

Implementation of an Integrated RPS Information System for Monitoring Course Content Alignment and Digital Signature Automation

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Article Info	ABSTRACT
Keywords: RPS Information System Course Content Alignment Digital Signature Automation Academic Governance Higher Education Systems	This study aimed to design and implement an integrated Semester Learning Plan (RPS) information system to support course content alignment monitoring and digital signature automation in higher education. The research employed a system development-oriented methodology consisting of needs analysis, system design, development, testing, and deployment. The resulting web-based system integrated RPS document management, structured monitoring of instructional alignment, and secure digital signature workflows within a single platform. Functional testing and initial system utilization demonstrated that the system successfully standardized RPS formats, improved the effectiveness of learning implementation monitoring, and significantly reduced approval time through automated digital validation. Role-based access control ensured data security and workflow integrity, while audit logs enhanced traceability and accountability of academic documents. User feedback indicated positive acceptance, improved usability, and better coordination among lecturers, administrators, and quality assurance officers. Overall, the implementation of the integrated RPS information system contributed to increased transparency, efficiency, and accountability in academic planning and governance. The system also supported institutional digital transformation efforts by promoting paperless administration and sustainable academic quality assurance practices.
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INTRODUCTION

Curriculum is an essential foundation in higher education systems, serving as a strategic framework for defining graduate learning outcomes, course content structures, learning strategies, and evaluation methods applied in academic processes (Mahgafhira et al., 2023). A systematically designed and implemented curriculum plays a crucial role in ensuring learning quality and aligning graduate competencies with labor market demands and the development of scientific knowledge (Aziira et al., 2023). Therefore, periodic curriculum evaluation and revision are imperative to maintain relevance, accountability, and the competitiveness of higher education institutions (Supriyanto et al., 2024). As an operational derivative of the curriculum, each course is required to have a Semester Learning Plan (*Rencana Pembelajaran Semester/RPS*) that is systematically developed and aligned with program learning outcomes (Sepniwita, 2021). The RPS functions as a learning planning document that outlines learning objectives, instructional materials, teaching methods, assessment forms, and references used throughout the semester (Aminuddin et al., 2021). The existence of the RPS not only serves as a guideline for lecturers and students during the learning process but also acts as a critical instrument for academic quality assurance and program accreditation assessment.

Despite its strategic role, the implementation and management of RPS in many higher education institutions still face various challenges. Common issues include non-uniform RPS formats, difficulties in monitoring the alignment between delivered course content and the planned syllabus, as well as validation processes that still rely on manual signatures. Such manual procedures tend to be time-

consuming, inefficient, and vulnerable to administrative errors and potential document forgery (Adilah et al., 2022).

In addition, lecturers' levels of understanding regarding standardized RPS preparation in accordance with curriculum and accreditation policies vary considerably. This condition adversely affects the quality of learning monitoring and evaluation conducted by study programs and internal quality assurance units. Without the support of an integrated system, supervising the alignment between planned and implemented learning activities becomes difficult to conduct objectively and sustainably (Monoarfa et al., 2024). Advances in information technology offer opportunities to address these challenges through the implementation of integrated academic information systems. A digital-based RPS information system enables centralized, consistent, and easily accessible management of RPS documents for all stakeholders. The integration of course content alignment monitoring features within the RPS system allows study programs to conduct real-time supervision of learning activities, thereby enhancing lecturers' compliance with predetermined learning plans (Habib et al., 2021).

Furthermore, the adoption of digital signatures within RPS information systems represents a relevant solution for improving the efficiency and security of academic document validation processes. Digital signatures have been proven to accelerate document authorization, reduce paper usage, and enhance the legal validity and integrity of academic documents. The implementation of digital signatures in the context of RPS also supports higher education digital transformation toward modern and transparent academic governance (Penubadi et al., 2023).

The persistence of conventional and non-integrated RPS management practices, as observed in the Information Systems Study Program at University, highlights an urgent need for the development of an integrated RPS information system capable of accommodating course content alignment monitoring and digital signature-based document validation (Da Silva et al., 2020). Therefore, this study aims to implement an integrated RPS information system that not only facilitates RPS preparation and management but also supports learning monitoring and digital validation processes as part of efforts to enhance academic quality.

