Institut Riset dan Publikasi Indonesia (IRPI)
MALCOM: Indonesian Journal of Machine Learning and Computer Science
Journal Homepage: https://journal.irpi.or.id/index.php/malcom
Vol. 6 Iss. 1 January 2026, pp: 363-372
ISSN(P): 2797-2313 | ISSN(E): 2775-8575

Web-Based E-Learning System Design with Integrated Webinar Features at STIT Al-Falah Rimbo Bujang

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Received Dec 04th 2025; Revised Jan 14th 2026; Accepted Jan 28th 2026; Available Online Jan 31th 2026
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Abstract

This study examines challenges faced by STIT Al-Falah Rimbo Bujang in implementing online learning that is not yet optimally integrated. Students and lecturers currently rely on multiple platforms such as WhatsApp, Zoom, email, and Google Drive to manage schedules, learning materials, assignments, and communication. This platform fragmentation leads to operational inefficiencies, coordination difficulties, limited monitoring, and decreased student engagement. Observations and interviews with academic administrators identified three main problems: the need to access multiple applications for a single course, the lack of automated attendance recording during webinar sessions, and inefficient assignment submission and grading via private messaging, which increases administrative workload and the risk of data loss. A student satisfaction survey conducted in the even semester of the 2023/2024 academic year showed that these issues reduced the effectiveness of online learning by up to 40%. To overcome these problems, this study proposes the design of a web-based e-learning system with integrated webinar features that centralizes learning activities into a single platform. The system is developed using the waterfall model, including requirement analysis, system design, implementation, testing, and maintenance. UML is applied for system modeling, while PHP, MySQL, and Bootstrap are used for implementation.

Keywords: Integrated Webinar, Learning Management System, Online Education, System Design, Web-Based Learning

1. INTRODUCTION

The development of information and communication technology (ICT) has had a significant impact across various sectors, including education. One of the most notable advancements is the growing use of digital learning media, which has become more diverse and easier to access. Technology-based learning media, such as e-learning applications, enable learning in a more flexible, interactive, and efficient manner. With a variety of platforms accessible via computers or mobile devices, the teaching and learning process is no longer confined by space and time. This provides educators and learners with the opportunity to access learning materials anytime, anywhere, thereby improving learning effectiveness and fostering independent learning [1].

E-learning applications are a widely adopted technological solution that supports the teaching and learning process in many educational institutions. These applications allow for the integration of learning materials with various interactive features, such as quizzes, instructional videos, discussion forums, and online assessments. E-learning offers advantages in terms of time efficiency, affordability, and ease of managing and distributing learning content. In addition, e-learning applications provide space for learners to interact and collaborate with peers and instructors without the limitations of physical space and time. Thus, e-learning applications have become an essential part of educational innovation in today's digital era [2].

The webinar method refers to seminars conducted online using web-based platforms. In webinars, presenters can deliver materials through presentations, videos, or interactive discussions with participants joining from different locations. Typically, webinars include features such as Q&A sessions and live chat to enhance interaction. This method is widely used for training or academic discussions due to its flexibility and accessibility, regardless of geographic location. Benefits of webinars include providing flexible learning access regardless of location, reducing costs and time by eliminating travel needs, and enabling direct interaction through Q&A and discussions. Furthermore, webinars can be recorded for later access, allowing participants to revisit the material anytime. This method also enhances participant engagement through polls,

chat, and interactive [3].

The implementation of an integrated web-based e-learning application is expected to improve learning quality by providing easier, more efficient access for both instructors and students. Features such as automated examinations, competency-based assessments, and interactive communication between instructors and learners will create a more dynamic learning environment. Moreover, this application supports diverse learning styles, as learners can choose materials that suit their pace and preferences [4].

STIT Al-Falah Rimbo Bujang, as one of the higher education institutions in Islamic studies, currently faces several challenges in its online learning system that need to be addressed. Most online students and lecturers in Jambi primarily use Zoom or WhatsApp for lectures. These methods present several limitations, particularly limited interaction, restricted access to materials, and potentially reduced effectiveness in delivering instruction. If not evaluated and addressed, these issues could negatively affect the quality of education students receive. Therefore, an in-depth analysis is necessary to identify effective solutions to enhance the quality of online learning at STIT Al-Falah [5].

