

Development of Integrated Student Information System to Improve the Efficiency of Academic and Administrative Services at Universitas Negeri Medan

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The research is financed by LPPM Universitas Negeri Medan. No. 2025 (Sponsoring information)

Abstract

Digital transformation has become a strategic program in higher education management in the era of the Industrial Revolution 4.0 and Society 5.0. Universities are required to develop technology-based services that can improve operational efficiency, service quality, and user satisfaction. However, the management of student services in many universities still faces various obstacles, such as data fragmentation, limited access to information, low service integration, and suboptimal use of data in decision-making. This study aims to develop an integrated Student Information System (SIK) that can effectively manage various academic and non-academic student services at Universitas Negeri Medan. The study used the Research and Development (R&D) method with the ADDIE model consisting of Analysis, Design, Development, Implementation, and Evaluation. Research data were obtained through observation, interviews, documentation, expert validation, and user evaluation. The results of the study indicate that the developed system is able to integrate student data services, student activities, achievements, scholarships, and academic administration in a single web-based digital platform. The results of the material expert validation showed a feasibility level of 88%, while the media expert validation obtained a score of 86%. User evaluations showed a usability rating of 81.5%, which is considered excellent. Qualitative analysis yielded four main themes: increased information accessibility, efficiency of administrative services, transparency of data management, and support for data-driven decision-making. This study demonstrates that an integrated student information system can improve service effectiveness, accelerate administrative processes, and support the digital transformation of higher education. The research findings contribute to the development of more responsive, transparent, and sustainable digital governance in higher education.

Keywords: student information system, digital transformation, academic services

DOI: 10.7176/ISDE/16-1-03

Publication date: July 31st 2026

1. Introduction

The development of digital technology has transformed nearly every aspect of human life, including the higher education sector. Digitalization is no longer seen as an option but rather as a strategic necessity for universities to maintain competitiveness and improve the quality of services to students. According to Fernández et al. (2023), digital transformation in higher education encompasses comprehensive changes in academic processes,

administration, governance, and student services through the integrated use of information technology. This transformation aims not only to improve organizational efficiency but also to create a better user experience for students, the primary stakeholders.

In a global context, the COVID-19 pandemic has catalyzed the acceleration of digital transformation in higher education institutions. Universities across the world are being forced to adopt digital technology to support online learning, administration, and student services. Research by Katsamakos et al. (2024) shows that successful digital transformation requires the integration of technology, organizational culture, and data-driven governance to generate sustainable benefits.

In Indonesia, digitalization in higher education continues to evolve in line with the growing need for fast, accurate, and transparent services. Various universities have implemented academic information systems to support student registration, grade management, and educational administration. However, student services are often managed separately, hampering service effectiveness. This situation leads to data redundancy, delays in information delivery, and low efficiency in student service management.

Students are a key user group who rely heavily on the availability of fast and accurate information. Information regarding scholarships, organizational activities, student competitions, the Student Creativity Program (PKM), Independent Learning on an Independent Campus (MBKM), and various self-development activities must be easily accessible and in real time. If this information is spread across various, unintegrated media, students potentially miss out on opportunities to participate in various available programs.

Universitas Negeri Medan, as one of the largest public universities in Indonesia, faces a similar challenge. Based on a needs analysis, student information is still scattered through various communication channels, such as social media, instant messaging groups, bulletin boards, and direct communication with administrative staff. This situation makes it difficult for students to obtain information quickly and equitably. Furthermore, student data management is still carried out through various documents and applications that are not connected to each other, increasing the risk of data duplication and administrative errors.

Another problem identified was the limited ability of existing systems to provide data that could be used to support decision-making. Yet, the concept of modern higher education governance emphasizes the importance of evidence-based decision-making. Integrated student data can be used to monitor student achievement, evaluate student programs, and design more targeted policies.

The importance of information system integration in higher education has been demonstrated by various previous studies. Egodawe et al. (2022) stated that successful digital transformation is characterized by an organization's ability to integrate various services into a single, easily accessible platform. Meanwhile, Prabowo and Bandur (2022) emphasized that digital service integration can increase organizational efficiency while enhancing the user experience.

