Integrated Quality Assurance Information System for Higher Education: A Web-Based Platform for SPMI, HRIS, SIAKAD Integration, and Accreditation Readiness

Rizza Muhammad Arief[1]*, Hudan Eka Rosyadi[2], Nofrian Deny Hendrawan[3]

[123]Faculty of Information Technology, Universitas Merdeka Malang, Malang, Indonesia
Email: rizza@unmer.ac.id, hudan@unmer.ac.id, nofrian.hendrawan@unmer.ac.id

*Correspondence Author: rizza@unmer.ac.id

***Abstract*—Quality assurance in higher education depends on continuous evidence management, yet SPMI, SIAKAD, HRIS, AMI, and accreditation data are often fragmented across separate repositories. This study designs and evaluates a web-based quality assurance information system that links the PPEPP cycle with BAN-PT/LAM accreditation preparation. Following Design Science Research Methodology, the artifact integrates SPMI workflows, SIAKAD/HRIS data mapping, LKPS/LED evidence management, readiness dashboards, role-based access control, audit trails, and accreditation export packages. Evaluation in a staging environment used black-box testing, RBAC testing, API smoke testing, integration-flow testing, and UAT with 10 stakeholders. Operational readiness increased from a 23% baseline to 82%, LED preparation time decreased from 21 days to 6.7 days (68%), 42 of 45 API endpoints passed (93.3%), and the SUS score reached 81.2. These results indicate improved traceability and operational readiness, but they should not be interpreted as a direct prediction of accreditation rank.**

***Keywords*—Internal Quality Assurance System, PPEPP, Higher Education Accreditation, SIAKAD-HRIS Integration, Quality Assurance Information System, Design Science Research, Evidence Traceability, Audit Trail**

I. INTRODUCTION

A. *Background*

National accreditation policies issued by BAN-PT and LAM require higher education institutions in Indonesia to implement a documented and measurably sustainable Internal Quality Assurance System (SPMI). In the current regulatory context, higher education quality assurance is governed by Permendikti Saintek No. 39 of 2025, while the operational SPMI cycle is commonly implemented through PPEPP (Determination, Implementation, Evaluation, Control, and Improvement of Standards) [1].

In many higher education quality assurance contexts, quality-related data are distributed across several systems that are not always directly connected. Academic data reside in SIAKAD, lecturer and education staff data reside in HRIS/SIMPEG, national higher education records are consolidated through PDDikti, SPMI documents are stored in separate repositories, and Internal Quality Audit (AMI) data and Quality Review Meetings (RTM) are manually documented in reports [2]. Moreover, accreditation requirements—including Higher Education Performance Reports (LKPS), Self-Evaluation Reports (LED), physical evidence, and self-assessment—are generally compiled from these scattered data [3, 4].

This fragmentation creates several operational problems. First, data duplication occurs because different work units enter the same data into different systems. Second, quality indicator inconsistency arises when SIAKAD records one value but SPMI documents record another. Third, the verification process for accreditation physical evidence becomes slow because verifiers must open many separate systems. Fourth, accreditation readiness is difficult to monitor because there is no centralized dashboard showing document completeness status per criterion [5, 6, 7, 8].

The specific problem addressed in this study is the limited availability of an end-to-end mechanism that connects daily operational data with LKPS, LED, and accreditation physical evidence requirements. The accreditation document preparation process remains reactive and manual, and is often conducted close to the accreditation period rather than as a continuous process integrated with the SPMI/PPEPP cycle [1].

B. *Research Gap*

A review of related work indicates both practical and research gaps. Many existing systems in the market or independently developed by higher education institutions tend to focus on partial functions, such as SPMI document storage, AMI monitoring, corrective-action follow-up, or accreditation portals. Integrated support for PPEPP, HRIS, SIAKAD, and accreditation evidence management in a single command-center model remains limited [5, 6, 9, 7, 10, 11].

Prior studies have examined quality assurance applications as document repositories, audit support tools, accreditation data-management systems, or dashboard prototypes. However, the linkage between daily academic transactions, human-resource records, PPEPP activities, and accreditation evidence remains underdeveloped. This study therefore focuses on data-to-evidence traceability and readiness monitoring rather than merely on storing accreditation files [9, 7, 12, 10, 8, 13, 14].

C. *Research Questions*

Based on the problem identification above, the study formulates four research questions:

1) How can an integrated system architecture be designed

to connect SIAKAD, HRIS, and SPMI data with BAN-PT/LAM-based accreditation requirements?
2) How can academic data (SIAKAD) and human-resource data (HRIS) be automatically mapped into LKPS, LED, and accreditation physical evidence?
3) How can periodic accreditation readiness monitoring be implemented based on a PPEPP workflow that is accessible to various stakeholders?
4) How can role-based access control (RBAC), audit trails, and evidence traceability be ensured in the developed system?

D. *Research Objectives*

This study has four main objectives that are aligned with the research questions:
1) To design an integrated architecture that connects SIAKAD, HRIS, SPMI, and BAN-PT/LAM-based accreditation requirements.
2) To develop a data mapping and evidence management mechanism that links academic and human-resource data to LKPS, LED, and accreditation physical evidence.
3) To implement accreditation readiness monitoring based on PPEPP workflow indicators that can be accessed by relevant stakeholders.
4) To evaluate the system's security and accountability features, including RBAC, audit trails, and evidence traceability, through functional testing and user acceptance testing.

