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Design and Implementation of a Digital Faculty Activity Monitoring System in the Computer Science Education Study Program at Universitas Pendidikan Indonesia

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ABSTRACT

Digital transformation in higher education demands increased transparency, efficiency, and accountability, particularly in managing faculty activity data. This study aims to develop an integrated digital system that facilitates the recording and reporting of faculty activities based on the three pillars of higher education (Tri Dharma Perguruan Tinggi). The research employed a Research and Development (R&D) methodology with an iterative approach, allowing the system to be developed incrementally and adapted to user needs. The system was designed as a web-based platform with institutional authentication support to ensure data security and validity. Trials were conducted with several faculty members and department heads, and the system was validated by experts in information systems and academic management. The testing results indicate that the system offers high usability, reduces time consumption, and improves the accuracy and productivity of faculty activity documentation. These findings align with the Ministry of Education, Culture, Research, and Technology's policy direction on accelerating digital transformation in higher education. This research is expected to make a tangible contribution to supporting professional, data-driven academic governance.

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1. INTRODUCTION

University lecturers serve as central actors within the higher education ecosystem. Their roles in fulfilling the Tri Dharma of Higher Education—teaching, research, and community service—are not only operational in nature but also strategic in shaping the direction and quality of educational institutions (Huda, 2017; Setyawan, 2017). Consequently, comprehensive and continuous monitoring of lecturer performance has become a fundamental necessity, particularly in ensuring institutional accountability, meeting accreditation standards, and supporting data-driven policymaking (Prasetyo et al., 2022).

However, in practice, data collection and reporting of lecturer activities in many academic programmes are still conducted manually, lacking integration and heavily dependent on individual initiative (Olayiwola, 2024). This is also the case in the Computer Science Education Study Program at Universitas Pendidikan Indonesia (UPI), where no integrated digital monitoring system is currently in place. As a result, documentation becomes disorganised, reporting is delayed, and programme leadership often faces challenges in accessing essential data. These issues not only hinder administrative efficiency but also pose risks to the institution's credibility in external evaluations and accreditation processes (Milkhatun et al., 2020).

In the context of digital transformation and the increasing demand for transparency in the education sector, outdated and non-digitised systems are becoming increasingly irrelevant. This urgency aligns with national policies promoting the digitalisation of higher education, as outlined in the 2024 Guidelines for the Assistance Program for the Development and Implementation of Digital Learning (Ministry of Education, Culture, Research, and Technology, 2024). Prior studies have shown that the digitalisation of academic processes enhances operational efficiency, data transparency, and supports evidence-based decision-making (Mikidenko et al., 2022).

The advancement of information technology should be leveraged to build smart, measurable, and responsive academic management systems that align with institutional needs. Research has consistently demonstrated that digital academic systems can foster better governance, more efficient data flows, and improved institutional accountability (Seneviratne et al., 2020). Accordingly, the development of a digital monitoring system for lecturer activities is no longer optional but has become a strategic imperative.

In response to these issues and institutional needs, this study aims to design an integrated digital monitoring system tailored to the academic management needs of the Computer Science Education Program at UPI. This system is expected not only to address existing administrative challenges but also to serve as a transformative step toward a more adaptive, professional, and technology-based model of academic governance (Indiran, 2022). With this approach, the institution will be better positioned to meet the demands of modern higher education, which requires efficiency, accountability, and continuous innovation.

2. METHODS

This study adopts a Research and Development (R&D) approach with the primary objective of producing an integrated digital system to monitor and document faculty activities (Gamba, 2019; Guan & Zhang, 2023). This approach was selected as it aligns closely with the main goal of the research: to design and develop an information technology-based solution that enhances the efficiency of faculty data management within the framework of the Tri Dharma of Higher Education. The system development process employed an iterative model, a phased methodology that allows for continuous improvement based on user feedback.

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Figure 1 illustrates the workflow of the research process leading to the implementation of the developed system.

