

WEB-BASED ACADEMIC INFORMATION SYSTEM DEVELOPMENT USING AGILE: A HIGHER EDUCATION CASE STUDY

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ABSTRACT

This research aimed to develop a web-based academic information system using the Agile method to improve academic data management in a higher education institution. The background of this study was based on the need for a more efficient, integrated, and accessible system to manage academic activities, such as student data, lecturer data, course data, schedules, attendance, grades, and academic reports. This research used a research and development approach with a case study design. The system development process followed Agile stages, including requirement analysis, sprint planning, system design, implementation, testing, evaluation, and revision. Data were collected through observation, interviews, and document analysis to identify user needs and academic administration problems. The system was implemented with role-based access for administrators, lecturers, and students. The results showed that the developed system could manage academic data in an integrated manner, improve information access, and support faster academic reporting. Black-box testing showed that the main system functions worked properly, while user acceptance testing indicated positive user responses. This study concludes that the Agile method is suitable for developing an adaptive web-based academic information system.

Keywords :Academic information system, Agile method, Higher education, System development, Web-based system.

1. Introduction

The development of information technology has encouraged higher education institutions to improve the quality of academic services through digital systems(Aithal & Maiya, 2023; Mohamed Hashim et al., 2022; Sudrajat et al., 2024). Academic activities such as student data management, course scheduling, grade processing, attendance recording, and academic reporting require accurate, fast, and well-integrated information management. However, in many higher education institutions, academic administration is still often carried out manually or using separate applications. This condition may cause data duplication, delays in information delivery, difficulty in monitoring academic activities, and a higher risk of administrative errors.

A web-based academic information system is one solution that can support the effectiveness of academic management(Agustianingsi & Yaqin, 2026; Makkaraka et al., 2024). Through a web-based system, academic data can be accessed more easily by authorized users such as administrators, lecturers, and students. The system also enables centralized data management, improves service efficiency, and supports better decision-making in academic administration. In the context of higher education, the implementation of an academic information system is important because academic services must be responsive, transparent, and able to meet the needs of various users.

Theoretically, an information system is designed to collect, process, store, and distribute information to support organizational activities. In academic institutions, information systems play an important role in connecting academic processes with institutional management needs. Meanwhile, web-based technology provides flexibility because it can be accessed through various devices and does not require complex installation on the user side. Therefore, the development of a web-based academic information system is expected to provide a practical and efficient solution for managing academic data.

The Agile method is used in this research because it supports flexible and iterative system development. Agile emphasizes user involvement, continuous feedback, and gradual system

improvement(Eboh, 2024; Zorzetti et al., 2022). This method is suitable for academic information system development because user needs may change during the development process. By using Agile, the system can be developed in several stages, starting from requirement analysis, system design, implementation, testing, evaluation, and refinement based on user feedback.

Several previous studies have shown that web-based academic information systems can improve the efficiency of academic services, reduce manual work, and increase the accuracy of academic data management. Other studies also indicate that the Agile method is effective in developing information systems because it allows developers and users to collaborate intensively during the development process. However, each higher education institution has different needs, workflows, and administrative characteristics. Therefore, a case study approach is important to ensure that the developed system is relevant to the real conditions of the institution.

Based on this background, this research aims to develop a web-based academic information system using the Agile method at a higher education institution(Faid, 2025; Himmah & Laouar, 2025). The system is designed to support academic data management, improve administrative efficiency, and provide easier access to academic information for users. This research is expected to contribute both practically and academically by providing a system development model that can be adapted to similar higher education environments.

2. Literature Review

An academic information system is an important digital platform used to manage academic data and support institutional administration. In educational institutions, academic information systems help process student data, teacher or lecturer data, schedules, grades, attendance, and other academic activities. Previous research explains that academic information systems are useful because they can reduce manual data processing, improve data integration, and make information access faster and more efficient . Therefore, the development of an academic information system is closely related to the need for accuracy, efficiency, and accessibility in educational management.

In higher education, academic information systems have a broader role because they support academic services for students, lecturers, administrative staff, and institutional leaders. A study on integrated academic information systems in higher education found that users need systems that are interactive, responsive, and able to provide features such as academic service tracking, notifications, schedule access, and grade viewing . This shows that academic information systems are not only administrative tools but also service platforms that improve communication and transparency between institutions and users.

