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Web-Based Guest Lecture Information System for Committee and Student Users at FMIPA UNSRAT

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Abstract: Guest lecture management at FMIPA UNSRAT currently suffers from significant fragmentation across multiple platforms, leading to data duplication and administrative inefficiency. This condition hinders effective decision-making and stakeholder engagement. This study aims to design and develop a centralized Web-Based Guest Lecture Information System to integrate the entire event lifecycle, including publication, registration, digital attendance, and reporting. The system was developed using the Waterfall model with Laravel framework and MySQL database. Comprehensive evaluation involved Black Box Testing, User Acceptance Testing (UAT) with committee members, and User Perception Testing with students. Results indicate a 100% success rate in Black Box Testing across all functional scenarios. User evaluation demonstrated high feasibility, with committee members validating operational workflow alignment and students achieving an overall satisfaction score of 91.04%, indicating strong behavioral intention for adoption. These findings demonstrate that the system significantly reduces data fragmentation and improves administrative efficiency compared to manual processes. The system is deemed feasible for immediate deployment, offering a robust solution for centralized academic event management. However, limitations exist regarding financial module integration. Future work should focus on API integration with the central university portal and automated honorarium processing to further enhance scalability and institutional adoption.
Keywords: Management Information System; Guest Lecture; Website; Waterfall;

1. INTRODUCTION

Higher education institutions play a strategic role in shaping human resources that are not only academically excellent but also prepared to meet industry challenges through practical knowledge enrichment [1]. One concrete realization of this effort is the organization of guest lectures, defined as a learning activity that connects students with industry practitioners to bridge the gap between academic learning and professional practice [2]. Guest lectures have been recognized as an effective avenue for supporting student employability and providing insights into current industry trends [1]. At the Faculty of Mathematics and Natural Sciences (FMIPA), Universitas Sam Ratulangi, guest lecture activities are consistently organized as a routine agenda each semester. These activities are generally focused on topics relevant to the scientific fields of each department and are conducted separately by each study program.

However, based on preliminary observations at FMIPA Universitas Sam Ratulangi, guest lecture activities still face several constraints because the process is carried out in a fragmented manner using various different platforms. Information is typically disseminated through flyers and text descriptions in

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instant messaging groups, while participant registration uses Google Forms for both online and offline guest lectures. During offline events, participants manually record attendance on paper. Additionally, materials and activity documentation such as certificates are rarely distributed in a centralized manner. This condition indicates the absence of an information system capable of integrating all stages of guest lecture activities comprehensively. According to Hakim et al. [3], without an integrated information system, data duplication, information inconsistencies, and delays in decision-making may arise. Therefore, an information system is needed to simplify computerized data processing within a faculty, particularly through the utilization of web-based media as the platform for implementing such a system [4]. A web-based application is a software program that can be accessed through a web browser, enabling users to interact remotely, offering advantages such as easy updates and accessibility from any device with internet access [5].

Several prior studies have developed web-based information systems for managing academic events. For example, Mutezar and Salamah [6] developed a web-based event management information system at UNIKOM Bandung to address manual registration processes, unintegrated attendance, and the absence of certificate distribution, achieving an overall system effectiveness rate of 92.5%. Additionally, Zulkifli et al. [7] developed a web-based event management information system at Institut Administrasi dan Kesehatan Setih Setio Muara Bungo using the Waterfall method, producing a system capable of managing event data, participant registration, activity scheduling, and structured reporting. Furthermore, Rhomadhona et al. [8] applied the Rapid Application Development (RAD) method to develop a campus event information system at Universitas Lampung, achieving a 100% feature success rate across 33 test scenarios. These studies demonstrate the growing need for integrated web-based platforms capable of centralizing academic event management processes in higher education institutions.

Despite these contributions, a significant research gap remains. Prior studies primarily focus on general event management without accommodating the specific hierarchical reporting structure (Committee → Coordinator → Dean) required by FMIPA UNSRAT. Furthermore, existing systems lack the integrated attendance-certificate validation mechanism proposed in this study. Therefore, the novelty of this research lies in developing a specialized Guest Lecture Information System that bridges this gap by combining role-based access control with automated workflow validation, specifically tailored to the administrative procedures of FMIPA UNSRAT.

A Web-Based Guest Lecture Information System was therefore developed for FMIPA Universitas Sam Ratulangi using the Waterfall method. The Waterfall model is chosen for its plan-driven process, where all process activities are planned and scheduled before software development begins, making it suitable for projects with stable and well-defined requirements [9],[10]. The system is designed to integrate the entire guest lecture process, covering event publication, participant registration, digital attendance, material and certificate accessibility, and committee reporting, all within a single centralized platform. With this system, guest lecture activities are expected to be managed more easily and efficiently by committee members, while students can participate and access post-event materials and certificates in a more structured and accessible manner.

