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Development of a Web-Based Academic Information System for Politeknik Anika Palembang Using the Web Engineering Method

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Abstract

The rapid development of information technology in higher education has transformed academic data management systems. At Politeknik Anika Palembang, academic operations such as student registration, course scheduling, and grade entry were previously managed through a desktop-based system requiring manual administrative input. This approach limited accessibility and data efficiency.This study focuses on the development of a web-based Academic Information System (SIAKAD) utilizing the Web Engineering (WE) method. The WE framework emphasizes systematic and structured web application development. The system was implemented using PHP and MySQL for the back end, while HTML and CSS were applied for the front end.System testing employed the Black Box Testing approach to evaluate functionality and reliability. The results confirmed that all components met functional requirements, allowing administrators, lecturers, and students to access academic data efficiently.

Keywords

Academic Information System, Web-Based, Web Engineering

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Introduction

The rapid expansion of information and communication technology (ICT) has transformed the operational landscape of educational institutions, reshaping how academic and administrative processes are conducted. Information systems have become indispensable in supporting institutional governance, improving service quality, and ensuring data accuracy and efficiency in higher education management. As Rahmawati and Gunawan (2017) emphasize, the integration of ICT into educational environments not only streamlines routine administrative tasks but also enhances decision-making capabilities and transparency. Universities and polytechnics increasingly rely on digital platforms to facilitate academic processes such as course scheduling, registration, and grading, which are vital for maintaining academic integrity and institutional competitiveness.

At Politeknik Anika Palembang, academic management activities such as course scheduling, grade processing, and student registration were traditionally handled using desktop-based applications. While these systems initially improved upon fully manual operations, they remained limited in flexibility and scalability. Administrative staff were required to perform repetitive manual data input, which often led to delays, human errors, and difficulties in ensuring data synchronization across departments. Furthermore, desktop-based systems restricted access to on-site users only, meaning that lecturers and students could not retrieve academic information outside the campus network. These limitations underscored the need for a more integrated and accessible solution capable of supporting real-time data management across multiple users.

In response to these challenges, transitioning to a web-based Academic Information System (SIAKAD) became a strategic imperative for the institution. A web-based system offers universal accessibility, allowing students, lecturers, and administrators to access academic data anytime and anywhere via internet-connected devices. The move toward a web-based platform also aligns with broader trends in educational digitalization, as institutions seek to enhance responsiveness, scalability, and data transparency. By adopting a centralized web-based infrastructure, the institution can improve coordination among academic units, reduce data redundancy, and foster a more efficient academic environment.

Moreover, the implementation of a web-based SIAKAD supports Indonesia's ongoing efforts in digital transformation within the education sector. It contributes to the modernization of academic services by integrating online data access, digital communication, and real-time reporting. Such systems are not only beneficial for internal management but also strengthen accountability to external stakeholders, including students, accreditation bodies, and government agencies. Through these advancements, institutions like Politeknik Anika Palembang can ensure their administrative systems remain adaptive, transparent, and aligned with the evolving expectations of digital-native users.

To guide the development process, this study applies the Web Engineering (WE) methodology—an approach specifically designed to structure and manage web-based system development. The WE framework emphasizes systematic analysis, design, implementation, and testing phases, ensuring that the resulting application meets both functional and non-functional requirements. This methodology integrates principles from software engineering with the unique characteristics of web development, such as user-centered design, scalability, and continuous content evolution. Employing the WE approach ensures that system

development remains iterative, flexible, and capable of incorporating feedback from end users throughout its lifecycle.

Accordingly, the primary objective of this research is to design and develop a web-based Academic Information System for Politeknik Anika Palembang using the Web Engineering methodology. The system aims to optimize academic management processes by integrating data access and operations for students, lecturers, and administrative staff within a unified online platform. In addition, the study seeks to evaluate the system's performance, functionality, and usability in accordance with structured software engineering principles. Ultimately, the development of this web-based SIAKAD is expected to enhance institutional efficiency, minimize administrative errors, and strengthen the overall quality of academic services at Politeknik Anika Palembang—positioning the institution as a model for effective ICT-driven educational management in Indonesia.

