory, the manual and fragmented nature of traditional internal quality audits represents a critical failure in Information Quality (IQ) and Decision Support Systems (DSS). According to DeLone and McLean's IS Success Model, information quality directly influences user satisfaction and individual performance. When audit data is stored in isolated spreadsheets, it lacks accessibility, coherence, and timeliness, thereby hindering strategic decision-making.

To address this, the implementation of a web-based dashboard can be conceptualized as an executive Decision Support System and an application of Business Intelligence (BI) in higher education (academic analytics). By utilizing Information Visualization (IV) principles (Tufte, 2001), the dashboard applies cognitive design guidelines to reduce data complexity. This allows university leaders to identify quality assurance bottlenecks rapidly. The system acts as a visual cognitive aid, converting high-volume multi-dimensional operational data into real-time, actionable insights, thereby supporting continuous quality improvement cycles and strengthening institutional quality culture.

2. METHOD

2.1 Research Design

This research adopts a Research and Development (R&D) design, specifically adopting the Design Science Research (DSR) paradigm as the overarching research framework. Design Science Research is highly suited for information systems development as it focuses on creating and evaluating innovative IT artifacts to solve practical organizational problems (Hevner et al., 2004). Within this DSR framework, the software development lifecycle (SDLC) is executed using the structured Waterfall model. The Waterfall model, characterized by its linear and sequential phases (requirements analysis, system design, implementation, and testing), provides a systematic approach to operationalize the creation of the dashboard. This ensures that requirements are fully captured and documented before design and implementation, leading to a robust, high-quality dashboard artifact that satisfies the rigorous evaluation criteria of DSR. The model is especially suitable for dashboard development since it facilitates strict planning and well-defined stages, which is essential when building tools with specific functional expectations (Helminski et al., 2024).

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The development process begins with the requirements analysis phase, in which detailed information regarding user needs, system functionality, existing problems, and workflow challenges is collected through observation and interviews. The insights gained from this phase serve as the foundation for defining system specifications. This is followed by the system design phase, where the overall architecture of the system is developed, including interface design, database structure, and workflow modeling. The design process focuses on creating an intuitive and efficient dashboard layout supported by clear information flow and appropriate data visualization techniques.

The system database was designed using an Entity Relationship Diagram (ERD) to define relationships between audit-related data entities. The ERD serves as the foundation for organizing structured data within the interactive dashboard system. The main entities include audit units, audit indicators, audit results, follow-up actions, and user management. Through this database structure, the system can display audit information in a centralized and integrated manner while supporting real-time visualization and monitoring processes.

To ensure data integrity and prevent update, insertion, and deletion anomalies, the database schema was designed following relational database normalization principles up to the Third Normal Form (3NF). Every non-key attribute in the tables is fully dependent only on the primary key (no transitive dependencies).

The cardinality and operational relationships between the 8 main entities are defined as follows:

1. Periode_audit (1) to Penugasan_audit (N): An audit period can contain multiple audit assignments, while each assignment belongs to exactly one period.
2. Auditor (1) to Penugasan_audit (N): An auditor can be assigned to multiple audit tasks across the institution, resolving the many-to-many relationship between auditors and periods.
3. Penugasan_audit (1) to Daftar_tilik (N): Each specific audit assignment maps to multiple checklist items that must be evaluated.
4. Standart_mutu (1) to Daftar_tilik (N): A quality standard governs multiple checklist items, ensuring audit compliance with institutional criteria.
5. Daftar_tilik (1) to Temuan_audit (0..N): A checklist item can result in zero or more audit findings depending on compliance.
6. Temuan_audit (1) to Tindakan_koreksi (1..N): Each identified finding must trigger at least one or more corrective actions to close the audit loop.
7. Temuan_audit (1) to Peluang_peningkatan (0..N): A finding may lead to zero or more opportunities for improvement (OPI) to support quality growth.