METHODS

This study employs a system development-oriented research methodology aimed at designing, developing, and implementing an integrated RPS (Semester Learning Plan) information system to support course content alignment monitoring and digital signature automation. The research method emphasizes practical system construction supported by empirical data collection to ensure that the developed system addresses real academic administrative needs in higher education institutions.

The overall research process is structured into several sequential stages, including needs analysis, system design, system development, implementation, and functional validation. This approach is commonly applied in information systems research where the primary contribution lies in the development of a technological artifact that solves organizational problems (Rezazade et al., 2022). System development stages of the integrated RPS information system can be explained at table 1.

Table 1. System Development Stages of the Integrated RPS Information System

Stage	Activities	Description	Outputs
Needs Analysis	Document review, observation, stakeholder consultation	Identification of functional and non-functional requirements based on existing RPS documents, curriculum standards, and academic workflows	System requirement specification
System Design	Architecture design, database modeling, interface prototyping	Development of system architecture, user roles, database structure, and user interface mockups for RPS management, monitoring,	System design documents and prototypes

		and digital signature modules	
System Development	Coding, module integration, iterative refinement	Implementation of system features including RPS creation, content alignment monitoring, and digital signature automation using web-based technologies	Functional integrated RPS information system
System Testing	Functional testing, scenario-based validation	Verification of system functionalities to ensure accurate data processing, workflow execution, and security of digital signatures	Tested and validated system
System Deployment	Installation, user orientation, initial operation	Deployment of the system within the academic environment and introduction to end users	Operational system in academic use
System Evaluation	User feedback collection, improvement identification	Collection of feedback from users to identify usability issues and opportunities for further enhancement	System refinement recommendations

Data Source: Researcher 2025

The initial stage focuses on identifying system requirements through document analysis, observations, and stakeholder consultations. Existing RPS documents, institutional curriculum guidelines, and academic quality assurance policies are reviewed to understand the standard structure and mandatory components of RPS documents. Observations are conducted to examine current RPS management practices, particularly the manual processes involved in document validation and monitoring of course content delivery (Wahyono & Widiyanto, 2024).

In addition, informal interviews are conducted with lecturers, program administrators, and quality assurance personnel to capture functional requirements and common challenges related to RPS preparation, approval, and monitoring. This stage ensures that the system requirements reflect actual academic workflows and align with institutional governance practices, as recommended in recent educational information system development studies (Salama & Aly, 2024).

Based on the identified requirements, the system architecture and functional design are developed. The system is designed as a web-based information system to enable centralized access, scalability, and ease of integration with existing academic platforms. The design phase includes the development of use case diagrams, database schemas, and interface prototypes, which describe interactions between users and system components.

Key functional modules designed in this stage include RPS document management, course content alignment monitoring, and digital signature automation. The monitoring module maps weekly learning activities and teaching materials against predefined RPS components, enabling structured supervision of instructional consistency. The digital signature module is designed to support secure and traceable electronic approval processes, following best practices in academic document authentication (Fakour & Pourier, 2024).

The use case diagram illustrates the functional interactions between users and the Integrated RPS Information System, it can be explained at figure 1.

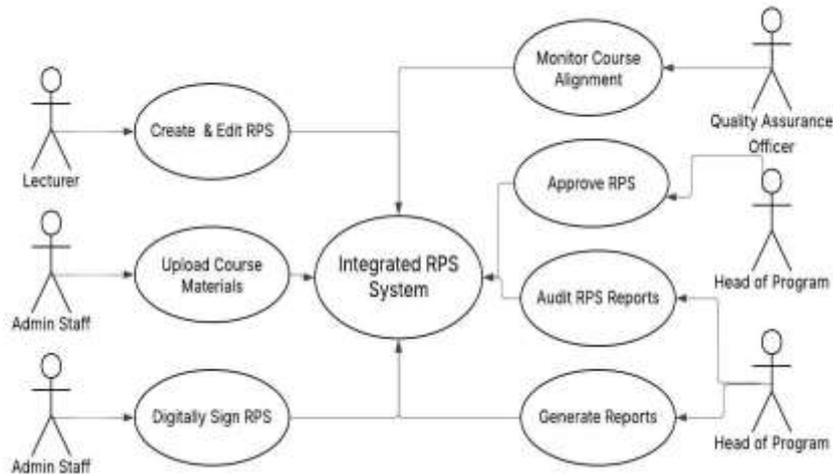


Figure 1. Use Case Diagram RPS System

The use case diagram illustrates the functional interactions between users and the Integrated RPS Information System, which is designed to support the preparation, monitoring, and validation of Semester Learning Plans (RPS). The diagram represents the system as a centralized platform that integrates RPS document management, course content alignment monitoring, and digital signature automation to improve academic governance and quality assurance processes.

