

Web-Based System for Statistical Analysis and Thesis Progress Monitoring



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ABSTRACT: Web-based monitoring systems serve as valuable tools in enhancing learning activities, particularly in the context of thesis supervision. Program heads and academic supervisors require timely, accurate information regarding students' progress to guide academic outcomes effectively. This paper presents the development and implementation of an integrated web-based statistical and monitoring application tailored for thesis progress reporting. Built using the Laravel framework, the system incorporates statistical data visualization to enable students, supervisors, and administrators to interpret progress and communicate insights effectively. The system was developed using the prototype method, allowing iterative improvements based on user feedback. To ensure quality and functionality, the system was evaluated using the ISO/IEC 25010 quality model. A case study conducted in an electrical engineering department at a public university in Indonesia, involving students, academic supervisors, and administrative staff. The results demonstrate that the system not only improves oversight and coordination but also supports data-driven decision-making. By offering a clear, accessible overview of thesis progress, the application empowers all parties to take timely corrective actions, ultimately enhancing the overall educational experience.

Key words: Thesis progress report, web-based system, prototype, monitoring, ISO/IEC 25010

1. INTRODUCTION

The monitoring system plays a crucial role as an educational tool in higher education, particularly in supporting a wide range of student learning activities [1], [2]. In the context of thesis supervision, managing and monitoring student progress presents significant challenges [3], [4], [5]. For example, students are often required to meet structured deadlines and submit comprehensive progress reports to their academic supervisors [6]. Without a systematic approach to track and evaluate this progress, administrators and supervisors may struggle to maintain oversight and provide timely and effective guidance [7].

Web-based reporting systems offer a promising solution to these challenges due to their accessibility [1], [2]. Such systems allow users to access to data anytime and from anywhere through standard web browsers, enabling real-time updates and efficient communication between student and supervisors [8], [9], [10]. Furthermore, they facilitate the storage and retrieval of historical data which can be useful for academic planning, performance analysis, and decision-making [5], [11].

Current studies in the context of academic thesis supervision have largely focused on developing systems that support monitoring and tracking of student activities [12], [13]. While these systems contribute to administrative efficiency, they often lack the capability to present data in a visual and analytical form that aids deeper understanding and decision-making [13], [14], [15]. In practice, supervisors and administrators require not only status updates but also meaningful insights into progress trends,

delays, and performance over time [5], [16]. To address this gap, this paper presents a web-based application that not only monitors thesis progress but also provides statistical and detailed data visualizations. These visualizations aim to enhance transparency, support informed academic decision-making, and improve communication among students, supervisors, and administrators [1], [14], [15].

Therefore, this study aims to develop a web-based thesis progress reporting application that can be used effectively by students, supervisors, and academic staff to support and enhance the thesis supervision process. Through this application, students can submit progress reports, upload thesis documents, and download logbooks efficiently. Supervisors can provide feedback and validate submitted reports, ensuring the accuracy of the data entered by students. Academic staff or program administrators can monitor each student's progress through clear status updates and statistical bar graphs, allowing for transparent and organized supervision management. By integrating real-time data tracking with comprehensive visualization features, the system not only records progress but also transforms it into actionable insights for supervisors and administrators. By providing structured monitoring and visualized data, this application is expected to facilitate a more efficient and effective academic process for all stakeholders involved in thesis supervision.

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2. PROPOSED MODEL

The main steps of the proposed model begin with the development of a student proposal progress report, as illustrated in Figure 1. This initial step is designed to establish a clear understanding of each student's thesis topic, objectives, and timeline. In this phase, the system collects detailed information regarding the student's thesis, including the research title, background, methodology, discussion, and supervision status. This stage of data entry can only be accessed and filled in by students to ensure the accuracy and accountability of the submitted information. Once gathered, this data is systematically injected into the centralized database. The stored information serves as a foundational reference for tracking future progress and enables the generation of structured and standardized progress reports. This process ensures consistency and accuracy in data collection, laying the groundwork for efficient monitoring and analysis throughout the duration of the thesis project. The integrity of this information is particularly important, as it becomes the basis for the subsequent step involving supervisor verification and approval.

