

Optimizing the Research System to Enhance Research Productivity in Indonesian Higher Education Institutions

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Abstrak

Sistem penelitian di perguruan tinggi Indonesia menghadapi tantangan struktural yang signifikan, termasuk integrasi yang lemah antara fungsi penelitian dan kegiatan keterlibatan masyarakat. Masalah-masalah ini menghambat kontribusi perguruan tinggi terhadap pembangunan berkelanjutan. Penelitian ini bertujuan untuk mengeksplorasi optimalisasi sistem penelitian sebagai sistem terintegrasi yang mencakup analisis kebijakan penelitian, kapabilitas kelembagaan, peran kepemimpinan, kolaborasi internal dan eksternal, serta integrasi penelitian dengan pengabdian kepada masyarakat. Penelitian ini mengadopsi desain kualitatif deskriptif dengan menggunakan pendekatan studi kasus di Universitas Riau. Pengumpulan data dilakukan melalui triangulasi dengan menggunakan wawancara semi-terstruktur dan analisis dokumen. Data dianalisis menggunakan analisis tematik dengan tahapan reduksi data, penyajian data, dan verifikasi data. Hasil penelitian menunjukkan keterbatasan pada versi awal sistem E-PPM, termasuk arsitektur perangkat lunak dan kurangnya mekanisme komunikasi digital yang terintegrasi. Berdasarkan analisis sistem dan evaluasi kebutuhan pengguna, penelitian ini merekomendasikan desain ulang sistem E-PPM dengan spesifikasi antarmuka yang intuitif, alur kerja otomatis, dan visualisasi data berbasis teknologi.

Kata Kunci: Keterlibatan masyarakat, kelembagaan, komunikasi digital, sistem penelitian

Abstract

Research in Indonesian universities faces significant structural obstacles. These issues restrict universities' capacity to support sustainable development. This study aims to evaluate the optimization of the research system as a unified framework covering research policy analysis, institutional capabilities, leadership roles, internal and external collaboration, and the connection between research and community service. The study used a descriptive qualitative design with a case study approach at the University of Riau. Data collection relied on triangulation, combining semi-structured interviews and document analysis. The data were examined through thematic analysis, following data reduction, data display, and data verification. The findings show limitations in the original E-PPM system, such as weaknesses in the software architecture and the lack of an integrated digital communication mechanism. Based on system analysis and an assessment of users' needs, the study recommends redesigning the system with requirements for an intuitive interface, automated workflows, and technology data visualization.

Keywords: Community engagement, digital communication, institutional, research systems

INTRODUCTION

The research system in higher education has become a fundamental element in driving innovation, economic development and addressing global social challenges. High research productivity is recognised as a crucial indicator of institutional performance and a university's international reputation (Râlea et al., 2025). However, research shows that many higher education institutions, particularly in developing countries, face structural barriers to optimising their research systems, including funding constraints, limited infrastructure capacity, and a lack of structured research policies (Kadikilo et al., 2024). At the same time, higher education institutions are also expected to contribute to society through community engagement or outreach activities, creating a complex challenge in balancing the university's three core missions: teaching, research and community engagement (Mokhtar et al., 2025). This challenge requires a deep understanding of the systemic mechanisms that optimise research whilst maximising the social impact of educational institutions.

In the Indonesian context, the university research system faces unique challenges that reflect the specific conditions of a developing country with limited operational funds and a patchwork of infrastructure. Data shows that research productivity in Indonesian higher education institutions still lags behind that of other Southeast Asian countries, with the majority of publications concentrated in a small number of institutions (Seiyaboh & Raimi, 2025). The main obstacles include the fragmentation of research policies across institutions, the lack of an effective incentive system to motivate researchers, limited access to modern research resources, and the lack of integration between research functions and community engagement activities. Furthermore, many researchers in Indonesia face an excessive administrative workload, limited leadership support for research, and suboptimal internal and external collaboration (Asbari et al., 2025). This issue not only affects the production of high-quality research, but also hinders the university's contribution to addressing local problems and promoting sustainable development in line with the Sustainable Development Goals.