Several actors are involved in the system, each representing a distinct role within the academic environment. The Lecturer acts as the primary content creator, responsible for creating and editing RPS documents in accordance with curriculum standards. Lecturers also interact indirectly with the monitoring mechanism through the alignment of weekly learning activities and instructional materials with the predefined RPS structure. This interaction ensures that instructional planning remains consistent throughout the semester.

The Administrative Staff supports academic operations by managing course-related data and assisting in the uploading of course materials into the system. Their role ensures that RPS documents and learning materials are properly organized and accessible within the platform. Additionally, administrative staff facilitate the digital signing process by ensuring that documents are ready for validation and approval, contributing to workflow efficiency and document integrity.

The Quality Assurance Officer plays a supervisory role in monitoring course content alignment. This actor uses the system to evaluate whether the implemented learning activities correspond with the approved RPS. The monitoring function allows quality assurance personnel to perform structured oversight in real time, supporting internal quality assurance mechanisms and continuous improvement of the learning process.

The Head of Program is responsible for formal approval and academic accountability. This actor interacts with the system to approve RPS documents through the digital signature feature, ensuring official authorization and traceability. In addition, the Head of Program can audit RPS reports and generate summary reports related to course implementation and compliance. These reporting functions support decision-making processes and accreditation requirements by providing documented evidence of curriculum implementation.

Overall, the use case diagram demonstrates how the Integrated RPS Information System coordinates multiple academic roles within a single digital environment. By clearly defining user responsibilities and system functionalities, the diagram highlights how the system enhances efficiency, transparency, and accountability in RPS management. The integration of monitoring and digital signature features ensures that both academic planning and validation processes are conducted in a structured, secure, and sustainable manner.

The system development phase involves translating the conceptual and architectural system design into a fully functional application using appropriate web-based development technologies. At

this stage, all system components that were previously defined during the design phase, such as user roles, functional modules, database structures, and workflow mechanisms are implemented into executable software. The development process follows an iterative and incremental approach, in which system features are developed in successive cycles rather than in a single deployment. Each iteration focuses on implementing specific functionalities, including RPS document creation and management, course content alignment monitoring, and digital signature automation. After each development cycle, internal testing is conducted to verify system functionality, data consistency, and workflow accuracy. Feedback from potential users, such as lecturers and academic administrators, is continuously collected and incorporated into subsequent iterations to refine system performance and usability. This iterative development strategy enables early identification of design inconsistencies, functional gaps, and usability issues, thereby reducing the risk of major revisions at later stages. Furthermore, continuous refinement based on user feedback ensures that the system aligns closely with real academic practices and institutional requirements. By adopting this approach, the development process not only enhances system usability and reliability but also minimizes discrepancies between initial design expectations and actual system implementation, ultimately resulting in a robust and user-centered integrated RPS information system that effectively supports academic planning, monitoring, and digital validation processes (Pressman & Maxim, 2020).

During the implementation stage, user roles are clearly defined and structured to reflect actual academic governance and operational responsibilities, including lecturers, study program administrators, quality assurance officers, and academic leaders. Each role is assigned specific access privileges and system permissions based on the principle of role-based access control, ensuring that users can only perform actions relevant to their responsibilities. Lecturers are granted access to create, edit, and submit RPS documents and upload course-related materials, while study program administrators manage academic data, oversee document completeness, and facilitate workflow coordination. Quality assurance officers are provided access to monitoring features that allow them to review course content alignment with approved RPS documents and identify deviations from planned learning activities. This role differentiation enhances data security, prevents unauthorized access, and maintains workflow integrity throughout the RPS lifecycle. In parallel, digital signature automation is implemented using secure authentication mechanisms, such as user identity verification and cryptographic validation, to ensure that only authorized users can approve and sign academic documents. The digital signature process guarantees document integrity by preventing unauthorized modifications after approval, ensures traceability by recording signing activities and timestamps, and supports non-repudiation by binding the signer's identity to the document. These elements are essential for electronic academic document validation, as they provide legal reliability and institutional accountability. By integrating secure role management and digital signature automation, the system establishes a trustworthy and efficient digital environment that supports transparent academic administration and strengthens the overall governance of RPS management processes (Rakhra et al., 2024).