E. *Research Contributions*

The main contribution of this study is to position SPMI as an operational quality-data hub rather than only as a document repository. The study contributes: (1) an integrated PPEPP-to-accreditation architecture, (2) a data-to-evidence mapping model connecting SIAKAD/HRIS records to LKPS and LED artifacts, (3) a configurable readiness scoring mechanism, and (4) an auditable evidence management workflow with RBAC, reviewer comments, approval logs, and export-package support.

II. THEORY

This section positions the study in relation to prior quality-assurance information systems, accreditation instruments, enterprise integration concepts, and dashboard-based monitoring approaches. The focus is not only on whether quality documents can be digitized, but also on whether operational academic and human-resource data can be traced into accreditation artifacts and readiness indicators.

A. *SPMI and PPEPP Cycle in Indonesia*

The Internal Quality Assurance System (SPMI) is part of Indonesia's national framework for higher education quality assurance. In this study, the operational cycle is represented through PPEPP: Determination (Penetapan), Implementation (Pelaksanaan), Evaluation (Evaluasi), Control (Pengendalian), and Improvement (Peningkatan) of Standards. The current regulatory reference is Permendikti Saintek Number 39 of 2025 [1].

According to the BAN-PT accreditation instruments (IAPT 3.0 and IAPS 4.0), SPMI effectiveness is a key indicator in higher education accreditation assessment. Higher education institutions are assessed not only on the existence of SPMI documents but also on implementation evidence, achievement measurability, and continuous improvement evidence [3, 4].

B. *Accreditation Data Requirements*

The main components that higher education institutions are expected to prepare for the accreditation process include LKPS, LED, physical evidence, and self-assessment artifacts defined by BAN-PT accreditation instruments [3, 4]:
1) LKPS (Higher Education Performance Report): Quantitative report containing statistical data on students, lecturers, curriculum, research, community service, and other outputs.
2) LED (Self-Evaluation Report): Narrative and analytical report explaining achievements, strengths, weaknesses, and development plans.
3) Physical Evidence: Supporting documents that verify the accuracy of data and narratives in LKPS and LED.
4) Self-Assessment: A self-evaluation form completed by the institution before visitation.

The ongoing gap is that quality documents resulting from the PPEPP cycle are not automatically connected to LKPS and LED requirements [1].

C. *Integrated Information Systems in Quality Assurance*

Prior studies have discussed several aspects of quality assurance information systems, including SPMI document management, AMI execution, accreditation data management, corrective-action tracking, and digital dashboards. However, the gap addressed in this study is the limited integration of four domains in a single evaluated artifact: (1) PPEPP cycle, (2) HRIS data, (3) SIAKAD data, and (4) complete accreditation module covering LKPS, LED, evidence, review, approval, and export.

This study addresses this gap by combining perspectives from higher education quality regulation, enterprise application integration, dashboard design, and accreditation evidence management [1, 3, 4, 5, 6, 9, 7, 10, 11, 8, 15, 16, 17].

Table I presents a conceptual comparison based on common quality-assurance system patterns observed in institutional practice. The comparison is used to position the proposed artifact

TABLE I COMPARISON WITH SIMILAR SYSTEMS

Feature	AMI System	Repository	Portal	Proposed
PPEPP Cycle	×	×	×	✓
HRIS Integration	×	×	×	✓
SIAKAD Integration	×	×	×	✓
End-to-End Accreditation	×	×	Partial	✓
RBAC	✓	✓	✓	✓
Audit Trail	×	×	×	✓
Evidence Traceability	×	Partial	Partial	✓
Periodic Monitoring	×	×	×	✓

TABLE II RESEARCH GAP POSITIONING

Stream	Main Focus	Remaining Gap	This Study
SPMI/AMI systems	Document and audit workflow digitalization	Limited linkage to operational SIAKAD/HRIS data	Adds source-data mapping to evidence artifacts
Accreditation portals	LKPS/LED and evidence submission support	Readiness often checked near submission period	Adds periodic readiness monitoring
Enterprise integration	Data normalization and application architecture	Not specific to PPEPP and accreditation evidence	Adapts integration to SPMI–LKPS/LED workflow
Dashboard systems	Performance visualization and monitoring	Weak audit trail and reviewer accountability	Combines dashboard, RBAC, approval logs, and traceability

functionally and is not intended as a direct benchmark against a specific commercial product.

D. *Research Gap Positioning*

The comparison in Table I shows that existing quality-assurance information systems usually emphasize one dominant function, such as AMI workflow, document repository, corrective-action follow-up, or accreditation portal. Prior web-based quality assurance and internal audit systems demonstrate that digitalization can improve document access, audit monitoring, follow-up control, and usability, but they do not always provide end-to-end traceability from SIAKAD/HRIS source data to LKPS/LED artifacts, reviewer decisions, and readiness dashboards [5, 6, 9, 12, 18, 7, 10, 11, 8]. Therefore, the research gap is formulated at the intersection of system integration, accreditation evidence management, and measurable operational readiness.