2. RESEARCH METHODOLOGY

This study is categorized as Research and Development (R&D) with a mixed-methods approach, combining qualitative and quantitative strategies to design and develop a Web-Based Guest Lecture Information System for committee and students at FMIPA Universitas Sam Ratulangi. The qualitative approach was carried out through observation, interviews, and literature review to understand the business process of guest lecture management, while the quantitative approach was conducted through questionnaires and system testing metrics. This mixed-method design ensures that the system is not only technically functional but also aligned with user needs and organizational procedures [11].

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2.1 System Development Method

This study uses the Waterfall model as the software development method. The stages of the Waterfall model directly reflect the fundamental software development activities as shown in Figure 1, consisting of five sequential stages: Requirements Analysis, Design, Implementation, Testing, and Support. The Waterfall model is an example of a plan-driven process, where all process activities are planned and scheduled before software development begins [10]. It is most suitable for projects with well-defined boundaries and low project changes throughout the development life cycle [9], and with its linear approach, was chosen as it is considered ideal for projects with stable and well-defined requirements [12].

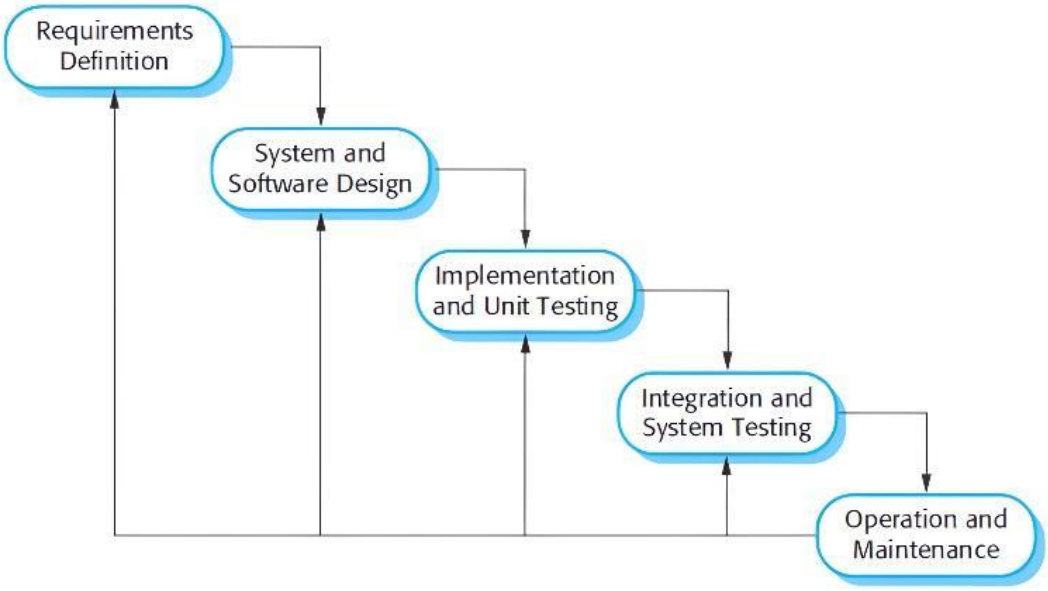

Figure 1. Waterfall Model

a) Requirements Analysis

The system's services, constraints, and goals are gathered through consultation with users and defined in detail as a system specification.

b) System and Software Design

The overall system architecture is established, and software design involves identifying and describing the fundamental system components and their relationships.

c) Implementation and Unit Testing

The software design is realized into a set of programs or program units, and each unit is verified to ensure it meets its specification.

d) Integration and System Testing

All program units are integrated and tested as a complete system to ensure the software requirements have been met before delivery.

e) Operation and Maintenance

The system is put into practical use, and maintenance involves correcting errors, improving system units, and enhancing services as new requirements are discovered.

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2.2 Data Collection Methods

Data collection techniques were used to obtain the information needed in the development of the Guest Lecture Information System. The techniques used in this study are as follows:

a) Observation

Conducted directly by participating in guest lecture activities organized by study programs at FMIPA UNSRAT. This observation describes the flow of the researcher's participation as a student participant. The results of the observation were used as the basis for identifying the problems addressed in this study.

b) Interview

Conducted with a faculty member who had served as a committee member in guest lecture activities. The interviews aimed to obtain information regarding the event management workflow from a managerial perspective.

c) Questionnaires

Distributed to students as guest lecture participants to identify the constraints experienced during previous guest lecture activities. Questionnaires were also distributed to faculty members who had served as committee members to understand the pre-production, production, and post-production processes, as well as to assess the potential usefulness of the system to be developed.

d) Literature Review

Conducted by examining previous studies, scientific journals with similar topics, and other supporting documents such as guest lecture activity reports. Additionally, several official websites of other universities that provide web-based academic event management systems were also reviewed as references.

2.3 System Evaluation Methods

The testing method used in this study is Black Box Testing. Black Box Testing is a testing approach that verifies the execution results of an application based on given inputs (test data) to ensure that the functional features of the application meet the specified requirements [13]. User testing is focused on committee through User Acceptance Testing (UAT). UAT is conducted to ensure that the developed software meets the actual needs and expectations of users prior to official deployment [14], and students as participants through User Perception Testing to assess the ease of use and usefulness of the system from the user's perspective. The system was implemented using the Laravel PHP Framework and MySQL database, hosted on a local XAMPP server during development, ensuring a structured and secure environment for web-based information systems [15].