After the development phase is completed, the system undergoes a comprehensive functional testing process to ensure that each module operates in accordance with predefined requirements and system specifications. Functional testing is conducted to verify the accuracy and consistency of RPS data processing, including the creation, modification, storage, and retrieval of RPS documents. Particular attention is given to the reliability of the course content alignment monitoring module, which is tested to confirm that learning activities and instructional materials are correctly mapped against the approved RPS structure. In addition, the digital signature workflow is rigorously tested to ensure that document approval processes function correctly, that authorization is properly enforced based on user roles, and that digitally signed documents remain secure and unaltered after validation. Validation is performed by systematically comparing system outputs, such as approved RPS documents, monitoring reports, and audit logs with expected academic administrative outcomes defined by institutional policies and quality assurance standards (Sartika et al., 2023).

Beyond technical testing, user-based validation is also carried out by allowing selected end users, including lecturers, study program administrators, and quality assurance officers, to interact with the system in real academic scenarios. This practical validation phase aims to evaluate system usability,

workflow suitability, and alignment with daily academic practices. Feedback collected from users is analysed to identify usability issues, navigation difficulties, and functional gaps that may not be detected during technical testing. The system is then refined based on this feedback prior to full deployment. This combined approach to functional and user-based validation ensures that the system is not only technically reliable but also contextually appropriate and effective in supporting academic administration, learning monitoring, and digital document validation processes within higher education environments (Atalla et al., 2023).

The finalized system is deployed in the Information Systems Study Program environment and integrated into routine academic administration processes. Deployment includes user orientation sessions to familiarize stakeholders with system features and workflows. System utilization is monitored during the initial implementation phase to ensure stability and adoption. The implementation of the integrated RPS information system is expected to improve transparency, efficiency, and accountability in academic planning and monitoring processes. By digitalizing RPS management and validation, the system supports institutional efforts toward digital transformation and sustainable academic governance (Kasmia & M'hamed, 2023).

Once the system has been finalized and validated, it is deployed within the Information Systems Study Program environment and formally integrated into routine academic administration processes. Deployment is carried out in a controlled manner to ensure system stability and minimize disruption to ongoing academic activities. As part of this phase, user orientation and training sessions are conducted to familiarize key stakeholders, including lecturers, study program administrators, and quality assurance personnel with the system's features, workflows, and operational procedures. These sessions aim to enhance user readiness, reduce resistance to change, and promote effective utilization of the system in daily academic practices. During the initial implementation period, system usage is closely monitored to assess operational stability, identify technical issues, and evaluate the level of user adoption across different roles. Usage logs and user feedback are reviewed to ensure that the system functions as intended and supports academic workflows efficiently (Adepapo et al., 2023).

The implementation of the integrated RPS information system is expected to significantly enhance transparency, efficiency, and accountability in academic planning and monitoring processes. By digitalizing RPS management, course content alignment monitoring, and document validation through automated digital signatures, the system reduces administrative workload, shortens approval cycles, and minimizes the risk of documentation errors or inconsistencies. Furthermore, centralized and traceable data management strengthens institutional oversight and supports evidence-based decision making for curriculum evaluation and quality assurance. In line with higher education digital transformation initiatives, the system contributes to sustainable academic governance by promoting standardized processes, improving data integrity, and enabling continuous monitoring of learning implementation. These outcomes align with contemporary perspectives on digital transformation in higher education, which emphasize the role of integrated information systems in enhancing organizational performance and academic quality (Thelma et al., 2024).

RESULTS AND DISCUSSION

Implementing the integrated RPS information system designed to support course content alignment monitoring and digital signature automation. The findings are derived from system development outcomes, functional testing, and initial system utilization within the academic environment. The discussion focuses on how the implemented system addresses previously identified challenges in RPS management, including document standardization, monitoring effectiveness, and validation efficiency. By examining system functionality, user interaction, and operational impact, this section highlights the practical contributions of the system to academic planning, quality assurance, and digital governance in higher education. The results are interpreted in relation to the research objectives and existing literature on academic information systems and digital transformation, providing insights into the system's effectiveness and its implications for sustainable academic administration.