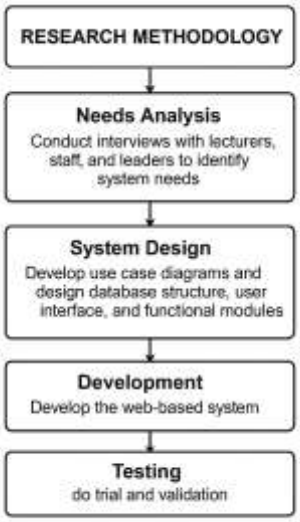

Figure 1. Research Methodology

2.1. Needs Analysis

The development process commenced with a system requirements analysis, which involved conducting interviews with lecturers, administrative personnel, and the head of the Computer Science Education Study Program at UPI. Furthermore, documentation related to activity reporting, such as the Lecturer Workload Report (BKD), was examined to identify the necessary data types and workflow processes to be incorporated into the system.

2.2. System Design

The subsequent phase was the system design, which encompassed the development of the database structure, user interface design, and the identification of essential system features. The system was designed to accommodate two primary user roles: lecturers and the head of the study programme. Lecturers can record their Tri Dharma activities, upload supporting documentation, and access compiled activity reports. Meanwhile, the Head of the Study Programme can monitor lecturers' activities through a structured and real-time data dashboard.

2.3. Development

Following the completion of the design phase, the system was developed as a web-based application to ensure accessibility across various devices. Additionally, the system was equipped with institutional account-based login features to ensure data security and maintain user authentication integrity.

2.4. Testing

After the system was developed, a limited trial was conducted involving several lecturers and department heads. The main purpose of this trial was to evaluate whether the system functioned as intended and was user-friendly. The researchers also collected direct feedback from users regarding the strengths and weaknesses of the system with the instruments that had been studied (Apriyanthi et al., 2023).

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The feedback obtained from the trial phase was utilised to refine the system, including improving the user interface, adding necessary features, and simplifying user workflows. This process was repeated iteratively until the system was deemed sufficiently stable and aligned with the users' practical needs.

Through this approach, the research emphasised the development of a practical system that is responsive to user needs and readily applicable in an academic setting. The resulting system is expected to serve as a tangible solution to enhance the effectiveness, efficiency, and accountability of faculty activity reporting.

3. RESULTS AND DISCUSSION

3.1. Results of Requirements Analysis

The requirement analysis was conducted through interviews with lecturers, administrative staff, and the head of the Computer Science Education Study Program at Universitas Pendidikan Indonesia (UPI). The results of these interviews, along with a review of relevant documentation, revealed that faculty activity reporting was still carried out manually using separate forms for the Lecturer Workload Report (BKD). This manual process led to data redundancy, the potential for input errors, and difficulties in generating accurate and timely summaries of information.

Most respondents expressed the need for a system that is user-friendly, integrated, and capable of supporting evidence-based reporting. Figure 2 illustrates the business process derived from the analysis, which serves as the basis for system development.

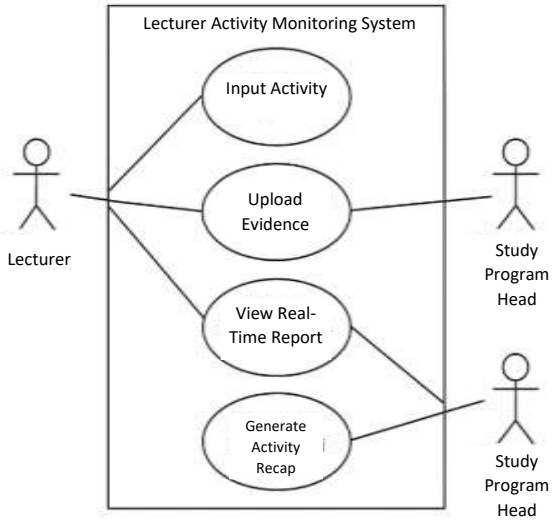

Figure 2. Use Case Diagram of the Faculty Activity Monitoring System

3.2. System Design Results

Based on the results of the needs analysis, the system was designed with a web-based architecture that can be accessed from various devices. The system structure consists of three main components: (1) a web-based user interface (UI) for both lecturers and department heads, as illustrated in Figure 4; (2) an application server that processes the data; and (3) a database that serves as the primary storage. Authentication is implemented using

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institutional accounts through a Single Sign-On (SSO) mechanism to ensure secure and authorised access.