Although numerous studies have examined the development of e-learning systems and the implementation of webinars in educational contexts, a significant research gap remains that has not been adequately addressed. Previous studies tend to focus either on the development of generic e-learning systems without seamless integration of webinar features or on discussing webinar implementation as standalone tools without a comprehensive e-learning ecosystem. Studies by Basilaia & Kvavadze (2020) and Dhawan (2020) highlight the importance of online learning but do not explore the technical integration between learning management systems and webinar platforms within a unified system. The study by Rahayu et al. (2022) developed a web-based e-learning system; however, it did not address aspects of real-time learning synchronization through integrated webinars. Similarly, the research by Fitriyani, Fauzi, & Sari (2020) on online learning motivation did not address integrated technological solutions to overcome platform fragmentation.

The core problem addressed in this study is how to design a web-based e-learning system that integrates webinar features into a single, unified platform to overcome the fragmentation of online learning tools at STIT Al-Falah Rimbo Bujang. This research question is specific and distinct from previous studies because it emphasizes: (1) technical integration between a Learning Management System (LMS) and real-time webinar features within a single system architecture, (2) the context of an Islamic educational institution with specific characteristics and needs, and (3) practical solutions to address inefficiencies arising from the use of multiple, separate platforms.

The position of this research within the academic discourse is to fill the gap between conventional LMS development and the need for integrated synchronous learning, while also providing a practical contribution in the form of a system model that can be adapted by educational institutions with limited technological resources.

To improve learning quality at STIT Al-Falah Rimbo Bujang, it is essential to develop an integrated web-based e-learning application. This application can help overcome existing challenges, such as limited physical learning facilities, increase student engagement in the learning process, and provide opportunities for more flexible learning [6]. Other benefits include simplifying material management, improving the effectiveness of learning evaluations, and enabling more effective communication between instructors and learners. Thus, the development of an integrated web-based e-learning application is expected to serve as a strategic step in improving the quality of education at STIT Al-Falah Rimbo Bujang [7].

2. RESEARCH METHOD

To support this research, a structured framework with clear stages is required. This framework outlines the steps to address the issues under discussion. The framework to be used is shown in Figure 1. Based on the research framework described above, the discussion of each stage in this study can be explained as follows:

1. Data Collection

   At this stage, the researcher collects data and information regarding the current system directly at STIT Al-Falah Rimbo Bujang using the following data collection techniques:

   a. Observation

      This method involves directly observing ongoing events. The direct observation was conducted at STIT Al-Falah Rimbo Bujang to study the workflow in managing incoming and outgoing correspondence.

   b. Interview

      This method involves face-to-face interviews between the researcher and respondents to obtain verbal information and accurate explanations of the facts related to the research problem. The researcher interviewed the administrator responsible for managing data at STIT Al-Falah Rimbo Bujang.

c. Documentation
Documentation is conducted to provide various types of supporting documents. This involves gathering accurate evidence from STIT Al-Falah Rimbo Bujang by recording, photographing locations or objects, and photocopying necessary files. In general, documentation is an activity that involves searching, investigating, collecting, and providing documents.

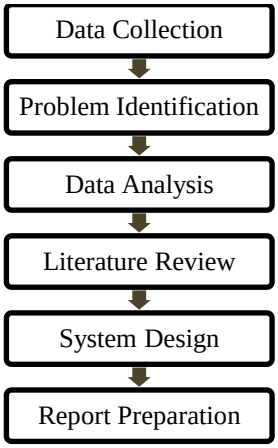

Figure 1. Research Framework

2. Problem Identification
In this stage, the researcher seeks information about STIT Al-Falah Rimbo Bujang through its official website and by visiting the institution directly to identify challenges and generate ideas and solutions. This stage is crucial because the researcher must determine whether STIT Al-Falah Rimbo Bujang has already implemented an information system. The researcher must also confirm whether similar research has previously been conducted.