Methodology

Research design, site, and participants

This study adopts a quantitative approach, as described by Donmoyer in Given (2008), emphasizing systematic data collection, analysis, and interpretation to generate measurable outcomes. The quantitative approach facilitates the objective evaluation of system functionality and user satisfaction.

Data collection and analysis

Data collection was carried out using three methods:

1. InterviewsInterviews were conducted with administrative staff, lecturers, and students to gather user requirements and expectations for the new academic information system.
2. Literature ReviewReference materials such as journals, books, and previous studies related to academic information systems and Web Engineering were analyzed to establish a theoretical foundation.
3. ObservationDirect observations were made at Politeknik Anika to identify operational inefficiencies in the current system, including manual data processing and limited system scalability.

System Development

Method The system was developed using the Web Engineering (WE) methodology proposed by Pressman (2005). Web Engineering applies structured engineering principles to the development of high-quality web applications.

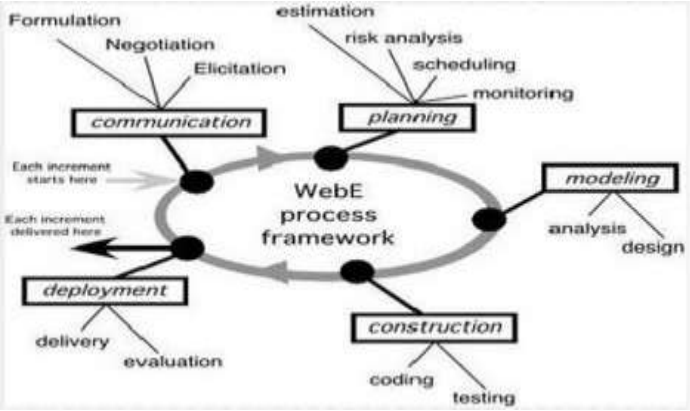

Figure 1.1 Web Engineering Process Framework

The Web Engineering model ensures that system development follows a disciplined process emphasizing maintainability, scalability, and usability.

Results

System Overview

The developed web-based Academic Information System (SIAKAD) enables real-time access to academic information for administrators, lecturers, and students. The system consists of multiple modules, including:

1. Admin Module: Management of faculties, programs, courses, lecturers, students, and class schedules.
2. Lecturer Module: Entry and review of student grades, attendance lists, and course materials.
3. Student Module: Access to course registration (KRS), schedules, and academic transcripts (KHS).Each module integrates seamlessly to streamline academic data management and reduce redundancy.

System Interface

Key interfaces of the system include: List of Implemented System Interfaces

1. Login Page
2. Admin Dashboard
3. Lecturer Page
4. Student Page

The system interface design prioritizes usability, ensuring intuitive navigation and responsive performance across devices.

System Testing

The testing process used the Black Box Testing method, focusing on the system's input and output functionality. Each module was tested to verify its capability to process user input and generate expected results.

Summary of Black Box Testing Results:

1. Login Authentication
2. Data Input (Admin)
3. Data Retrieval (Lecturer/Student)
4. Course Registration
5. Grade Entry

All modules functioned as intended, confirming system reliability and usability.

Validity and User Feedback

The system's functionality and user satisfaction were also assessed through a user feedback survey. Summary of User Feedback Results:

1. Ease Of Use
2. System Performance
3. Interface Design
4. Accuracy Of Information
5. Overall Statisfaction

The average score of 4.66 indicates that the developed SIAKAD system is well-received and meets the needs of users across all roles.