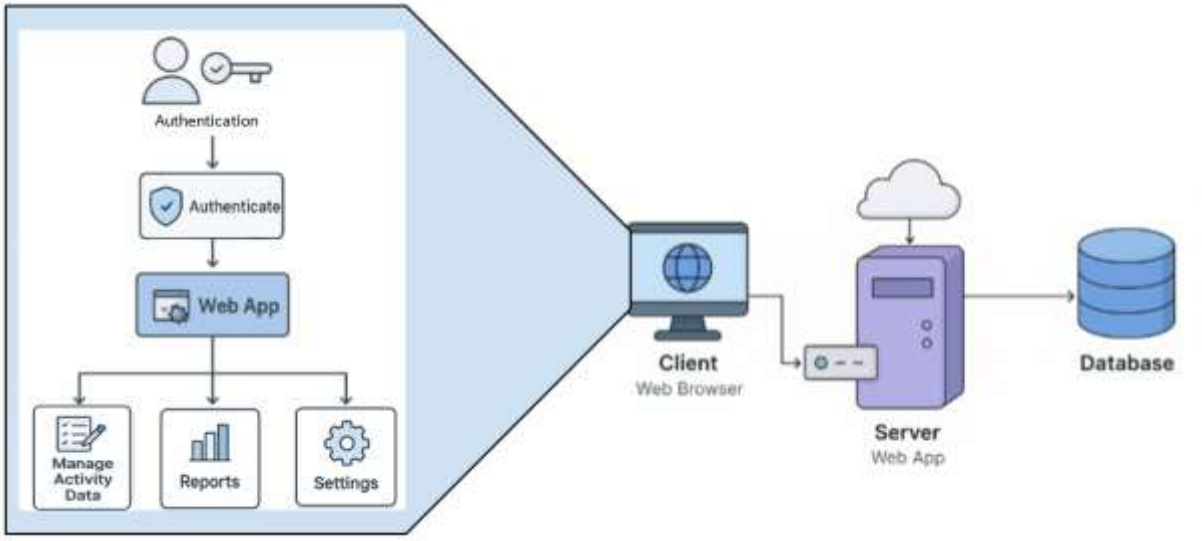

Figure 3. System Architecture Diagram

The system comprises several core modules: input of Tri Dharma activities, submission of off-campus activity requests, uploading of supporting evidence, a performance monitoring dashboard, and automated reporting. The use case diagram in **Figure 2** illustrates the role of lecturers in entering data and the role of the department head in monitoring and accessing summary reports. Meanwhile, **Figure 4** depicts the features for managing lecturer activities, covering the workflow from entering event invitations to generating the final activity report.

Figure 4a. User Interface (UI) Display of the System for Lecturers and Program Leaders

Figure 4b. User Interface (UI) Display of the System for Lecturers and Program Leaders

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Figure 4c. User Interface (UI) Display of the System for Lecturers and Program Leaders

Figure 4d. User Interface (UI) Display of the System for Lecturers and Program Leaders

3.3. Implementation Results and Testing

The system was developed using an iterative methodology, allowing for revisions and adjustments after each testing phase. The initial implementation encompassed all the fundamental functions that had been designed. Functional testing was conducted by the development team, while user testing was performed by nine lecturers and the programme head.