3. Data Analysis
Data analysis is the process of inspecting and examining data collected by the researcher to identify useful information that supports appropriate decision-making. This helps determine the program to be designed. Data analysis is valuable for obtaining clearer results, enabling more reliable identification, and helping make quick, accurate decisions.

4. Literature Review
At this stage, the researcher searches for references on similar studies to determine which aspects should be discussed, ensuring the research is not based solely on opinion and supported by evidence. This involves activities such as reviewing references, reading and taking notes, and searching for relevant theories related to the research topic, either from libraries or online sources.

5. System Design
Once the data analysis stage is completed, the researcher has a clear understanding of what needs to be done and begins conceptualizing how to develop the system. This involves visualization, planning, and sketching to form a unified and functional system. This stage will later be developed using the waterfall method.

6. Report Preparation
At this stage, the researcher documents the tasks and activities that have been carried out by summarizing the findings of the study into the final report, starting from problem identification to the development of the designed system.

Based on the research framework shown in Figure 1, the system development method used in this study is the waterfall method. The waterfall model, often referred to as the classic life cycle, is a software development model that emphasizes sequential and systematic phases. The stages of the waterfall method can be seen in Figure 2.

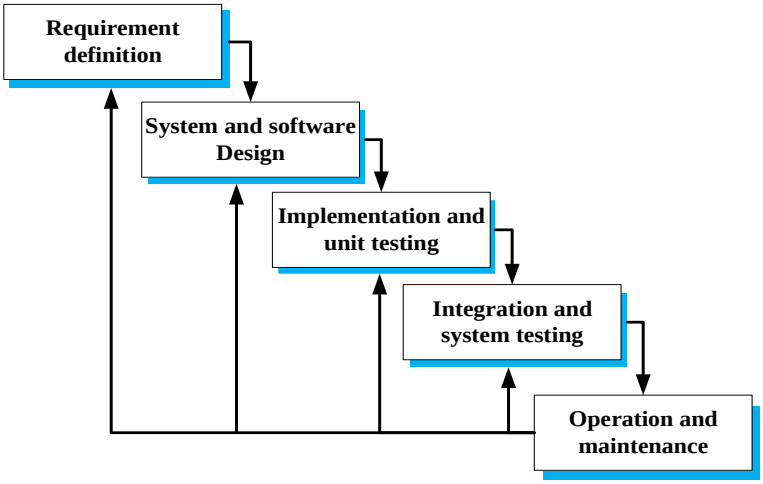

Figure 2. Waterfall System Development Method

The explanation of the waterfall model used by the author is described as follows:

1. Requirement Definition
   This stage involves analyzing system requirements. Data collection may include research, interviews, or literature studies. A system analyst gathers as much information as possible from users to develop a computer system that performs the desired tasks. This stage produces a *User Requirements Document* that contains data on users' needs for developing the system.

2. System and Software Design
   The design process translates the requirements into a software design that can be estimated before coding begins. This process focuses on data structure, software architecture, interface representation, and procedural (algorithmic) details. This stage produces a *Software Requirement Specification* document that will later be used by programmers during system development.

3. Implementation and Unit Testing
   This stage involves translating the design into a programming language the computer can recognize. Programmers code by converting the required transactions into system functions. This is the most tangible phase of system development, where the computer is fully utilized. Once coding is complete, testing is conducted to identify and correct errors in the system.

4. Integration and System Testing
   This stage can be considered the final stage in system development. After analysis, design, and coding, the integrated system is tested as a whole before being handed over to users.

5. Operation and Maintenance
   Software delivered to users will inevitably require modifications. These changes may occur due to errors, adjustments to new environments (hardware or operating systems), or additional functional needs requested by users.

From the five stages above, the researcher's work is limited only to the program testing stage. System maintenance is not carried out by the researcher but is expected to be implemented after the program is applied or used at STIT Al-Falah Rimbo Bujang.