The next step is crucial, as it incorporates the academic supervisor's role in validating the student's submitted thesis information. At this stage, supervisors are prompted to review the previously recorded data and determine its accuracy and academic validity. The system provides

supervisors with a clear and accessible interface to assess proposal components such as the research scope, relevance, and feasibility. Based on their evaluation, supervisors can either approve the information, allowing the thesis to move forward in the tracking process, or request revisions from the student. This approval mechanism ensures that only verified and academically sound thesis plans are allowed to proceed, thereby maintaining the quality and credibility of the overall supervision workflow.

Following the supervisor's approval, the final step in the proposed model is the reporting and visualization of thesis progress data. This step transforms the validated information into an intuitive and interactive format that supports informed decision-making by all parties. The system aggregates the collected data and generates comprehensive visual reports using stacked bar charts, which effectively illustrate various dimensions of progress, such as completed tasks. These visualizations enable supervisors, administrators, and students to easily interpret the development and status of each thesis project at a glance. Moreover, by presenting data in a comparative format, the system facilitates early identification of delays or inconsistencies and supports timely intervention when necessary. This data-driven visualization approach enhances transparency, improves communication, and fosters a more responsive academic supervision process.

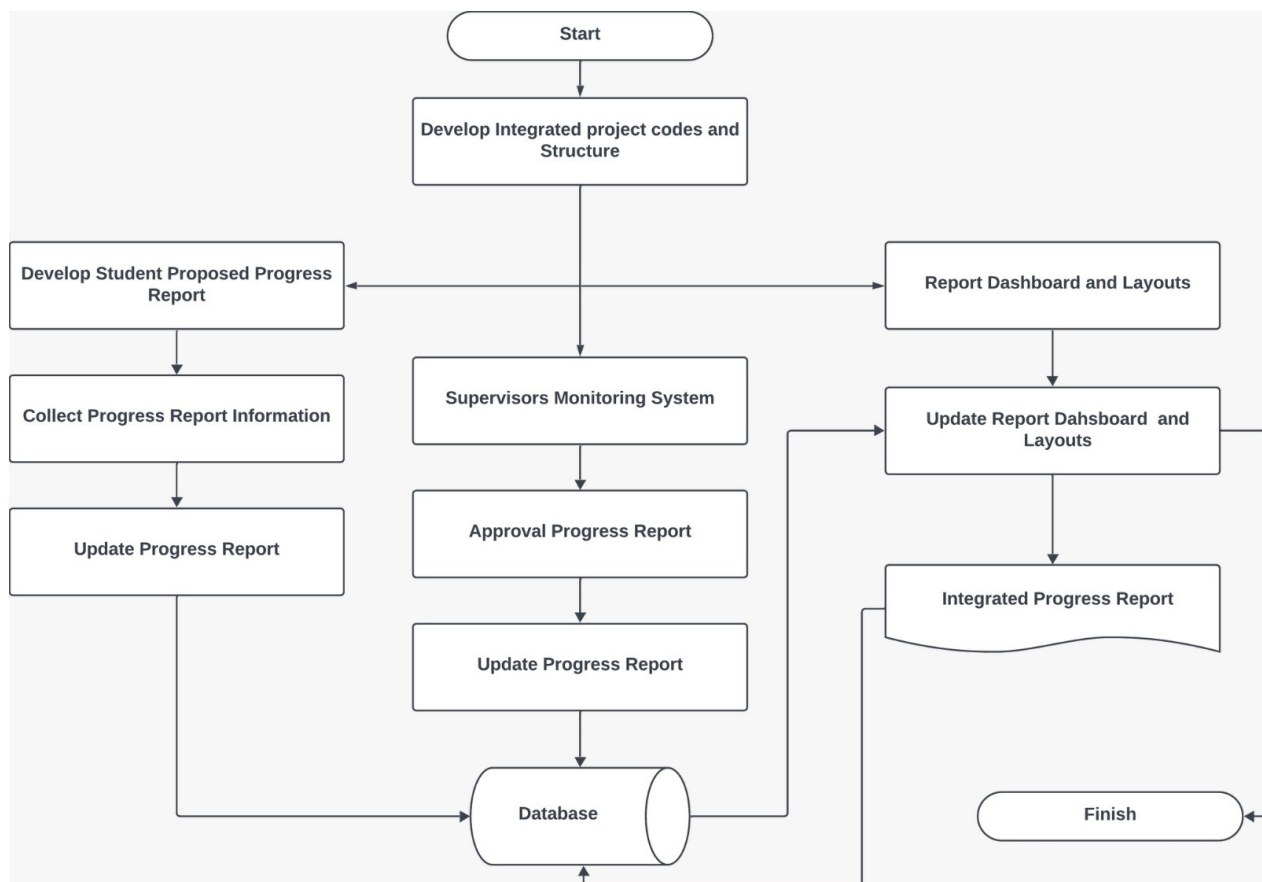


Fig. 1. Proposed Model

2.1 Development Approach

This study used a prototype development approach to design and implement a web-based thesis progress reporting system. The prototype method emphasizes building an initial working system that can be delivered to users, allowing them to interact with the system and provide direct feedback for iterative refinement [17], [18]. This approach ensures that the system aligns with real user needs and practical supervision workflows while maintaining flexibility for continuous improvements throughout development [19].

During the prototyping phase, trial deliveries were conducted with end-users, including students and supervisors, allowing them to use the system in actual reporting and supervision scenarios. Feedback gathered during these trial phases was carefully analyzed to identify usability challenges, feature gaps, and workflow mismatches [20]. Based on this feedback, iterative modifications were made to enhance the system's user interface, improve ease of navigation, and align system functionalities with user expectations and supervision procedures.

The prototype cycles focused on usability and interface refinement, as these elements are critical for effective adoption in academic environments [21]. The iterative delivery and feedback mechanism allowed developers to test the system's responsiveness, validate feature implementation, and optimize the user experience progressively. This feedback-driven refinement aligns with best practices in user-centered and participatory design for system development [22].