Then, the transformation of digital communication within a system can be understood through Media Richness Theory (MRT) and Computer-Mediated Communication (CMC) Theory (Stein, 2011). Media Richness Theory, developed by Daft and Lengel, explains that communication media differ in their ability to convey information effectively, including their capacity for immediate feedback, the use of verbal and non-verbal cues, and message

personalization (Ishak & Min, 2025). In the context of the E-PPM system, this theory is relevant because the limitations of integrated digital communication mechanisms constrain the sharing of information among stakeholders. Redesigning the system with an intuitive interface and automated workflows is an effort to increase the richness of institutional digital communication. Meanwhile, the process of human communication through computers involves audiences in particular contexts and uses media for specific purposes (Wardah & Pandjaitan, 2023) CMC theory further argues that digitalization can generate new communication patterns that are enabled by digital media (Pratiwi et al., 2025).

Optimising the research system requires a holistic approach that addresses institutional, organisational and individual barriers simultaneously. Previous research indicates that the most effective interventions encompass three key dimensions: (1) Visionary leadership and managerial support that translates research policy into operational action, (2) Institutional capacity building through investment in infrastructure, funding, and the development of research staff, and (3) Structured incentive and reward systems to motivate researchers to be productive (Asbari et al., 2025). Research across various contexts shows that transformational leadership which emphasises an inspiring vision, intellectual stimulation and individual support has been shown to enhance researchers' commitment and research output (Agarwal et al., 2026). Furthermore, the integration of data-driven management technologies and knowledge management systems helps institutions make more informed strategic decisions and optimise the allocation of resources for research. This combination of multi-level interventions is believed to be capable of creating a more mature and sustainable research ecosystem.

Contemporary literature suggests that the optimisation of research systems cannot be understood solely through output metrics (publications, citations), but requires an in-depth analysis of process mechanisms, institutional capabilities, and leadership dynamics. International comparative studies reveal that institutions with mature research systems exhibit the following characteristics: (1) clear and transparent governance structures, (2) strategic alignment between institutional mission and research priorities, (3) sustained investment in researcher capacity building, (4) strong interdisciplinary and multi-institutional collaboration, and (5) evidence-based performance evaluation mechanisms (Medved et al., 2026). Research also highlights the importance of integrating community engagement as an integral part of the

research ecosystem, rather than as a separate function, to ensure social relevance and developmental impact (Al-Dmour, 2025).

Although the existing literature provides valuable insights into the drivers of research productivity, there is a significant gap in our understanding of how the mechanisms for optimising research systems operate within the specific context of Indonesian higher education institutions (Moshtari & Ghorbani, 2025). Most research on research and community engagement in Indonesia is descriptive in nature or focuses on specific aspects alone (for example, research funding or researcher satisfaction), but has not yet integrated a holistic perspective that simultaneously combines policy analysis, institutional capacity, leadership and research outputs (Achruh et al., 2024). This study addresses this gap by conducting an in-depth exploration of the optimisation of the research system as an integrated system, involving an analysis of: (a) research policy and its implementation mechanisms, (b) institutional capabilities resources, infrastructure, human resources, (c) the role of leadership in fostering a research culture, (d) internal and external collaboration, and (e) the integration of research with community engagement. The novelty of this research lies in: (1) the combination of qualitative and quantitative methodologies to analyse the research system comprehensively within the Indonesian context, (2) the focus on the mechanisms of integration between research and community engagement functions, and (3) an understanding of the role of leadership and institutional governance in driving not only research productivity but also social impact.