Based on this positioning, the proposed artifact is evaluated as an integrated command-center model rather than as a stand-alone repository. The model must demonstrate four capabilities: (1) connecting SIAKAD, HRIS, SPMI, AMI/RTM, and accreditation artifacts; (2) mapping source data into LKPS/LED evidence; (3) measuring criterion-level readiness; and (4) preserving accountability through RBAC, audit trails, reviewer comments, and approval logs.

III. METHODS

This section explains the DSRM procedure, proposed artifact, dataset scope, test-case design, and measurement procedure used to evaluate the integrated quality assurance information system.

A. *Research Approach*

This study follows the Design Science Research Methodology (DSRM) adapted from Peffers et al. [19]. DSRM was selected because the study builds an information system artifact that is valid, useful, and empirically tested. The choice is also consistent with design science principles that emphasize artifact construction, relevance, rigor, and evaluation in information systems research [19, 20, 21, 22].

B. *DSRM Stages*

The work was organized into six DSRM stages based on the process model proposed by Peffers et al. [19]:

1) Problem Identification: A field study was conducted through in-depth interviews with the Head of the Quality Assurance Institute, Head of the Quality Assurance Unit, AMI auditors, and accreditation staff. Output: a list of data integration problems and functional requirements.
2) Objective Definition: The ideal solution was defined based on the identified problems. Output: an objective list, requirement specifications, and measurable evaluation indicators.
3) Design and Development: This stage covered system architecture design, database design, API design, user-interface design, and accreditation workflow design. Output: system artifact version 1 with complete technical documentation.
4) Demonstration: The system was implemented in a staging environment with sample integrated data. Output: a working system in a staging environment.
5) Evaluation: Functionality testing, integration testing, access security testing, evidence traceability checking, and UAT. Output: quantitative and qualitative data.
6) Communication: This stage involved journal article writing and artifact reporting.

C. *Proposed Data Integration Model*

The proposed system treats SPMI as a quality-data hub rather than a passive document repository. Academic records from SIAKAD, human-resource records from HRIS/SIMPEG, SPMI standard documents, AMI findings, and RTM follow-up records are normalized into a quality data repository. This repository links operational data with accreditation artifacts, allowing daily academic and staffing transactions to be reused for LKPS tables, LED narratives, evidence indexing, and readiness monitoring [15, 16, 13, 14].

Data synchronization is organized into three stages: extraction from source systems, validation against quality and accreditation

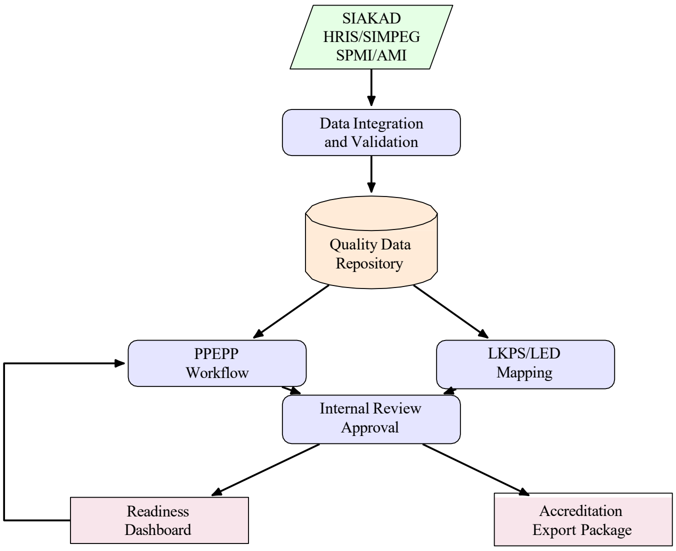

Fig. 1 Integrated Quality Assurance System Flow

rules, and mapping to target accreditation fields. The validation stage checks data completeness, period consistency, document ownership, and role-based approval status. The mapping stage then connects each verified record to the relevant PPEPP activity and BAN-PT/LAM accreditation evidence category [3, 4]. Fig. 1 illustrates the source-to-evidence workflow implemented by the artifact.

D. *Accreditation Readiness Score Formulation*

Accreditation readiness is modeled as a weighted aggregation of evidence completeness, data validity, review status, and approval status for each accreditation criterion. The score can be calculated periodically so that quality managers can identify weak criteria before the formal accreditation period. Let R_c denote readiness for criterion c, E_c evidence completeness, V_c data validation score, Q_c internal review quality, and A_c approval completion. The readiness score is defined as:

$$Rc = wE\ Ec + wV\ Vc + wQ\ Qc + wA\ Ac \quad (3.1)$$

where $w_E + w_V + w_Q + w_A = 1$. In the staging evaluation, equal weights were used ($w_E = w_V = w_Q = w_A = 0.25$) to avoid over-prioritizing one readiness component during prototype testing. The production version keeps the weights configurable so that quality assurance units can adapt the formula to institutional accreditation priorities. The overall institutional readiness score is obtained by averaging all criterion scores:

$$Rtotal = (R1 + R2 + \dots + Rn) / n \quad (3.2)$$

where n is the number of accreditation criteria. This formulation is intended to support evidence-based monitoring because each score can be traced to concrete documents, source-system data, reviewer comments, and approval logs [13, 14].

For operational use, each component was normalized to a 0–1 scale. Evidence completeness measured whether required files or links existed; data validity measured whether mapped SIAKAD/HRIS values matched the expected period and source record; review quality measured whether reviewer comments and verification status were available; and approval completion measured whether authorized roles had finalized the artifact. The readiness score component table summarizes the interpretation used during staging evaluation.