To ensure system quality, the final prototype was evaluated using the ISO/IEC 25010 software quality model, assessing critical software characteristics. Usability was evaluated using the User Experience Questionnaire (UEQ), which provides consistent and structured evaluation across six scales: Attractiveness, Efficiency, Perspicuity, Dependability, Stimulation, and Novelty. A total of 60 surveys were distributed (20 to supervisors, 40 to students), providing quantitative and qualitative insights into system usability and user experience, supporting objective

validation of the system's readiness for academic deployment.

3. RESULT AND DISCUSSION

3.1 Prototype

The thesis progress reporting system was successfully developed using the Laravel framework, a widely adopted PHP-based web application platform known for its scalability and ease of integration. Laravel's Model-View-Controller (MVC) architecture facilitates a clear separation of concerns, making the system modular and maintainable. For data storage and management, MySQL was chosen as the database solution due to its reliability, support for complex queries, and seamless compatibility with Laravel. Collectively, these technologies enabled the creation of a responsive web-based application capable of collecting, processing, and displaying student thesis progress data in real-time. The following figures illustrate key system interfaces, demonstrating how students input their progress, how supervisors validate submissions, and how the system generates statistical visualizations to support informed academic decision-making.

Figure 2 illustrates the interface within the web-based system. This page serves as the primary input point for students to submit and update their thesis progress data. It is divided into two main sections: the Thesis Progress Input Form (left side) and the Thesis Detail Checklist (right side). On the left, students are required to fill in specific details related to their progress meetings. The "Guidance" field records the session number of the thesis supervision. The "Discussion" field allows students to summarize the content or outcome of discussions with their supervisor. They are also required to upload a PDF file of their current thesis work under the "Thesis File" section. On the right, the "Thesis Detail" section consists of a checklist organized by chapter, enabling students to mark which components of their thesis have been completed. This structure includes essential sections such as Background, Problem Formulation, Research Methods, and Conclusions.

Fig. 2. Thesis Progress Report Submission Form

Figure 3 displays the Supervisor Interface of the web-based thesis progress monitoring system. This view is designed for academic supervisors to oversee and manage the progress of students assigned to them. In this interface, supervisors are presented with a filtered list of students under their guidance, along with essential details such as Student ID, Name, Current Thesis Stage (e.g., Title Proposal), Important Date (Proposal Date), Duration, and Description indicating the current approval process.

