Journal of Artificial Intelligence and Engineering Applications

Website: https://ioinformatic.org/

15th June 2025. Vol. 4. No. 3; e-ISSN: 2808-4519

Development of a Web-Based Entrance Examination System to Increase the Efficiency and Accuracy of New Student Selection at the STMIK Kaputama Campus

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Abstract

This research aims to develop a web-based entrance examination system so that the new student selection process at STMIK Kaputama becomes more efficient and accurate. This system is designed to replace traditional methods that often require a lot of time, paper and are prone to human error. System development involves literature analysis, creating interface mockups, drawing business process userflow, and creating entity-relationship diagrams (ERD) for optimal database management. This system allows prospective students to take exams online with results that can be processed and displayed in real-time. The results of this research include design documents, user guides, comprehensive final research reports, as well as the publication of scientific articles in journals discussing the development of information systems and educational technology. With this system, it is hoped that the campus can manage the new student selection process more efficiently, accurately and transparently.

Keywords: *Information System, Website, Exam, New Student, Efficiency*

1. Introduction

To realize the vision of improving campus quality, all processes that can be optimized must be maximized, including the development of a more efficient information system for new student selection. This screening process has an important role in determining prospective students who meet academic standards and have the potential to succeed in college. The success of new student selection greatly influences the quality of education on campus. The image of a university also greatly influences the reasons why students choose to continue their higher education at that campus [1].

With rapid technological advances, many educational institutions are now switching from traditional paper-based examination methods (Paper Based Tests) to computer-based examination systems (Computer Based Tests). This switch was made to overcome various challenges in paper-based exams, such as the validity of assessments, delays in announcing results, and difficulties in managing exam data. Even paper-based exams are gradually being replaced as a matter of course in some higher education institutions that have adopted online exams [2].

According to Santi and Prajana (2018), the use of a computer-based examination system not only increases efficiency and accuracy, but also strengthens transparency in the selection process, which is very important for maintaining the credibility of educational institutions [3].

With the rapid progress of information technology, universities need to utilize this technology to increase efficiency and accuracy, including in the selection of new students. The development of a web-based entrance examination system is an effective solution to overcome the weaknesses of conventional methods. This system makes it easy for prospective students to take exams online, as well as speeding up the processing and presentation of exam results in real-time. Web-based testing and assessment systems offer greater flexibility than the traditional approach because test could be offered at different times by students and in different locations [4]. Thus, the development of this system not only supports the campus's vision to improve the quality of education, but also contributes significantly to optimizing the overall administrative process.

This research will focus on developing a web system for the new student selection process at STMIK Kaputama. This system is expected to increase the efficiency of the selection process, reduce dependence on physical resources such as paper, and minimize the potential for human error. In addition, this system allows exam results to be obtained more quickly and accurately, thereby improving the quality of campus administration services in the process of screening potential student candidates.

2. Research Methodology

This research employs the Research and Development (R&D) method with the Waterfall development model, which includes the stages of requirement analysis, system design, implementation, testing, deployment, and maintenance [5]. Data is collected through literature review to understand the standards of online examination systems, as well as observations and interviews with users to identify system requirements. The system design includes a web-based architecture using Laravel and database design to manage user data, exam questions, and exam results. Implementation is carried out by developing key features such as question management, exam execution, and automatic grading.

a. The Requirement Analysis phase

Involves identifying the needs of the web-based entrance exam system at STMIK Kaputama. During this stage, information is gathered from relevant stakeholders, covering functional requirements such as registration features, question management, exam execution, and automated grading, as well as non-functional requirements like system security and performance. All requirements are documented in detail to serve as a reference for subsequent stages.

b. In the System Design phase

The system architecture is structured based on the requirement analysis results. The design includes database structures for storing participant data, questions, exam results, and reports, as well as user interface design to ensure ease of use. Additionally, process flow diagrams, an Entity-Relationship Diagram (ERD), and UI/UX mockups are created to facilitate user-friendly navigation.

c. The Implementation phase

Involves developing the system according to the established design. At this stage, the source code is written using appropriate programming languages, and integration with the database and server configurations is performed. Each module is developed sequentially, including registration, question management, exam execution, and grading.

d. The Testing phase

Ensures that the system functions according to specifications. This includes functional testing for each feature, integration testing to verify seamless collaboration between modules, and performance testing to assess system speed and stability under high user loads. Any errors or bugs identified during testing are fixed before deployment.

e. The Deployment phase

Occurs once the system is deemed ready for use. The system is installed and configured on the designated server at STMIK Kaputama. Additionally, training and socialization sessions are conducted for exam administrators and participants to ensure effective usage.

f. The Maintenance phase

Follows system deployment to ensure its performance and reliability remain optimal. Maintenance activities include fixing any bugs that arise during usage, optimizing the system based on user feedback, and updating features to accommodate future requirements. Regular evaluations are conducted annually to align the system with institutional developments.