3.1. System Implementation Results

The implementation of the integrated RPS information system resulted in a fully functional web-based platform that supports RPS document management, course content alignment monitoring, and digital signature automation. The system successfully integrates multiple academic roles within a single environment, allowing lecturers, study program administrators, and quality assurance officers to perform their respective tasks efficiently according to predefined workflows. All core modules, RPS creation, editing, submission, approval, monitoring, and validation were implemented and operated as designed during the deployment phase.

The RPS management module enables lecturers to create and update RPS documents using standardized templates aligned with institutional curriculum guidelines. This standardization reduces inconsistencies in RPS format and content, which were previously common in manual or semi-digital practices. The system ensures data completeness by enforcing mandatory fields before submission, thereby improving the overall quality of RPS documentation. These results indicate that the system effectively supports structured academic planning and documentation processes. Interface description about the system can be explained by figure 2.

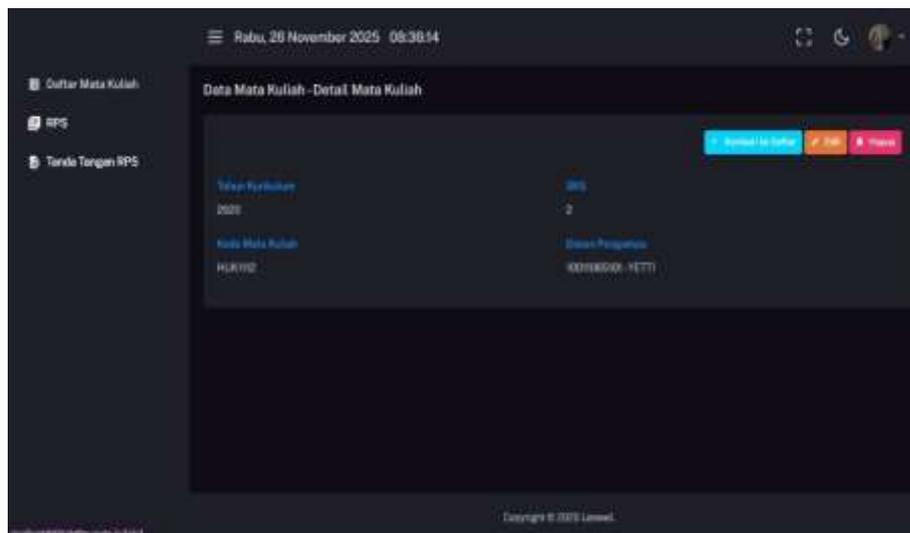


Figure 2. Home Page Interface of the RPS Information System

The home page of the RPS Information System serves as the main entry point for users and provides an overview of system functionalities and academic information. The interface is designed to be intuitive, role-aware, and informative, enabling users to access key features efficiently.

Main components of the home page include:

1. **Header Section**
Displays the system title, institutional identity, and navigation menu for accessing core modules such as RPS Management, Course Monitoring, Digital Approval, and Reports.
2. **User Authentication Panel**
Provides secure login access using user credentials. After authentication, the system automatically adjusts displayed features based on the user's role (e.g., lecturer, administrator, quality assurance officer).
3. **Dashboard Overview**
Presents a summary of academic information, including the number of RPS documents created, submitted, approved, and pending validation. This section offers a quick snapshot of system activity.
4. **Quick Access Menu**
Contains shortcut buttons to frequently used functions such as creating a new RPS, reviewing submitted RPS documents, monitoring course content alignment, and accessing digital signature approvals.

5. Notification and Status Panel
Displays system notifications related to RPS submission deadlines, approval status, monitoring alerts, and system updates.
6. Footer Section
Includes copyright information, system version details, and institutional contact information.