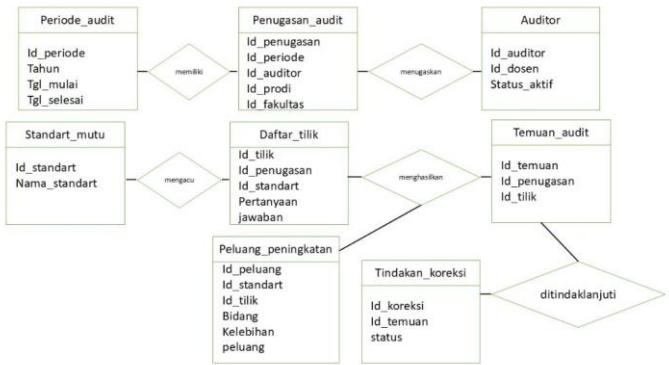

Figure 1 : ERD Design

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The diagram shows the database structure of an Internal Audit Management System, consisting of 8 entities. The flow starts from Periode_audit (audit schedule), which assigns tasks to an Auditor through Penugasan_audit. The auditor then fills out a Daftar_tilik (checklist) based on Standart_mutu (quality standards), which produces Temuan_audit (audit findings). Each finding is followed up through Tindakan_koreksi (corrective actions), while improvement opportunities are recorded in Peluang_peningkatan.

Subsequently, the implementation phase is carried out, in which the system is developed using web-based technologies based on the predefined design specifications. All features, including data input, monitoring, and visualization modules, are integrated into a functional dashboard system. Finally, the testing and evaluation phase is conducted using black-box testing methods to ensure that each system feature operates correctly according to its intended function. In addition, usability evaluation is performed to assess whether the system meets user expectations and supports effective decision-making. The results of this stage determine the readiness of the system for practical use in monitoring and evaluating internal quality audits.

2.2 Data collection

The data collection process in this study was conducted using multiple techniques to ensure the validity and completeness of the information obtained. First, direct observation was carried out to examine the existing internal quality audit practices within the institution. This observation aimed to identify how audit data are currently managed, the tools being used, and the challenges faced during the audit process, particularly in terms of data organization, reporting delays, and monitoring inefficiencies.

In addition to observation, semi-structured interviews were conducted with key stakeholders involved in the internal quality audit process, including auditors, administrative staff, and institutional leaders. These interviews were designed to gather in-depth insights into user needs, system expectations, and specific problems encountered in managing audit data. The flexibility of semi-structured interviews allowed participants to provide detailed explanations, which contributed to a deeper understanding of system requirements (Campbell et al., 2020).

Furthermore, documentation analysis was performed by reviewing existing audit-related documents such as audit reports, spreadsheets, and institutional guidelines. This step aimed to understand the structure of audit data, reporting formats, and standard operating procedures currently applied. The collected documents also served as a reference for designing the database structure and dashboard features.

By combining observation, interviews, and documentation analysis, this study ensures that the data collected are comprehensive and accurately reflect real conditions, thereby supporting the development of an effective and user-centered interactive dashboard system.

3. RESULTS AND ANALYSIS

The results of this study indicate that the developed web-based interactive dashboard successfully addresses the main problems identified in the existing internal quality audit process. Previously, audit activities relied heavily on manual data processing using spreadsheet files, which resulted in fragmented data management, delayed reporting, and limited accessibility for stakeholders. Through the implementation of the proposed dashboard system, audit data can now be presented in a centralized and integrated platform, enabling users to access information more efficiently and in real time.

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The developed system focuses on presenting audit results through visual and interactive elements rather than serving as a data input platform. The dashboard displays key information such as quality indicators, audit results for each unit, follow-up status, and overall audit progress (Hasnine et al., 2023). These data are presented using visual components such as cards, bar charts, pie charts, and progress indicators, which help users understand the condition of audit implementation quickly and intuitively. The inclusion of interactive features, such as filtering based on units or audit periods and hover-based detail views, allows users to explore data more deeply without modifying the original dataset.

From the implementation perspective, the system was developed using web technologies and structured with a clear separation between frontend, backend, and database components. The dashboard operates as a read-only system, ensuring that all displayed data have been verified and cannot be altered by general users. This design decision is crucial to maintain data integrity and prevent unauthorized manipulation, especially considering that audit data are sensitive and used as a basis for strategic decision-making.