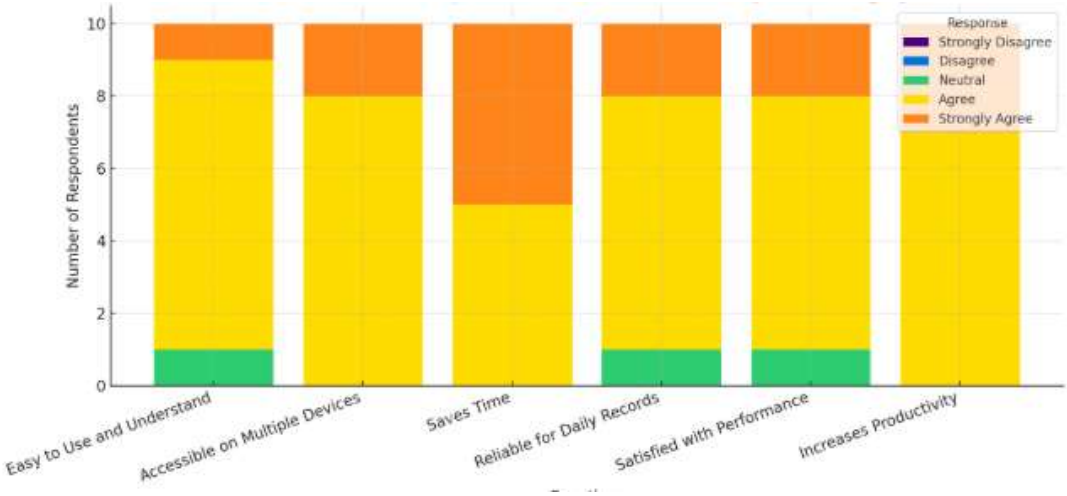

Figure 5. User Testing Results Chart, Satisfaction and Usability

The bar chart in **Figure 5** illustrates the distribution of responses to six key questions, covering aspects of ease of use, accessibility, time efficiency, reliability, satisfaction, and productivity improvement. Each colour represents a response category: Strongly Disagree, Disagree, Neutral, Agree, and Strongly Agree.

From the chart, it can be observed that most respondents selected 'Agree' or 'Strongly Agree', indicating a positive acceptance of the system. The Neutral category appeared in several aspects but was not predominant, and no respondents chose Disagree or Strongly Disagree. This suggests that the system generally met user expectations.

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3.4. Discussion

The results of this study reinforce previous findings that the digitalisation of faculty activity reporting can enhance administrative work efficiency and institutional accountability (Witt et al., 2021). The developed system successfully reduced reliance on manual processes and promoted transparency in the reporting of Tri Dharma activities. These findings align with the policy direction of the Ministry of Education, Culture, Research, and Technology (Kemdikbud Ristek) in accelerating the digital transformation of higher education.

The successful implementation of the system also underscores the importance of a user-driven design approach in the development of educational technology. Direct user involvement from the early stages helped ensure that the system effectively addressed real needs in the field.

4. CONCLUSION

This study successfully designed and developed a digital system for monitoring faculty activities based on a Research and Development (R&D) approach with an iterative development model. The system is designed to support the integrated, accurate, and easily accessible documentation of faculty activities in carrying out the Tri Dharma of Higher Education. User evaluation results indicate that the system demonstrates high usability and acceptance levels, as evidenced by most respondents agreeing or strongly agreeing on aspects such as ease of use, accessibility, time efficiency, and system reliability.

Although the system has demonstrated good performance in limited trials, this study acknowledges room for further development. These include comprehensive integration with institutional academic information systems and the development of advanced analytic features to support predictive and longitudinal faculty performance evaluations.

Thus, the system is expected to contribute significantly to fostering professional, transparent, and adaptive academic governance aligned with technological advancements. Moving forward, cross-disciplinary collaboration among system developers, academic managers, and policymakers will be crucial to expanding the system's benefits and scalability across the national higher education environment.

5. ACKNOWLEDGMENT

The author expresses sincere gratitude to the Computer Science Education Study Program at Universitas Pendidikan Indonesia (UPI) for their support and collaboration throughout the research process. Thanks, are also extended to the lecturers, administrative staff, and programme leaders who willingly participated as respondents and provided valuable input during the needs analysis and system testing phases.

High appreciation is also conveyed to the experts in information systems and higher education management who contributed their insights during the system validation process. Without the contributions of these various parties, the development and evaluation of this digital faculty activity monitoring system would not have been optimally realised.

This research was also inspired by the Merdeka Belajar – Kampus Merdeka (MBKM) policy, which emphasises the importance of digital transformation in higher education, as well as the moral and academic support from the entire academic community of UPI, whose contributions cannot all be individually mentioned.

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6. AUTHORS' NOTE

The author assumes full responsibility for the content, analysis, and interpretation presented in this article. This article was prepared as part of efforts to develop an academic information system that supports data-driven governance within higher education institutions, particularly in the integrated documentation and monitoring of faculty activities.

The entire research process, from planning, data collection, and system development to report preparation, was conducted independently and without any conflicts of interest. The author welcomes constructive criticism and suggestions from readers to improve future research.

For any questions or further clarifications regarding the content of this article, the author can be contacted via the academic email address provided in the publication.

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