ISSN: 3026-4596
Journal of Computer-based Instructional Media, Vol. 2, No. 2, pp. 86-101, 2024

Promoting audit transparency in higher education through an internal academic quality audit application

Dwi Yuliyanti, Indah Kusuma Dewi and Yera Wahda Wahdi*

Department of Informatic Engineering, Universitas Ibnu Sina, **Indonesia**

*Corresponding Author: wahdawahdiyera@gmail.com
Received 08th August 2024; Revised: 10th October 2024; Accepted: 21st October 2024

https://doi.org/10.58712/jcim.v2i2.132

Abstract: This study aims to design and develop a web-based application for Internal Quality Audit at Universitas Ibnu Sina, replacing the conventional audit process which is currently in use. The previous manual audit process resulted in inefficiencies and increased the risk of errors. Key challenges identified include limitations in human resources, time, and funding, as well as the low effectiveness of the audit process. In order to address these issues, the proposed information system facilitates the distribution of online checklists and document uploads, thereby expediting the verification and reporting audit results. This research adopts the System Development Life Cycle (SDLC) approach in its development, utilizing methods that include use case diagrams, activity diagrams, sequence diagrams, and database design. These methods enhance interaction and workflow within the audit team. Testing results indicate that the system functions to the expected specifications. Furthermore, this study demonstrates that implementing a web-based system can accelerate reporting, improve the structure and documentation of audits, and support efforts to enhance academic quality at the university. Implementing this system is expected to increase efficiency and accuracy in the academic quality audit process at Universitas Ibnu Sina.

Keywords: Internal quality audit; Internal quality assurance system; Web-based application; System development life cycle

1. Introduction

In efforts to maintain and enhance the quality culture in higher education institutions, the implementation of Internal Quality Audits (IQA) is a critical component of the Internal Quality Assurance System (IQAS) (Kooli, 2019). An Internal Quality Audit is a systematic evaluation process conducted annually to ensure that the execution of IQAS standards is both compliant and effective (Chiarini et al., 2021; Hazaea et al., 2020). However, challenges in the implementation of IQA often arise due to limitations in human resources, time, and funding, which can hinder a thorough and efficient audit process. Moreover, the complexity of the stages and the dynamic nature of IQAS policies necessitate that higher education institutions continuously innovate to respond flexibly to changes while maintaining academic quality as part of institutional autonomy (Zuhairi et al., 2020).

Universitas Ibnu Sina (UIS), as an accredited private higher education institution, also faces similar challenges in executing Internal Quality Audits (Nurhikmah et al., 2024; Putra et al., 2024; Ulia et al., 2024). Based on an interview with the Head of the Internal Quality Assurance Agency at UIS, it was revealed that the current IQA process, which is still performed manually with computerization, is not entirely effective. The large volume of documents requiring audit often results in an inefficient and poorly documented audit process, potentially leading to data loss and extended reporting times. Furthermore, auditors reporting audit results often take up to two weeks, increasing the workload and diminishing audit effectiveness (Heo et al., 2021).

Several studies support the negative impact of manual audits. For instance, research conducted by (Stewart & Subramaniam, 2010) found that manual audits in higher education institutions led to an increase in data management errors, with reports indicating that 25% of documents were misplaced or inaccurately recorded, resulting in delays in decision-making and inefficient quality improvement efforts. Similarly, (Anchors et al., 2024) highlighted that manual audits exacerbate the administrative burden on staff, with their research showing that 40% of auditors reported extended working hours and higher stress levels due to the tedious nature of manual document handling.

In order to address the urgency of overcoming challenges in implementing Internal Quality Audits (IQA) in higher education, concrete examples and statistical evidence can illustrate its impact. For example, studies have shown that institutions that effectively implement IQA can observe improvements in student learning outcomes and institutional rankings. According to a study by (Chiarini et al., 2021), universities that conduct regular and comprehensive internal audits experienced a 15% increase in student satisfaction and a 12% increase in graduation rates within two years. IQA has also played a crucial role in identifying gaps in teaching methods, curriculum design, and administrative processes, leading to enhanced overall institutional performance (Hazaea et al., 2020).

Conversely, institutions that do not adequately invest in IQA often face challenges such as declining academic performance, inefficient resource allocation, and increased administrative burden. A report (Kooli, 2019) indicates that universities with poor IQA processes have a 20% higher likelihood of encountering accreditation issues and struggle to meet continuously evolving quality standards. Furthermore, delays in audits and reporting, as seen at UIS, can exacerbate these issues. In the case of UIS, adopting a web-based internal quality audit application is expected to yield significant benefits, such as reducing audit reporting time from two weeks to just a few days and improving document management, thereby minimizing the risk of data loss.

In an era where automation and technological solutions are increasingly adopted in higher education, web-based internal quality audit applications can address these inefficiencies. Institutions such as Hongik University, which have transitioned to digital audit systems, report a 30% reduction in audit processing times and significant improvements in data accuracy and reporting efficiency (Heo et al., 2021). By implementing similar solutions, UIS can significantly enhance its IQA processes, reducing the time for auditing and reporting from two weeks to just a few days while also improving document management and mitigating the risk of data loss.