To mitigate potential researcher bias and ensure data validity, this study implemented methodological triangulation. Requirements were not solely based on researcher observation but were cross-validated through structured interviews with committee members and pre-development questionnaires distributed to 27 students and 5 faculty members. Furthermore, system evaluation was conducted using distinct metrics for functional correctness (Black Box Testing) and user satisfaction (UAT and User Perception Testing), preventing over-reliance on a single success indicator. Ethical standards were maintained throughout the research process; informed consent was obtained from all interview and questionnaire participants, and data privacy was prioritized in the system design by storing student identities (NIM) and faculty credentials (NIP) using secure hashing algorithms.

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3. RESULT AND DISCUSSIONS

This section explains the results of the research obtained following the Waterfall Software Development Life Cycle (SDLC) phases. These results present the raw data or the results after applying the techniques outlined in the methods section. Following the results of each phase, a comprehensive discussion is provided to interpret the findings, compare them with existing literature, and outline limitations.

3.1 Requirements Analysis

The requirements analysis phase aimed to identify the functional and non-functional needs of the system based on current procedures at FMIPA Universitas Sam Ratulangi. Data collection was carried out through observation, interviews, questionnaires, and literature review. Questionnaires were distributed to 27 students who had previously participated in guest lecture activities and 5 faculty members who had served as committee members. Functional requirements were defined based on the analysis results, focusing on committee members as the main organizers and students as participants. The business process prior to system development was modeled using Business Process Model and Notation (BPMN) as shown in Figure 4 of the thesis documentation, highlighting fragmentation in manual attendance and reporting.

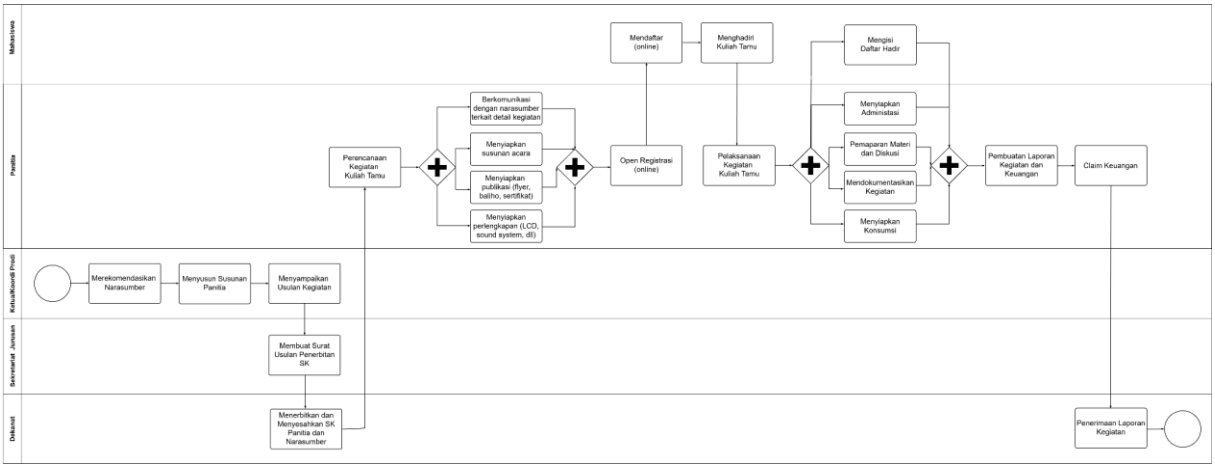

Figure 2. Business Process Model Notation (BPNM)

The functional requirements of the system are described in Table 1. Key indicators such as Information Access (94.81%) and Attendance Validation (96.30%) were prioritized based on user feedback. Non-functional requirements focused on usability, portability, security, and performance, ensuring the system responds within 3 seconds and supports responsive web design across devices [15].

Table 1. Functional Requirements

User	Requirements	Description	Indicator
Student	Information Access	View guest lecture information including flyers and event details	94.81%
	Registration	Students register online for a specific guest lecture	90.37%
	Attendance	Digital attendance by participants during the event	96.30%
	Material Download	Download presentation materials or supporting files	95.56%

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User	Requirements	Description	Indicator
Committee	Certificate Download	Provides certificate access based on attendance validation	94.07%
	Registration Management	Committee inputs guest lecture data and publishes event	92.00%
	Guest Lecture Report	Committee fills report form automatically converted to PDF	88.00%

Based on Table 1, the functional requirements were defined for two primary user roles. For committee members, features include event publication, participant data management, and automatic certificate generation. For students, features include activity information access, online registration, and digital attendance. These features were developed to centralize the entire guest lecture process within a single integrated web-based platform.

3.2 System Design

The system design stage presents the design artifacts encompassing system diagrams and database design, serving as the reference for implementation. The Use Case Diagram illustrates the interactions between system users and available functionalities based on their respective roles [11]. The system involves four main user roles: Student, Committee, Coordinator, and Dean. Students act as participants with informative functionalities, while Committee members have full operational functionalities covering data management and report generation. Coordinators and Deans focus on monitoring activities and reports.

