SIMPELMAS: an Integrated Information System for Research and Community Service using a Prototype Development Approach

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***Abstract*— The Institute for Research and Community Service (LPPM) plays a strategic role in coordinating academic research and community engagement activities. However, fragmented data management continues to hinder performance evaluations and strategic decision-making in many universities. This study aims to develop SIMPELMAS (Research and Community Service Management Information System), an integrated platform designed to streamline the management of human resources, research, and community service data. Using a prototype-based development methodology, SIMPELMAS was implemented and tested in Universitas Muria Kudus. The system achieved high success rates in various aspects: over 95% in functionality, 99–100% in security, and 80–85% in user satisfaction. Key features such as proposal submission, fund monitoring, and final reporting functioned optimally. Integration testing confirmed effective data synchronization, while user feedback highlighted the need for improvements in user experience, particularly for students and new users. This study contributes to the digital transformation of higher education by providing a replicable model for academic information systems that support real-time monitoring, transparency, and data-driven governance. While the system has met key eligibility standards, further enhancements in user interface and mobile responsiveness are recommended to ensure broader usability and adoption.**

Keywords—Management Information System, Research, Community Service, Data Integration, Higher Education, Digital Transformation

I. INTRODUCTION

The Research and Community Service Institute (LPPM) plays a pivotal role in coordinating and evaluating research and community engagement in higher education institutions. In today's era of digital transformation, effective and integrated information systems are crucial for managing complex academic data, ensuring transparency, and improving institutional performance. Despite the growing need for data-driven governance, many universities continue to manage their research, human resource, and community service data separately. This fragmented management approach hinders efficient performance monitoring and informed decision-making. Recent reports from the Ministry of Education (2023) indicate that more than 65% of Indonesian universities lack integrated systems for academic data governance, resulting in reporting delays and underutilized research outputs. Previous studies have explored the role of information systems in higher education [1] [2], but limited attention has been given to systems that simultaneously integrate human resource, research, and community service data. This presents a critical research gap, especially in the context of performance-based evaluations and output-oriented funding models increasingly adopted by academic institutions [3] [4].To address this gap, this study focuses on the development of SIMPELMAS (Sistem Informasi Manajemen Penelitian dan Pengabdian kepada Masyarakat), an integrated information system aimed at streamlining academic data management and supporting strategic planning. SIMPELMAS was developed using a prototype methodology that enables iterative improvements through user feedback and testing. The novelty of this research lies in its integrated design, real-time monitoring features, and comprehensive approach to data centralization, which contrasts with most existing systems that focus solely on administrative or siloed operations. By offering a holistic solution for managing academic performance, the proposed system aims to support universities in achieving better governance, improved service delivery, and stronger contributions to society and industry. This paper is structured as follows: Section 2 describes the methodology used in system development. Section 3 presents the results of system implementation and testing. Section 4 provides a detailed discussion of the findings and their implications. Section 5 concludes the study and offers recommendations for future research.

The existence of an integrated management information system is a pressing need to ensure accuracy in reporting and academic performance evaluation. The Research and Community Service Management Information System (SIMPELMAS) is expected to serve as a solution for enhancing efficiency in research and community service data management, as well as improving HR quality in supporting outcome-based education [5]. With a comprehensive system in place, outputs such as scientific publications, books, teaching materials, and community service results can be systematically

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documented, supporting the achievement of the Tri Dharma of Higher Education [6]. As challenges in managing fragmented data increase, many universities in Indonesia have started implementing integrated information systems; however, these remain limited to administrative applications without supporting in-depth data-dr[7]iven evaluation. Recent studies indicate that an effective management information system can expedite evaluation processes, enhance accountability, and optimize the use of human resources and research [8][5]. Artificial intelligence and data analytics technologies are also beginning to be utilized to improve transparency and accuracy in academic data management [9][10]. However, the implementation of these technologies within the context of Indonesian universities, particularly in integrating HR and research data, remains limited. Therefore, this research contributes significantly to developing an integrated system that can improve academic data and community service management.