The urgency of this research lies in Indonesia's pressing need to strengthen the university research system as a pillar of innovation, global competitiveness and sustainable development. In this era of digital transformation and globalisation, Indonesia's higher education institutions must be capable of producing research that is not only productive in terms of the number of publications, but also relevant and impactful in addressing local social, economic and environmental issues. This study makes a practical contribution by identifying critical factors, operational barriers and effective strategies that institutional leaders can implement to optimise the research system. The findings of this research will provide an empirical basis for policy-makers at the institutional and national levels in formulating research policies that are more contextually appropriate, effective, and sustainable, whilst ensuring that investment in university research yields significant returns for human resource development, innovation, and Indonesia's overall social development.

RESEARCH METHODOLOGY

This study adopts a descriptive qualitative research design using a case study approach to explore the optimisation of research systems in promoting research productivity and the impact of community engagement at Indonesian higher education institutions, particularly the University of Riau. The qualitative approach was chosen as it enables the researcher to gain an in-depth understanding of the dynamics and mechanisms of optimising complex research systems within an institutional context (Asbari et al., 2025).

The case study design facilitates a structured analysis of the policies, implementation and operational challenges faced by higher education institutions in integrating research with community engagement (Sahri et al., 2025). Research informants involved ten key informants who were purposively selected based on their strategic roles in the research and community service system at the University of Riau. The informants consisted of: (1) The Head of the Institute for Research and Community Service (LPPM) as the highest leader responsible for the institution's research policy; (2) The LPPM secretary managing the operational research program; (3) Two people in the IT field of the EPPM system who integrate the community engagement function; (4) Two reviewers who coordinate the research and community service cluster; and (5) Three senior research lecturers with a minimum of 10 years of experience and internationally indexed publications. Semi-structured interviews were conducted to explore perceptions of barriers, optimization strategies, and the role of leadership in increasing research productivity.

In addition to interviews and document analysis, this study also conducted an evaluation of the E-PPM system through three stages: (1) A system audit of the initial version of E-PPM to identify limitations in software architecture, database structure, and digital communication mechanisms; (2) Development of redesign recommendations based on the results of the SWOT analysis and the institution's digital transformation needs. The system evaluation process used a user-centered design approach with a focus on three dimensions: user interface (UI), automated workflow (automated workflow), and data visualization. Technical data on system limitations were collected through direct observation of the E-PPM platform and technical documentation available at the LPPM Universitas Riau. Secondary data was also collected from national and international publication databases to evaluate the results. Secondary data was also collected from national and international publication databases to evaluate output. Qualitative

data from interviews and documentation were analysed using thematic analysis, comprising the following stages: (1) data reduction through open coding and categorisation, (2) presentation of data in the form of matrices and thematic narratives, and (3) verification and drawing of conclusions, involving member checking with key respondents to ensure validity (Wang, 2025).

RESULTS AND DISCUSSION

Research plays a vital role in driving economic growth and improving a nation's welfare (Erlin Puspaputri, 2026). In this context, higher education institutions play a key role in advancing science, technology and innovation through the implementation of the three pillars of higher education, which encompass education, research and community service. As a state university, the University of Riau bears the responsibility of contributing to national development through the production of scientific knowledge, technological advancement and the sustainable empowerment of communities. Higher education institutions strengthen the national education system by fostering intellectual capacity, innovation and social transformation. To support these objectives, the University of Riau demonstrates its institutional commitment by providing funding schemes for research and community engagement for academic staff within the university. Enhancing research productivity, encouraging scientific collaboration, and increasing the practical application of research outcomes in addressing social and industrial challenges. Through these support mechanisms, the University of Riau seeks to strengthen academic competitiveness whilst promoting the sustainable application of science and technology for the wider benefit of society.



Figure 1. Stages of the Research and Community Engagement Process

Figure 1 illustrates four stages: planning, selection, approval and monitoring. Visually, the diagram employs a linear flow model that demonstrates the systematic interrelationships between processes in the management of research or community service proposals. This phased structure reflects the implementation of an organised administrative mechanism geared towards institutional accountability. Each stage has specific, mutually supportive functions to ensure the quality of proposals and the effectiveness of research programme implementation. The first stage, planning, focuses on the process of announcing and submitting proposals. This stage serves as the initial foundation for encouraging participation by lecturers or researchers through the provision of information regarding funding schemes, administrative requirements, and the institution's research policy direction. Next, the selection stage serves as a mechanism for evaluating the quality of the proposals submitted. In this phase, the novelty of the research, its relevance, methodology, and potential outcomes are the key indicators in determining the eligibility of a proposal.