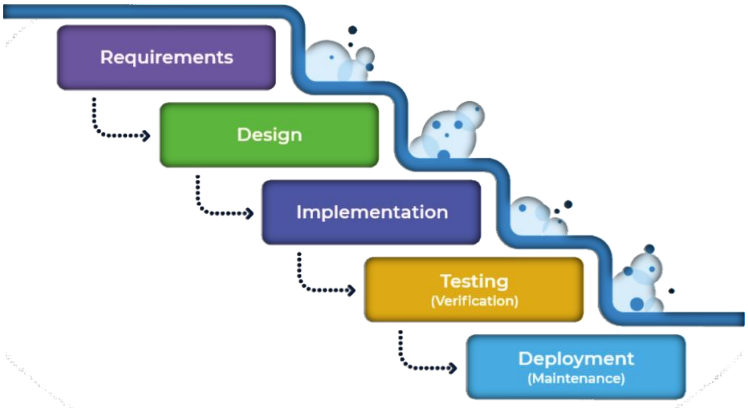
This study aims to design and develop a web-based academic internal quality audit application at UIS, hoping to improve the effectiveness and efficiency of IQA implementation while supporting UIS's commitment to enhancing the quality of higher education. This research will be evaluated through several Key Performance Indicators (KPIs). First, the reduction in audit processing time will be measured by comparing the time before and after the implementation of the web-based system. Second, the accuracy and completeness of audit reports will be evaluated by tracking data management errors to ensure improved document reliability. Third, user satisfaction surveys will assess the system's impact on the workload of auditors and administrative staff. Finally, audit efficiency will be measured based on the number of documents audited within a specified period, highlighting the role of automation in enhancing the speed and accuracy of the process.

2. Methods

This study employs the System Development Life Cycle (SDLC) approach utilizing the Waterfall model to design and develop a web-based Academic Internal Quality Audit application at Ibn UIS (Christanto & Singgalen, 2023; Nurhikmah et al., 2024; Samala et al., 2024). The Waterfall model

was selected because it provides a structured and sequential framework for software development, allowing each Phase to be fully developed and completed before progressing to the next (Muskhir et al., 2024; Prasetya et al., 2023, 2024). The stages of the Waterfall model utilized in this research are detailed below and illustrated in Figure 1.

Figure 1.
Waterfall model



2.1 Software requirements analysis

The first Phase involves identifying and analyzing the system requirements UIS desires. Data is collected through interviews, observations, and literature reviews to understand user needs and the functionalities the internal quality audit application must provide (Betti & Sarens, 2021; Christ et al., 2021).

2.2 Design

In this Phase, the application system design is conducted based on an analysis of the previously gathered requirements. This design encompasses system architecture, database design, user interface, and module specifications to be developed within the application. JavaScript is employed as the programming language for the web interface, while FaunaDB serves as the cloud-based database supporting application data management (Taibi et al., 2021).

2.3 Implementation

This Phase involves translating the designed specifications into executable code (Chaichana et al., 2022). The coding process uses JavaScript to develop and integrate the application interface with FaunaDB for data management.

2.4 Testing

Application testing uses Black-Box Testing techniques, focusing on the system's functionality without regard for the internal code structure (Nidhra, 2012; Rismayani et al., 2022). This testing is done by inputting various entries into the application forms and verifying that the output meets the expected results.

2.5 Maintenance

The final stage of the Waterfall model is maintenance, which involves bug fixes, feature enhancements, and system adjustments to accommodate evolving user needs (Christanto & Singgalen, 2023). This process continues after the application has been implemented to ensure optimal functionality.

2.6 Data collection technique

Data is collected directly from the research subjects through interviews with the Head of the Internal Quality Assurance Agency at UIS, observations of the ongoing Internal Quality Audit processes, and data gathering related to desired system requirements. Data obtained from literature studies, journals, and publications related to the Internal Quality Assurance System utilizes the System Development Life Cycle with a Waterfall model approach and the development of web-based applications (Sriadhi et al., 2022).

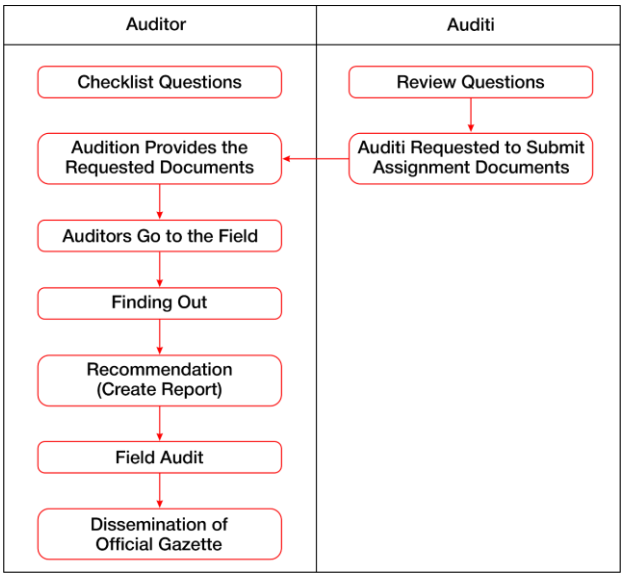
This methodology encompasses a literature review, interviews, and observations. The literature review is conducted to establish a theoretical foundation and understand concepts related to information systems and academic quality audits (Kotb et al., 2020). Interviews with stakeholders at UIS aim to acquire in-depth information regarding the needs and challenges encountered in executing the Internal Quality Audit. Meanwhile, direct observation of the Internal Quality Audit process is performed to comprehend workflow and identify areas requiring improvement through the application development. By implementing this systematic and structured research methodology, it is anticipated that the developed Academic Internal Quality Audit application will meet the needs of UIS in enhancing the effectiveness and efficiency of the audit process, as well as contribute to the improvement of educational quality and foster an academic quality culture within the institution.

3. Results

3.1 Old system flow and new system flow

The current system for report generation remains conventional. This is illustrated by the system flow presented in Figure 2.