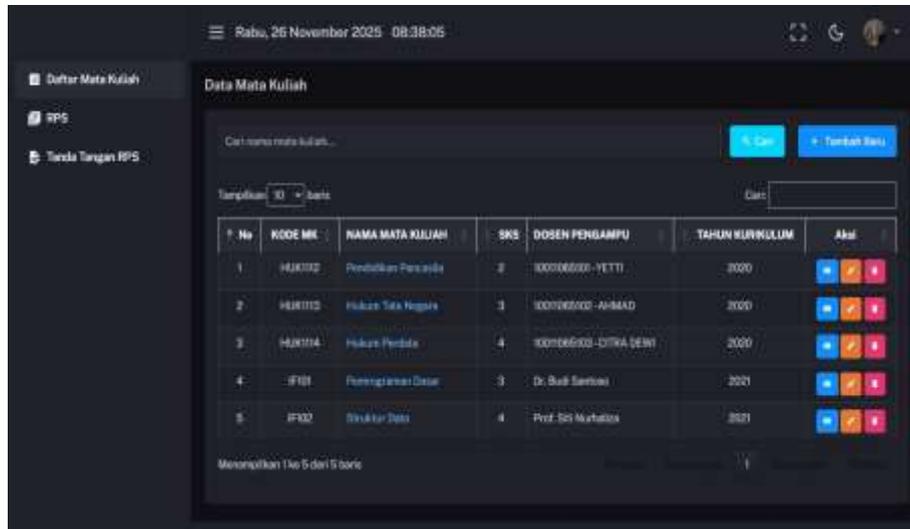


Figure 3. List of RPS information systems courses

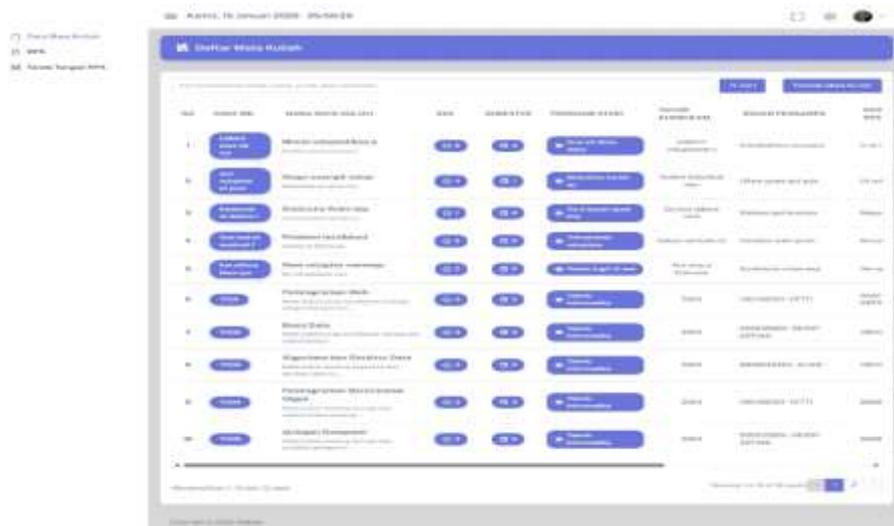


Figure 4. Course data pages

The home page of the RPS Information System is designed to function as a centralized dashboard that facilitates efficient access to academic planning and monitoring processes. By presenting essential information and system functions in a structured and user-friendly layout, the interface supports users in performing their tasks with minimal navigation effort. Role-based content presentation ensures that each user views only relevant features, thereby enhancing usability and data security. The dashboard overview provides real-time visibility into RPS management progress, enabling users to quickly identify pending tasks and system status. Overall, the home page plays a critical role in improving transparency, operational efficiency, and user engagement by integrating academic planning, monitoring, and digital validation processes into a single, accessible interface.

3.2. Course Content Alignment Monitoring

One of the key outcomes of this study is the successful implementation of a course content alignment monitoring feature. This module allows learning activities and instructional materials to be

systematically mapped against the approved RPS components. During system utilization, quality assurance officers were able to monitor alignment between planned and implemented learning activities in a timely and structured manner. Monitoring reports generated by the system provide clear visibility into compliance levels across courses, enabling early identification of deviations from planned instruction.

This functionality addresses a critical gap in conventional RPS management, where monitoring is often retrospective and document-based. By enabling real-time or near-real-time supervision, the system enhances academic oversight and supports continuous quality improvement. The results demonstrate that the monitoring feature contributes to improved accountability and consistency in course implementation, reinforcing the role of RPS as an active control instrument rather than a static administrative document.