By utilizing the Waterfall methodology, the development of this web-based entrance exam system is carried out in a structured and organized manner, ensuring that each phase is completed thoroughly before progressing to the next. This approach guarantees that the system meets the required specifications and is ready for optimal use at STMIK Kaputama.

3. Result and Discussion

3.1. System Design

In this study, I will design a user flow for an online exam system that illustrates the key stages from registration to exporting exam results. This user flow aims to visualize the interaction process within the system, starting from retrieving participant data, re-registration payment, generating exam numbers, and scheduling exam sessions. Following these steps, participants will take the exam, and the system will export the exam results based on the scheduled sessions. By developing this user flow, the system design can be more structured, ensuring that each stage is efficiently implemented in the development of the online exam system.

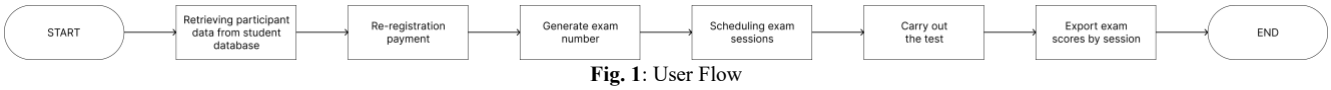

Fig. 1: User Flow

Then, the database structure of the web-based entrance examination system was carefully designed using an Entity-Relationship Diagram (ERD) to ensure efficient data management and seamless system functionality. This diagram establishes relationships between several key entities that play a crucial role in the examination process. These entities include exam questions, which store the question bank used in different test sessions, student biodata, which contains essential participant information such as name, registration number, and student details, exam sessions which categorize different exam schedules or batches, question packages which group related sets of questions to

be assigned to specific exams and grades record the performance and results of students after completing the exam. By structuring the database using ERD, the system ensures data integrity, minimizes redundancy, and optimizes query performance, ultimately improving the overall functionality and reliability of the online examination system.

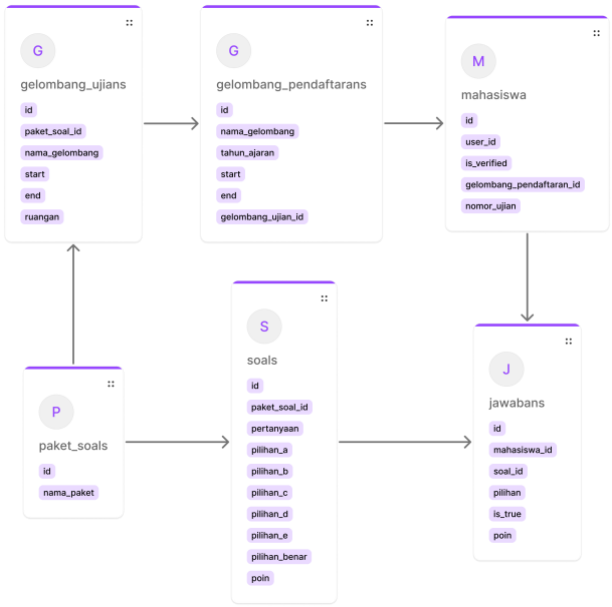

Fig. 2: Entity-Relationship Diagram

After designing, the researcher created a web-based system with a display tailored to system needs and an effective flow for use by users such as login pages, exam scheduling management, exam participant logins, exam question pages, and exam result score reports.

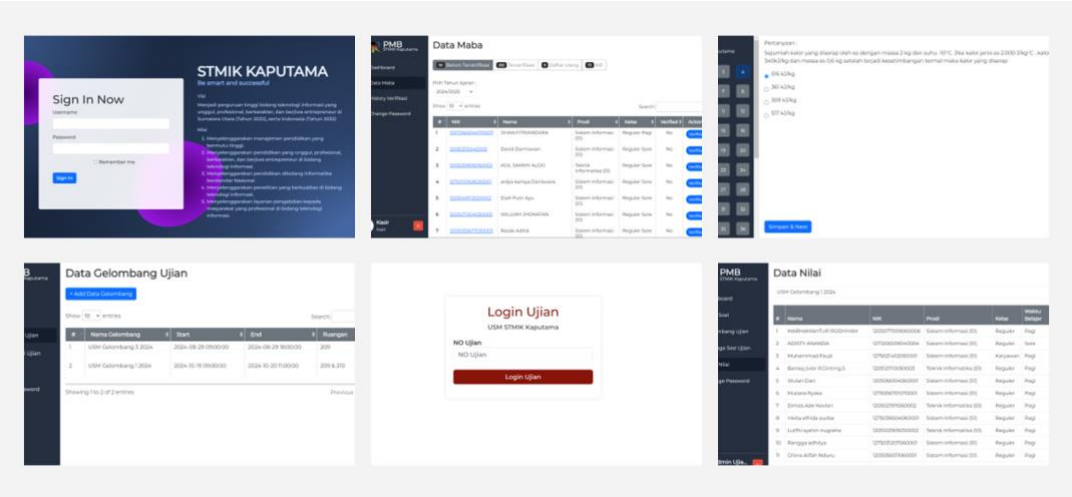

Fig. 3: Entrance Examination System

With this system, the selection process becomes significantly more efficient compared to conventional methods, which often involve a lengthy and error-prone manual process. One of the key improvements is the automation of critical steps, such as the assignment of exam numbers and the reporting of exam results, which were previously handled manually. In the past, administrators had to manually distribute exam numbers to each participant, a process that was not only time-consuming but also prone to mistakes. Now, with the automated system, exam numbers are generated instantly, ensuring accuracy and efficiency.

