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Website-Based Academic Information System at SMA Negeri 1 Lubai, Muara Enim Regency, Using Extreme Programming

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Abstract

Rapid technological progress has encouraged educational institutions to exploit digital innovations that enhance academic administration and institutional competitiveness. Academic information systems (AIS) provide structured management of student, teacher, registration, and grade data while simultaneously supporting school promotion. SMA Negeri 1 Lubai still maintains its academic records manually, a process that limits efficiency, accessibility, and transparency. With 574 students distributed across 10 classes, the school requires a website-based AIS capable of handling academic data and providing public access to institutional information. This study designs and develops a web-based academic information system for SMA Negeri 1 Lubai employing the Extreme Programming (XP) methodology a lightweight agile framework suitable for small teams facing evolving requirements. The system enables efficient storage, retrieval, and dissemination of academic information, improving administrative performance and accessibility for teachers, students, and the general public.

Keywords

academic information system, Extreme Programming, website, SMA Negeri 1 Lubai

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Introduction

The rapid advancement of information and communication technology (ICT) has profoundly transformed the way organizations, institutions, and individuals manage and disseminate information. Digital technologies have become the backbone of administrative and operational activities across all sectors, particularly in education, where accurate and efficient data management is vital for institutional governance. As noted by Laudon (2000), information systems play a critical role in enhancing decision-making processes and organizational performance by facilitating the collection, processing, and distribution of information. In schools, web-based information systems now serve not only as administrative tools but also as platforms that foster transparency, accountability, and public accessibility.

In the context of Indonesian education, many schools—particularly those in regional areas—still rely on manual administrative processes. One such institution is SMA Negeri 1 Lubai, located in Muara Enim Regency, South Sumatra, Indonesia, which serves a total of 574 students: 180 in Grade 10, 207 in Grade 11, and 187 in Grade 12. Despite having sufficient digital infrastructure, the school continues to manage its academic data manually on paper, covering student registration, grades, attendance, and teacher records. This manual system presents various inefficiencies, including redundant data entry, difficulties in error correction, and slow document retrieval. Moreover, paper-based archives are prone to physical degradation and loss, thereby compromising data integrity and accessibility over time.

These operational limitations hinder the school's ability to meet modern educational management standards, which increasingly demand digital transformation and real-time access to institutional data. A web-based Academic Information System (AIS) can serve as a comprehensive solution by digitizing administrative workflows and providing structured, centralized data management. Such a system enables teachers and administrative staff to input, update, and retrieve student data efficiently, while students and parents can access academic records and school announcements through online interfaces. Furthermore, a well-designed AIS can function as a promotional and communication medium, showcasing school programs, achievements, and admissions information to prospective students and the wider public.

Developing an effective AIS requires not only technical expertise but also a structured software engineering framework that can accommodate evolving requirements and ensure the delivery of high-quality software. One suitable approach is Extreme Programming (XP), an agile software development methodology introduced by Beck (1996). As further elaborated by Beck and Fowler (2000), XP emphasizes continuous feedback, iterative development, and collaboration between developers and users to ensure that the final product meets functional and usability expectations. XP is particularly effective for small- to medium-scale projects where requirements are dynamic or uncertain, as it allows for rapid adaptation to user feedback and changing institutional needs.

According to Dewangga et al. (2020), XP's iterative nature ensures that every software component undergoes incremental testing and refinement, reducing the likelihood of defects and ensuring long-term maintainability. Similarly, Supriyatna (2018) highlights XP's flexibility and efficiency in handling unpredictable project scopes while maintaining high technical standards through practices such as pair programming, test-driven development, and continuous integration. In the context of school information systems, these principles are essential for ensuring that the application remains responsive to evolving academic requirements and user expectations.

Therefore, this research aims to develop a web-based Academic Information System for SMA Negeri 1 Lubai using the Extreme Programming (XP) methodology. The system is designed to improve operational efficiency, strengthen data integrity, and promote public transparency in academic management. By aligning with Indonesia's digital education transformation agenda, the project seeks to create an information system that not only streamlines school administration but also enhances communication and trust among stakeholders—teachers, students, parents, and policymakers alike. Ultimately, this study contributes to the broader goal of modernizing educational administration through innovative, agile, and sustainable technological solutions.

Methodology

Research Period and Location

The research was conducted from June 2021 to October 2021 at SMA Negeri 1 Lubai, located on Prabumulih–Baturaja Street, Beringin Village, Lubai District, Muara Enim Regency, South Sumatra Province.