The third stage is the approval of proposals, which is the decision-making process regarding proposals that have passed the selection stage. This stage reflects the institutional legitimacy of the research to be funded. The final stage, monitoring, emphasises the importance of evaluating and supervising the implementation of research activities. This process aims to ensure alignment between the research plan, its implementation, and the outcomes achieved. Overall, the diagram illustrates that the proposal submission system is designed in a structured manner to support transparency, academic quality, and the effectiveness of research governance within higher education institutions.

Table 1. SWOT Analysis

STRENGTHS	1. The Tri Dharma Framework as an Integrated System. Research data shows that Indonesian universities possess strategic advantages through the Tri Dharma framework, which synergistically integrates teaching, research, and community service. 2. Self-Leadership and Academic Staff Capacity. Research findings reveal that lecturers who demonstrate high levels of self-leadership are more likely to engage in innovative work practices and actively share knowledge. 3. High Community Engagement Potential shows that the community service category recorded the highest score indicating a strong relationship between academic activities and community needs.
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	4. Multi-stakeholder Collaboration. Research shows that institutions with mature research systems exhibit strong interdisciplinary and multi-institutional collaboration characteristics.
WEAKNESSES	1. Infrastructure and Technology Limitations. The research identified that the initial version of the E-PPM system was limited by its non-normalized database structure and the lack of an integrated digital communication mechanism between stakeholders. 2. Digital Literacy Disparities and Cultural Resistance. Research findings reveal that disparities in technological proficiency among lecturers, support staff, and students can hinder system adoption. Many researchers in Indonesia face excessive administrative workloads and suboptimal internal and external collaboration
OPPORTUNITIES	1. Supporting National Policy. The government, through the Directorate General of Research and Development of the Ministry of Higher Education, has issued the 2026 Research and Community Service Guidelines, which serve as the basis for national policy for optimizing the research system. Research findings provide an empirical basis for policymakers at the institutional and national levels. 2. Access to Funding and Strategic Collaboration. Universitas Riau demonstrates its institutional commitment by providing funding schemes for research and community service for academic staff. 3. Integration of AI and Machine Learning Technology. The research recommendation states that further research is needed to explore the integration of Artificial Intelligence (AI) and machine learning into E-PPM systems to support more accurate predictions of proposal success.
THREATS	1. Cybersecurity. Research data identifies cybersecurity as an external threat that must be anticipated in the context of implementing sustainable digital transformation of higher education information. 2. Dynamic User Expectations. Evolving user expectations pose a challenge that must be addressed in the context of the ongoing implementation of the E-PPM system. 3. Digital Literacy Gap. Research findings indicate that the digital literacy gap, adaptation difficulties, and technological barriers hinder the full realization of the benefits of digital transformation. 4. Lagging Research Productivity. Data shows that research productivity in Indonesian universities still lags behind that of other Southeast Asian countries, with the majority of publications concentrated in a small number of institutions.

SWOT analysis (Strengths-Weaknesses-Opportunities-Threats) is a fundamental strategic framework for evaluating the optimisation of research and community service systems in Indonesian higher education institutions. From the perspective of internal strengths, Indonesian universities possess a strategic advantage through the Tri Dharma framework, which synergistically integrates teaching, research, and community service. Digital integration across

these three pillars has proven capable of simultaneously enhancing the quality of teaching, research output, and community engagement. However, identified internal weaknesses include limitations in infrastructure and technology, academic cultural resistance to change, and inadequate contextualisation of performance indicators. External threats, meanwhile, include cyber security, rising user expectations, and a digital literacy gap that hinders the full realisation of digital transformation.