The system testing phase, conducted using black-box testing, shows that all main functionalities operate correctly according to the defined requirements. Features such as data visualization, filtering, and report display function as expected without significant errors (Sorour & Atkins, 2024). In addition, the system is capable of displaying updated data dynamically without requiring full page reloads, which improves user experience and supports real-time monitoring.

Table 1 : Black-Box Testing Results

No	Tested Feature	Testing Scenario	Expected Result	Result
1	Dashboard Display	User accesses dashboard page	Dashboard successfully displays audit information and charts	Valid
2	Interactive Filter	User selects audit category filter	System displays filtered audit data correctly	Valid
3	Popup Detail Information	User hovers over dashboard card	Popup detail information appears successfully	Valid
4	Chart Visualization	System loads audit statistics	Charts are displayed dynamically without errors	Valid
5	Real-Time Data Update	Data changes in database	Dashboard updates information automatically	Valid

Based on the black-box testing results, all primary features of the developed dashboard system functioned properly according to the expected requirements. The testing confirms that the dashboard is capable of supporting audit monitoring and visualization processes effectively without significant functional errors.

From the analysis perspective, the implementation of the dashboard significantly improves the accessibility and transparency of audit information. Stakeholders, including institutional leaders, auditors, and quality assurance teams, can monitor audit results directly through the dashboard without needing to request data manually from the quality assurance unit. This reduces dependency

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on manual communication, minimizes delays, and ensures that users always access the most recent data (Herminingsih & Saputra, 2025).

Furthermore, the dashboard enhances the effectiveness of monitoring and evaluation processes by providing a clear overview of audit progress and follow-up actions. Users can quickly identify which units have completed audits, which are still in progress, and which require further attention. This capability supports faster and more accurate decision-making, particularly in evaluating institutional performance and planning quality improvement strategies.

Overall, the results demonstrate that the developed interactive dashboard is effective in improving the efficiency, transparency, and usability of internal quality audit monitoring systems. The system not only simplifies data interpretation through visual representation but also supports a more structured and data-driven evaluation process. These findings confirm that the implementation of a web-based interactive dashboard can serve as a practical solution to overcome the limitations of manual audit systems and contribute to strengthening quality assurance practices in higher education institutions.

3.1. Usability and Performance Evaluation

To evaluate the effectiveness and user acceptance of the developed interactive dashboard, a usability evaluation was conducted using the System Usability Scale (SUS), a standard industry tool for measuring software usability. The evaluation involved 30 respondents representing three key user groups: 5 institutional leaders (executive views), 10 internal auditors, and 15 quality assurance administrators. The SUS consists of 10 items scored on a 5-point Likert scale. The results of the usability evaluation are presented in Table 2.

Table 2 : System Usability Scale (SUS) Evaluation Results

No	SUS Question Item	Mean Score
1	I think that I would like to use this dashboard frequently.	4.2
2	I found the dashboard unnecessarily complex.	1.8
3	I thought the dashboard was easy to use.	4.3
4	I think that I would need the support of a technical person to be able to use this dashboard.	1.5
5	I found the various functions in this dashboard were well integrated.	4.1
6	I thought there was too much inconsistency in this dashboard.	1.6
7	I would imagine that most people would learn to use this dashboard very quickly.	4.4
8	I found the dashboard very cumbersome to use.	1.7
9	I felt very confident using the dashboard.	4.2
10	I needed to learn a lot of things before I could get going with this dashboard.	1.7
	Calculated SUS Score	**81.2 (Excellent)**

The average SUS score of 81.2 indicates that the dashboard has 'Excellent' usability and falls well within the 'Acceptable' range of user satisfaction. In addition to usability, a quantitative

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performance evaluation was conducted to compare the efficiency of the new dashboard system with the traditional manual spreadsheet-based approach. The results are summarized in Table 3.