TABLE III READINESS SCORE COMPONENTS

Component	Operational Meaning	Evidence
E_c	Required evidence exists and is linked to LKPS/LED items	Completeness checklist
V_c	Source data match period, owner, and validation rules	Validation log
Q_c	Internal reviewer has checked and commented on the artifact	Review notes
A_c	Authorized role has approved or finalized the artifact	Approval log

E. *System Architecture*

The system is designed using a three-tier architecture that separates the presentation layer, business logic layer, and data layer. This separation allows the SPMI workflow, SIAKAD/HRIS connectors, accreditation evidence repository, review process, and readiness dashboard to be managed as connected but clearly defined components. The architectural design follows common software engineering, enterprise-application, and architecture-description principles [23, 24, 25, 26, 27].

TABLE IV SYSTEM ARCHITECTURE COMPONENTS

Layer	Technology	Function
Frontend	Next.js 14	Dashboard and UI
Backend API	Node.js/Express	RESTful endpoints
Database	PostgreSQL 15 + Prisma	Data storage
Integration	SIAKAD/HRIS connectors	Data synchronization
Repository	Evidence metadata and files	LKPS/LED traceability
Security	RBAC and audit trail	Access accountability

F. *System Modules*

The developed prototype consists of eleven main modules: (1) Quality Dashboard, (2) SPMI Standards & Documents, (3) PPEPP Workflow, (4) AMI, (5) RTM, (6) Quality Indicators, (7) HRIS Data, (8) SIAKAD Integration, (9) Accreditation Module, (10) Roles & Permissions, and (11) Audit Trail. The implementation stack uses Next.js, Node.js/Express, PostgreSQL, and Prisma, following their official technical documentation [28, 29, 30, 31].

1) Accreditation Module Focus

The accreditation module includes a Master Instrument (IAPT 3.0 import with nine criteria), a Criteria & Elements tree structure, Accreditation Period management, LKPS with automatic data from SIAKAD+HRIS, LED with structured narratives per criterion, Physical Evidence upload, a Self-Assessment form, Internal Review with comments and recommendations, Approval/Finalization with a tiered workflow, an Export Package as a ZIP file with manifest.json, and a Readiness Checklist showing the completeness percentage for each criterion. Access-control and audit-trail features were aligned with web-application security and digital identity guidance [32, 33, 34, 35].

2) Data Integration Mechanism

The mapping mechanism is designed to connect SIAKAD student data to LKPS 1.a (daily), SIAKAD grade data to LKPS 1.c (daily), HRIS lecturer data to LKPS 2.a (daily), HRIS workload data to LKPS 2.c (weekly), SPMI indicator achievements to LED 7 (monthly), and AMI findings to LED 8 (monthly).

G. *Dataset and Test Case Design*

The evaluation used a staging dataset representing one accreditation preparation cycle. The dataset covered nine accreditation criteria, 45 readiness indicators, 11 system modules, 45 API endpoints, six user roles, and 10 UAT participants. The data objects consisted of SPMI standard records, SIAKAD academic exports, HRIS lecturer records, AMI findings, RTM follow-up items, LKPS fields, LED narrative sections, reviewer notes, approval logs, and supporting evidence files. This scope was selected to test traceability from source data to accreditation artifacts without claiming production-scale institutional deployment.

TABLE V STAGING DATASET AND EVALUATION SCOPE

Scope Item	Coverage	Purpose
Accreditation criteria	9 criteria	Check criterion-level readiness
Readiness indicators	45 indicators	Compare baseline and final readiness
System modules	11 modules	Verify end-to-end workflow coverage
API endpoints	45 endpoints	Test integration and service availability
User roles	6 roles	Validate RBAC and separation of duties
UAT participants	10 stakeholders	Assess usability and perceived usefulness

Seven evaluation dimensions were used: black-box functional testing, API smoke testing, RBAC testing, integration-flow testing, readiness-score checking, evidence traceability checking, and UAT. The test case design table maps each dimension to its test object, acceptance criterion, and expected evidence.

TABLE VI TEST CASE DESIGN

Dimension	Test Object	Acceptance Criterion
Functional flow	LKPS, LED, evidence, review, approval, export	Core workflow executes without blocking defect
API smoke test	45 critical endpoints	Endpoint returns expected status and payload structure
RBAC	6 roles and permission matrix	Unauthorized action is blocked and logged
Integration flow	SIAKAD/HRIS to accreditation mapping	Mapped values match source exports and target fields
Readiness score	45 readiness indicators	Score follows Equation (3.1) and checklist status
Traceability	Source records, evidence files, reviewer notes	Sampled item is traceable end-to-end
UAT	10 stakeholder scenarios	SUS and perceived-benefit scores collected

H. *Baseline and Measurement Procedure*

The baseline readiness value of 23% was estimated before system implementation by auditing the availability and verification status of accreditation artifacts. The baseline assessment was conducted using a checklist derived from BAN-PT IAPT 3.0 criteria. A total of 45 indicators across nine criteria were evaluated. Each indicator was scored 0 (not available), 0.5 (available but not verified), or 1 (available and verified). The baseline score of 23% was calculated as the average of 45 indicator scores before system implementation. Items were marked as ready only when the evidence existed, matched the related LKPS/LED requirement, had a clear owner, and could be verified by the quality assurance team.