Additionally, the reporting of exam results has been streamlined, allowing administrators to export and process data within minutes instead of spending hours or even days compiling and verifying results manually. This automation not only reduces the administrative burden but also minimizes human errors, ensuring that the selection process runs smoothly and fairly. As a result, institutions can handle a larger number of applicants more effectively, allocate resources more efficiently, and provide students with faster access to their exam results, ultimately improving the overall experience for both administrators and participants.

3.2. Efficiency Testing

One of the significant changes offered by this web-based exam system is the efficiency in the use of resources and exam time. Conventionally, each exam participant needs at least one printed question sheet and one printed answer sheet, plus an attendance sheet and other supporting documents. With an average of 80 exam participants per wave, paper usage can reach hundreds of sheets. With a web-based system, all of these needs can be replaced by a digital display on a computer device, so there is no longer a need to print questions or answer sheets.

In addition to saving paper, the system has also proven to be able to streamline implementation time. If previously the implementation of the exam took 2-3 days for preparation, implementation, and correction of scores, this system allows the selection process to be completed in just 1 day, even if the implementation is close to the start of the new school year.

The following is a comparison table of efficiency between conventional methods and web-based systems:

Table 1: Comparison of manual and web-based process efficiency

Component	Manual System	Web-Based System
Number of papers per participant	±3 sheets	0 (replaced digital display)
Total paper for 80 participants	±300 sheets	0
Question preparation time	1 day (typing + printing)	<1 day (input to system)
Implementation of exams	1 day	1 day
Correction & recapitulation of points	1–2 days	Instant (automatic)
Total selection time	±3 days	±1 day
Risk of data loss/error	High (manual, error prone)	Low (auto saved)

From the table, it is clear that the developed system not only reduces the use of physical resources such as paper, but also increases the speed and efficiency of the new student selection process, which is very crucial especially in the period leading up to the start of lectures.

3.3. Effectiveness Testing

To measure the effectiveness of the developed system, an analysis was conducted on the time required from the beginning of the exam until the final results in the form of participant rankings were obtained. This process consists of several important stages, both in manual methods and web-based systems.

Manual selection process stages:
1. Implementation of written exam: ±1 day
2. Collection and sorting of answer sheets: ±½ day
3. Manual correction by the committee: ±1 day (depending on the number of participants)
4. Recap of scores to spreadsheet: ±½ day
5. Ranking: ±½ day
6. Total manual time: ±3 working days

Selection process stages with web system:
1. Implementation of the exam via computer/web: ±2 hours
2. Answers are automatically saved in the database
3. Corrections are made automatically by the system
4. Automatic score recap is available in the dashboard
5. Participant ranking is immediately displayed based on scores
6. Total web system time: ±2–3 hours

Table 2: Comparison of the effectiveness of manual and web-based processes

Selection Stage	Manual Method (Day)	Web System (Hour)
Implementation of exams	±1 day	±2 hours
Correction and verification of values	±1 day	Automatic (real-time)
Recap and ranking	±1 day	Automatic (real-time)
Total time	±3 days	±2–3 hours

The effectiveness of the system is demonstrated by a very significant time difference. In the manual method, the minimum total time required to complete the selection process is around 3 working days, while the developed system can complete the entire process in less than a day, even in just a few hours. In addition to time efficiency, this system also reduces the potential for human error and speeds up decision-making, especially when the exam is close to the start of the lecture schedule.

4. Conclusion

This research successfully developed a web-based entrance examination system that demonstrably improves both the efficiency and accuracy of the new student selection process at STMIK Kaputama. The implementation of this system replaces the conventional paper-based method, which was time-consuming, resource-intensive, and vulnerable to human error especially in scoring, data recording, and result dissemination. The transition to a digital system enabled faster exam scheduling, real-time result processing, and reduced reliance on physical documents.

The system's structured database, designed using an Entity-Relationship Diagram (ERD), ensures data integrity and supports efficient data retrieval. This, combined with a well-planned user flow, allows for seamless coordination across various processes such as student registration, question distribution, and automatic grading. These enhancements significantly reduce the administrative burden on staff and shorten the overall duration of the selection process from days to just hours in some cases.

Moreover, by enabling immediate result generation and ranking, the system ensures more accurate assessments with minimal intervention. This accuracy contributes to a fairer selection process and helps the institution make better-informed decisions. Overall, the developed system not only aligns with the institution's goal to modernize academic services but also delivers measurable improvements in performance, transparency, and reliability in student admissions.

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