The success of an information system implementation is determined not only by technical aspects, but also by information quality, service quality, and user satisfaction. The information system success model developed by DeLone and McLean explains that system quality, information quality, and service quality are key factors influencing system usage and the benefits derived by the organization. Recent research by Umaroh et al. (2025), Damana et al. (2024), and Siagian et al. (2025) showed that the quality of educational information systems has a positive relationship with user satisfaction and service effectiveness.

Although various studies have examined the evaluation of academic information systems, research on the development of student information systems that integrate academic and non-academic services remains relatively limited, especially in the context of Indonesian higher education. Most previous studies have focused on academic systems, online learning, or the evaluation of existing systems. Therefore, this study makes an important contribution to developing an integrated student information system model that meets user needs.

This study aims to: (1) develop a web-based integrated Student Information System using the ADDIE model; (2) evaluate the system's feasibility through expert validation; (3) analyze the level of user acceptance of the system; and (4) identify the impact of system implementation on the effectiveness of student services through a qualitative analysis of user experience.

The results of this study are expected to provide theoretical contributions to the development of higher education information systems and practical contributions to higher education institutions implementing the digital transformation of student services.

2. Literature Review

2.1 Digital Transformation in Higher Education

Digital transformation is a process of organizational change that utilizes digital technology to create new value, improve operational efficiency, and strengthen an organization's competitive advantage (Fernández et al., 2023). In the context of higher education, digital transformation involves the integration of technology into all academic, administrative, research, and student service activities.

According to Katsamakos et al. (2024), digital transformation in higher education must encompass three main dimensions: technological transformation, organizational transformation, and cultural transformation. These three dimensions are interconnected in forming a higher education ecosystem that is adaptive to technological developments.

Research by Bond et al. (2021) shows that the success of a higher education institution's digital transformation is influenced by institutional leadership, technological readiness, human resource digital competency, and organizational policy support. Universities that are able to integrate these factors tend to have a higher rate of transformation success.

2.2 Student Information System

A Student Information System is a system designed to manage all student-related activities throughout the educational process. This system encompasses the management of student data, achievements, student organizations, scholarships, extracurricular activities, administrative services, and various student development programs.

According to Adiyono et al. (2024), an integrated information system can improve the efficiency of administrative processes, reduce data recording errors, and expedite the delivery of information to users. Data integration also enables universities to produce more accurate reports and support more effective decision-making.

Research by Padu et al. (2024) shows that an integrated academic information system has a significant impact on improving service quality and user satisfaction. These findings reinforce the importance of developing a student information system that functions not only as an administrative tool but also as a means of managing institutional knowledge.

3. Methodology

This research uses the ADDIE model as a system development framework. ADDIE is one of the most widely used development models in educational technology due to its systematic and flexible structure. According to Branch (2021), the ADDIE model consists of five main stages: Analysis, Design, Development, Implementation, and Evaluation. These five stages form a development cycle that enables developers to produce products that meet user needs.

The first stage is Analysis, which is the process of identifying user needs, user characteristics, problems encountered, and the objectives to be achieved through system development. This stage serves as the main foundation for development because it determines the direction and specifications of the system to be built. In this research, the analysis stage was conducted through observation, interviews, and documentation studies of student service management at Universitas Negeri Medan.

The second stage is Design, which is the system design process based on the results of the needs analysis. This stage involves the development of the system structure, user interface design, database design, and system navigation flow. According to Aldoobie (2021), good design will increase system effectiveness because it can optimally accommodate user needs. Therefore, a user-centered design approach was used in this research to ensure that the developed system is easy to use by students and educational staff.

The third stage is Development, which is the process of building a system based on the previously formulated design. This stage involves program coding, database development, module integration, and system testing. The result of this stage is a system prototype ready for testing and validation by experts.

The fourth stage is Implementation, which is the process of implementing the system in a real-world environment. The developed system is implemented with target users through installation, configuration, user training, and operational trials. The implementation stage aims to determine the extent to which the system can be used in real-world conditions.