The final readiness value of 82% was estimated after the same artifact set was migrated, mapped, validated, and reviewed through the integrated platform. The increase was not interpreted as an accreditation score, but rather as an operational readiness indicator showing how many required artifacts were complete, traceable, and reviewable within the system. Therefore, the 23%→82% improvement represents a change in document and data readiness, not a direct prediction of BAN-PT/LAM accreditation rank.

LED preparation time was measured by comparing the estimated manual preparation duration with the time required to complete the same LED sections after data mapping and evidence indexing were available. In the initial condition, staff needed to search spreadsheets, SIAKAD exports, HRIS exports, and document folders manually. Based on staff interviews, the average manual LED preparation required approximately 21 working days. In the post-implementation condition, evidence links and mapped values were automatically displayed in the related LKPS/LED work area. This procedure resulted in a reduction from 21 days to 6.7 working days, representing a 68% reduction in preparation time.

TABLE VII QUANTITATIVE EVALUATION RESULTS

Metric	Target/Baseline	Result	Interpretation
API smoke test	45 endpoints	42 pass (93.3%)	Core services mostly available; 3 refinement items remain
Functional testing	≥90% pass	94%	Main accreditation workflow met acceptance threshold
Dashboard access time	<3 seconds	2.1 seconds	Readiness view was responsive in staging
Traceability sample	100% sample	100% traceable	Sampled artifacts linked to source data and review status
RBAC testing	6 roles	No violations	Unauthorized actions were blocked in tested scenarios
LED preparation time	21 days	6.7 days	Preparation time decreased by 68% in the evaluated scenario
Operational readiness	23% baseline	82% final	Readiness improved after migration, mapping, validation, and review

IV. ANALYSIS

A. *Quantitative Evaluation Results*

The three endpoints that did not pass smoke testing were related to export-package generation with incomplete evidence metadata, cross-period LKPS validation, and delayed HRIS workload synchronization. These issues did not block the core review workflow, but they were recorded as refinement items before production deployment.

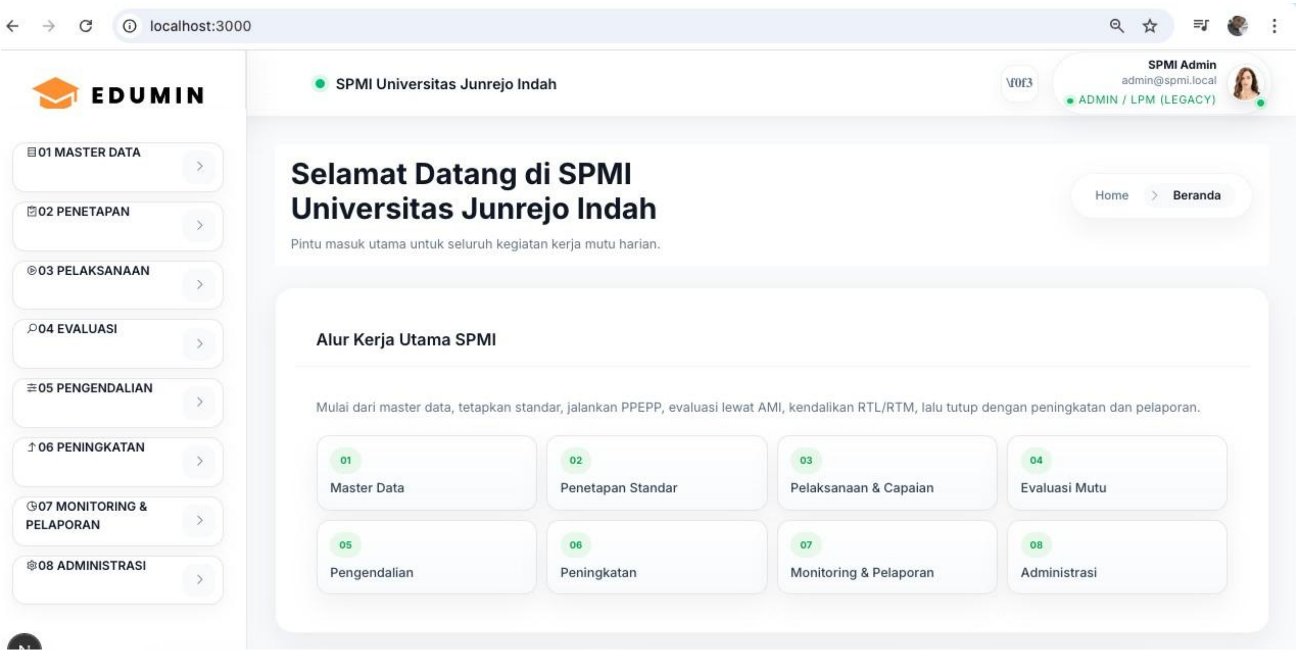

Fig. 2 Responsive SPMI Dashboard with Workflow Cards

B. *UAT Results*

The UAT involved 10 quality assurance users who executed the same set of scenarios: role-based login, dashboard inspection, data mapping, evidence review, commenting, approval, and export package generation. The participants consisted of 3 quality assurance managers, 4 study program heads, 2 AMI auditors, and 1 accreditation staff member. The average SUS score was 81.2 (Grade B, Acceptable), which corresponds to an "Excellent" rating based on SUS interpretation guidance [36, 37], while the perceived benefit average was 4.6 on a 1–5 scale.