Figure 2. Flow of current information system at UIS



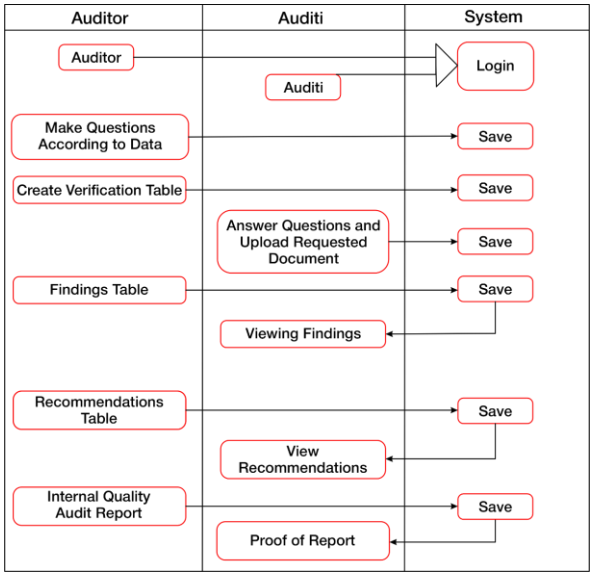
The flowchart in Figure 2 depicts the ongoing information system process for managing internal academic quality audits at UIS. The process begins with audit planning and the auditor creating a questionnaire or checklist. This checklist is then provided to the auditee for review, and the auditee is requested to prepare the necessary documents for the auditor. The auditor subsequently conducts an on-site audit, collecting evidence and making observations. Following this, the documents prepared by the auditee are submitted to the auditor for verification. The auditor identifies findings and compiles a report that includes recommendations. The audit results are then recorded in an Excel sheet for

documentation, while physical copies of the audit documents are archived. The audit report is submitted to the university rector for final approval. This process is predominantly manual, involving multiple steps to handle, review, and store documents in electronic and physical formats.

3.2 Proposed information system flow

This flowchart illustrates the proposed information system flow for the internal academic quality audit at UIS. The flow commences with audit planning by the audit team, followed by the digital distribution of questionnaires or checklists to the auditee. The auditee will receive and prepare the necessary documents via the system, allowing for direct uploads. This system is elaborated upon in Figure 3.

Figure 3. Proposed information system flow

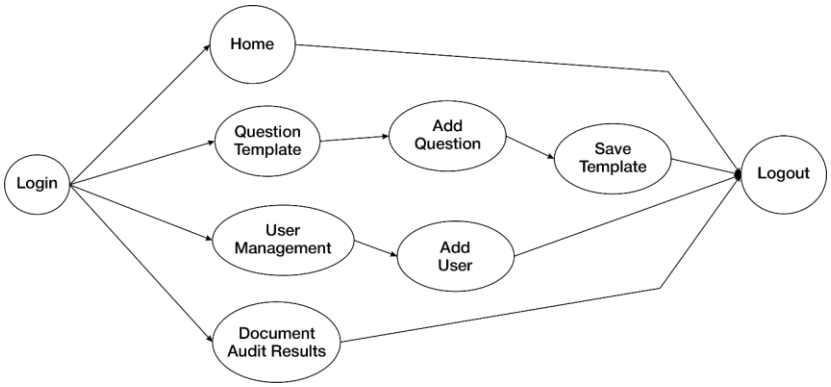


After the documents have been uploaded, auditors can access them online and conduct verifications without needing to visit the auditee's location. The auditor then records their findings within the system and digitally completes the audit report. The system automatically processes this report to generate relevant recommendations based on existing findings. Upon completion, the finalized audit results will be stored within the system's database and accessible to authorized parties such as the university rector. The system also provides facilities for digital document storage, thereby reducing the need for physical document retention and facilitating future document retrieval. With this flow, the entire audit process becomes more efficient, structured, and well-documented, minimizing the risk of errors and duplicative work while enabling quicker and more accurate decision-making by university management.

3.3 Use case diagram

The use case diagram in Figure 4 presents the interactions between the quality audit team and the academic quality audit system at UIS. The audit team has several critical functions within the system, including planning audits, preparing audit checklists, accessing documents uploaded by auditees, recording audit findings, and generating and storing audit reports. This diagram illustrates the audit team's role throughout various stages of the audit process, from planning to report completion, and how they utilize the system to support each of these steps. This system renders the audit process more structured and efficient, ensuring that all audit aspects are executed effectively and well-documented.

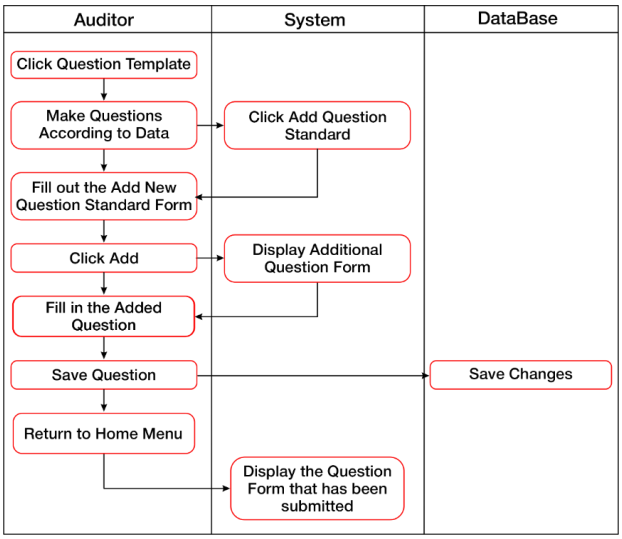
Figure 4.
Quality audit team
use case diagram



3.4 Activity diagram

Figure 5 presents an Activity Diagram that outlines the flow of specific processes. The process begins with the "Start" step, followed by the initial Phase, "Login." After logging in, the user faces two possible scenarios: if the login is successful, the system proceeds to the next step, "Selecting Menu." If the login fails, the user is redirected to the login page. Subsequently, after selecting the menu, the user can choose several activities. These activities include "Add Data," "View Data," and "Modify Data." Once the user completes one of these activities, the system provides an option to "Logout." If the user chooses to log out, the process concludes at the "Finished" stage. However, if the user does not log out, they will be redirected to the menu selection, allowing them to continue with other activities. Overall, this diagram illustrates a series of activities conducted within a system, from the login process to logout, along with actions that can be taken between these two processes.