Table 3 : Performance and Efficiency Comparison

Evaluation Metric	Manual Spreadsheet	Interactive Dashboard	Improvement (%)
Data Compilation Time	40 hours per audit cycle	10 hours per audit cycle	75%
Reporting Delay	14 - 21 days	Real-time (Instant)	> 95%
Form Inconsistency Rate	15.4% of audit forms	0% (System validated)	100%
Follow-up Tracking Speed	5 days to retrieve status	5 seconds (Query search)	> 99%

3.2. Academic Discussion

The findings of this study demonstrate that migrating from manual spreadsheets to an interactive dashboard significantly improves higher education quality assurance. The 75% reduction in compilation time addresses the core issue of data fragmentation highlighted by Javed (2023). Moreover, the real-time availability of audit findings enables faster strategic responses, supporting the findings of Sorour and Atkins (2024), who argued that business intelligence dashboards improve institutional performance monitoring.

In contrast to static reporting tools, the inclusion of interactive filtering and hover-based detail cards reduces the cognitive load of users, which aligns with modern Information Visualization guidelines (Tufte, 2001; Aditama et al., 2020). By providing a centralized, read-only platform, the system ensures data integrity—a critical challenge in academic audit transparency discussed by Yulianti et al. (2024). Ultimately, these improvements foster a data-driven quality culture that enables continuous academic improvement.

3.3. Implementation Findings

The implementation of the web-based interactive dashboard demonstrates that the system successfully improves the process of monitoring and evaluating internal quality audits in higher education. The developed dashboard integrates audit data into a centralized platform, allowing stakeholders to access information more efficiently compared to the previous manual system that relied on spreadsheets and separate documents.

The system is designed as a read-only platform that focuses on data visualization rather than data input. It presents key audit information such as quality indicators, audit results by unit, follow-up status, and overall audit progress. These data are displayed using visual elements such as cards, bar charts, and progress indicators, enabling users to understand audit conditions quickly and intuitively (Yulianti et al., 2024). Interactive features such as filtering by unit and audit period, as well as hover-based detail displays, enhance user experience by allowing deeper data exploration without modifying the original data.

From a technical perspective, the system is developed using web-based technologies with a structured architecture that separates the frontend, backend, and database components (Sampe &

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Arifin, 2024). The use of dynamic data loading enables real-time updates without requiring full page reloads, which improves system responsiveness and usability. Based on black-box testing results, all main features of the system function properly according to the defined requirements, indicating that the system is reliable for practical use.

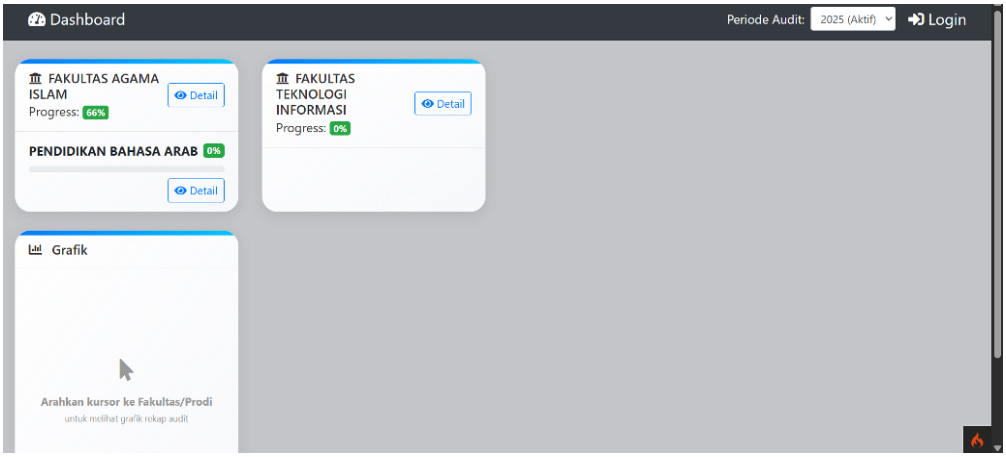

Figure 2. Main dashboard interface displaying audit indicators and overall performance