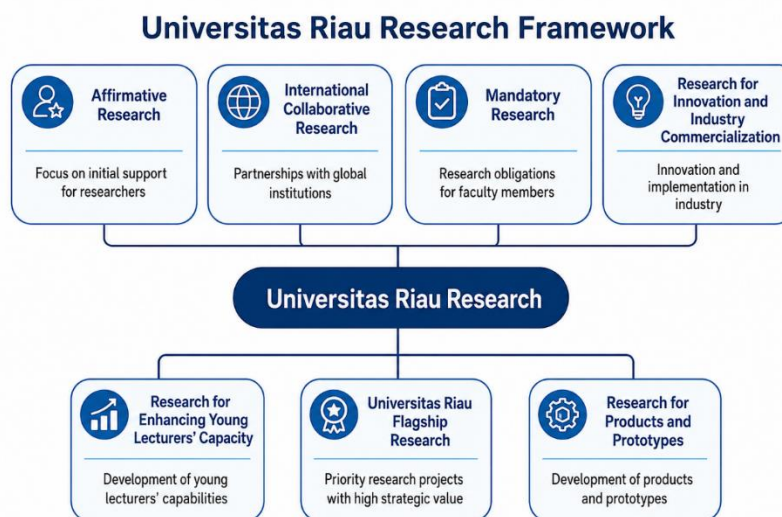


Figure 2. Riau University's Research Roadmap

Figure 2 illustrates the research ecosystem of the University of Riau, which has been developed through an integrated approach encompassing academic capacity building, international collaboration, institutional obligations and an industrial innovation focus. Structurally, the diagram positions University of Riau Research' as the central hub connecting seven distinct research schemes. The placement of the core element in the centre indicates that all research programmes are directed towards supporting the university's strategic agenda as a whole. From the perspective of academic visual communication, this model demonstrates both a top-down and a bottom-up approach simultaneously. The schemes at the top of the diagram represent the institution's strategic policy direction, whilst the lower section illustrates technical implementation and research capacity development at the operational level.

At the top of the hierarchy, Affirmative Research emphasises early support for researchers, indicating a focus on academic renewal and inclusivity in human resource development. Meanwhile, International Collaborative Research reflects the university's global orientation through partnerships with overseas institutions. The existence of this scheme

demonstrates efforts to enhance international visibility, strengthen academic networks, and increase the potential for internationally recognised publications. Furthermore, Mandatory Research frames research as a professional obligation for lecturers, positioning it not merely as a voluntary activity but as an integral part of the university's threefold mission. As for Innovation and Industrial Commercialisation Research, this highlights the university's focus on technology transfer and the application of research outcomes in the industrial sector, aligning with the entrepreneurial university paradigm.

At the bottom of the diagram, the Research Programme for Capacity Building of Early-Career Lecturers reflects the institution's strategy for ensuring the sustainability of research through the development of young academics' competencies. This programme has the potential to strengthen long-term research productivity and cultivate a new generation of researchers. University of Riau's Flagship Research highlights a focus on priority research projects of strategic value and high competitiveness. Meanwhile, Product and Prototype Research emphasises the importance of research outputs that are practical and measurable, particularly in the form of innovative products or technological prototypes.

Overall, this diagram illustrates that the University of Riau's research system is not only focused on the production of academic knowledge, but also on institutional capacity building, internationalisation, and socio-economic impact through innovation and commercialisation. This visualisation demonstrates the integration between research policy, human resource development, and industry needs. Consequently, this model represents the transformation of higher education institutions towards a research ecosystem that is adaptive, competitive, and relevant to both global challenges and national development needs.