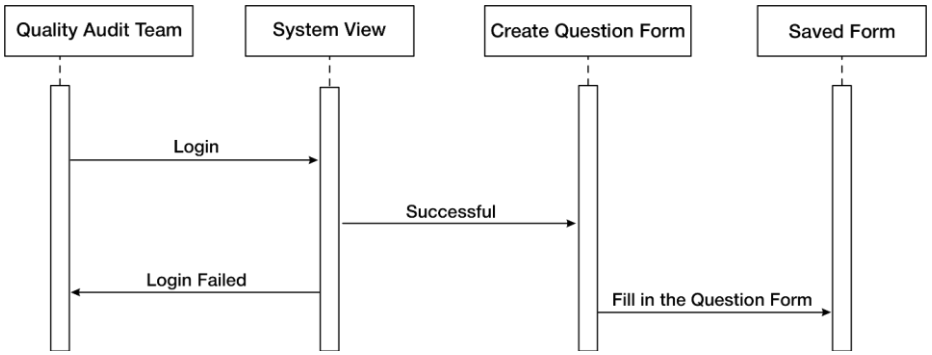
Figure 5.
Activity diagram



3.5 Sequence diagram

Figure 6 depicts a Sequence Diagram illustrating the interactions between actors and objects within the quality audit team. This diagram visualizes the communication flow among several entities or components within the system, where each vertical line represents an entity, and horizontal lines represent messages exchanged between entities. The process begins with initiation by the first entity, followed by message transmission to other entities within the audit team. These messages may include information requests, verification actions, or other communications necessary for the quality audit process. Each message is transmitted in a specific chronological order, represented by the horizontal line position indicating the sequential timeline of each interaction.

Figure 6. Quality audit team sequence diagram



This Sequence Diagram assists in visualizing how the quality audit process is conducted by the team, demonstrating how each team member or system component communicates and coordinates to achieve audit objectives. The interactions involve data collection, information analysis, and audit reporting. Accordingly, this diagram clearly represents workflow and communication within the quality audit team.

3.6 Database design

Class diagrams are applied in projects utilizing object-oriented concepts due to their comprehensible representation. This diagram presents the structure illustrated in Tables 1 used in the subsequent project.

Tabel 1. The structure of diagram

Name	Data type
User process	
Name	String
Role	String
Document first process	
Name	String
Format	Array
Standard	String
Question	Array
Text	String
Unit	String
Answer	Array of string
Document second process	
Data	Array
Standard	String
Question	Array of string
Text	String
Unit	String

3.7 Interface design

Interface design is the framework utilized to structure the layout of a website to align with program specifications before proceeding to the design or coding phase. This process typically occurs using specialized design software to create a concept that will be applied to the developed system. Below is the interface design for login access on the Internal Quality Audit website of UIS, which includes fields for the username, password, and login button.

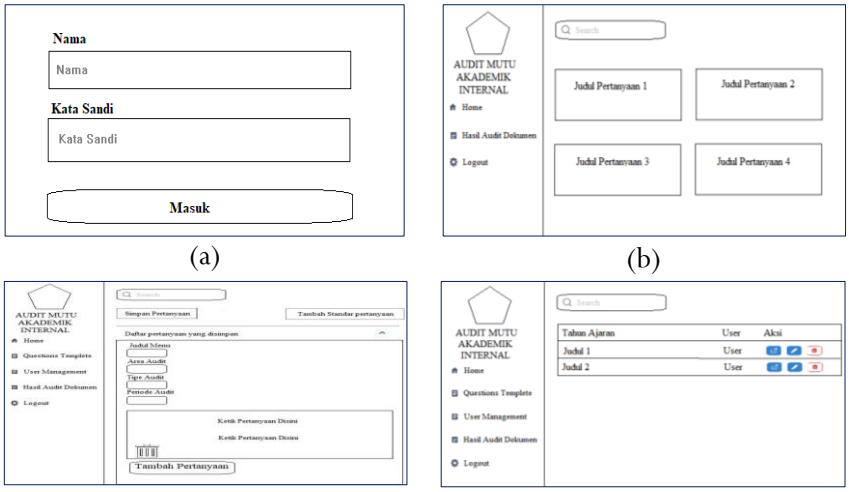


Figure 7. (a) Login interface design; (b) User/Audit home interface design; (c) Add question interface design; (d) Quality admin/auditor document audit result interface design

In Figure 7, the Home menu presents the audit title on the initial page. When clicked, the Auditor's Question form opens, containing questions formulated by the auditor for the auditee to answer. After responding to all questions and uploading the necessary documents, the auditee can save or submit their responses, which will be stored in the Audit Document Results menu. The Add Question menu allows users to incorporate questions that will appear in the standard internal quality form, serving as a derivative of the question outline created in the Add Standard Questions menu. Questions in this menu can be added or removed to establish the internal quality standards at UIS. The Audit Document Results menu displays the documents resulting from completed audits. Users can view and edit the contents of these documents, while admins or auditors possess the authority to view, modify, and delete existing audit results.

3.8 Implementation

The coding process aims to implement or construct the system according to the planned design, ensuring that the outcome meets the expected objectives. This coding serves to articulate and describe each component within the application. In the context of developing the internal quality audit application at UIS, coding is executed using the JavaScript programming language with support from the ReactJS framework.

Figure 8. (a) Login coding implementation; (b) Implementation of standard question add coding; (c) Implementation of question update; (d) Implementation of delete data coding

3.9 Testing

During the testing phase, the system undergoes trials to identify errors within the software, which is a crucial aspect of system development. Testing aims to ensure software quality by detecting and rectifying existing issues. The black-box testing method evaluates the system without requiring knowledge of the underlying code; the focus is on verifying whether the program operates according to the desired specifications. This method can enhance the system, minimizing errors and deficiencies.