The implementation of an integrated management information system also enables academic stakeholders to monitor research and community service progress more effectively [11]. With integration, faculty members can easily access and report their research findings, while universities can more accurately map academic achievements [12]. This system also has the potential to enhance administrative efficiency and reduce redundancies in documentation processes [7]. Beyond administrative aspects, an integrated system supports data-driven research strategies, enabling universities to identify research trends, optimize resources, and strengthen collaborations between academia, industry, and government [13]. Digitalization in research and community service management is also believed to improve institutional transparency and accountability, as well as support the attainment of national and international accreditation standards [14]. As the need for accurate and real-time data in higher education management increases, the use of artificial intelligence and data analytics technology is becoming a growing trend in academic information systems [9]. These technologies allow for deeper analysis of faculty performance and the effectiveness of research and community service activities [10]. Consequently, data-driven decision-making can be more accurate and strategic in supporting the improvement of higher education quality [15].

There is a significant gap between the need for an integrated information system and the reality of its implementation in many universities. Although many data-driven information systems are beginning to be adopted, most remain focused on administrative data management and do not support strategic data-driven decision-making. Furthermore, many systems have yet to fully leverage the potential of analytics and artificial intelligence in supporting research and community service performance evaluation. This study focuses on developing a more comprehensive system that integrates HR data, research, and community service into a single platform to provide a more accurate and holistic overview while supporting the achievement of the Tri Dharma of Higher Education. Given the various benefits offered, this study aims to develop and implement the integration of HR data with research and community service data through SIMPELMAS. This approach is expected to enhance the quality and effectiveness of faculty performance management and strengthen academic contributions to society and industry [7]. Additionally, this research will evaluate the impact of system integration on the effectiveness of reporting and decision-making in higher education institutions [16].

II. METHOD

This research employed a prototype-based system development methodology to design and implement the SIMPELMAS platform. The methodological framework comprises three main phases: data collection, system development, and validation. 1. Data Collection The data collection process was conducted using both primary and secondary sources: - Primary data were obtained through direct observation of LPPM operations, interviews with faculty members, and usability testing involving 10 lecturers and 5 administrative staff. These interactions provided insights into the user requirements, operational workflows, and system expectations. - Secondary data included institutional documents, academic reports, and relevant literature. A review of recent studies (published within the last five years) helped situate the system within current academic discourse and informed best practices in system design. 2. System Development Approach The development followed the Prototype model, which supports iterative design and feedback-driven improvement. The process included:- Requirement Analysis: Identification of functional and non-functional requirements through stakeholder meetings and process mapping.- Rapid Design: Creation of system architecture and initial user interface mock-ups using UML diagrams (Use Case, Activity, and Class Diagrams).- Prototype Construction: Initial version of SIMPELMAS was built incorporating key features like proposal submission, progress tracking, and member verification.- User Evaluation: Users tested the prototype in a controlled environment, focusing on functionality, usability, and responsiveness. Feedback was systematically recorded. - Refinement and Iteration: Based on feedback, interface improvements and functional adjustments were made to optimize user experience. - Final Implementation: The refined prototype was deployed in the production environment of Universitas Muria Kudus. 3. Validation and Testing To ensure reliability and performance, several types of testing were conducted:- Functionality Testing: Assessed whether each feature operated as intended.- Integration Testing: Verified data flow between modules.- Security Testing: Checked data encryption, authentication mechanisms, and SQL injection vulnerability.- Responsiveness Testing: Ensured system compatibility with multiple devices and network conditions.- User Acceptance Testing: Measured satisfaction and usability, with success rates recorded at 85% for lecturers and 80% for students. This comprehensive methodology ensures that the developed system not only aligns with the operational context of LPPM but also reflects academic standards for integrated digital platforms in higher education.