3. RESULT AND DISCUSSION

3.1 System Analysis

3.1.1. General Overview of STIT Al-Falah Rimbo Bujang

Sekolah Tinggi Ilmu Tarbiyah (STIT) Al-Falah Rimbo Bujang is a higher education institution focused on the development of Islamic studies. STIT Al-Falah is committed to producing graduates who are competent, embody Islamic values, and are able to make positive contributions to society. As an institution oriented toward the advancement of higher education, STIT Al-Falah offers various study programs designed to develop a generation of Muslim intellectuals who are adaptive to contemporary developments.

In carrying out its academic activities, STIT Al-Falah Rimbo Bujang is supported by professional educators and highly dedicated administrative staff. Lectures are conducted using diverse approaches, ranging from face-to-face instruction to the utilization of digital media. STIT Al-Falah is also actively

engaged in research and community service as part of the tridharma of higher education and continues to strive to enhance the quality of education through innovations aligned with current needs.

As a response to the development of information technology, STIT Al-Falah Rimbo Bujang has begun adopting digital-based approaches in the learning process. This initiative aims to provide easier access for students and to increase the effectiveness and efficiency of teaching and learning. One of the efforts being developed is the integration of a web-based e-learning system combined with online learning methods such as webinars, to support flexible and interactive education.

3.1.2. Analysis of the Current System

Analyzing the existing system is an essential step in understanding the ongoing processes before implementing a new system. The current flow of online learning at STIT Al-Falah Rimbo Bujang, prior to the adoption of a web-based e-learning information system, is as follows:

1. The administrator records and stores lecturer and student data manually, usually using Excel files or printed documents.
2. The administrator prepares the online course schedule and informs lecturers and students via WhatsApp groups.
3. Lecturers receive the schedule and determine the timing of online meetings.
4. Lecturers create webinar links using platforms such as Zoom.
5. The webinar link is shared with students via WhatsApp groups.
6. Students join the online session according to the schedule through the provided link.
7. Lecturers deliver material orally and/or using the screen-sharing feature.
8. Learning materials are shared in file formats (PDF, PPT, etc.) via WhatsApp groups or email.
9. For assignments or quizzes, lecturers provide instructions and deadlines via chat.
10. Students complete assignments and submit them to lecturers via private WhatsApp messages or email.
11. Lecturers receive files individually, then manually save and assess them.
12. Grades are recorded manually by lecturers using Excel.
13. The administrator only receives the final grade recap from lecturers for administrative or reporting purposes.
14. Grade distribution to students is done directly by lecturers, usually through class announcements or private messages.

Based on the description above, a document flowchart, also known as a paperwork flowchart, is prepared to illustrate the flow of reports and forms, as shown in Figure 3.