The Action column includes a button that allows supervisors to view detailed progress reports for each student. While this specific page indicates that student submissions are "Waiting for the approval of the Study Program Admin," supervisors can use this interface to track submission timelines and monitor proposal processing duration, ensuring that students remain within the expected academic schedule. Supervisors play a pivotal role in this system, providing validation and oversight throughout the thesis process. By enabling real-time visibility into student status and administrative progress, the interface enhances transparency, supports timely interventions, and improves supervisory efficiency.

Figure 4 illustrates the Approval Page interface of the web-based thesis progress monitoring system. This page is specifically designed for academic supervisors to assess and manage students' progress submissions. Each row in the table presents key information, including the Student ID, Name, Status (either *Thesis LogBook* or *Proposal LogBook*), the submission date, a description field, and an Action column.

The Action column includes three icons that allow supervisors to interact with the submission. The first icon enables supervisors to view detailed information about the student's thesis progress. The second icon allows them to approve the submission, while the third icon is used to decline it. Upon choosing to approve or decline a student's progress report, supervisors are prompted to provide comments or assessments. These supervisor remarks are then displayed in the Description column, offering clear feedback on the student's thesis progress. This structured approach facilitates effective communication, enhances transparency, and helps ensure timely academic oversight.

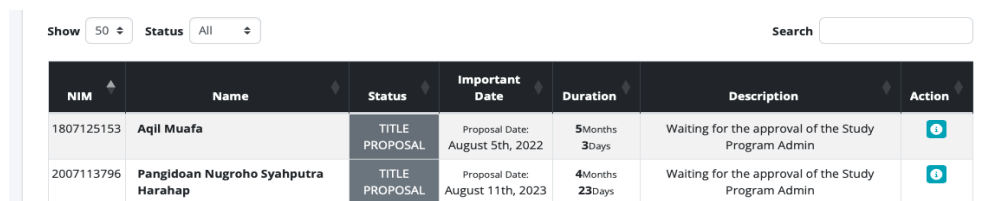
Figure 5 displays the individual student's progress

report interface within the web-based thesis monitoring system. The interface features two stacked bar charts: one representing the Proposal Progress Percentage and the other showing the Thesis Progress Percentage. Each chart visually breaks down the completion rate of thesis chapters (from Chapter 1 to Chapter 5) using color-coded segments, allowing for a quick assessment of progress at different stages. The chart on the left illustrates the student's advancement during the proposal phase, while the chart on the right depicts the cumulative progress of the final thesis report across multiple supervision sessions.

Below the charts, the History section presents a tabular log of the student's supervision sessions. Each row contains details such as the session number, progress percentage, supervisor name, status (linked to the thesis logbook), session date, qualitative description (e.g., "Very Good"), and available actions. Additionally, students can download a detailed PDF logbook that compiles their progress history and session details. This feature enhances documentation, facilitates academic review, and serves as an official record of their thesis development journey.

Figure 6 displays the administrator interface within the web-based thesis monitoring system. This page is specifically designed for administrative users to monitor and manage the workload distribution among academic staff involved in thesis supervision. The table presents an overview of each lecturer's supervision responsibilities, including columns for Lecturer Code, Lecturer's Name, number of students supervised as Supervisor 1 and Supervisor 2, the total number of students under their guidance, and the Average Guidance duration (displayed in months and days).

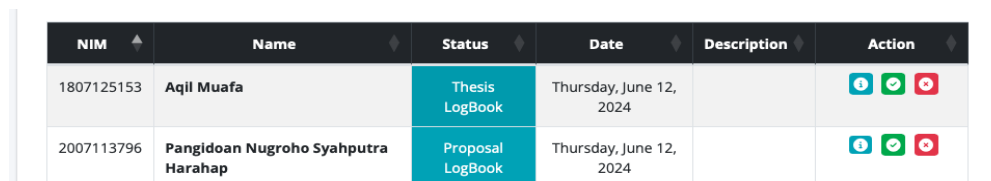
This interface enables administrative staff or program coordinators to evaluate the distribution of supervision assignments across faculty members, ensuring a balanced workload and accountability in student guidance. The Action column includes buttons that allow administrator to view detailed information regarding the student progress reports under each lecturer's supervision. By consolidating this data into a centralized view, the system enhances operational efficiency and supports evidence-based decisions related to supervision budgeting, performance evaluation, and workload planning.