Tabel 2. Testing

Test Factor	Result	Description
Login testing		
If the user enters the username and password incorrectly or enters one of the password and username incorrectly	Successful	Successful (a description of failed login will appear!)
If the user correctly enters the username and password	Successful	Success can display the home page (will appear with the caption "Success, Successful login!)
Question form testing		
If we click the question title form on the auditor login, it will display the audit results for the document.	Successful	Successful, can display the document audit results page.
If the question title form on the User/audit login is clicked, the question sheet from the auditor will appear.	Successful	Successful will display the question sheet and, if filled in and submitted, will be saved and returned to the home menu (a success statement appears; the form was successfully created).
Testing adds question standard		
If you click the add standard question button, a form will appear that must be filled in.	Successful	If successful, then it will return to the Questions template menu
If you add a new question to one of the titles that have been created, just click add the question, fill it in, and click the save question button.	Successful	Successful, directly display the Home page (a description of Success appears, the question template is successfully updated)
Home menu testing		
If the Home menu is clicked	Successful	Successful, directly displays the Home page
If the Question Template menu is clicked	Successful	Successful, directly display the Question Template page
User management menu testing		
If the User Management menu is clicked.	Successful	Successful, directly displays the user management page

If the Add user button is clicked	Successful	Successful will display a new user add page that must be filled in. Once filled in and saved, it will go to the user management page (Successful, User Successfully created).
If you click the trash button	Successful	Successful: when the trash button is clicked, the created user will disappear (appears Success, the user successfully deleted)
Logout menu testing		
If the logout menu is clicked True,	Successful	Return to the login view

3.10 Development (Maintenance)

The operational and maintenance Phase refers to the stage where the application is operated in a real-world environment, and routine maintenance is conducted periodically to ensure optimal performance. The software development process is divided into several smaller modules, which will be integrated in subsequent stages. One of these modules is the Login module, which includes the initial interface for user authentication.

Figure 9.
Login menu

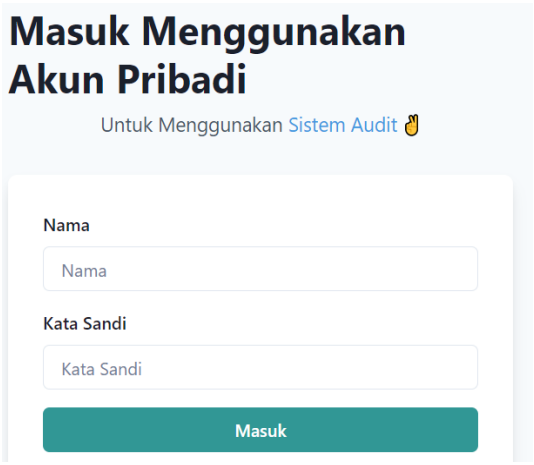
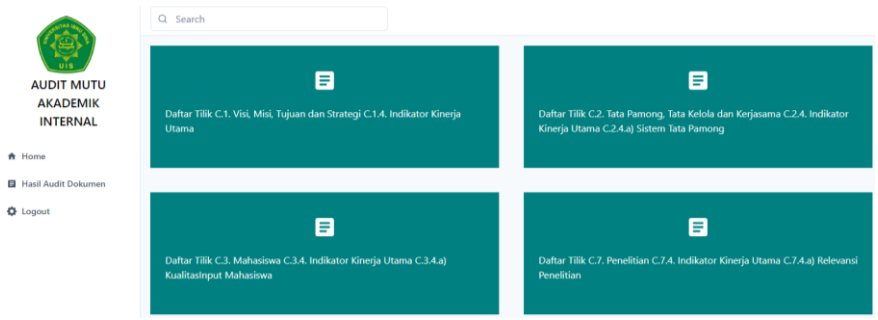


Figure 9 presents this initial interface, which serves as the main entry point before users can access the internal quality audit website of UIS. This interface is designed to ensure that only authorized users can log in, thereby maintaining the integrity and security of the data within the audit quality system.

Figure 10.
Auditor/Admin
home menu



The Home Menu for Auditor/Admin, shown in Figure 10, contains a list of question titles prepared by the auditor. When the audit user clicks on one of these question titles, a form appears containing the questions the administrator or auditor created. This form facilitates the structured and systematic collection of information and responses from the audited parties.

Figure 11. Audit/User question form

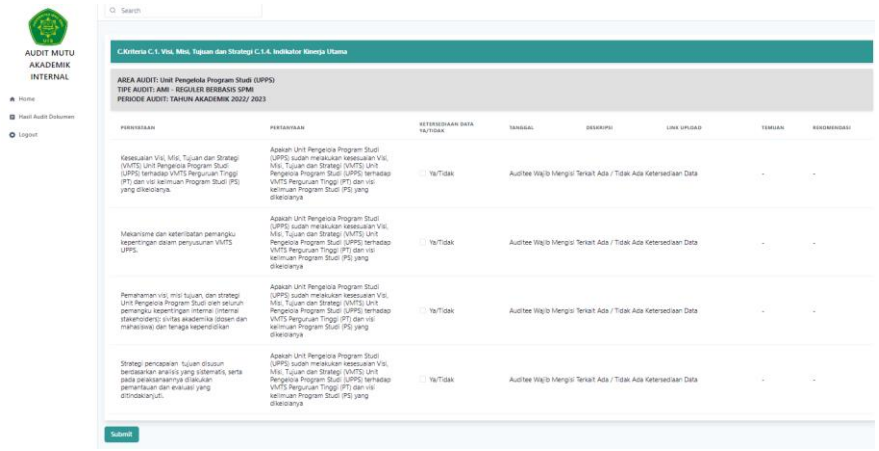


Figure 11 depicts the question form menu. Users are directed to the document audit results menu when a question title is clicked. This menu is a place to review and analyze the collected audit results, allowing auditors to assess compliance and performance based on the audited documents.