The final stage is Evaluation, which is the process of assessing the quality of the developed system. Evaluation is conducted both formatively and summatively to determine the level of system feasibility, user satisfaction, and the system's effectiveness in solving user problems. The advantage of the ADDIE model lies in its ability to integrate the evaluation process into each development stage so that the resulting product can be continuously refined based on user feedback.

The ADDIE model was chosen in this research because it has characteristics that are appropriate for the development of educational information systems. In addition to providing a systematic workflow, ADDIE also allows the development process to be carried out in stages and continuously so that the quality of the resulting product can be guaranteed.

This research employed a Research and Development (R&D) method with the goal of producing a Student Information System (SIK) capable of supporting the integrated management of student academic and non-academic services. The Research and Development method was chosen because it focuses not only on theoretical testing but also on producing a product that can be directly used to solve problems encountered in the field. According to Sugiyono (2022), development research is a research method used to produce a specific product while simultaneously testing its effectiveness in the context of its use.

The development model used in this research is ADDIE (Analysis, Design, Development, Implementation, Evaluation). The ADDIE model was chosen because it has systematic, flexible, and appropriate stages for developing educational information systems. Furthermore, this model allows for continuous evaluation at each stage of development, allowing for continuous refinement of the resulting product's quality based on user needs.

The research was conducted at Universitas Negeri Medan, involving students, lecturers, and educational staff as the primary users of the system. The research subjects consisted of two groups: an expert group and a user group. The expert group consisted of material experts and media experts, tasked with validating the developed system. The user group consisted of students and educational staff involved in the system implementation and evaluation process.

Data collection was conducted through observation, interviews, documentation, and questionnaires. Observations were conducted to identify the existing state of student service management and the problems faced by users. Semi-structured interviews were conducted to obtain more in-depth information regarding user needs for the student information system. Documentation was used to collect data related to service procedures, administrative workflows, and other supporting documents. Meanwhile, questionnaires were used to obtain quantitative data regarding the level of system feasibility and user satisfaction.

The research instruments consisted of observation sheets, interview guidelines, expert validation sheets, and user usability questionnaires. The expert validation sheets were used to assess aspects of content quality, system quality, interface appearance, navigation, and system functionality. The usability questionnaires were used to measure user perceptions of ease of use, effectiveness, efficiency, and user satisfaction with the system.

Data analysis was conducted using a mixed methods approach, namely quantitative and qualitative analysis. Quantitative data were obtained from the results of expert validation and the usability questionnaire, which were then analyzed using descriptive statistics in the form of percentages. Qualitative data were obtained from interviews and observations, analyzed using thematic analysis techniques. Thematic analysis was conducted through a process of data reduction, coding, grouping themes, interpretation, and drawing conclusions. This approach was chosen to provide a more comprehensive understanding of the effectiveness of the developed system.

The validity of qualitative data was maintained through source and method triangulation. Source triangulation was conducted by comparing information obtained from students, lecturers, and educational staff. Method triangulation was conducted by comparing the results of observations, interviews, and documentation to obtain more credible and scientifically accountable data.

4. Results

4.1 Analysis Phase

Based on the results of a needs analysis conducted through observation, interviews, and user input, it was found that student services at Universitas Negeri Medan still face various obstacles, particularly related to limited access to information, administrative processes that have not been fully digitized, and information dissemination that is still carried out through various non-integrated media. Students expect a system that can provide

information on scholarships, competitions, internships, MBKM, and student activities quickly, comprehensively, transparently, and easily accessed. In addition, users also want digitized administrative services through a one-stop service concept that includes submitting student certificates, document legalization, submitting UKT appeals, issuing student cards, and real-time service status tracking. From a communication aspect, automatic notification features, student aspiration or complaint services, and direct communication facilities are needed to improve service responsiveness. Meanwhile, from a technical aspect, users expect a system with a simple, easy-to-use interface, fast access, security, and minimal errors. Based on these findings, the development of the Student Information System is directed at integrating information services, digitizing administration, improving two-way communication, and providing an analytical dashboard that supports data-driven decision-making.