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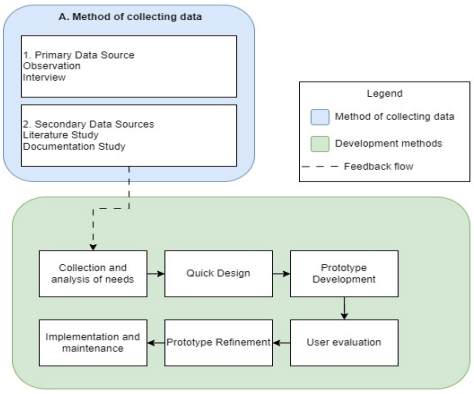

Fig. 1. Research framework

A. Data Collection Methods

The data collection approach in this study was designed hierarchically with two categories of sources:

A.1 Primary Data Sources

Primary data is obtained through direct interaction with the phenomenon under study, ensuring high validity and credibility for the research [17]. The methods for acquiring primary data include:

Observation: Direct observation of business processes at Universitas Muria Kudus, particularly regarding thesis submission and thesis outcomes within the study program. According to [18], this approach enables researchers to document phenomena objectively and gain a comprehensive understanding of the operational context.

Interviews: Data collection through dialogical interactions with relevant stakeholders allows for an in-depth exploration of perspectives, needs, and challenges faced in the existing system [19].

A.2 Secondary Data Sources

Secondary data complements and enriches primary findings, providing a theoretical and referential foundation for the research [20]. The collection methods include:

Literature Review: Exploration of scientific literature related to system analysis and design, guidance systems, and thesis outcomes. As stated by [21], this approach strengthens the conceptual foundation of the research and positions it within a broader scientific context.

Document Study: A systematic examination of documents from various sources, including online materials, textbooks, and other literature, to enhance analytical and comparative perspectives [22].

B. System Development Method (Prototype)

The implementation of the Prototype methodology follows an iterative-incremental approach in system development, integrating six interrelated stages [23]:

B.1 Requirement Collection and Analysis

The initiation phase involves a comprehensive identification of user requirements through collaborative dialogues between developers and stakeholders. As explained by [24], this process aims to articulate functional and non-functional expectations in detail, ensuring that the developed system aligns with the organizational needs of LPPM.

B.2 Rapid Design

Based on the requirement analysis, developers construct a conceptual design framework encompassing system architecture, process flows, and user interfaces. According to [25], although preliminary, this design serves as an essential blueprint for the development of the initial prototype.

B.3 Prototype Development

The conceptual design is implemented into a functional prototype that materializes the system's core features. As noted by [26], this prototype serves as a tangible representation of the proposed concept and forms the basis for user evaluation.

B.4 User Evaluation

This critical phase involves testing the prototype with potential users within relevant operational contexts. [27] highlights that the feedback collected covers aspects of functionality, usability, and the system's effectiveness in addressing identified needs.

B.5 Prototype Refinement

Based on insights from user evaluations, the prototype undergoes modifications and refinements through an iterative process. [28] suggests that this refinement may involve feature revisions, interface improvements, or workflow restructuring to optimize user experience and system functionality.

B.6 Implementation and Maintenance

The culmination of the development process sees the final prototype transformed into an operational system deployed in a production environment. According to [29], this phase also includes continuous maintenance strategies to ensure the system's sustainability and adaptability to institutional changes.

C. Methodological Integration and Information Flow

The schematic representation illustrates a bidirectional flow of information, where outputs from the data collection methods serve as fundamental inputs for the system development process. Findings from observations, interviews, and literature reviews inform each stage of development, from requirement analysis to prototype evaluation [25]. The iterative nature of the Prototype methodology, represented by feedback loops, underscores an adaptive development philosophy wherein the system undergoes continuous refinement based on empirical insights. As emphasized by [30], this approach ensures that the final system not only meets technical specifications but is also aligned with the operational context and user expectations at LPPM Universitas Muria Kudus. This comprehensive methodology represents a holistic approach that integrates academic rigor with operational pragmatism, ensuring the development of a system that is both responsive to the specific needs of the institution and grounded in scientific principles [18].

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III. RESULTS AND DISCUSSION

The SIMPELMAS platform was successfully developed and implemented at Universitas Muria Kudus as an integrated system that centralizes research and community service data. This section presents the key findings from system testing and discusses their implications.

1. System Features and User Interface SIMPELMAS includes a dashboard with intuitive navigation, modules for proposal submission, progress tracking, and final reporting. Key features like membership verification and fund monitoring were also integrated. Figures 2 to 5 illustrate these functionalities. User feedback indicated that the system's layout was easy to understand, though performance on mobile devices with poor internet connection could be improved.