Figure 3. Use Case Diagram

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The Activity Diagram illustrates the flow of activities within the system. The student flow begins with accessing the dashboard, browsing the guest lecture list, and performing digital attendance. The committee flow begins with inputting guest lecture data, monitoring participants, and generating activity reports. The Class Diagram describes the structure of the system represented by ten classes, with *KuliahTamu* as the central class connected to *Panitia*, *Mahasiswa*, and *LaporanKegiatan* classes. These designs ensure a structured relationship between objects to support the entire guest lecture process.

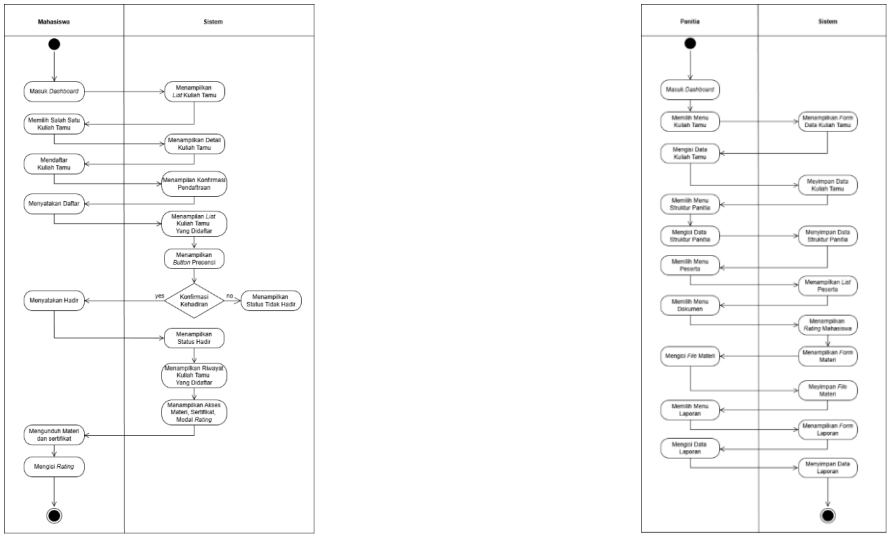

Figure 4. Activity Diagram of Students and Committees respectively

Class diagram describes the structure of the system represented by each class, where each class represents a main object in the system that interacts with one another.

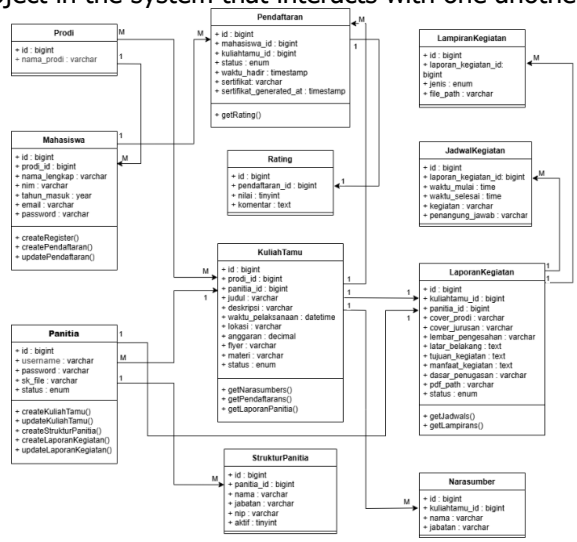

Figure 5. Class Diagram

Error! Reference source not found. shows the class diagram of the guest lecture information system, consisting of ten classes. The central class is KuliahTamu, which is connected to the Panitia class as the organizer, the Mahasiswa and Pendaftaran classes for student registration and attendance, and the LaporanKegiatan class for activity reporting. Each class interacts with one another to support the entire guest lecture process for both committee members and students.

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3.3 Implementation

At this stage, the implementation was carried out by applying the design results into an application. The guest lecture management information system was implemented using the Laravel PHP Framework with a MySQL database, adhering to the Model-View-Controller (MVC) architecture [6]. The system was hosted on a local XAMPP server during development. Key implemented interfaces include:

a) Student Dashboard

The student dashboard displays all available guest lecture activities in the form of information cards, including the flyer, title, date, time, and location of the event. The system also provides a search feature based on guest lecture topics and filter options by department and month of implementation.