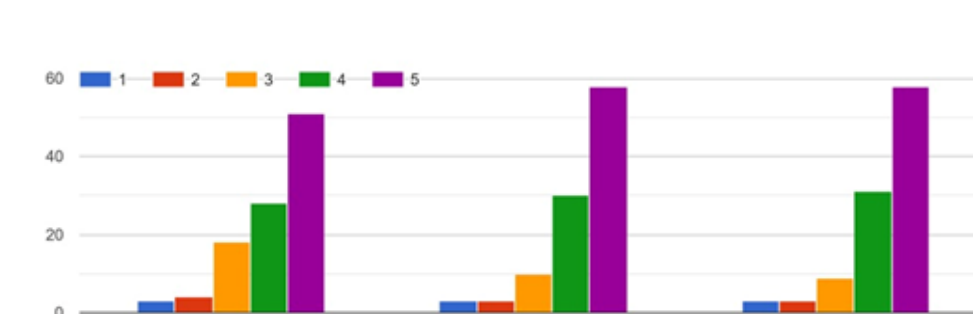


Figure 1. student needs regarding the student information system

Based on the questionnaire results, the majority of respondents gave an agreement (4) and strongly agree (5) rating for all indicators of the need for a new Student Information System. Respondents assessed that the system needs to be able to provide real-time and detailed information on student activities, facilitate access to administrative services so that it is more efficient in terms of time and energy, and have a user-friendly display and can be accessed via mobile devices. Only a small number of respondents gave a neutral or disagree rating. These findings indicate that students have a high need for the development of a Student Information System that is more integrated, easy to use, and in accordance with user needs.

4.2 Design Phase

The design phase is conducted based on the results of the user needs analysis. At this stage, the system architecture, database structure, user interface, and system navigation flow are designed. The system design prioritizes user-centered design principles so that all features can be easily used by users with varying levels of technological proficiency.

The system design includes several main modules: the login module, user dashboard, student data, scholarship information, student activities, student achievements, administrative services, and reporting. The system interface is designed using responsive principles so that it can be accessed via computers and mobile devices.

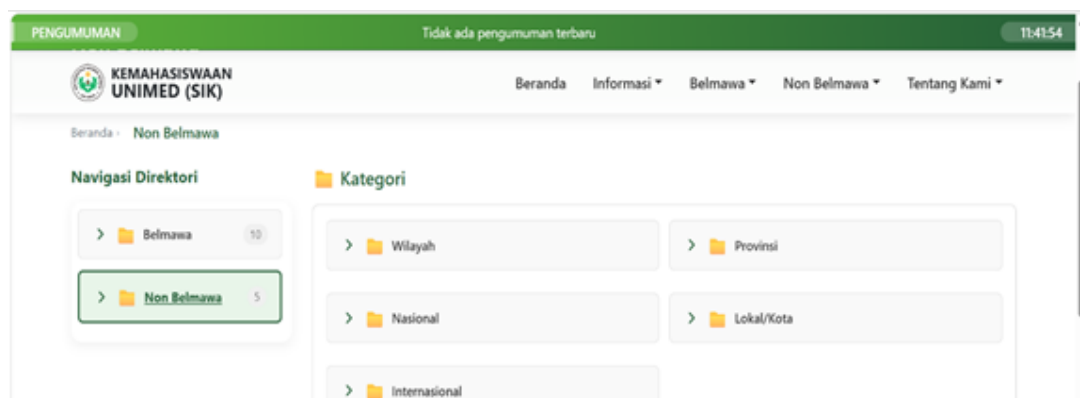
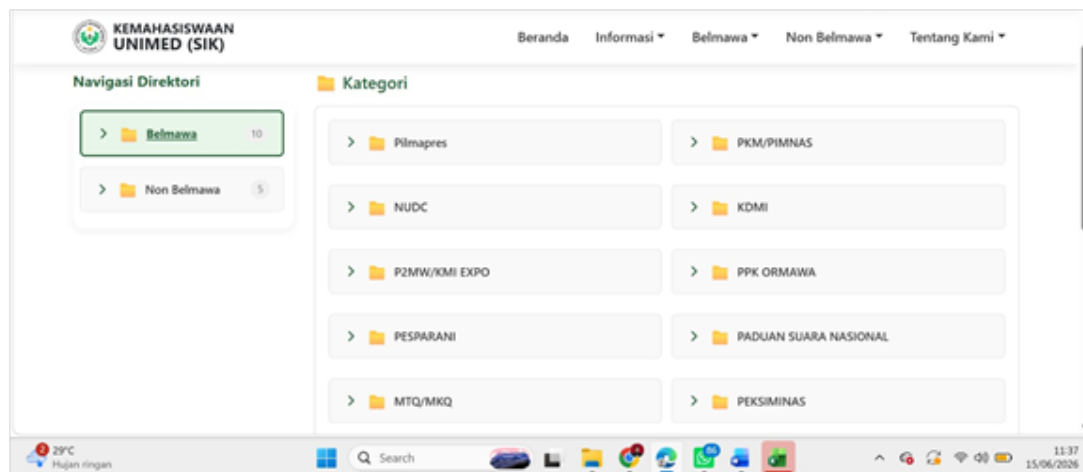