Web-based technology is widely used in academic information system development because it allows users to access information through internet-connected devices without complex installation. Web-based systems can support flexible access, centralized data management, and faster information distribution. Lontaan and Sinadia found that a web-based school information system could integrate student data, teacher data, class schedules, and related academic information while improving the quality of educational services and supporting digital transformation . Although the study was conducted in a school context, its findings are relevant to higher education because both require efficient academic data management and accessible information services.

The Agile method is one of the software development approaches that emphasizes flexibility, user collaboration, and continuous improvement. The Agile Manifesto highlights four main values: individuals and interactions, working software, customer collaboration, and responding to change . These values are relevant for academic information system development because user needs may change during the development process. In the context of higher education, Agile allows developers to involve users, receive feedback, and improve the system gradually through iterative development.

The use of Agile in information system development is also supported by software life cycle principles. ISO/IEC/IEEE 12207:2026 explains that software life cycle processes can be applied iteratively and incrementally, and the standard is applicable to Agile approaches and methods . This supports the idea that Agile is suitable for developing systems that require continuous

refinement, especially when the system must adapt to institutional workflows and user expectations.

Several previous studies have discussed the development of web-based academic or educational information systems using various methods. Lengkong et al. developed a web-based academic information system using the prototype method and found that the system could run according to expected functions based on black-box testing . Lontaan and Sinadia developed a web-based school information system using the Waterfall method and showed that the system improved data management and information access . Meanwhile, Wandri et al. applied Agile Scrum in developing a web-based school information system and reported that the system improved administrative efficiency and achieved a high user satisfaction rate.

Table 1. Previous studies related to web-based academic information systems and Agile development.

Author/Year	Research Focus	Method Used	Key Findings	Relevance to This Study
(Makkaraka et al., 2024)	Web-based academic information system in vocational school	Prototype method	The system helped academic data processing and ran properly based on black-box testing	Supports the importance of web-based academic data management
(Triyana & Fianty, 2023)	Web-based school information system	Waterfall method	The system improved data management, access flexibility, and educational services	Shows the benefits of web-based systems in educational institutions
(Rahayu, 2026)	Needs analysis of integrated academic information system in higher education	Descriptive qualitative method	Users needed responsive, interactive, and integrated academic services	Strengthens the need for higher education academic information systems
(Wandri et al., 2025)	Web-based school information system using Agile Scrum	Agile Scrum	The system improved administrative efficiency and user satisfaction	Supports the use of Agile in educational information system development

Based on the literature, web-based academic information systems have been proven to support efficiency, accessibility, and accuracy in academic administration. However, previous studies have mostly focused on school-level systems, prototype-based development, or general educational administration. Therefore, this study focuses on the development of a web-based academic information system in a higher education institution using the Agile method. The novelty of this study lies in the use of Agile as an iterative development approach to produce a system that is more adaptive to user needs and institutional academic workflows.

3. Research Methods

This research used a research and development approach with a case study design.(Cahyani & Yaqin, 2024) The main objective of this research was to develop a web-based academic information system using the Agile method. The case study was conducted at a higher education institution that required a digital system to support academic data management, including student data, lecturer data, course data, class schedules, attendance, grades, and academic reports.

The Agile method was selected because it allows system development to be carried out iteratively and flexibly. In this research, the development process was divided into several stages, namely requirement analysis, sprint planning, system design, implementation, testing, evaluation, and system refinement. Each stage involved user feedback so that the system could be improved according to institutional needs.

Data were collected through observation, interviews, and document analysis. Observation was conducted to understand the existing academic administration process. Interviews were carried out with academic administrators, lecturers, and students to identify system requirements. Document analysis was used to examine academic forms, student records, course schedules, grade reports, and other documents related to academic services.

The research procedure consisted of several steps. First, the researcher identified the problems in the existing academic administration process. Second, the researcher analyzed user needs and system requirements. Third, the system was designed using use case diagrams, database design, interface design, and system workflow design. Fourth, the system was developed using web-based technology. Fifth, the system was tested using black-box testing and user acceptance testing. Sixth, the system was evaluated and improved based on user feedback.