2. Functionality and Integration Testing As shown in Table 1 to Table 4, system components performed with high success rates: - Research module: average success rate of 97.2%. - Community service module: success rate of 96.7%. - General functions (login, file upload/download): 97.6%. - System integration: 98% effectiveness in data flow and feature synchronization.

3. Security and Responsiveness Security tests demonstrated high reliability: - Login and authentication: 99%. - SQL injection protection: 98%. - Data encryption and session timeout: 100% and 97%, respectively. Responsive testing across desktop, tablet, and mobile platforms averaged 98% success. However, the system's speed dropped by 4–5% under slow connections, requiring further optimization.

4. User Acceptance and Usability User satisfaction varied across roles:- Lecturers: 85% satisfaction. - Students: 80% satisfaction.- Admin LPPM and reviewers: over 88%. These scores highlight the need to enhance the user experience, particularly for students and first-time users, through UI/UX refinements and simplified navigation.

5. Comparison with Existing Systems Compared to existing academic platforms, SIMPELMAS provides more comprehensive integration of research and community service management. Most existing systems focus only on administrative data without real-time analytics. The centralization of HR data and research outputs in SIMPELMAS allows more accurate tracking and evaluation, enhancing institutional accountability.

6. Practical Implications The use of SIMPELMAS enables LPPM and faculty to manage research and community service more transparently. Real-time reporting and automated verification reduce manual workload, allowing academic staff to focus on quality improvement. The platform also supports strategic planning through data analytics and reporting features.

7. Limitations Despite high system performance, limitations include: - Suboptimal user experience for mobile and rural users. - The need for training sessions for less tech-savvy users. These insights will guide further development and ensure broader adoption across departments. The integration of academic functions through SIMPELMAS demonstrates a practical model for other institutions seeking digital transformation in higher education.

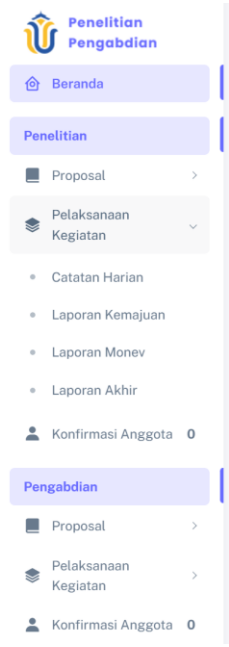

Fig. 2. Menu Features on the SIMPELMAS System

Before displaying the main page of SIMPELMAS, it is important to first understand the main role of this system in supporting academic and research management in higher education environments. SIMPELMAS is designed as an integrated platform that combines human resource data, research, and community service in one comprehensive system. With a data-based approach, this system not only facilitates the recording and reporting of academic activities, but also increases the effectiveness of decision-making and transparency in managing lecturer performance. Through an intuitive interface and complete features, SIMPELMAS provides more structured and efficient access for all users, both academics and other stakeholders. On Figure 3, users will be presented with various main menus designed to facilitate navigation and access to important information related to research, community service, and academic performance evaluation. This view provides a comprehensive overview of the main features of SIMPELMAS and how this system contributes to improving collaboration and academic achievement in higher education.

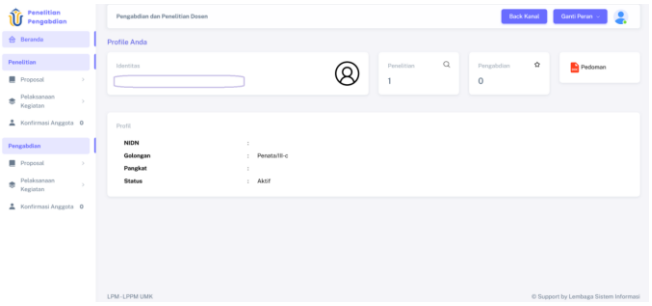

Fig. 3. Dashboard SIMPELMAS

In order to support the improvement of the quality and

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efficiency of research management in higher education, SIMPELMAS provides the Addition of Research Proposals feature. This feature is designed to facilitate lecturers and researchers in submitting research proposals systematically, structured, and well-documented. Through this page, users can input important information related to research, such as title, field of study, research team, and funding sources. With a data-based system, every proposal submitted will be stored in an integrated manner, allowing the verification and evaluation process to run more transparently and efficiently. In Fig. 4, the Addition of Research Proposals page interface is displayed, which makes it easier for users to compile and manage research proposals before they are submitted for further selection and approval processes.