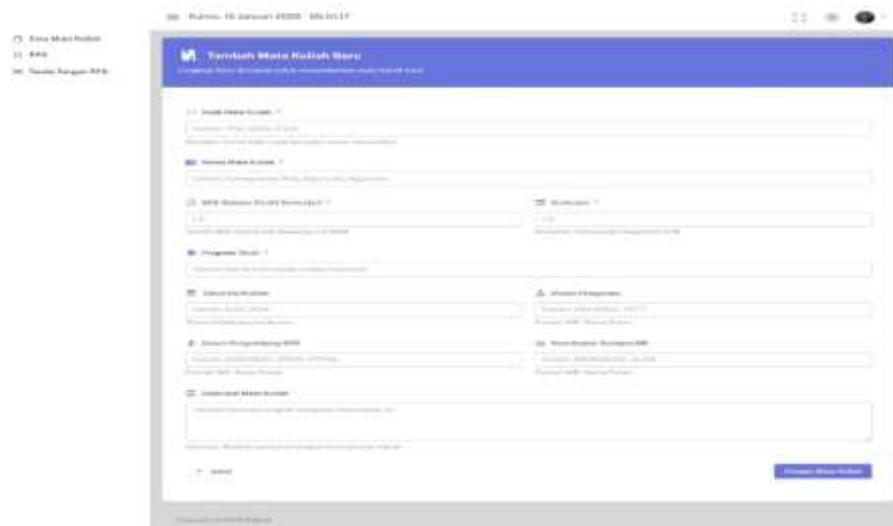


Figure 5. Add courses data to the RPS system



Figure 6. Edit courses data to the RPS System

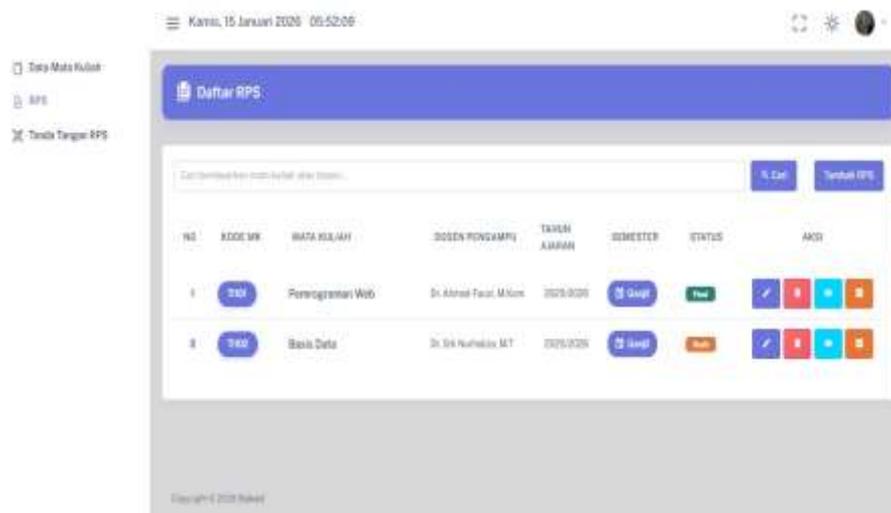


Figure 7. Page of RPS information system

3.3. Digital Signature Automation Outcomes

The digital signature automation module was successfully implemented and integrated into the RPS approval workflow. Academic leaders and authorized personnel were able to validate and approve RPS documents electronically using secure authentication mechanisms. Once signed, documents were automatically locked to prevent unauthorized modifications, ensuring document integrity and traceability. Audit logs generated by the system record signing activities, timestamps, and user identities, supporting non-repudiation and administrative transparency.

The implementation of digital signatures significantly reduced the time required for document approval compared to manual signature processes. Moreover, the system minimized dependency on physical documents, contributing to paperless administration and operational efficiency. These results confirm that digital signature automation is a viable and effective solution for academic document validation in higher education environments.