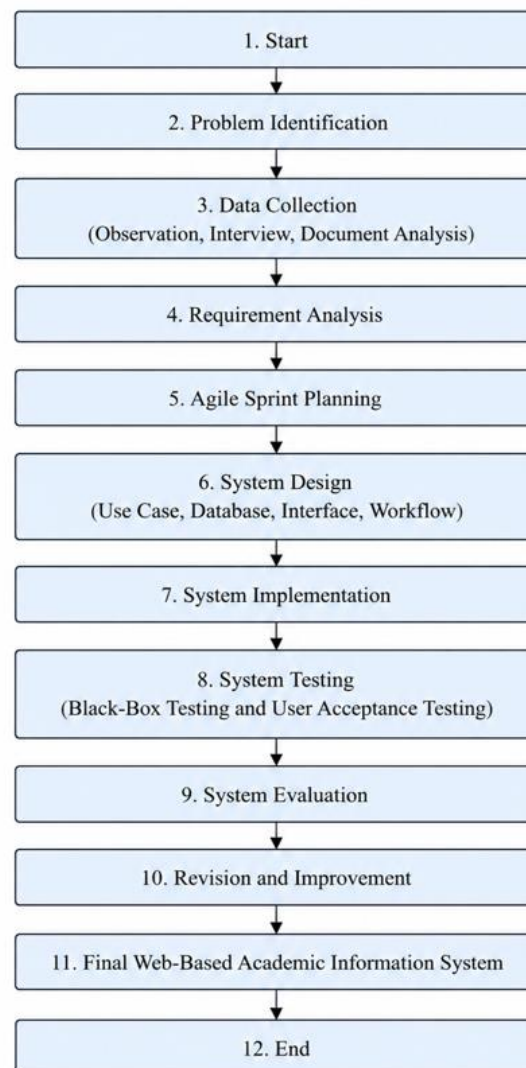


Fig. 1. Research framework of the web-based academic information system development.

The system design stage included the modeling of actors, processes, database structure, and user interface. The main actors in the system were administrator, lecturer, and student. The administrator managed master data such as student data, lecturer data, course data, class data, and academic schedules. Lecturers managed attendance and student grades. Students accessed academic information such as schedules, attendance records, and grades.

The general system rule was based on role-based access control. Each user could only access features according to their role. The administrator had full access to manage academic data. Lecturers had access to manage academic activities related to their courses. Students had access only to view their own academic information. This rule was applied to maintain data security and prevent unauthorized access.

The basic algorithm of the system can be described as follows:

1. User opens the academic information system.
2. User enters username and password.
3. System validates login data.
4. If login is valid, the system checks the user role.
5. System displays dashboard based on the user role.
6. User selects an academic menu.
7. System processes the request based on access permission.
8. System stores, updates, deletes, or displays academic data.
9. User logs out from the system.

The database design was developed to support integrated academic data management. The main entities included users, students, lecturers, courses, classes, schedules, attendance, grades, and academic reports. Each entity was connected through relational database relationships to reduce data duplication and improve data consistency.

Table 2. Main system modules and functions.

Module	Main Function	User Role
Login	Validates user access to the system	Administrator, Lecturer, Student
Student Data	Manages student identity and academic information	Administrator
Lecturer Data	Manages lecturer identity and teaching information	Administrator
Course Data	Manages course information	Administrator
Class Schedule	Manages academic schedules	Administrator, Lecturer, Student
Attendance	Records and displays student attendance	Lecturer, Student
Grade Management	Inputs and displays student grades	Lecturer, Student
Academic Report	Provides academic data reports	Administrator

System testing was conducted using black-box testing to check whether each function worked according to its requirements. The tested features included login, data input, data editing, data deletion, data search, schedule management, attendance management, grade management, and report generation. User acceptance testing was also conducted to determine whether the system was easy to use and suitable for academic administration needs.

The final result of this research was a web-based academic information system developed using the Agile method. The system was expected to improve the efficiency of academic data management, reduce manual administrative work, minimize data errors, and provide easier access to academic information for users in higher education institutions.

4. Results and Discussions

Results

The results of this research show that the web-based academic information system was successfully developed using the Agile method. The system was designed to support academic data management in a higher education institution, including user management, student data, lecturer data, course data, class schedules, attendance records, grade management, and academic reports. The development process was carried out through iterative stages, starting from requirement identification, system design, implementation, testing, evaluation, and improvement based on user feedback.

Based on the observation and interview results, several main problems were found in the existing academic administration process. These problems included manual data processing, repeated data entry, slow academic information delivery, limited access to academic records, and difficulty in

generating academic reports. These findings became the basis for defining the main system requirements.

Table 3. Main problems and system solutions.