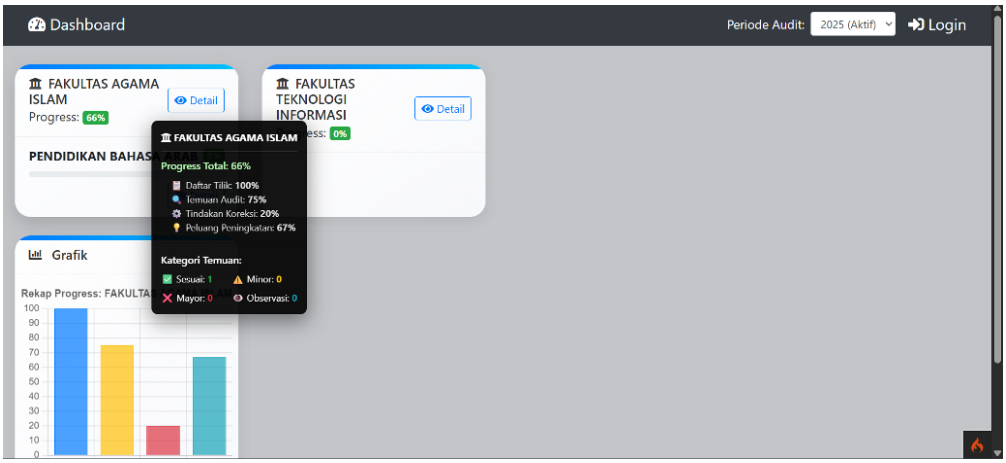

Figure 3. Interactive filtering feature allowing users to explore audit data dynamically

Furthermore, the implementation of this dashboard significantly improves data accessibility and transparency. Stakeholders such as institutional leaders, auditors, and quality assurance teams can directly monitor audit results without needing to request reports manually. This reduces delays in information delivery and ensures that users always access the most up-to-date data. Overall, the dashboard effectively supports data-driven decision-making and enhances the efficiency of internal quality audit processes.

3.4. Challenges

Despite the successful implementation, several challenges were identified during the development and application of the interactive dashboard. One of the main challenges is related to data availability and sensitivity. Since audit data are considered confidential, the system cannot directly use real data during the development and testing stages. As a result, synthetic data were used

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to simulate real audit conditions, which may not fully represent all complexities of actual data in real-world scenarios.

Another challenge lies in the limitation of system functionality, where the dashboard is intentionally designed as a read-only system. While this approach ensures data security and integrity, it also limits user interaction, as users cannot directly update or input audit data through the system. This creates a dependency on external processes for data entry and validation, which are still managed separately by the quality assurance team.

In addition, integrating user needs from diverse stakeholders presents its own difficulty. The system must be designed to accommodate both technical and non-technical users, such as auditors, administrators, and institutional leaders. Ensuring that the interface remains simple, intuitive, and informative for all user groups requires careful design considerations and iterative adjustments.

Another challenge is related to the transition from manual to digital systems. Users who are accustomed to traditional methods, such as spreadsheet-based reporting, may require time to adapt to the new dashboard system. This highlights the importance of user training and system socialization to ensure optimal utilization.

Lastly, system scalability and integration remain future challenges. The current dashboard operates as a standalone system and is not yet fully integrated with other institutional information systems. For long-term implementation, further development is needed to enable system integration, improve data automation, and support more advanced analytical features.

4. CONCLUSION

This study successfully develops a web-based interactive dashboard for monitoring and evaluating internal quality audits in higher education. The system addresses key problems found in the existing manual audit process, such as fragmented data management, limited accessibility, and delays in reporting. By transforming audit data into a centralized and visualized platform, the dashboard enables stakeholders to access information more efficiently and in real time.

The implementation results show that the dashboard effectively presents audit information through interactive visual elements, including quality indicators, audit results, and follow-up progress. The system improves data transparency and supports stakeholders such as institutional leaders, auditors, and quality assurance teams in conducting monitoring and evaluation activities more efficiently. Additionally, the use of a read-only system ensures data integrity and security, which is essential for maintaining the reliability of audit information.

Despite its effectiveness, several limitations remain, including the use of synthetic data for testing, the lack of direct data input features, and the absence of integration with existing institutional systems. These limitations highlight opportunities for future development, particularly in terms of system integration, automation of data processing, and the addition of advanced analytical features.