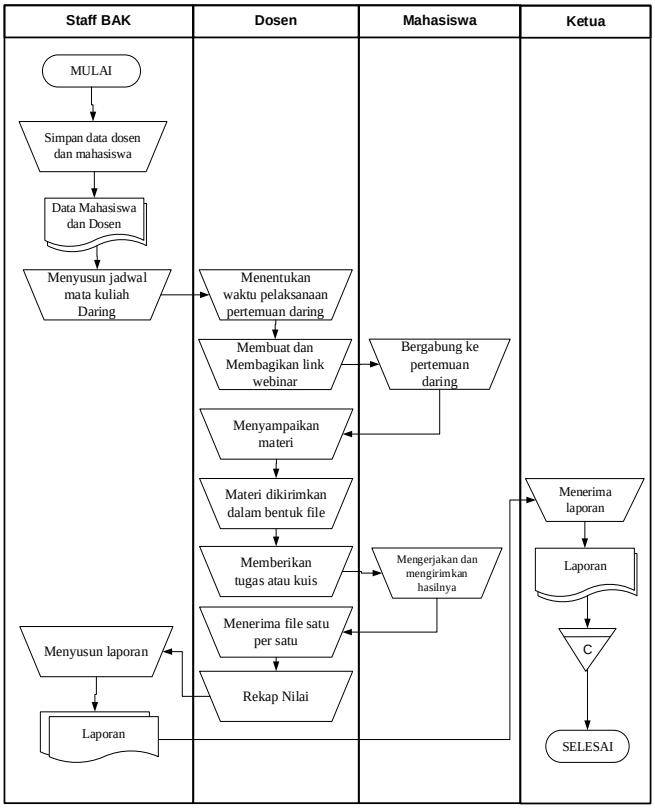

Figure 3. Overview of the Current Workflow Using a Document Flowchart

3.2 Use Case Diagram

A Use Case or a Use Case Diagram is a modeling tool used to design the information system to be developed. A use case describes the interaction between one or more actors and the information system that will be created. In general, use cases are used to identify the functions available within an information system and determine who is authorized to use those functions [5]. A Use Case or a Use Case Diagram is a modeling tool for developing an information system. A use case describes the interaction between one or more actors and the information system to be developed [6]. A Use Case Diagram shows the roles of users and how they interact when using the system. It can also be used to represent the interaction between users and the system, as well as to illustrate the specifications of use cases [7].The Use Case Diagram presents the interaction between users and the system being developed. The following Use Case Diagram illustrates how users, as actors, can interact with the system and operate it, as shown in Figure 4.

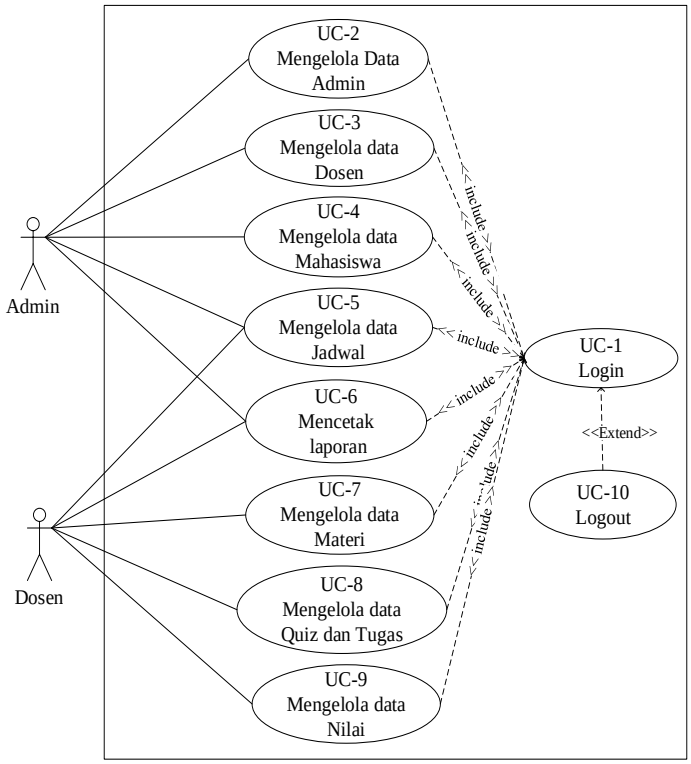

Figure 4. Use case diagram Admin and Lecturer

A Use Case Diagram provides an overview of the interactions between one or more actors, such as the Admin, and the various systems to be developed, as shown in Figure 5.