Figure 12. Question menu template

Figure 12 displays the question template menu, which includes several additional options, such as adding question standards and saving questions. This menu presents an outline of each question that has been created. The "Add Question Standard" option allows users to include new standards, which will be listed in the question menu. All changes and additions to the standards can be saved using the "Save Questions" option, ensuring that each modification is well-documented.

Figure 13. Add question standard menu

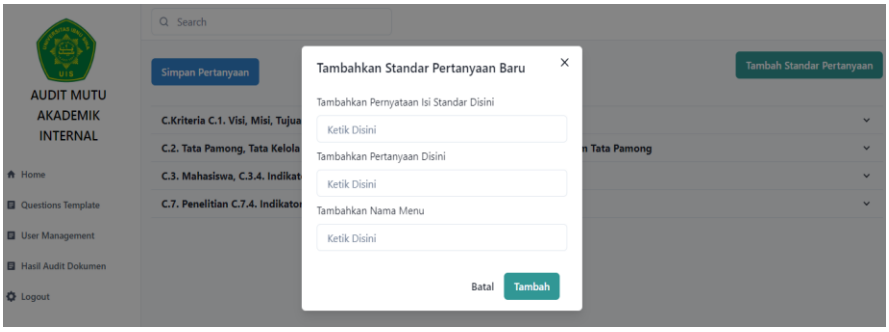


Figure 13 shows the menu for adding question standards, where users can incorporate questions that will serve as the primary framework for internal quality audits at UIS. These questions are formulated to establish the standards used in the audit process, ensuring that all relevant aspects are covered and

aligned with institutional policies. These standards then serve as a reference for evaluating performance and compliance with established quality procedures.

Figure 14.
Add question menu

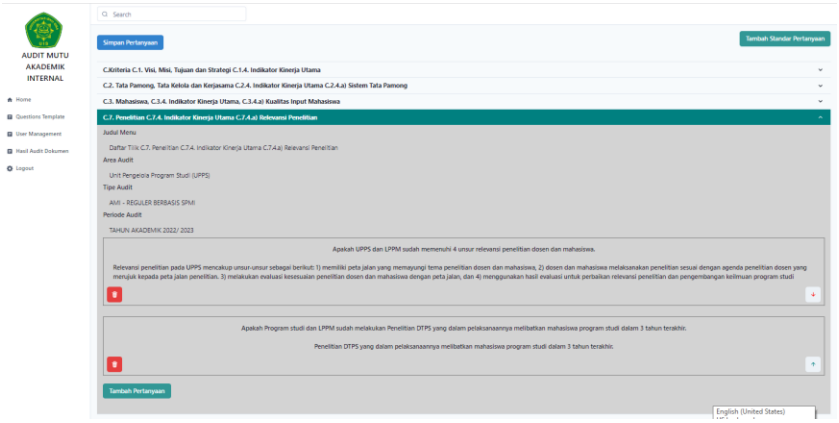


Figure 14 presents the interface for adding new questions in the question template menu. On this page, users can add questions that will complement the outline previously established through the add question standard menu. In addition to adding, users can also remove questions deemed irrelevant or needing revision. This feature ensures that each question included meets the audit requirements and supports achieving internal quality evaluation objectives at UIS.

Figure 15.
User management
menu

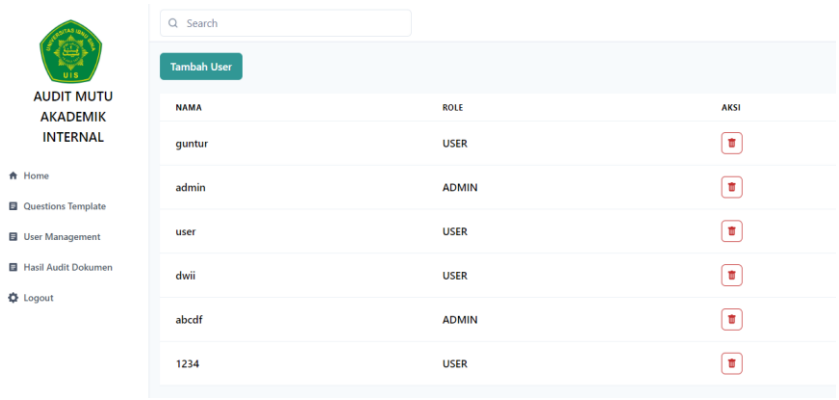


Figure 15 illustrates the User Management Menu, where users can be managed to access the developed application. On this page, the administrator or auditor can add new users who are granted access rights to the application and remove existing users if necessary. This feature is crucial for ensuring that only authorized individuals can access and participate in the system, thereby preserving the security and integrity of the data within the application.

Figure 16.
User
management
menu

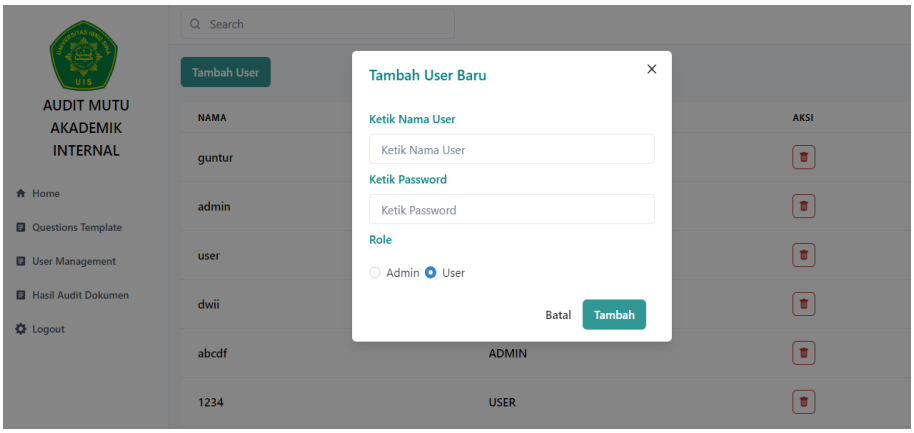


Figure 16 displays the interface for adding new users, where the administrator can enter the username and password and assign roles or functions to the user within the system. This process allows the administrator to configure access and privileges based on the roles of each user, ensuring that every individual has authority commensurate with their tasks and responsibilities within the application.