No.	Identified Problem	System Solution
1	Academic data were managed manually	The system provides digital data management
2	Data input was repeated in different documents	The system uses integrated database storage
3	Academic information was difficult to access quickly	The system provides web-based access
4	Grade and attendance records were not fully centralized	The system provides attendance and grade modules
5	Academic reports took a long time to prepare	The system provides academic report generation

The system development produced several main modules. Each module was developed according to the needs of the users, namely administrator, lecturer, and student. The administrator has access to manage master data and academic reports. Lecturers can manage attendance and student grades. Students can access academic information such as schedules, attendance records, and grades.

Table 4. Developed system modules.

No	Module	Description	User Role
1	Login	Provides user authentication and access control	Administrator, Lecturer, Student
2	Dashboard	Displays academic information summary	Administrator, Lecturer, Student
3	Student Data	Manages student identity and academic records	Administrator
4	Lecturer Data	Manages lecturer identity and teaching data	Administrator
5	Course Data	Manages course information	Administrator
6	Class Schedule	Manages and displays academic schedules	Administrator, Lecturer, Student
7	Attendance	Records and displays student attendance	Lecturer, Student
8	Grade Management	Inputs and displays student grades	Lecturer, Student
9	Academic Report	Generates academic reports	Administrator

The implementation result shows that the system applies role-based access control (Averina & Widagda, 2021; Informa & Indonusa, 2022; Mohammed et al., 2020; Rony & Panuju, 2018; Timotheou et al., 2023). Each user can only access menus and data according to their assigned role. This mechanism was applied to maintain data security and ensure that academic information is accessed only by authorized users.

Table 5. User access rights in the system.

Feature	Administrator	Lecturer	Student
Login	Yes	Yes	Yes
Manage student data	Yes	No	No
Manage lecturer data	Yes	No	No
Manage course data	Yes	No	No
Manage class schedule	Yes	View only	View only
Manage attendance	No	Yes	View only
Manage grades	No	Yes	View only

View academic report	Yes	Limited	Limited
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System testing was conducted using black-box testing. The testing focused on checking whether each function worked according to the expected output. The tested functions included login, data input, data editing, data deletion, data search, schedule management, attendance recording, grade input, and report generation.

Table 6. Black-box testing results.

No	Tested Function	Expected Result	Test Result	Status
1	Login	User can enter the system with valid account data	The system accepted valid login data	Valid
2	Invalid login	System rejects wrong username or password	The system displayed an error message	Valid
3	Add student data	Student data can be saved	Data were saved successfully	Valid
4	Edit student data	Student data can be updated	Data were updated successfully	Valid
5	Delete student data	Student data can be deleted	Data were deleted successfully	Valid
6	Search academic data	System displays data based on keywords	Search results were displayed correctly	Valid
7	Manage schedule	Schedule data can be saved and displayed	Schedule was saved and displayed	Valid
8	Record attendance	Attendance data can be stored	Attendance data were stored successfully	Valid
9	Input grades	Grade data can be saved	Grade data were saved successfully	Valid
10	Generate report	Academic report can be displayed	Report was generated successfully	Valid

The black-box testing results showed that all tested functions worked according to the expected results. No critical error was found during functional testing. Minor revisions were made to improve interface consistency, menu layout, and validation messages.

User acceptance testing was also conducted to measure user responses toward the developed system. The assessment focused on ease of use, feature suitability, information access, interface display, and system usefulness. The results show that users gave positive responses to the system.

Table 7. User acceptance testing results.

No.	Assessment Aspect	Average Score	Category
1	Ease of use	4.30	Good
2	Feature suitability	4.25	Good
3	Information accessibility	4.40	Good
4	Interface display	4.20	Good
5	System usefulness	4.45	Good

The average score of user acceptance testing was 4.32. This result indicates that the system was accepted by users and could support academic administration activities. The highest score was obtained in the system usefulness aspect, while the lowest score was obtained in the interface display aspect. Based on user feedback, improvements were made to simplify navigation, adjust menu placement, and make several forms easier to understand.

The final result of this research is a web-based academic information system that can manage academic data in an integrated manner. The system provides access for administrators, lecturers, and students according to their respective roles. The system also supports academic service

activities by providing centralized data management, faster access to academic information, and more efficient report generation.

Discussion

The results of this research indicate that the development of a web-based academic information system using the Agile method can support more effective academic data management in a higher education institution. The system was able to provide several main functions, including user authentication, student data management, lecturer data management, course management, schedule management, attendance recording, grade management, and academic report generation. These findings show that the use of a web-based system can reduce the limitations of manual academic administration, especially in terms of data accuracy, information accessibility, and service efficiency.