System Development Method

According to Dinu (2008 as cited in Gita, 2019), system development comprises procedures and rules guiding the creation of information systems. This study adopts the Extreme Programming (XP) method, one of the agile models designed for dynamic environments. XP focuses on collaboration, frequent feedback, and incremental delivery (Anwer et al., 2017).XP is particularly effective for small teams encountering evolving requirements (Riyadi, 2020). Its lightweight, flexible nature enables rapid adaptation without compromising software quality. The five XP stages applied in this study are: Planning: Identifying user needs and defining functional objectives. Design: Modeling processes using Unified Modeling Language (UML) diagrams to visualize system interactions. Coding: Implementing the design using appropriate programming languages and database structures. Testing: Verifying system functionality, reliability, and performance. Software Increment: Refining the system iteratively through user feedback and performance evaluation.

System Design

System design defines operational requirements and describes how the proposed AIS fulfills them.

Functional Requirements, The system must store and process academic data quickly with validated accuracy. The integrated database must support large-scale storage. The user interface must be intuitive and easily accessible for administrators, teachers, students, and the public.

Non-Functional Requirements Non-functional requirements include reliability, scalability, security, and accessibility of the web application.

Use Case Design A Use Case Diagram illustrates the interaction between actors and the system. The primary actors are: Administrator: Manages academic data and user access. Teacher: Inputs grades and class activities. Student: Views schedules, grades, and announcements. Public / Prospective Student: Accesses general information and online registration features.

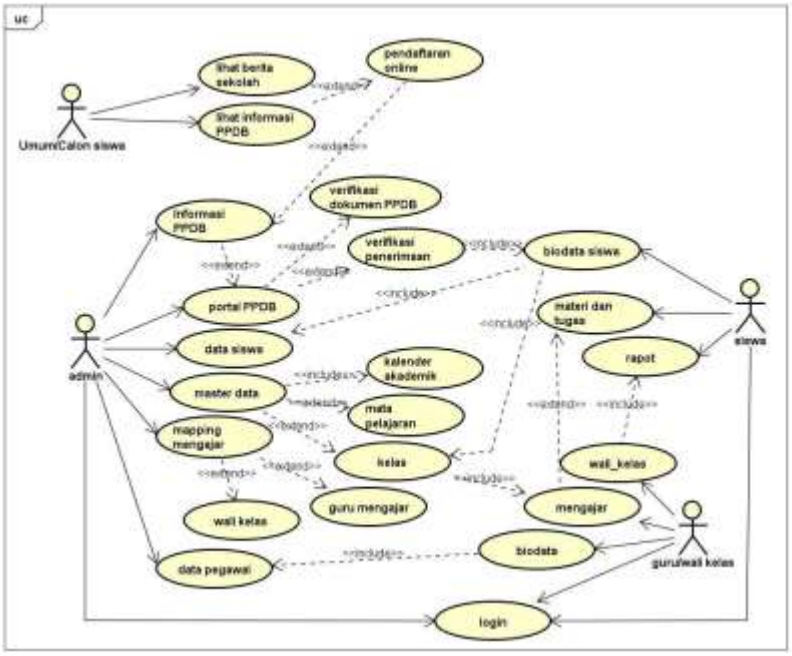

Figure 1. Use Case Diagram of the Website-Based Academic Information System

Results

After development and testing, the AIS was successfully implemented at SMA Negeri 1 Lubai. The principal outcomes are summarized below.

Index Page

The homepage contains menus for Home, Profile (with submenus for Welcome Message, Vision and Mission, and Organizational Structure), Academic (Academic Calendar, Subjects, Teachers, and Students), and Information (Announcements, Events, Facilities, and Gallery). A PPDB (New Student Admission) menu provides online registration access. Contact details and external links are displayed in the sidebar.

Figure 2. Homepage of the SMA Negeri 1 Lubai Website

PPDB Page

The PPDB (New Student Admission) page presents registration schedules, procedures, and announcement timelines for accepted students.