Figure 17. Document audit results menu for auditor/admin

Figure 17 shows the Document Audit Results Menu, which has been compiled and populated. This form displays various audit results, allowing the administrator or auditor to review, edit, and delete audit results as needed. This feature allows the administrator or auditor to conduct further evaluations, ensuring that every recorded audit result adheres to the established standards and procedures.

4. Discussion

The findings of this research align with and extend previous studies related to implementing Internal Quality Audits in higher education institutions. Prior research by (Chiarini et al., 2021; Kooli, 2019) has established IQA as a critical Internal Quality Assurance System (IQAS) component. These studies emphasize that IQA enhances educational quality when conducted systematically and effectively. This research corroborates that assertion by highlighting the inefficiencies faced by UIS due to its manual audit processes, which impede the institution's ability to conduct comprehensive audits and report findings efficiently.

A primary limitation identified in this study, is consistent with the findings of (Stewart & Subramaniam, 2010), is that manual audits often result in inefficiencies, such as data management errors and reporting delays. At UIS, the audit process remains manual, involving computer-based tasks that have not yet been fully automated. This methodology leads to document accumulation and an increased risk of data loss, prolonging the audit reporting process by nearly two weeks. (Stewart & Subramaniam, 2010), Also noted is that 25% of documents are misplaced or inaccurately recorded in manual systems, a similar problem at UIS, further supporting the need for automation in the audit process.

Moreover, this study highlights the impact of administrative burdens on staff, as noted by (Anchors et al., 2024), who reported that 40% of auditors working with manual systems experience increased stress due to extended working hours. At UIS, auditors face similar challenges, as the manual audit process exacerbates their workload and creates inefficiencies, underscoring the need to transition to a web-based audit system. The proposed new system, as demonstrated in this research, aims to reduce audit time and improve overall accuracy.

The study also indicates that universities with automated audit systems experience significant improvements in operational efficiency and data accuracy. According to (Heo et al., 2021) demonstrated that adopting digital audit systems can reduce audit processing times by up to 30%. The proposed web-based audit system at UIS is anticipated to yield similar benefits, reducing the audit period from two weeks to just a few days while ensuring better document management and mitigating

the risk of data loss. This adoption will align UIS with other higher education institutions that have benefited from digital transitions, such as Hongik University (Heo et al., 2021).

In summary, this research confirms previous studies by illustrating the negative impacts of manual audit processes and the positive outcomes that digital solutions can provide. The introduction of a web-based internal audit application at UIS aims to enhance efficiency and support the university's commitment to quality assurance, which aligns with global trends in higher education audit practices. The next step is to evaluate the system's impact on key performance indicators such as audit processing time, report accuracy, and staff satisfaction, all of which are essential for maintaining high standards of educational quality at UIS.

5. Conclusion

This study successfully developed a more efficient and structured internal academic quality audit information system at UIS. Adopting digital technology has transformed the previously conventional audit process into a more systematic and automated one. Before this development, the university's academic quality audit information system was manual, resulting in various challenges, such as difficulties in document management and time wastage. The proposed system includes a streamlined digital workflow and improved document storage, effectively addressing these issues. Testing results indicate that the new system operates effectively, meets all user needs, and provides better accessibility to documents and audit results. This enhancement not only accelerates the audit process but also improves accuracy and documentation, thereby contributing to the overall quality of education at the university. Implementing this system is expected to enhance the efficiency and effectiveness of the audit process and facilitate quicker and more precise decision-making by university management.

Based on the findings of this research, it is recommended that UIS promptly implement the proposed academic quality audit information system to improve audit management quality. Furthermore, training for auditors and other users is crucial to ensure optimal system utilization. Another recommendation is to conduct regular evaluations of the implemented system to identify areas for improvement and ensure the system remains relevant to the university's needs. Through these measures, the university can continue to enhance the quality of education and achieve better academic accreditation.

Acknowledgment

The authors would like to thank the research team and the Internal Quality Assurance Agency of Universitas Ibnu Sina who have helped a lot in the research and development of this web-based Academic Internal Quality Audit application.

Declarations

Author contribution

Dwi Yuliyanti: Conceptualization, methodology, Validation, data curation and writing - original draft. Indah Kusuma Dewi: Writing - original draft, software, formal analysis, investigation and data curation. Yera Wahda Wahdi: Investigation, resources, writing - review & editing.

Funding statement

The research is independent and not funded by any person or institution.

Conflict of interest

No conflicts of interest in this research.

Ethical clearance

This research does not involve humans or animals as subjects.

References

Anchors, Z. G., Moore, L. J., Burnard, S. D., Bressington, C. A., Moreton, A. E., & Arnold, R. (2024). A mixed-methods stress audit with midwives in the United Kingdom. *Women and Birth*, *37*(5), 101639. https://doi.org/10.1016/j.wombi.2024.101639

Betti, N., & Sarens, G. (2021). Understanding the internal audit function in a digitalised business environment. *Journal of Accounting and Organizational Change*, *17*(2), 197–216. https://doi.org/10.1108/JAOC-11-2019-0114

Chaichana, C., Wongkalasin, S., & Sanrutsadakorn, A. (2022). A Learning Platform for Computer Numerical Control (CNC) Laboratory. *Journal of Computer Science*, *18*(8), 705–714. https://doi.org/10.3844/jcssp.2022.705.714