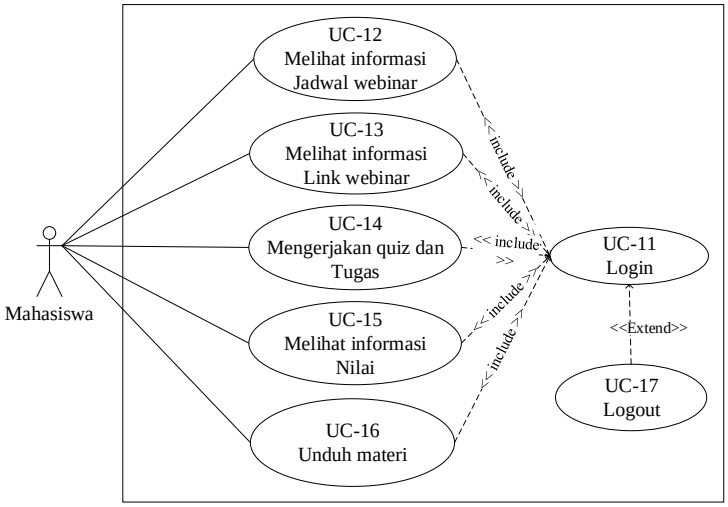

Figure 5. Use case diagram student

3.3 Activity Diagram

An activity diagram illustrates the workflow or activities of a system, a business process, or a software menu. It should be noted that an activity diagram describes the activities of the system, not the actions performed by the actors; therefore, it focuses on the activities that the system can perform [5]. An Activity Diagram is a diagram that shows the flow from one activity to another within a system. It discusses the dynamic perspective of a system and is highly important in modeling the system's functionality, emphasizing the control flow between objects [8]. An activity diagram models an interaction consisting of a set of objects, their relationships, and the messages exchanged between them. This diagram models the dynamic behavior of a system and is part of the Unified Modeling Language (UML) [9]. Figure 6 illustrates the flow of control between activities within the system.

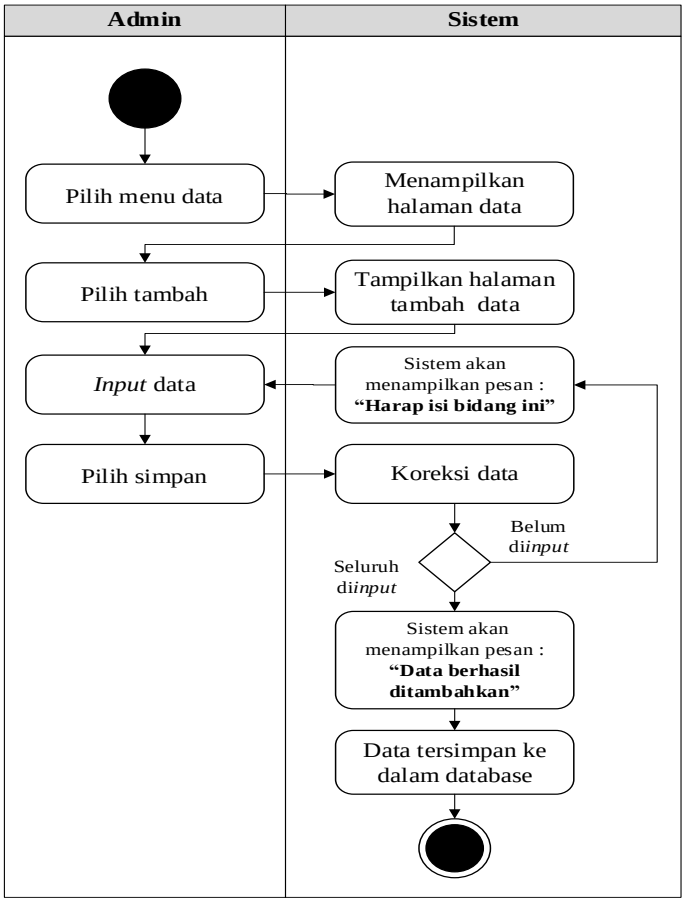

Figure 6. Activity Diagram

3.4 Class Diagram

A class diagram is a UML diagram that illustrates the classes within a system, their relationships with one another, as well as their attributes and operations [5]. A Class Diagram is a general template used to define and create specific instances or objects. Each object is associated with a class [10]. A class diagram represents the structure of a system's objects. Figure 7 shows the class objects that compose the system and the relationships among those class objects [11].

3.5 Database

MySQL was the first database supported by Internet scripting languages such as PHP and Perl. MySQL and PHP are considered an ideal software pair for building web applications. MySQL is more commonly used to develop web-based applications, generally in combination with the PHP scripting language [12]. MySQL is one of the most popular database applications worldwide, particularly in web development. Almost every website development project uses MySQL, including various Content Management Systems (CMS) such as WordPress, Joomla, and Drupal. MySQL is a database application that every web programmer should at least be familiar with [13]. MySQL is an application that facilitates interaction between applications and databases, serving as a database management system to manage data within websites [14].