Figure 2. information menu



Figure 3. announcement menu

Furthermore, an integrated database is designed to store all student information in a single, centralized system. This database integration is the main foundation for improving the quality of information management and minimizing data redundancy.

4.3 Développement phase

The development process was carried out in stages, with separate modules such as the login module, student data module, KRS module, grades module, and report module, among others.

Each module was tested individually to ensure proper functionality. Furthermore, the system was equipped with basic security features such as authentication, role-based authorization, and input data validation. Development was conducted locally before being deployed to the campus server.

Expert validation was then conducted to assess the feasibility of the student information system before wider implementation. This validation involved two experts: a subject matter expert (an academic specializing in higher education management) and a media/information systems expert (an IT lecturer with experience in academic software development).

The validation process involved granting system access and using an assessment sheet based on indicators of educational information system feasibility. Aspects assessed included the suitability of features to user needs, system security and reliability, usability, and interface design.

1. Subject Matter Expert

The subject matter expert assessed the suitability of the system's content and functions to the needs of academic services at the university. Based on the evaluation results, the expert assessed that the system met basic student administration needs, such as managing student data, the Student Study Plan (KRS), and grade reporting. Suggestions for improvement from the subject matter expert included the addition of a notification feature for KRS filling reminders and manual validation by the academic advisor for academic control. The subject matter expert's average feasibility score was 88%, which falls into the "Very Feasible" category.

2. Media Expert

The media expert evaluated the system's technical aspects, such as navigation structure, application performance, data security, and user interface design. Based on the assessment results, the system was found to be stable, had an organized page structure, and was compatible with various devices (computers and smartphones). The expert also appreciated the use of the Laravel framework, which facilitates module management and authentication security. However, it was recommended that password recovery and user activity log features be added as part of the audit system. The media expert's average score was 86%, also falling into the "Very Feasible" category.

4.4 Implementation

After the system was developed and tested internally, the implementation phase involved uploading the system to the campus' internal server for limited use within the academic unit. The implementation process included system installation on the hosting server, database configuration, and user training for administrative staff and lecturers.

The trials were conducted using real-world scenarios such as student study plan (KRS) input for current semesters, lecturers entering grades, administrators printing grade summaries, and inputting information and events such as scholarships, student achievement competitions, student community service (PKM), etc. Initial implementation results demonstrated stable system performance, easy-to-use user interface, and fast and accurate data processing. This process also included user documentation and a technical manual for system administrators.

This implementation process was carried out in stages to ensure optimal system performance and user adaptation to the change from a manual to a digital system. Implementation consisted of five main steps: system installation, server configuration, data migration, user training, and live system testing.