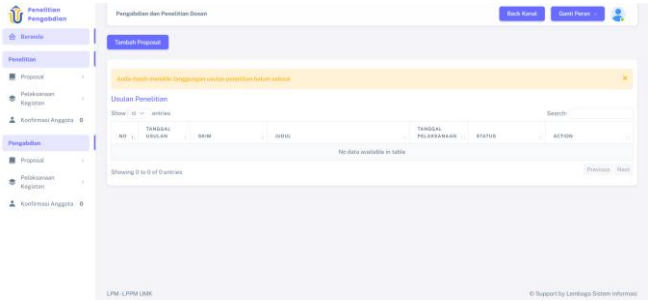

Fig.4. Propose Research Page

The process of managing research and community service in SIMPELMAS is designed to ensure the accuracy and validity of data integrated into the system. One important feature in this platform is the Member Confirmation Page, which functions as a verification step to ensure that each member in a research or community service activity has been registered correctly. Through this page, users can confirm membership by reviewing the list of members that have been entered, making changes if necessary, and approving the team structure involved in the project. This feature not only increases transparency in the management of academic teams but also helps in more accurate administration and reporting processes. Fig. 5 shows the interface of the member confirmation page, which makes it easy for users to ensure the validity of the data before proceeding to the next stage in the SIMPELMAS system.

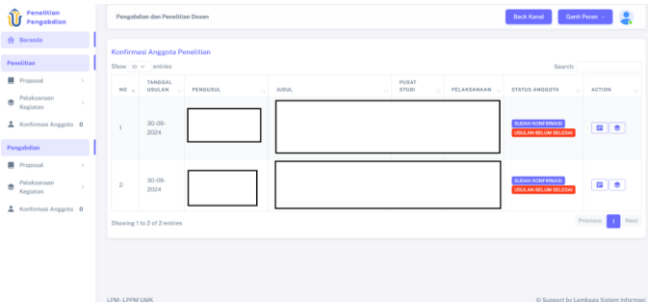

Fig.5. Confirmation Page

Testing on the system focuses on the functionality of each menu and the integration between the menus. In this system testing table, I divide it into 7 main categories:

1. *Research Menu Testing* - Testing all submenus under the Research menu (Home, Research, Proposal, Activity Implementation, Daily Notes, Progress Report, Monitoring and Evaluation Report, Final Report, and Member Confirmation)

TABLE 1. RESEARCH MENU TESTING

No	Submenu	Tested Function	Expected Result	Success Rate (%)	Evaluator
1.1	Dashboard	Dashboard display	Dashboard appears correctly & updated	100%	LPPM Admin
1.2	Research	Research list display	Research data appears accurately	95%	Research Coordinator
1.3	Proposal Submission	New proposal submission	Proposal saved correctly	98%	Research Lecturer
1.4	Proposal Revision	Proposal revision	Revised data saved properly	97%	Lecturer & Reviewer
1.5	Activity Execution	Progress documentation	Progress data saved completely	96%	Research Lecturer
1.6	Daily Notes	Activity recording	Daily notes stored completely	94%	Research Team
1.7	Progress Report	Upload progress report	File uploaded without error	99%	Research Lecturer
1.8	Fund Monitoring	Fund evaluation	Monetary data is accurate & aligned	96%	Monitoring Team
1.9	Final Report	Final report upload	Final report saved correctly	98%	Research Coordinator
1.10	Member Verification	Member confirmation	All members verified	100%	Lead Researcher

2. *Testing the Community Service Menu* - Testing the submenus under Community Service (Proposal, Activity Implementation, and Member Confirmation).