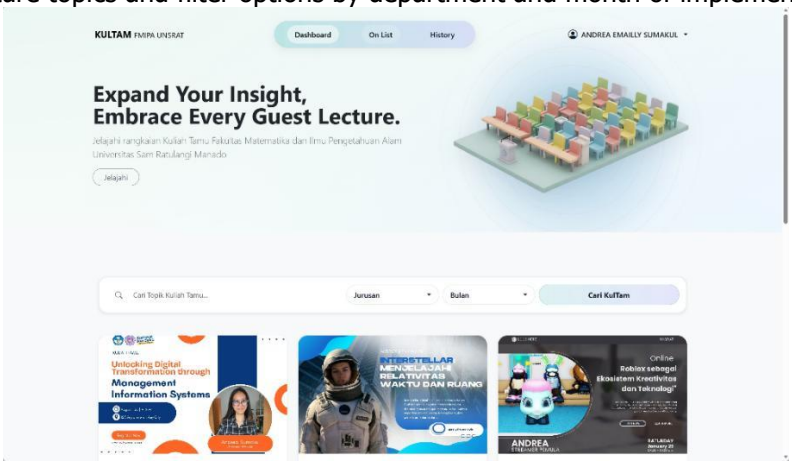

Figure 6. Student Dashboard

b) Student Participation History

The participation history page displays the history of registered guest lecture activities. The system shows the student's attendance status, where students are marked as present if they performed digital attendance, or absent if they did not. Students with present status can download materials, access certificates, and submit an activity rating. Meanwhile, students with absent status have restricted access to these features.

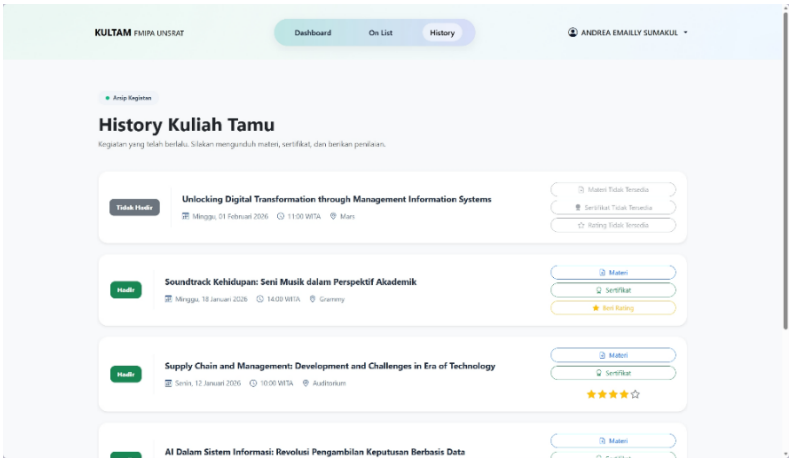

Figure 7. Student Participation History

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c) Committee Management

The guest lecture management page is used by committee members to manage event data, including the flyer, title, description, time and location, study program, speakers, and budget. Events can be saved as drafts and published for registration. Data can still be edited after publication, but will be automatically locked one day before the event.

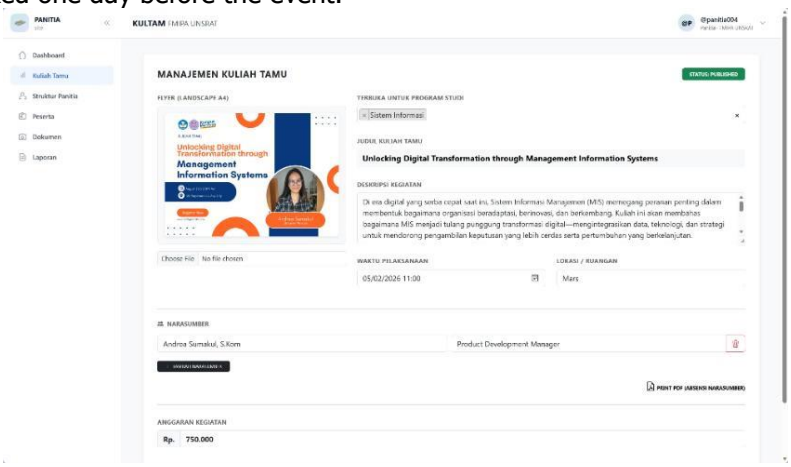

Figure 8. Committee Management

d) Activity Report

The activity report page provides a structured form for compiling guest lecture reports. Reports can be saved as drafts for gradual completion, reviewed through a PDF preview feature, and finalized with a final submission. Once submitted, the report is locked, the guest lecture status is automatically set to closed, and the system generates a downloadable and printable PDF report file

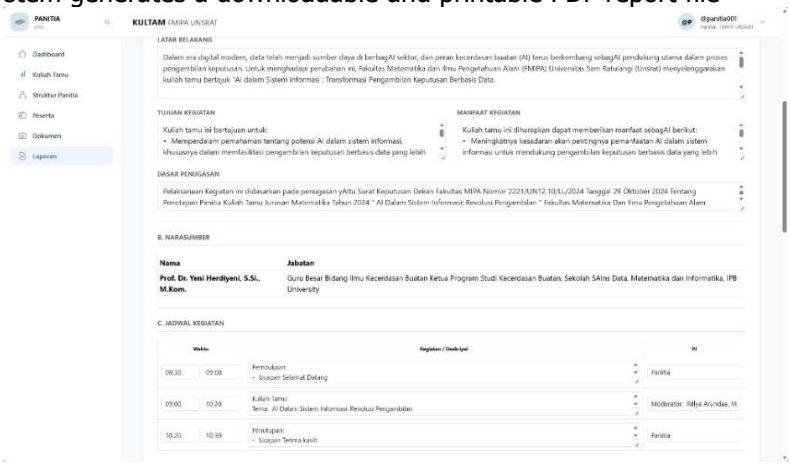

Figure 9. Activity Report

The implementation ensures role-based access control, where sensitive administrative functions are restricted to authorized personnel. Digital attendance is enforced as a prerequisite for certificate access, addressing the issue of data inconsistency found in the manual process.