The first step was installing the system into the institution's hosting environment. After the system was successfully installed, the hosting server was configured, including adjusting the campus domain/subdomain (e.g., sik.unimed.ac.id). Next, initial user accounts were created for the system, with roles assigned to them: admin (system manager), lecturers, and students. Each role was given access to features as needed. Admins could manage student and lecturer data, lecturers could input grades, and students could complete the KRS (Student Study Plan) and view grades, etc. The migration process was carried out in stages and carefully using the import tools built into the system. All data entered was checked to avoid duplication or input errors.



Figure 4 product implementation

To support system use, training was conducted for academic staff, lecturer representatives, and students. This activity aimed to provide a basic understanding of how the system works, the user flow, and how to handle any issues. The training materials covered login, navigating key features, inputting and editing data, and reporting.

Outreach was also provided to students through official announcements and short guides in PDF format or video tutorials accessible from the system's homepage. The goal was to ensure all users had a clear initial understanding of the system's operation.

Every error report or user complaint is recorded and analyzed for immediate remediation. System logs are also monitored to detect potential issues such as traffic overload or data inconsistencies. Periodic evaluations are conducted weekly during the trial period, until the system is deemed suitable for wider implementation.

4.5 Evaluation Phase

The evaluation phase was conducted to assess system quality and user acceptance. Quantitative evaluation was conducted through a usability questionnaire administered to users after using the system. The evaluation results showed that the system achieved a usability score of 81.5%, which is considered very good. This finding indicates that users found the system easy to use, useful, and capable of meeting their needs in accessing student services.

Qualitative data analysis was conducted on interview and observation results obtained during the implementation

phase. Thematic analysis yielded four main themes:

1. The first theme was increased information accessibility. Students stated that the system made it easier for them to obtain information about scholarships, student activities, and various personal development programs because all the information was available on a single digital platform.
2. The second theme was efficiency of administrative services. Education staff stated that the system reduced administrative work that was previously done manually. The processes of data retrieval, document verification, and report preparation could be performed more quickly and accurately.
3. The third theme was transparency in data management. Users stated that the system enabled more open and structured data access, minimizing the risk of data loss and recording errors.
4. The fourth theme is support for data-driven decision-making. Student unit leaders stated that the dashboards and reports available in the system facilitated the monitoring and evaluation of student programs. The real-time information provided helped decision-makers design more targeted policies.

Discussion

The research results show that the development of a Student Information System based on the ADDIE model is capable of addressing various issues facing previously fragmented student services. This finding aligns with Fernández et al. (2023), who stated that digital transformation in higher education requires the integration of services and information within a single, connected digital ecosystem.

The success of the developed system can also be explained by the expert validation and usability scores indicate that the system has good system and information quality. According to Umaroh et al. (2025), high system quality will increase user satisfaction and encourage continued system use.

Qualitative findings indicate that the integration of student services has a positive impact on the user experience. Students gain faster access to information, while educational staff experience increased work efficiency. These results are consistent with research by Damana et al. (2024), which found that an integrated information system can improve the effectiveness of organizational services.

Furthermore, the system's ability to provide accurate and real-time data supports the implementation of data-driven governance. Universities can leverage student data for more effective monitoring, evaluation, and decision-making. Thus, the developed system serves not only as an administrative tool but also as a strategic instrument in supporting the institution's digital transformation.

Conclusion

Based on the results of this research and development study, it can be concluded that:

1. This research successfully developed an integrated web-based Student Information System using the ADDIE model, which consists of Analysis, Design, Development, Implementation, and Evaluation. The developed system is able to integrate various student services into a single digital platform, thereby improving service efficiency, information quality, and user experience.
2. The validation results from subject matter experts (88%) and media experts (86%) indicate that the system is highly feasible. Furthermore, user evaluation results showed a usability rating of 81.5%, which is considered very good. Qualitative data analysis revealed that the system has a positive impact on information accessibility, administrative efficiency, data transparency, and data-driven decision-making.
3. Overall, this research demonstrates that the development of an integrated Student Information System can be an effective solution in supporting the digital transformation of higher education institutions. Further research is recommended to integrate artificial intelligence technology, data analytics, and predictive dashboards to improve service quality and support more strategic decision-making.

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