Discussion

The results of this research demonstrate that the web-based Academic Information System (SIAKAD) developed for Politeknik Anika Palembang has successfully achieved its intended objectives, significantly enhancing the institution's academic and administrative management processes. The system provides measurable improvements in data accessibility, information accuracy, and workflow efficiency, thereby addressing the key limitations identified in the previous desktop-based implementation. By enabling access through a centralized web platform, the system allows students, lecturers, and administrative staff to retrieve and manage academic data seamlessly anytime and anywhere, contributing to improved institutional responsiveness and service quality.

The application of the Web Engineering (WE) methodology played a crucial role in ensuring a structured and adaptive development process. As noted by Adinata and Udariansyah (2015), the Web Engineering framework provides a systematic foundation that integrates analysis, design, coding, and testing into iterative cycles, allowing for continuous refinement based on stakeholder feedback. This structured approach ensured that the SIAKAD was designed not only to meet functional requirements but also to remain scalable, maintainable, and user-centered. The iterative development phases allowed developers to incorporate user input effectively, resulting in a system that closely aligns with real academic workflows and end-user expectations.

Feedback collected from users—comprising lecturers, students, and administrative staff—showed a high level of satisfaction with the usability and interactivity of the system's interface. The system's design emphasizes simplicity and intuitiveness, enabling users to perform academic tasks such as registration, grade input, and report generation efficiently. These findings indicate that the interface design adheres to user experience (UX) principles

and aligns with Web Engineering's emphasis on human-centered design. The positive response also reflects the system's high learnability, a crucial attribute for educational software where users often possess diverse levels of digital proficiency.

During development and deployment, several technical challenges were encountered, notably in ensuring secure user authentication and optimizing server performance under high concurrent usage conditions. These challenges are typical in multi-user web-based systems where session control and database access must be managed efficiently. To address these issues, the research team implemented secure session management protocols and optimized database indexing to reduce query latency. These enhancements improved response times and reduced the likelihood of system crashes during simultaneous logins, thereby reinforcing the reliability and stability of the application. The successful resolution of these challenges underscores the adaptability of the Web Engineering approach in addressing both design and implementation-level complexities.

Comparative analysis with prior studies conducted by Adinata and Udariansyah (2015) and Hadinata and Udariansyah (2021) reveals consistent outcomes, reinforcing the methodological robustness of Web Engineering in developing academic and administrative information systems. Similar research efforts have demonstrated that WE's structured and iterative nature ensures that resulting applications are both technically sound and user-oriented. The present study thus contributes additional empirical validation to the literature by demonstrating the framework's effectiveness in a vocational higher education context, where operational efficiency and accessibility are critical.

In summary, the successful implementation of the web-based SIAKAD at Politeknik Anika Palembang exemplifies the transformative potential of Web Engineering in supporting digital governance in education. The system's effectiveness in enhancing accessibility, data reliability, and workflow efficiency confirms that the chosen methodology provides a comprehensive balance between technical precision and user experience. Furthermore, by adopting modern web technologies and structured development principles, the institution has strengthened its capacity for sustainable academic information management. Future improvements—such as mobile optimization, analytics integration, and cloud-based scalability—could further expand the system's functionality, ensuring that it continues to align with evolving technological trends and institutional objectives.

Conclusion and Recommendations

The implementation of a web-based Academic Information System for Politeknik Anika Palembang has proven successful in addressing the limitations of the previous desktop-based approach.

Key findings include:

1. The system supports efficient online management of academic data, including course registration, grade entry, and scheduling.
2. All functional tests (Black Box Testing) confirmed that modules perform as expected.
3. User satisfaction surveys indicate very positive feedback, with an overall performance rating of 93%.
4. The Web Engineering methodology effectively guided the development process, ensuring reliability and scalability.

Future work should focus on enhancing mobile responsiveness and integrating real-time notifications for academic activities.

Disclosure Statement

The authors declare that there are no conflicts of interest regarding this research. This study was conducted purely for academic purposes within the Faculty of Computer Science, Universitas Bina Darma, in collaboration with Politeknik Anika Palembang.

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