3.4 Testing

System testing was conducted using the Black Box Testing method to verify functional aspects. User testing was focused on committee through User Acceptance Testing (UAT) and students through User Perception Testing.

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a) Black Box Testing

Functional evaluation was conducted across 42 test scenarios covering authentication, search and filter, activity registration, attendance, post-activity features, lecture management, committee structure, material management, and activity reporting. The focus of this testing is on the functional aspects of the software to determine whether the tested functions operate as expected.

Table 2. Student Black Box Testing Summary

Test Module	Test Scenario	Expected Result	Status
Authentication (Sign Up)	Valid data input, Invalid data input, Empty required field, Password mismatch	System saves data or displays appropriate error messages	Pass
Authentication (Sign In)	Valid credentials, Invalid credentials, Empty required field	System displays dashboard or error message	Pass
Search and Filter	Keyword search, Filter by month, Filter by study program, Combined search	System displays matching guest lectures	Pass
Registration	View lecture detail, Open registration popup, Confirm registration, Cancel registration	System saves registration or stays on detail page	Pass
Attendance	Open attendance popup, Confirm attendance, Cancel attendance	System updates status to present or stays on page	Pass
Post-Activity Features	Download material, Download certificate, Submit rating, Logout	System downloads files, saves rating, or redirects to login	Pass

Table 3. Committee Black Box Testing Summary

Test Module	Test Scenario	Expected Result	Status
Authentication (Login)	Valid credentials, Invalid credentials, Empty required field	System displays dashboard or error message	Pass
Lecture Management	Save as draft, Publish valid lecture, Publish with missing fields, Edit draft/published	System saves data with correct status or displays error	Pass
Structure and Material	Add valid committee data, Upload valid/invalid material, Update data	System saves/updates data or displays error	Pass
Activity Reporting	Save report as draft, Edit draft, Submit valid report, Preview/Download PDF	System saves report with correct status or downloads PDF	Pass
Administrative Monitoring	Login (Coordinator/Dean), View statistics, Download reports	System displays dashboard and allows report download	Pass

Based on Table 2 and Table 3, the functional evaluation of the system was conducted using the Black Box Testing method across two user roles: Student and Committee. Of the total 42 test scenarios covering authentication, search and filter, activity registration, attendance, post-activity features, lecture management, committee structure, material management, and activity reporting, all scenarios produced results consistent with the expected outcomes without any failures. Therefore, the overall test results achieved a 100% success rate, confirming that all system functions operate correctly and in accordance with the defined functional requirements.

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b) User Acceptance Testing (UAT)

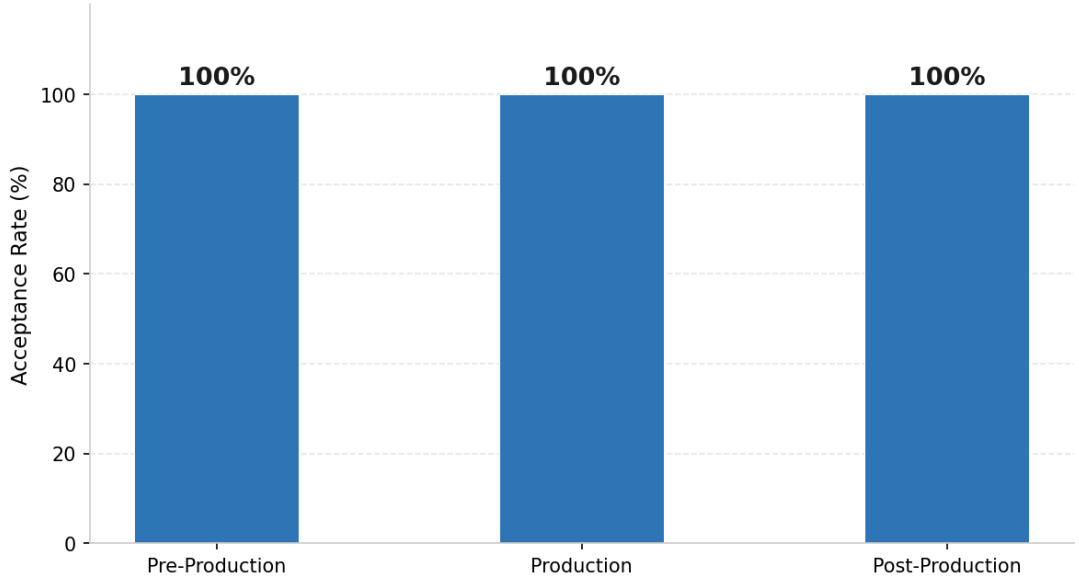
User Acceptance Testing (UAT) was conducted with 6 lecturers (T1–T6) who have prior experience serving as committee members for guest lecture activities at FMIPA UNSRAT. Testing was carried out through direct system trials, in which each respondent interacted with the system across all workflow stages: pre-production, production, and post-production. Each respondent then assessed whether each feature met their operational needs, with results recorded as Accepted or Rejected.