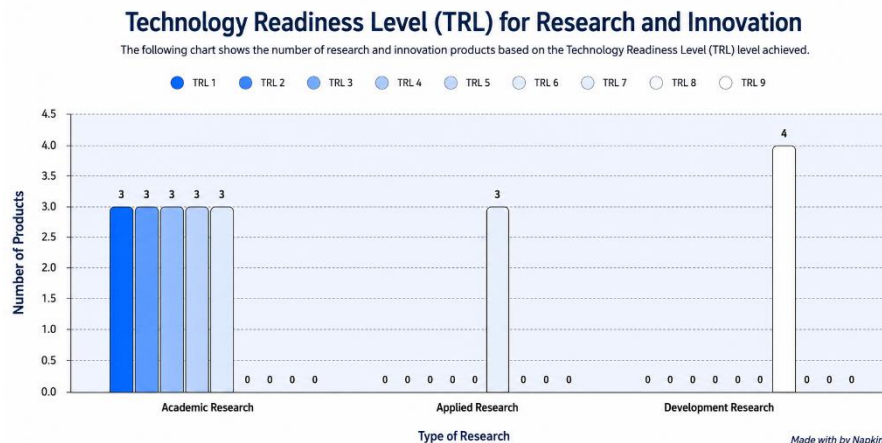


Figure 3. Research Technology Readiness Graph

The Technology Readiness Level (TRL) chart for Research and Community Service illustrates the distribution of technology readiness levels by type of Tri Dharma activity across various research funding and development schemes. Generally, the data reveals a predominance of medium to high TRLs in certain research categories, whilst most other categories remain at zero or have not yet shown significant progress. This pattern indicates that innovation development and technology implementation within the academic environment remain focused on only a few key fields. The visualisation using bar charts allows for a clear identification of the concentration of TKT achievements across each type of research and community service activity.

In the Basic Research category, all indicators show relatively consistent scores at level three. This suggests that basic research has reached the stage of concept validation and early-stage technology development, but has not yet entered the implementation or commercialisation phase. These findings indicate that research activities remain focused on scientific exploration and the strengthening of theoretical foundations. On the other hand, the Applied Research category shows a higher TKT score, namely at level thirty. This figure indicates an increase in technological readiness towards the practical application stage. Applied research generally focuses on solving real-world problems and therefore has greater potential to produce innovations that can be utilised by both society and industry.

The highest score was recorded in the Community Service category, with a score of forty. This high figure indicates that the research findings have been directly implemented in social and community contexts. This demonstrates a strong link between academic activities and community needs, whilst also signifying the successful transfer of knowledge from higher education institutions into practical applications. The dominance of scores in community

service also reflects the fact that research outputs are adopted more quickly in a social context than in the industrial or commercial sectors. Overall, this graph illustrates disparities in the development of TKT across research fields. Basic research remains at the conceptual stage, applied research is beginning to enter the implementation phase, whilst community engagement has demonstrated the highest level of readiness. These findings underscore the importance of an integrated strategy to strengthen the transition from basic research to applied innovation and commercialisation.

CONCLUSION

This study has successfully identified that optimising research and community service systems in Indonesian universities requires a comprehensive digital transformation approach, rather than merely the automation of administrative processes. Key findings indicate that the initial version of the E-PPM system at the Research and Community Service Centre (LPPM) of the University of Riau has fundamental limitations, including a rigid software architecture, a non-normalised database structure, and a lack of integrated digital communication mechanisms between stakeholders. The SWOT analysis reveals that the Tri Dharma Perguruan Tinggi framework represents a strategic strength that can be optimised through the simultaneous digital integration of the pillars of teaching, research and community service. However, threats such as the digital literacy gap, cybersecurity and dynamic user expectations remain challenges that must be anticipated in the context of ongoing implementation. The researchers' first recommendation is that university management should develop a sustainable digital capacity-building programme for the entire academic community, covering digital literacy training, research data management, and the utilisation of integrated information systems. These E-PPM system redesign recommendations were generated through a systematic evaluation process involving a system audit, user needs analysis, and integration of SWOT analysis results with digital transformation best practices in the context of Indonesian higher education.

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