TABLE II. COMMUNITY SERVICE MENU TESTING

No	Submenu	Tested Function	Expected Result	Success Rate (%)	Evaluator
2.1	Proposal Submission	Proposal submission	Proposal saved correctly	97%	Community Lecturer
2.2	Proposal Revision	Proposal revision	Revised data saved without error	96%	Lecturer & Reviewer
2.3	Activity Execution	Activity recording	Activity information saved completely	95%	Community Service Team
2.4	Member Verification	Member confirmation	All members verified	100%	Community Leader

3. *General Functional Testing* - Testing basic functions such as login, notifications, navigation, and file management that apply to the entire system.

TABLE III. GENERAL FUNCTIONAL TESTING

No	Component	Tested Function	Success Rate (%)	Evaluator
3.1	Login/Authentication	System access	99%	IT Team
3.2	Access Security	Login validation	98%	IT Security Team
3.3	Menu Navigation	Page-to-page navigation	97%	UX Specialist
3.4	File Upload	Document upload	95%	IT Team
3.5	File Download	File retrieval/download	99%	IT Team

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4. *Menu Integration Testing* - Testing how different menus interact with each other and share data correctly.

TABLE IV. MENU INTEGRATION TESTING

No	Component	Test Scenario	Success Rate (%)	Evaluator
4.1	Proposal Confirmation	Member notification	100%	LPPM Admin
4.2	Proposal Execution	Change approval	98%	Research Coordinator
4.3	Progress Report	Progress synchronization	97%	System Administrator
4.4	Data Security	Encryption and protection	99%	IT Security Team

5. *Responsive and Adaptive Testing* - Ensuring the system functions properly across a variety of devices and network conditions.

TABLE V. RESPONSIVE AND ADAPTIVE TESTING

No	Aspect	Test Device	Success Rate (%)	Evaluator
5.1	Layout	Desktop (1920×1080)	99%	UI Designer
5.2	Layout	Tablet (768×1024)	98%	UI Designer
5.3	Responsive Layout	Mobile (375×667)	97%	UI Designer
5.4	Network Performance	Slow connection	96%	IT Team

6. *Menu Security Testing* - Tests specific security aspects related to menu access and data manipulation.

TABLE VI. MENU SECURITY TESTING

No	Security Component	Tested Function	Success Rate (%)	Evaluator
6.1	Authentication	Login validation	99%	IT Security Team
6.2	Input Validation	SQL Injection check	98%	IT Security Team
6.3	Data Encryption	HTTPS & protection	100%	IT Security Team
6.4	Session Timeout	Automatic logout	97%	IT Security Team

7. *User Acceptance Testing* - Evaluating user satisfaction from different groups of system users.

TABLE VII. USER ACCEPTANCE TESTING

No	Test Group	Parameter	Success Rate (%)	Evaluator
7.1	Lecturers	Usability Testing	85%	UX Researcher
7.2	Students	Usability Testing	80%	UX Researcher
7.3	LPPM Admin	Task Completion	90%	Head of LPPM
7.4	Reviewer	Focus Group	88%	Reviewer Coordinator

For each test item, I have defined a specific test scenario, expected results, success criteria, and the responsible party as evaluator.

IV. CONCLUSION

This study developed SIMPELMAS, an integrated information system designed to manage research and community service data at Universitas Muria Kudus. Built using a prototype-based development methodology, the system was evaluated through a comprehensive series of functionality, security, integration, and usability tests. The results show that SIMPELMAS effectively centralizes academic data and enhances institutional efficiency. With functionality success rates above 95%, security performance reaching 99–100%, and user satisfaction levels exceeding 85%, the system demonstrates strong reliability and user acceptance. It significantly simplifies proposal submission, monitoring, and reporting processes while improving transparency and enabling data-driven decision-making. This research contributes to the digital transformation of academic management by offering a replicable model of integrated platform development. It addresses a gap in current systems that often operate in silos and lack real-time analytics capabilities. Future research is encouraged to incorporate artificial intelligence for predictive analytics, performance dashboards, and automation features. Additionally, enhancing user interface design and ensuring accessibility in low-bandwidth environments will be vital for broader adoption. Overall, SIMPELMAS serves as a strategic digital innovation that strengthens governance, academic performance, and institutional collaboration in higher education.

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