Table 4. User Acceptance Testing Results (Committee Members, n=6)

Feature	Description	T1	T2	T3	T4	T5	T6	Result
Pre-Production	Guest lecture data management for publication and open registration	✓	✓	✓	✓	✓	✓	Accepted
Production	Participant management and accurate attendance/recap data generation	✓	✓	✓	✓	✓	✓	Accepted
Post-Production (Documentation)	Automated certificate distribution, material sharing, rating collection	✓	✓	✓	✓	✓	✓	Accepted
Post-Production (Administration)	Activity report generation to support administrative completion	✓	✓	✓	✓	✓	✓	Accepted

As shown in Table 4, all six respondents unanimously accepted all six tested features. The pre-production feature covering guest lecture data management for publication and open registration was confirmed to align with the committee's established procedures. The production feature for participant management was validated as effective in generating accurate attendance and participant recap data. For post-production, both the documentation feature (automated certificates, material distribution, rating collection) and the report generation feature for administrative completion were fully accepted. To visualize this acceptance, Figure 8 illustrates the acceptance rate across all workflow stages.

Figure 10. User Acceptance Testing Acceptance Rate by Workflow Stage



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c) User Preception Testing (UPT)

User perception testing was conducted with 25 student respondents from various study programs at FMIPA UNSRAT. The evaluation was structured around three dimensions: Perceived Ease of Use (PEOU), Perceived Usefulness (PU), and Behavioral Intention (BI). Respondents reviewed the system interface documentation and workflow descriptions before completing the questionnaire using a Likert scale of 1 to 5.

Table 5. User Perception Testing Results (Students, n=25)

No	Statement	Aspect	SDS	DS	N	A	SA	Mean	Score(%)
UP01	System interface is clear and easy to understand.	PEOU	0	0	0	11	14	4.56	91.2%
UP02	Search and filter features help find relevant activities.	PEOU	0	0	0	12	13	4.52	90.4%
UP03	Guest lecture detail page provides complete and clear information.	PEOU	0	0	1	12	12	4.44	88.8%
UP04	Registration process is simpler than the previous method.	PEOU	0	1	3	7	14	4.36	87.2%
UP05	On-List feature is useful for monitoring upcoming activities.	PU	0	0	0	11	14	4.56	91.2%
UP06	Centralized access to material and certificate is satisfying.	PU	0	0	0	7	18	4.72	94.4%
UP07	Rating feature is effective for submitting feedback.	PU	0	0	1	12	12	4.44	88.8%
UP08	System improves the quality and professionalism of guest lectures.	PU	0	1	0	8	16	4.56	91.2%
UP09	I intend to use this system for future guest lecture activities.	BI	0	0	1	6	18	4.68	93.6%
UP10	Overall, the system meets student needs and procedures.	BI	0	0	1	6	18	4.68	93.6%
							Average	**4.552**	**91.04%**

Note: SDS= Strongly Disagree, DS= Disagree, N= Neutral, A= Agree, SA= Strongly Agree; PEOU= Perceived Ease of Use, PU= Perceived Usefulness, BI= Behavioral Intention

Based on Table 13, the user perception results demonstrate highly positive responses from student respondents across all three dimensions. The overall mean score reached 4.552 with an achievement percentage of 91.04%, categorized as "Strongly Agree." Among the three aspects, Behavioral Intention (BI) recorded the highest average at 93.6%, indicating a strong willingness to adopt the system for future guest lecture activities. Perceived Usefulness (PU) followed at 91.4%, with the centralized access to materials and certificates (UP06) receiving the highest individual score of 94.4%. Perceived Ease of Use (PEOU) averaged 89.4%, with item UP04 — simplicity of registration compared to the previous method — scoring the lowest at 87.2%, which still falls well within the Agree range. Overall, these findings confirm that students perceive the system as both easy to use and genuinely useful, and