C. *Discussion*

The evaluation results address the research questions in four ways. First, the architecture connects SIAKAD, HRIS, SPMI, AMI/RTM, and accreditation artifacts through a shared quality data repository, answering RQ1. Second, the mapping mechanism reduces repeated manual work by reusing operational academic and human-resource data for LKPS and LED preparation, answering RQ2. Third, the readiness dashboard converts distributed evidence status into measurable criterion-level indicators, answering RQ3. Fourth, RBAC, audit trails, reviewer comments, and approval logs strengthen accountability in evidence management, answering RQ4.

The results should be interpreted as operational evidence rather than as a direct accreditation prediction. The 23%→82% readiness improvement indicates that more artifacts became complete, traceable, and reviewable in the system. The 68% LED preparation-time reduction indicates that evidence indexing and source-data mapping reduced search and compilation effort. However, the three failed API endpoints show that export packaging, cross-period validation, and HRIS workload synchronization still require refinement before production deployment.

TABLE VIII FINDINGS MAPPED TO RESEARCH QUESTIONS

RQ	Finding	Evidence
RQ1	Integrated architecture connected SPMI, SIAKAD, HRIS, AMI/RTM, and accreditation artifacts	11 modules integrated in staging
RQ2	Source-data mapping reduced repeated manual compilation	78% selected LKPS fields populated automatically
RQ3	Readiness dashboard enabled criterion-level monitoring	Readiness increased from 23% to 82%
RQ4	RBAC and audit trails supported accountable evidence handling	6 roles tested with no unauthorized-action violations

D. *Key Findings*

1) Data mapping: The system populated 78% of selected LKPS cells automatically, while the remaining fields required interpretation or supporting documents.
2) Review efficiency: The internal review cycle decreased from 14 days to 4 days because evidence links, comments, and approval status were available in one workflow.
3) Traceability: Sampled artifacts could be traced from SIAKAD/HRIS/SPMI source records to LKPS cells, LED sections, evidence files, reviewer comments, and approval statuses.

V. CONCLUSION

A. *Concluding Remarks*

This study designed, developed, and evaluated an integrated quality assurance information system for higher education that connects SPMI (PPEPP), HRIS, SIAKAD, AMI/RTM, and accreditation preparation workflows. The artifact was evaluated using a staging dataset, functional tests, integration-flow tests, evidence traceability checks, access-control checks, and UAT with quality assurance stakeholders.

The main conclusions, mapped to the research questions and objectives, are:

1) The proposed integrated architecture connects operational academic and human-resource data with SPMI activities and accreditation evidence requirements. This architecture positions SPMI not only as a document repository but also as a quality-data hub that supports traceability from source data to LKPS, LED, evidence, review, approval, and export packages.
2) The data mapping and evidence management mechanism reduced repeated manual work by automatically filling 78% of selected LKPS fields from SIAKAD/HRIS sample data. The remaining fields still require human interpretation or supporting evidence, showing that automation should complement, not replace, quality assurance judgment.
3) The readiness monitoring dashboard enabled criterion-level monitoring based on evidence completeness, data validity, review status, and approval status. In the staging evaluation, operational readiness increased from 23% in the distributed-document baseline to 82% after integration. This value represents document and data readiness, not a direct prediction of BAN-PT/LAM accreditation rank.
4) The evaluation results indicate improved preparation efficiency within the evaluated staging scenario. LED preparation time decreased from 21 days to 6.7 days (68%), 42 of 45 API endpoints passed smoke testing (93.3%), and the UAT produced a SUS score of 81.2. These values support operational feasibility but still require production-scale validation.
5) The security and accountability features—including RBAC, separation of duties, audit trails, reviewer comments, and approval logs—support trustworthy evidence management by making accreditation artifacts traceable, verifiable, and accountable beyond the document-compilation period.

B. *Limitations and Future Research*

This study has several limitations. First, the evaluation used a staging dataset and has not yet been conducted across multiple institutions or with full-scale production data. Second, integration depends on the availability and quality of SIAKAD/HRIS APIs and data. The current implementation assumes that SIAKAD and HRIS provide RESTful APIs with JSON responses. For institutions without standard APIs, the system provides a CSV/Excel import fallback. However, this fallback mode requires manual data preparation and may reduce the automation level compared with API-based synchronization. Third, the system has not yet been evaluated using very large data volumes (>10,000 students) or simultaneous multi-study-program accreditation cycles. Fourth, the readiness score measures operational preparedness and should not be treated as an official accreditation score.

Future research may include multi-site implementation, longitudinal evaluation across several accreditation cycles, stress testing with large institutional datasets, and refinement of API connectors for different SIAKAD/HRIS platforms. Further work may also develop predictive analytics and recommendation modules to identify accreditation risk earlier, while maintaining human oversight in quality assurance decision-making.

ACKNOWLEDGMENT

The authors thank the quality-assurance stakeholders and institutional units that provided feedback, scenario data, and implementation support during this study.