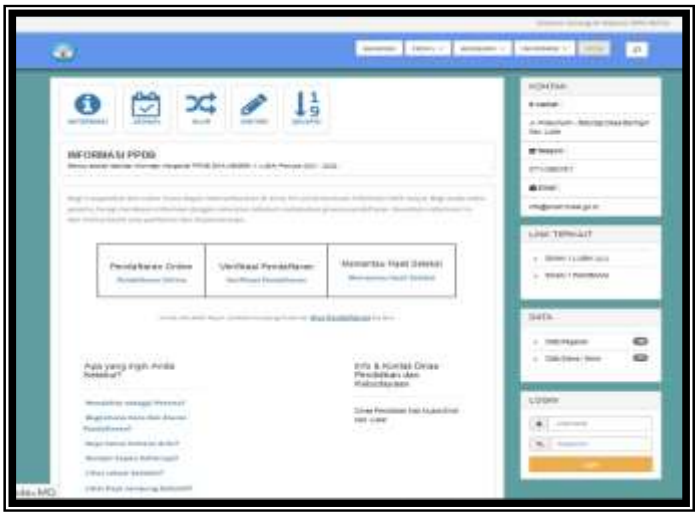

Figure 3. PPDB Page

Administrator Interface

a. Login Page
   Administrators log in with valid credentials. Successful authentication grants access to the dashboard; invalid entries redirect to the login page.
b. Administration Dashboard
   The dashboard includes menus for Home, Web Settings, Master Data, Teaching Assignments, PPDB Portal, Student Data, Staff Data, and Logout.
c. Student Data Page

Administrators can input and update student data class schedules, subjects, and extracurricular activities via this page.

d. Staff Data Page
This module displays teacher and staff information, including profiles, usernames, and employment records.

Discussion

The application of the Extreme Programming (XP) methodology in the development of the Academic Information System (AIS) for SMA Negeri 1 Lubai has proven to be both effective and adaptive in addressing the institution's digital transformation needs. XP, as introduced by Beck (1996) and refined by Beck and Fowler (2000), emphasizes iterative design, close collaboration between developers and users, and continuous integration. This approach allowed the development team to respond flexibly to feedback and evolving requirements throughout the system development life cycle. By applying XP, the project avoided the rigidity of traditional models and achieved a faster, more user-centered development process that aligns with the principles of agile software engineering.

Through this methodology, the system successfully digitized all previously manual academic processes, including student registration, grade recording, and teacher data management. This digitalization not only reduced data redundancy and minimized human error but also significantly improved processing speed and record accuracy. As noted by Dewangga et al. (2020), iterative testing and refinement—key practices within XP—help maintain system reliability and ensure that each function operates as intended. The integration of automated data validation and user input checks further reduced inconsistencies that often occur in manual administrative systems.

The iterative design cycle characteristic of XP was crucial in aligning the system's features with user expectations. Continuous feedback from administrators, teachers, and students ensured that the resulting AIS addressed real operational needs rather than theoretical assumptions. Frequent user testing after each iteration allowed for early detection of design flaws and usability issues, which were promptly resolved in subsequent development cycles. This iterative engagement cultivated a sense of ownership among users, increasing their acceptance and readiness to adopt the system in daily operations. As Supriyatna (2018) explains, XP's strength lies in its responsiveness—enabling rapid adjustments based on direct stakeholder input, which is essential in dynamic educational environments.

From a functional perspective, the web-based architecture of the AIS enhances accessibility and connectivity for all stakeholders. Teachers can input and update grades remotely, administrators can manage student databases in real time, and students can view their academic records and announcements without visiting the school office. This ubiquitous accessibility supports the broader educational objective of fostering technology-based learning ecosystems that encourage independence and digital literacy. Moreover, the system's responsive interface design ensures usability across different devices, making it inclusive for users with varying levels of technological proficiency.

Beyond operational improvements, the introduction of the AIS also strengthens institutional transparency and community engagement. By providing online access to academic and administrative information—such as school profiles, admission procedures, and announcements—the system enhances public trust and promotes accountability. This aligns

with Beck and Fowler's (2000) view that technology should serve both functionality and human collaboration. For SMA Negeri 1 Lubai, the platform functions not only as an administrative tool but also as a digital gateway that connects the school with parents, students, and the surrounding community, embodying the principles of open and participatory governance in education.

In a broader context, the successful implementation of this web-based AIS contributes to the digital transformation of educational administration in Indonesia. It reflects how agile methodologies like XP can be effectively applied to small- and medium-scale educational institutions that face resource constraints and rapidly changing requirements. The system's adaptability, simplicity, and reliability make it a replicable model for other schools aiming to transition from manual recordkeeping to integrated information management. Ultimately, this project demonstrates that the synergy between agile development practices and educational digitalization can lead to sustainable innovation—enhancing efficiency, transparency, and service quality in the management of academic information.

Conclusion and Recommendations

The implementation of a website-based academic information system using the Extreme Programming methodology at SMA Negeri 1 Lubai has produced several benefits: Improved efficiency and accuracy in academic data management. Centralized data storage and retrieval through an integrated database. Enhanced school promotion and information transparency. Simplified online registration for prospective students. The system thus supports institutional modernization and can serve as a model for other schools pursuing digital academic management.

Disclosure Statement

The authors declare no conflicts of interest regarding this study. The research was conducted independently within the Faculty of Computer Science, Universitas Bina Darma.

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