The screenshot shows the 'Supervisors Page' with a search bar and filters. The table lists two students with their NIM, Name, Status (TITLE PROPOSAL), Important Date (Proposal Date), Duration, Description, and Action (view icon).

NIM	Name	Status	Important Date	Duration	Description	Action
1807125153	Aqil Muafa	TITLE PROPOSAL	Proposal Date: August 5th, 2022	5Months 30days	Waiting for the approval of the Study Program Admin	
2007113796	Pangidoan Nugroho Syahputra Harahap	TITLE PROPOSAL	Proposal Date: August 11th, 2023	4Months 23Days	Waiting for the approval of the Study Program Admin	

Fig. 3. Supervisors Page



The screenshot shows the 'Approval Page' with a table listing two students with their NIM, Name, Status (Thesis LogBook or Proposal LogBook), Date, Description, and Action (view, approve, decline icons).

NIM	Name	Status	Date	Description	Action
1807125153	Aqil Muafa	Thesis LogBook	Thursday, June 12, 2024		
2007113796	Pangidoan Nugroho Syahputra Harahap	Proposal LogBook	Thursday, June 12, 2024		

Fig. 4. Approval Page

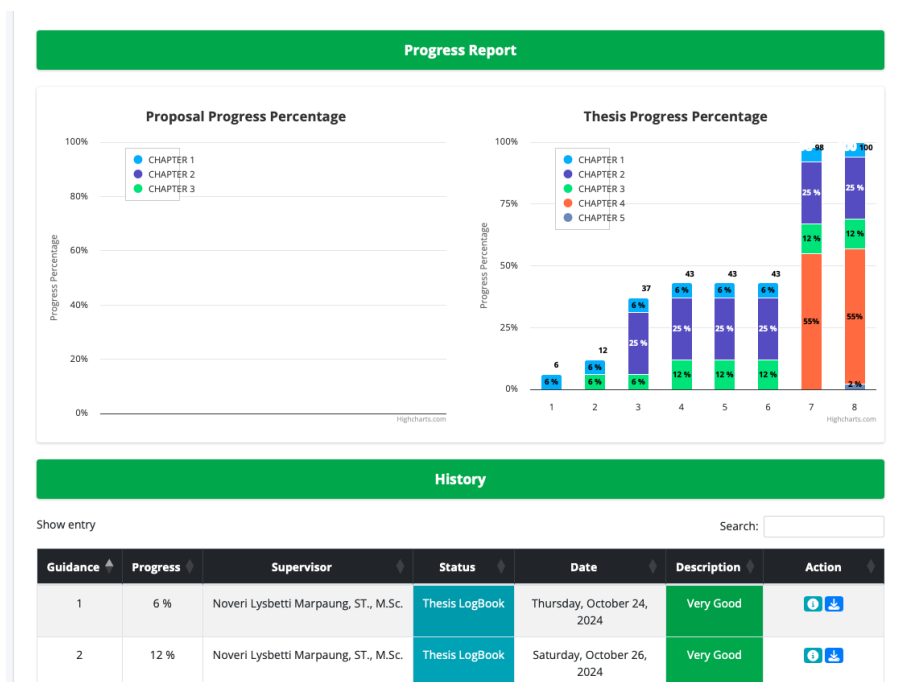


Fig. 5. History and Statistics Page

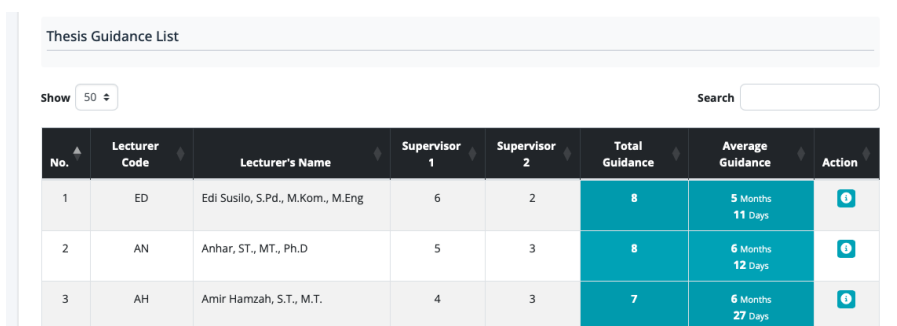


Fig. 6. Administrator Interface

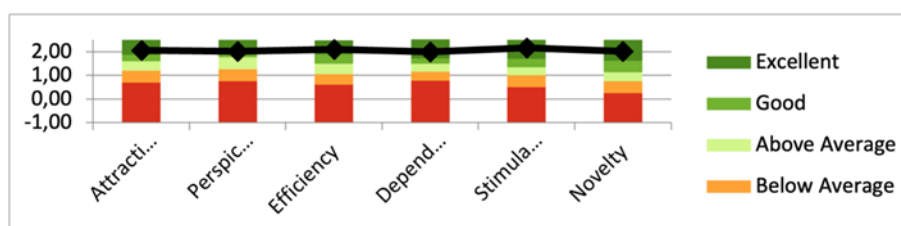


Fig. 7. Chart of UEQ Rating Scales

3.2 Testing

The prototype was tested using the ISO/IEC 25010 software quality model to evaluate key software quality characteristics. Usability was assessed using the UEQ, which provides a structured method to measure user perceptions of effectiveness, efficiency, and satisfaction during system use. A total of 60 survey responses were collected, consisting of 20 from lecturers and 40 from students, ensuring a comprehensive evaluation across different user roles within the thesis supervision process. One of the reasons for using the UEQ in this evaluation is its consistent calculation

method and its ability to measure six specific scales relevant to user experience: Attractiveness, Efficiency, Perspicuity, Dependability, Stimulation, and Novelty. The results for these six UEQ scales are obtained through structured questionnaires distributed to users, as illustrated in the figure below.