In conclusion, the developed interactive dashboard serves as an effective tool for improving the efficiency, transparency, and quality of internal audit monitoring systems. By achieving a System Usability Scale (SUS) score of 81.2, indicating 'Excellent' usability, and reducing data compilation time by 75% (from 40 hours to 10 hours), the system demonstrates its practical success. It supports data-driven decision-making and contributes to strengthening quality assurance practices in higher education institutions. Future research is recommended to enhance system capabilities and expand its implementation in broader institutional contexts.

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6. DECLARATION OF COMPETING INTEREST

We declare that we have no conflict of interest.

7. REFERENCES

Aditama, D., Tolle, H., & Muslimah Az-Zahra, H. (2020). Perancangan Dashboard Sistem Informasi Pemeringkatan UBAQA (UB Annual Quality Award) dengan Metode Human Centered Design. *Jurnal Pengembangan Teknologi Informasi Dan Ilmu Komputer*, *4*(4), 1100–1109. http://j-ptiik.ub.ac.id

Almasi, S., Bahaadinbeigy, K., Ahmadi, H., Sohrabei, S., & Rabiei, R. (2023). Usability Evaluation of Dashboards: A Systematic Literature Review of Tools. *BioMed Research International*, *2023*. https://doi.org/10.1155/2023/9990933

Campbell, S., Greenwood, M., Prior, S., Shearer, T., Walkem, K., Young, S., Bywaters, D., & Walker, K. (2020). Purposive sampling: complex or simple? Research case examples. *Journal of Research in Nursing*, *25*(8), 652–661. https://doi.org/10.1177/1744987120927206

Hasnine, M. N., Nguyen, H. T., Tran, T. T. T., Bui, H. T. T., Akçapınar, G., & Ueda, H. (2023). A Real-Time Learning Analytics Dashboard for Automatic Detection of Online Learners' Affective States. *Sensors*, *23*(9). https://doi.org/10.3390/s23094243

Helminski, D., Sussman, J. B., Pfeiffer, P. N., Kokaly, A. N., Ranusch, A., Renji, A. D., Damschroder, L. J., Landis-Lewis, Z., & Kurlander, J. E. (2024). Development, Implementation, and Evaluation Methods for Dashboards in Health Care: Scoping Review. *JMIR Medical Informatics*, *12*, 1–19. https://doi.org/10.2196/59828

Herminingsih, A., & Saputra, R. D. A. (2025). Building Quality Culture of Higher Education by Implementation of Internal Quality Assurance System (An Empirical Evidence). *Eduvest - Journal of Universal Studies*, *5*(1), 601–610. https://doi.org/10.59188/eduvest.v5i1.50270

Javed, Y. (2023). *A Case Study on Sustainable Quality Assurance in Higher Education*.

Sampe, N., & Arifin, Z. (2024). Internal Quality Assurance System in Indonesia Higher Education: Literature Review. *Indonesian Journal of Educational Research and Review*, *7*(1), 73–84. https://doi.org/10.23887/ijerr.v7i1.67925

Sorour, A., & Atkins, A. S. (2024). Big data challenge for monitoring quality in higher education institutions using business intelligence dashboards. *Journal of Electronic Science and Technology*, *22*(1), 100233. https://doi.org/10.1016/j.jnlest.2024.100233

ISSN Print : 1979-7141
ISSN Online : 2541-1942

Yulianti, D., Dewi, I. K., & Wahdi, Y. W. (2024). Promoting audit transparency in higher education through an internal academic quality audit application. *Journal of Computer-Based Instructional Media*, *2*(2), 86–101. https://doi.org/10.58712/jcim.v2i2.132

Hevner, A. R., March, S. T., Park, J., & Ram, S. (2004). Design Science in Information Systems Research. MIS Quarterly, 28(1), 75-105. https://doi.org/10.2307/25148625

Power, D. J. (2002). Decision Support Systems: Concepts and Resources for Managers. Quorum Books.

Tufte, E. R. (2001). The Visual Display of Quantitative Information (2nd ed.). Graphics Press.

ISSN Print : 1979-7141
ISSN Online : 2541-1942