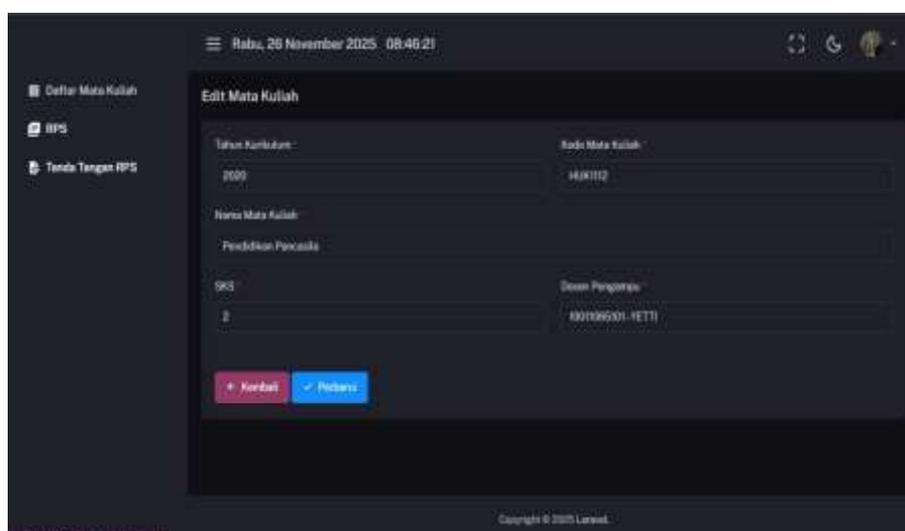


Figure 8. Digital signature automation at the RPS system

3.4. System Usability and Adoption

User interaction during the initial deployment phase indicates positive system acceptance across different academic roles. Lecturers reported that the system simplified RPS preparation and submission, while administrators and quality assurance officers highlighted improvements in workflow coordination and monitoring efficiency. The role-based access control mechanism ensured that users could perform their tasks without interference or data security concerns.

User feedback collected during the implementation phase was used to refine interface elements and workflow sequences, improving overall usability. These findings suggest that the iterative development and user-centered implementation approach contributed positively to system adoption and operational effectiveness.

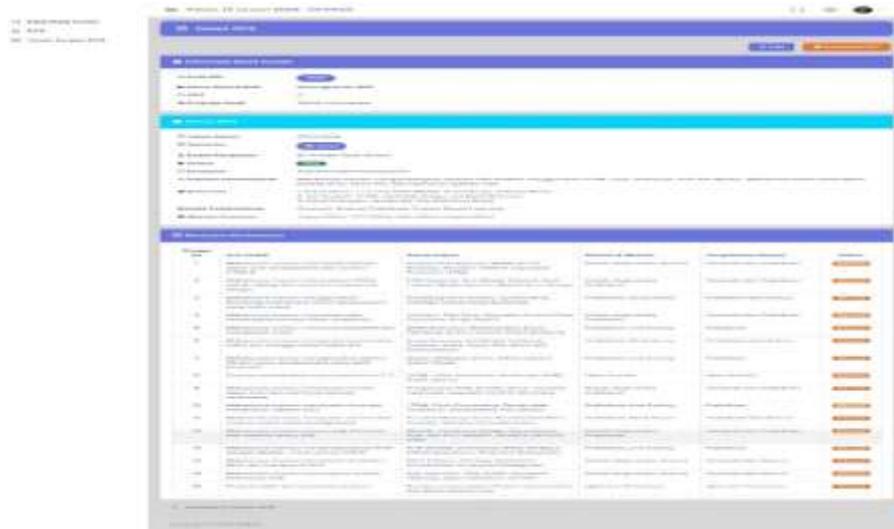


Figure 9. User interaction of RPS system and digital signature

3.5. Implications for Academic Governance

The results of this study demonstrate that the integrated RPS information system supports improved academic governance by enhancing transparency, efficiency, and accountability. Centralized data management and automated validation processes strengthen institutional control over curriculum implementation and learning quality. The system also provides documented evidence that can support accreditation processes and internal quality assurance audits.

Consistent with previous studies on digital transformation in higher education, the findings indicate that integrated academic information systems play a critical role in modernizing academic administration and supporting sustainable governance practices.

CONCLUSION

This study successfully designed and implemented an integrated RPS information system aimed at monitoring course content alignment and automating digital signatures within a higher education context. The system effectively addresses common challenges in conventional RPS management, including inconsistent document formats, limited monitoring capabilities, and inefficient manual validation processes. By integrating RPS management, monitoring, and digital signature functionalities into a single platform, the system enhances the quality and reliability of academic planning and documentation.

The implementation results demonstrate that the system improves transparency and accountability in curriculum execution by enabling structured monitoring of learning activities and secure digital validation of academic documents. The adoption of digital signatures ensures document integrity, traceability, and non-repudiation, while role-based access control strengthens data security and workflow integrity. Furthermore, the system supports institutional digital transformation initiatives by reducing administrative workload and promoting standardized academic processes.

Despite its positive outcomes, this study is limited to implementation within a single study program environment. Future research may expand the system to institution-wide deployment, integrate learning analytics features, or evaluate long-term impacts on learning quality and accreditation performance. Nevertheless, this research provides practical and empirical evidence that an integrated RPS information system can serve as a strategic tool for enhancing academic governance and quality assurance in higher education institutions.

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