Based on the benchmark scale results, the aspects of attractiveness, perspicuity (clarity), efficiency, dependability (accuracy), stimulation, and novelty all showed excellent results. These findings indicate that the progress reporting application has received positive evaluations across all assessed scales.

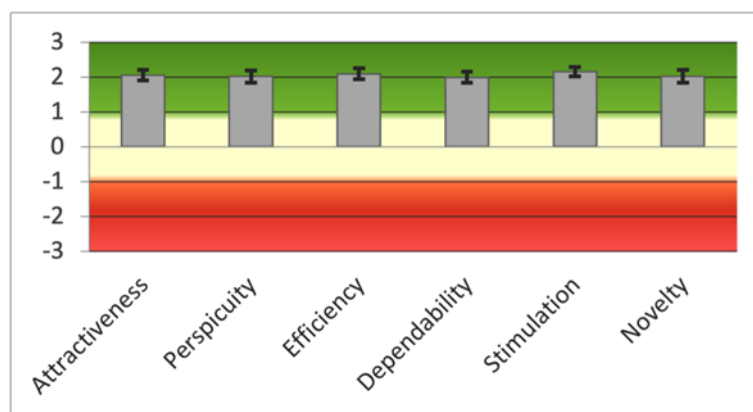


Fig. 8. Benchmark Results of UEQ Rating Scales

4. CONCLUSION

This paper presents the design and implementation of an automated, integrated web-based progress reporting system aimed at improving the effectiveness and efficiency of academic thesis supervision. The purpose of this research was to develop a system that facilitates structured progress tracking, transparent supervision management, and accessible communication among students, supervisors, and administrators during the thesis process.

The developed system combines structured data collection with statistical and visual analysis features to support the thesis progress reporting lifecycle. Built using the Laravel framework for its modular architecture and MySQL for reliable data management, the system allows students to submit progress reports, enables supervisors to validate and provide feedback, and generates detailed progress analytics through clear visualizations for easy monitoring.

To ensure the system meets quality standards, testing was conducted using the ISO/IEC 25010 quality model. The results indicate that the system provides a flexible, scalable, and user-friendly platform for monitoring student thesis progress. The immediate availability of updated progress data and visualized reports enhances transparency and facilitates timely interventions, supporting a more effective academic management process. These outcomes demonstrate that the developed system successfully meets the research objective of providing an accessible, systematic, and insightful tool for thesis supervision within higher education environments.

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