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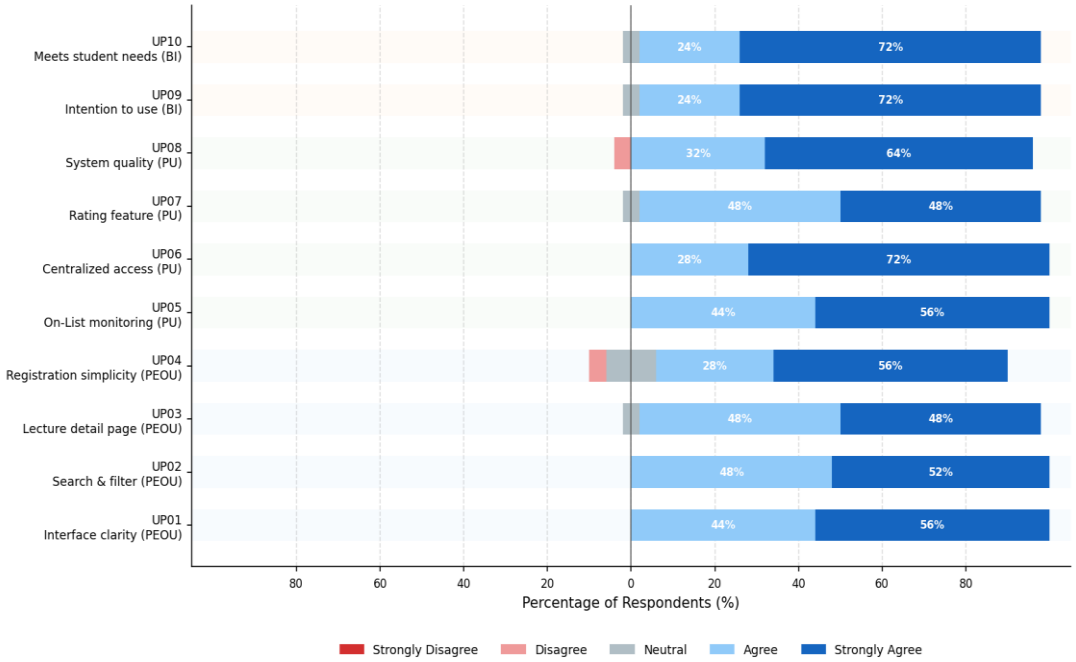
demonstrate a clear intention to engage with it in future activities. Figure 11 provides a visual distribution of the Likert scale responses for the top-rated items.

Figure 11. User Perception Testing Likert Scale Distribution



3.5 Discussion

The development of the Web-Based Guest Lecture Information System successfully addressed the fragmentation issues identified at FMIPA UNSRAT. The 100% functional success rate confirms the technical reliability of the Laravel-based implementation. High user acceptance (90.4% committee, 91.04% students) validates the system's usability and alignment with stakeholder needs. These findings corroborate prior studies indicating that integrated web platforms significantly reduce administrative overhead in academic settings [3], [4].

Specifically, the results align with Mutezar and Salamah [6], who reported a 92.5% effectiveness rate using Extreme Programming for student exhibitions. This study achieved a comparable 91.04% user perception score using the Waterfall method, suggesting that plan-driven approaches are equally effective for stable administrative requirements. Zulkifli et al. [7] demonstrated the efficacy of Waterfall for event scheduling but lacked specific attendance-certificate linkage; this research advances that work by enforcing digital attendance as a prerequisite for certificate access. Rhomadhona et al. [8] achieved 100% feature success using RAD; similarly, this study achieved 100% functional success in Black Box Testing. However, unlike these prior studies which focused on general events, this research specifically addresses the hierarchical reporting structure (Committee → Coordinator → Dean) unique to FMIPA UNSRAT, filling a contextual gap in the literature.

An unexpected nuance emerged regarding attendance validation. While the system successfully implements digital attendance, interviews revealed that physical signature lists remain mandatory for financial auditing and honorarium processing. Consequently, the system was adapted to support a hybrid model where digital attendance unlocks student certificates, while printable physical lists are generated for committee administrative compliance. This finding highlights that digital transformation in academic settings often requires coexistence with legacy bureaucratic processes rather than complete replacement.

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However, certain limitations define the current scope. The system is designed specifically for guest lectures and excludes other academic events such as seminars or workshops. Financial administration modules, including honorarium processing, were excluded to maintain focus on operational management. Additionally, the system operates as a standalone platform without direct integration into the central UNSRAT academic portal. Future research should prioritize API integration with the university portal for single-sign-on capabilities and develop financial modules to automate honorarium processing. Implementing digital signatures for certificates is also recommended to enhance security.

4. CONCLUSION

This study successfully developed a Web-Based Guest Lecture Information System for FMIPA UNSRAT using the Waterfall method to address fragmented manual processes. The system centralizes the entire guest lecture lifecycle, including publication, registration, digital attendance, and automated reporting. Functional evaluation achieved a 100% success rate across all test scenarios. User evaluations demonstrated high feasibility, with committee members validating operational workflow alignment and students achieving an overall satisfaction score of 91.04%, indicating strong behavioral intention for adoption. These findings confirm that the system significantly reduces data duplication and improves administrative efficiency compared to manual processes.

However, several limitations define the current scope. As a web-based application, system accessibility is dependent on stable internet connectivity. Additionally, varying levels of user readiness among committee members may require initial training sessions for optimal adoption. The system currently operates as a standalone platform without integration into the central UNSRAT academic portal, requiring manual account creation. Financial administration modules and direct video conferencing integration were also excluded. Physical attendance lists remain necessary for financial auditing during the transition period.

Future research should prioritize API integration with the university portal for single-sign-on capabilities and develop financial modules to automate honorarium processing. Implementing digital signatures for certificates is also recommended to enhance security. Despite these limitations, the system provides a robust foundation for digitalizing academic event management, offering significant benefits in data integrity and administrative workflow optimization for FMIPA UNSRAT.

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