REFERENCES

[1] Kementerian Pendidikan Tinggi, Sains, dan Teknologi Republik Indonesia, “Peraturan Menteri Pendidikan Tinggi, Sains, dan Teknologi Nomor 39 Tahun 2025 tentang Penjaminan Mutu Pendidikan Tinggi,” 2025, accessed: 2026-06-19. [Online]. Available: https://peraturan.bpk.go.id/Details/333967

[2] Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi Republik Indonesia, “Pangkalan Data Pendidikan Tinggi (PDDikti),” 2024, accessed: 2026-06-15. [Online]. Available: https://pddikti.kemdikbud.go.id/

[3] Badan Akreditasi Nasional Perguruan Tinggi, “Peraturan BAN-PT Nomor 3 Tahun 2019 tentang Instrumen Akreditasi Perguruan Tinggi,” 2019, accessed: 2026-06-15. [Online]. Available: https://www.banpt.or.id/wp-content/uploads/2019/09/PerBAN-PT-3-2019-IAPT.pdf

[4] ——, “Instrumen Akreditasi Program Studi 4.0,” 2019, accessed: 2026-06-15. [Online]. Available: https://www.banpt.or.id/wp-content/uploads/2019/10/Naskah-Akademik-IAPS-4.0.pdf

[5] S. Novieyana, L. Siswanto, and A. Setiawan, “Rancang bangun sistem informasi penjaminan mutu internal SIMAMI politeknik negeri pontianak,” *Jurnal ELIT*, vol. 2, no. 1, pp. 1–10, 2021. [Online]. Available: https://doi.org/10.31573/elit.v2i1.213

[6] I. Muslim, M. R. A. Saf, R. P. Sari, and S. R. Henim, “Rancang bangun sistem audit mutu internal guna optimalisasi kinerja penjaminan mutu perguruan tinggi,” *Sistemasi: Jurnal Sistem Informasi*, vol. 10, no. 2, pp. 490–501, 2021. [Online]. Available: https://doi.org/10.32520/stmsi.v10i2.1374

[7] A. R. Damanik, F. Firzada, W. Robiansyah, and S. Darma, “Sistem manajemen data elektronik akreditasi program studi (IAPS) 4.0,” *JISICOM: Journal of Information System, Informatics and Computing*, vol. 5, no. 2, pp. 195–201, 2021. [Online]. Available: https://doi.org/10.52362/jisicom.v5i2.510

[8] A. Fitriadi, M. Wan, S. Batang, Y. Andy Abeh, R. Wibawa, D. N. Mebang, A. Azainil, and H. Haeruddin, “Analisis penerapan sistem informasi SPMI berbasis digital dalam meningkatkan efektivitas audit mutu internal di universitas mulawarman,” *SIBATIK Journal: Jurnal Ilmiah Bidang Sosial, Ekonomi, Budaya, Teknologi, dan Pendidikan*, vol. 4, no. 9, pp. 2809–2820, 2025. [Online]. Available: https://doi.org/10.54443/sibatik.v4i9.3370

[9] S. D. Putra, S. Sukarno, and D. Aryani, “Perancangan sistem dokumentasi elektronik sistem penjaminan mutu internal menggunakan metode rapid application development,” *JISICOM: Journal of Information System, Informatics and Computing*, vol. 5, no. 1, pp. 120–127, 2021. [Online]. Available: https://doi.org/10.52362/jisicom.v5i1.467

[10] A. Yani, L. D. Bakti, A. Akbar, and B. Imran, “Design and development of an internal quality audit information system based PPEPP cycle,” *Jurnal Pilar Nusa Mandiri*, vol. 20, no. 1, pp. 9–17, 2024. [Online]. Available: https://doi.org/10.33480/pilar.v20i1.4729

[11] I. P. A. Yasa, I. N. Y. A. Wijaya, N. W. Utami, and K. Q. Fredlina, “Perancangan sistem permintaan tindak perbaikan dan pencegahan (PTPP) berbasis web dengan metode extreme programming,” *Jurnal Informatika Teknologi dan Sains*, vol. 7, no. 3, pp. 1379–1388, 2025. [Online]. Available: https://doi.org/10.51401/jinteks.v7i3.6109

[12] D. Aryani, H. Akbar, S. D. Putra, and M. B. Ulum, “An application design thinking in the internal quality audit system,” *Journal of Information System, Applied, Management, Accounting and Research*, vol. 6, no. 1, pp. 199–211, 2022. [Online]. Available: https://doi.org/10.52362/jisamar.v6i1.705

[13] E. Adot, A. Akhmedova, H. Alvelos, S. Barbosa-Pereira, J. Berbegal-Mirabent, S. Cardoso *et al.*, "SMART-QUAL: A dashboard for quality measurement in higher education institutions," *International Journal of Quality & Reliability Management*, vol. 40, no. 6, pp. 1518–1539, 2023. [Online]. Available: https://doi.org/10.1108/IJQRM-06-2022-0167

[14] D. Hart, "Conceptualizing the systemic evaluation of dashboards in quality enhancement processes in higher education," *Systems Research and Behavioral Science*, vol. 38, no. 6, pp. 817–832, 2021. [Online]. Available: https: //doi.org/10.1002/sres.2736

[15] L. M. Castro Benavides, J. A. Tamayo Arias, M. D. Arango Serna, J. W. Branch Bedoya, and D. Burgos, "Digital transformation in higher education institutions: A systematic literature review," *Sensors*, vol. 20, no. 11, p. 3291, 2020. [Online]. Available: https://doi.org/10.3390/s20113291