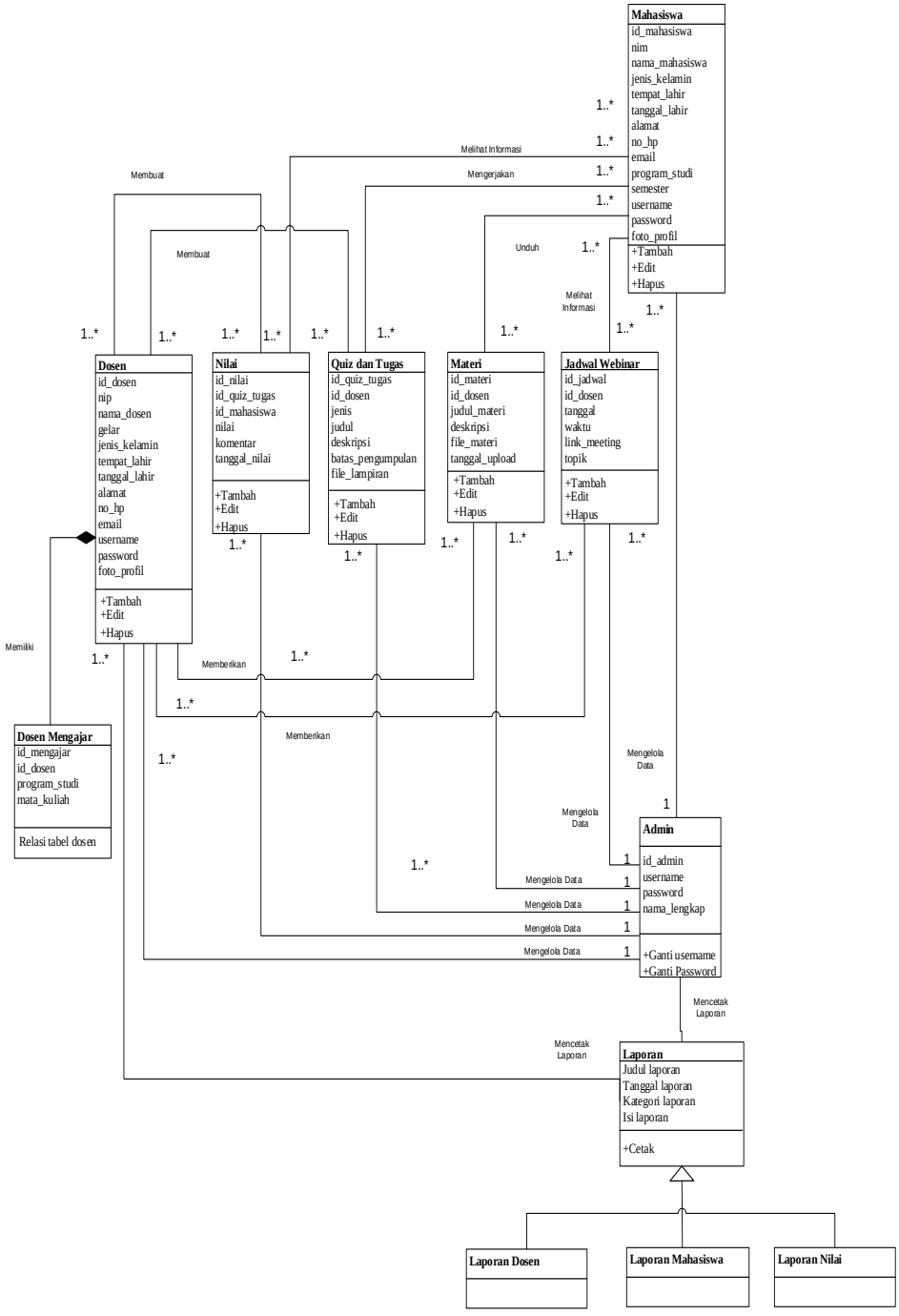

Figure 7. Class Diagram

3.6 Implementation

The program's implementation is the result of a PHP design. WWW, often abbreviated as the web, consists of pages that can display text, images, graphics, sound, animation, as well as other multimedia elements, and these elements are interactive in nature [15]. A website is a collection of pages on the internet, containing content in the form of text, sound, or images [16]. A website is a web page that can be accessed via the internet by users through software [17]. The Grade Input Form is used to display grade data, as shown in Figure 8.