Chiarini, A., Castellani, P., Rossato, C., & Cobelli, N. (2021). Quality management internal auditing in small and medium-sized companies: an exploratory study on factors for significantly improving quality performance. *Total Quality Management and Business Excellence*, *32*(15–16), 1829–1849. https://doi.org/10.1080/14783363.2020.1776101

Christ, M. H., Eulerich, M., Krane, R., & Wood, D. A. (2021). New Frontiers for Internal Audit Research. *Accounting Perspectives*, *20*(4), 449–475. https://doi.org/10.1111/1911-3838.12272

Christanto, H. J., & Singgalen, Y. A. (2023). Analysis and Design of Student Guidance Information System through Software Development Life Cycle (SDLC) dan Waterfall Model. *Journal of Information Systems and Informatics*, *5*(1), 259–270. https://doi.org/10.51519/journalisi.v5i1.443

Hazaea, S. A., Tabash, M. I., Khatib, S. F. A., Zhu, J., & Al-Kuhali, A. A. (2020). The Impact of Internal Audit Quality on Financial Performance of Yemeni Commercial Banks: An Empirical Investigation. *The Journal of Asian Finance, Economics and Business*, *7*(11), 867–875. https://doi.org/10.13106/jafeb.2020.vol7.no11.867

Heo, J. S., Kwon, S. Y., & Tan, H. T. (2021). Auditors' Responses to Workload Imbalance and the Impact on Audit Quality*. *Contemporary Accounting Research*, *38*(1), 338–375. https://doi.org/10.1111/1911-3846.12612

Kooli, C. (2019). Governing and managing higher education institutions: The quality audit contributions. *Evaluation and Program Planning*, *77*(May), 101713. https://doi.org/10.1016/j.evalprogplan.2019.101713

Kotb, A., Elbardan, H., & Halabi, H. (2020). Mapping of internal audit research: a post-Enron structured literature review. *Accounting, Auditing and Accountability Journal*, *33*(8), 1969–1996. https://doi.org/10.1108/AAAJ-07-2018-3581

Muskhir, M., Luthfi, A., Watrianthos, R., Usmeldi, U., Fortuna, A., & Samala, A. D. (2024). Emerging Research on Virtual Reality Applications in Vocational Education: A Bibliometric Analysis. *Journal of Information Technology Education: Innovations in Practice*, *23*, 1–26. https://doi.org/10.28945/5284

Nidhra, S. (2012). Black Box and White Box Testing Techniques - A Literature Review. *International Journal of Embedded Systems and Applications*, *2*(2), 29–50. https://doi.org/10.5121/ijesa.2012.2204

Nurhikmah, R, M., & Adi, N. H. (2024). Intelligent system for college selection with analytical hierarchy process method case study approach. *Journal of Computer-Based Instructional Media*, *2*(1), 42–52. https://doi.org/10.58712/jcim.v2i1.130

Prasetya, F., Fortuna, A., Jalinus, N., Refdinal, R., Fajri, R., Wulansari, R. E., Primawati, P., Andriani, W., Samala, A. D., Luthfi, A., Putra, W. P., Ayasrah, F. T. M., & Kaya, D. (2024). Revolutionizing CNC Lathe Education: Designing Instructional Media Integrated Using Augmented Reality Technology. *TEM Journal*, *13*(2), 1695–1701. https://doi.org/10.18421/TEM132-82

Prasetya, F., Syahri, B., Fajri, B. R., Wulansari, R. E., & Fortuna, A. (2023). Utilizing Virtual Laboratory to Improve CNC Distance Learning of Vocational Students at Higher Education. *TEM Journal*, *12*(3), 1506–1518. https://doi.org/10.18421/TEM123-31

Putra, D. P., Devega, A. T., & Afrina. (2024). Design of a web-based information system for domestic sea transportation services for limited liability company goods. *Journal of Computer-Based Instructional Media*, *2*(1), 20–30. https://doi.org/10.58712/jcim.v2i1.128

Rismayani, P, A., Nurhidayani, A., & Pineng, M. (2022). Fundamental Design of Flood Management Educational Games Using Virtual Reality Technology. *International Journal of Online and Biomedical Engineering*, *18*(3), 19–32. https://doi.org/10.3991/ijoe.v18i03.27787

Samala, A. D., Govender, T., Tsoy, D., Bojic, L., Samala, A. G., Samala, M. P., Prasetya, F., Tri, D., Yanto, P., Zainul, R., & Fortuna, A. (2024). 3D Visualizations in Learning : An Evaluation of an AR + Core Application for Computer Hardware Education using the Hedonic Motivation System Adoption Model. *TEM Journal*, *13*(1), 466–475. https://doi.org/10.18421/TEM131-48

Sriadhi, S., Hamid, A., & Restu, R. (2022). Web-Based Virtual Laboratory Development for Basic Practicums in Science and Technology. *TEM Journal*, *11*(1), 396–402. https://doi.org/10.18421/TEM111-50

Stewart, J., & Subramaniam, N. (2010). Internal audit independence and objectivity: Emerging research opportunities. *Managerial Auditing Journal*, *25*(4), 328–360. https://doi.org/10.1108/02686901011034162

Taibi, D., Spillner, J., & Wawruch, K. (2021). Serverless Computing-Where Are We Now, and Where Are We Heading? *IEEE Software*, *38*(1), 25–31. https://doi.org/10.1109/MS.2020.3028708

Ulia, R., Setyawan, D., & Afrina. (2024). Designing an information system for recapitulating goods received transactions. *Journal of Computer-Based Instructional Media*, *2*(1), 1–10. https://doi.org/10.58712/jcim.v2i1.126

Zuhairi, A., Raymundo, M. R. D. R., & Mir, K. (2020). Implementing quality assurance system for open and distance learning in three Asian open universities: Philippines, Indonesia and Pakistan. *Asian Association of Open Universities Journal*, *15*(3), 297–320. https://doi.org/10.1108/AAOUJ-05-2020-0034