[16] T. Gkrimpizi, V. Peristeras, and I. Magnisalis, "Defining the meaning and scope of digital transformation in higher education institutions," *Administrative Sciences*, vol. 14, no. 3, p. 48, 2024. [Online]. Available: https: //doi.org/10.3390/admsci14030048

[17] C. A. Tran, D. H. Van, T. T. P. Nguyen, T. T. T. Nguyen, and T. M. Nguyen, "Research in higher education quality assurance worldwide (2003–2023): A bibliometric analysis from the Scopus database," *Cogent Education*, vol. 12, no. 1, p. 2479405, 2025. [Online]. Available: https://doi.org/10.1080/2331186X.2025.2479405

[18] L. Sudianto and P. Simon, "Development application of a quality assurance management information system for paulus indonesia christian university," *IOP Conference Series: Materials Science and Engineering*, vol. 1088, p. 012042, 2021. [Online]. Available: https://doi.org/10.1088/1757-899X/1088/1/012042

[19] K. Peffers, T. Tuunanen, M. A. Rothenberger, and S. Chatterjee, "A design science research methodology for information systems research," *Journal of Management Information Systems*, vol. 24, no. 3, pp. 45–77, 2007. [Online]. Available: https://doi.org/10.2753/MIS0742-1222240302

[20] A. R. Hevner, S. T. March, J. Park, and S. Ram, "Design science in information systems research," *MIS Quarterly*, vol. 28, no. 1, pp. 75–105, 2004. [Online]. Available: https://www.jstor.org/stable/25148625

[21] S. Gregor and A. R. Hevner, "Positioning and presenting design science research for maximum impact," *MIS Quarterly*, vol. 37, no. 2, pp. 337–355, 2013. [Online]. Available: https://doi.org/10.25300/MISQ/2013/37.2.01

[22] S. T. March and G. F. Smith, "Design and natural science research on information technology," *Decision Support Systems*, vol. 15, no. 4, pp. 251–266, 1995. [Online]. Available: https://doi.org/10.1016/0167-9236(94)00041-2

[23] R. S. Pressman and B. R. Maxim, *Software Engineering: A Practitioner's Approach*, 9th ed. New York, NY, USA: McGraw-Hill, 2020.

[24] I. Sommerville, *Software Engineering*, 10th ed. Boston, MA, USA: Pearson, 2016.

[25] L. Bass, P. Clements, and R. Kazman, *Software Architecture in Practice*, 4th ed. Boston, MA, USA: Addison-Wesley, 2021.

[26] ISO/IEC/IEEE, "ISO/IEC/IEEE 42010:2022 Software, systems and enterprise—Architecture description," 2022. [Online]. Available: https: //www.iso.org/standard/74393.html

[27] ISO/IEC, "ISO/IEC 25010:2023 Systems and software engineering—Systems and software Quality Requirements and Evaluation (SQuaRE)—Product quality model," 2023. [Online]. Available: https://www.iso.org/standard/78176.html

[28] Vercel, "Next.js Documentation," 2024, accessed: 2026-06-15. [Online]. Available: https://nextjs.org/docs

[29] Node.js, "Node.js Documentation," 2024, accessed: 2026-06-15. [Online]. Available: https://nodejs.org/docs/latest/api/

[30] PostgreSQL Global Development Group, "PostgreSQL Documentation," 2024, accessed: 2026-06-15. [Online]. Available: https://www.postgresql.org/docs/

[31] Prisma Data, Inc., "Prisma ORM Documentation," 2024, accessed: 2026-06-15. [Online]. Available: https://www.prisma.io/docs/orm

[32] OWASP Foundation, "OWASP Application Security Verification Standard 5.0.0," 2025. [Online]. Available: https://github.com/OWASP/ASVS

[33] ——, "OWASP Top 10:2025," 2025. [Online]. Available: https://owasp.org/Top10/2025/0x00_2025-Introduction/

[34] National Institute of Standards and Technology, "Security and privacy controls for information systems and organizations," National Institute of Standards and Technology, NIST Special Publication 800-53 Rev. 5, 2020. [Online]. Available: https://doi.org/10.6028/NIST.SP.800-53r5

[35] D. Temoshok, J. Fenton, Y.-Y. Choong, N. Lefkovitz, A. Regenscheid, R. Galluzzo, and J. Richer, "Digital identity guidelines: Authentication and authenticator management," National Institute of Standards and Technology, NIST Special Publication 800-63B-4, 2025. [Online]. Available: https: //doi.org/10.6028/NIST.SP.800-63b-4

[36] J. Brooke, "Sus: A quick and dirty usability scale," in *Usability Evaluation in Industry*, P. W. Jordan, B. Thomas, I. L. McClelland, and B. Weerdmeester, Eds. London, U.K.: Taylor & Francis, 1996. [Online]. Available: https://digital.ahrq.gov/sites/default/files/docs/survey/systemusabilityscale%2528sus%2529_comp%255B1%255D.pdf

[37] J. Sauro and J. R. Lewis, *Quantifying the User Experience: Practical Statistics for User Research*, 2nd ed. Cambridge, MA, USA: Morgan Kaufmann, 2016. [Online]. Available: https://doi.org/10.1016/C2013-0-16583-3