The problems identified in the initial stage of the research, such as repeated data entry, slow information delivery, limited access to academic records, and difficulty in preparing academic reports, are common issues in institutions that still depend on manual or semi-digital administrative processes. The developed system responded to these problems by providing centralized data storage and role-based access. This result confirms the concept that an information system is designed to collect, process, store, and distribute information to support organizational activities. In the context of higher education, the system does not only function as a data storage tool, but also as a service platform that connects administrators, lecturers, and students in one integrated academic environment.

The implementation of role-based access control also became an important result of this study. The system allows each user to access features based on their role. Administrators can manage master academic data, lecturers can manage attendance and grades, while students can view their academic information. This access structure helps maintain data security and prevents unauthorized users from modifying sensitive academic data. This finding is important because academic information systems manage personal and academic records that require accuracy, confidentiality, and controlled access.

The black-box testing results showed that all main system functions worked according to the expected outputs. Login, data input, data editing, data deletion, data search, schedule management, attendance recording, grade input, and report generation were successfully tested. These findings indicate that the system met its functional requirements. The absence of critical errors during testing also shows that the development process was able to produce a stable system for academic administration needs. Minor revisions related to interface consistency and validation messages indicate that system improvement is still needed, especially in the user experience aspect.

The user acceptance testing results showed an average score of 4.32, which indicates that the system was positively accepted by users. The highest score was obtained in the system usefulness aspect, while the lowest score was obtained in the interface display aspect. This shows that users considered the system useful for supporting academic services, although visual design and interface layout still need improvement. This result is consistent with the principle of Agile development, where user feedback becomes an important basis for continuous system refinement. The use of the Agile method contributed significantly to the development process. Agile allowed the system to be developed gradually through iterative stages, starting from requirement analysis, design, implementation, testing, evaluation, and revision. This approach helped the researcher adjust the system based on user needs and feedback. In academic information system development, this flexibility is important because institutional workflows and user requirements may change during the development process. Therefore, Agile is suitable for developing systems that require direct user involvement and continuous improvement.

The findings of this research are in line with previous studies which stated that web-based academic information systems can improve the efficiency of academic services, reduce manual work, and make academic data easier to access. Previous studies using prototype, waterfall, or Agile approaches also showed that digital academic systems can support better data management in educational institutions. However, this study emphasizes the use of the Agile method in a higher education context, where academic processes are more complex and involve different user roles.

Therefore, this research strengthens previous findings while also showing that Agile can be applied effectively to develop academic information systems that are adaptive to institutional needs.

Scientifically, this research contributes to the field of information system development by showing that Agile can be used as an effective method for developing a web-based academic information system. Practically, the developed system provides a solution for higher education institutions to manage academic data in a more integrated, efficient, and accessible manner. The system can help reduce administrative workload, improve the speed of information delivery, and support more accurate academic reporting.

However, the results also show that system development is not only related to functional success, but also to user experience. Although the system functions worked well, interface display received the lowest score in user acceptance testing. This means that future development should pay more attention to interface design, navigation simplicity, mobile responsiveness, and user comfort. By improving these aspects, the system can become more effective and easier to use by all users.

Overall, the discussion shows that the development of a web-based academic information system using the Agile method produced positive results. The system was able to address the main problems found in academic administration and provide useful features for administrators, lecturers, and students. The Agile method also supported flexible and user-centered development, making the system more relevant to real institutional needs. Thus, this research confirms that a web-based academic information system developed through Agile can become an effective digital solution for improving academic management in higher education institutions.

5. Conclusion

This research concludes that the development of a web-based academic information system using the Agile method was successfully carried out and directly addressed the main objective of improving academic data management in a higher education institution. The developed system provides several advantages, including integrated academic data management, faster access to information, role-based user access, easier management of student, lecturer, course, schedule, attendance, grade, and report data, as well as improved efficiency in academic administration. The results of black-box testing showed that the main system functions worked according to the expected requirements, while user acceptance testing indicated that the system was positively accepted by users. However, this research also has limitations, particularly in the interface display and user experience aspects, which still require further refinement to make the system more attractive, responsive, and easier to use. Therefore, future studies are suggested to improve the system interface, add mobile-based access, enhance data security features, and test the system with a larger number of users so that the academic information system can become more efficient, reliable, and widely applicable in higher education environments.

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