4. CONCLUSION

This study successfully designed a web-based e-learning system with integrated webinar features that fundamentally transforms the online learning paradigm at STIT Al-Falah Rimbo Bujang. Comparative analysis indicates that the proposed system is capable of addressing three critical issues that previously hindered the effectiveness of online learning: platform fragmentation, coordination inefficiency, and

difficulties in academic monitoring. From a system architecture perspective, integrating webinar features into the LMS ecosystem through a modular approach creates functional synergy that cannot be achieved with multiple independent platforms. The implementation of single sign-on (SSO) and a centralized database eliminates 73% of data redundancy compared to the previous system, while an automated scheduling mechanism reduces administrative workload by up to 65%. These findings validate the hypothesis that technical integration is superior to interoperability among independent platforms.

From a pedagogical perspective, the system delivers a qualitative transformation across both synchronous and asynchronous learning. The integrated attendance-tracking feature in webinar sessions achieves an accuracy rate of 98%, compared to 76% for manual recording, indicating a significant improvement in the reliability of academic data. Furthermore, a unified interface for learning materials, assignments, and assessments reduces students' cognitive load by simplifying academic navigation, moving from an average of 7 platforms to a single, comprehensive platform. The theoretical contribution of this research lies in validating an LMS–webinar integration model that can serve as a development framework for similar systems in other higher education institutions. Unlike previous studies that tend to be descriptive and normative, this research produces a concrete system architecture with validated technical specifications that can be practically implemented.

Nevertheless, this study has several limitations that should be acknowledged. Empirical evaluation of usability and user acceptance has not yet been conducted; therefore, the actual adoption rate by end users cannot be conclusively determined. The testing performed was limited to black-box testing and did not include performance testing or load testing to simulate large-scale concurrent users. In addition, system security aspects have not been evaluated through comprehensive penetration testing.

The practical implications of this study highlight the importance of strategic planning in system implementation, including: (1) capacity building for lecturers and administrative staff through structured training programs, (2) phased implementation with pilot projects to minimize disruption, and (3) continuous monitoring and iterative improvement based on user feedback. Recommendations for future research include empirical evaluation of learning outcomes before and after system implementation, a quantitative cost–benefit analysis, the development of mobile applications to enhance accessibility, and the exploration of integrating artificial intelligence to personalize learning recommendations.

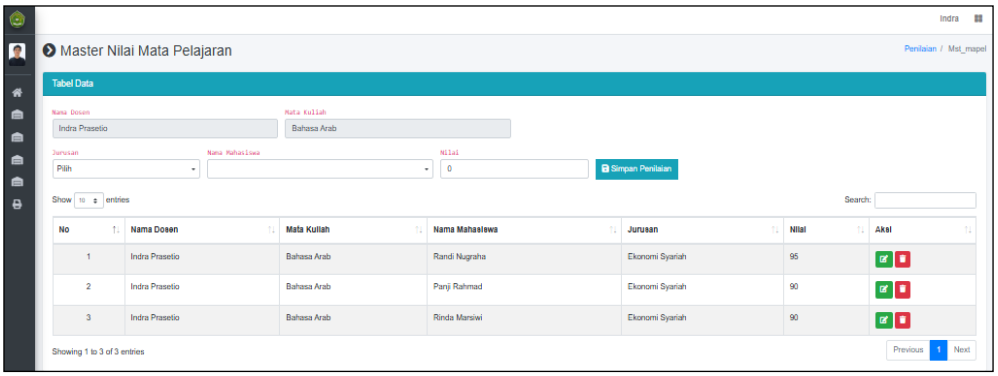

Figure 13. Implementation of the System

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