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Research Article

Development of an Initial Prototype of an Electronic-Based Government Agency Performance Accountability System (SAKIP) at State Universities with Legal Entities

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Abstract

Digital transformation in performance management at legal-entity state universities remains constrained by fragmented data, manual document exchange, disconnected SAKIP stages, and limited access to integrated performance information. This study aims to develop an initial prototype of an electronic Government Agency Performance Accountability System for Universitas Negeri Surabaya (UNESA), named SAKINA. Using a research and development approach, the study applied the 4D model limited to the define, design, and develop stages. Data were collected from July 2023 to June 2026 through document review, regulatory analysis, semi-structured interviews, focus group discussions, and work-process observations involving 30 purposively selected informants and 80 institutional, regulatory, and scientific documents. The define stage identified user, functional, non-functional, regulatory, and user-experience requirements. The design stage produced a three-layer architecture, module structure, role allocation, interface specifications, and integrated workflows. The develop stage generated SAKINA version 1.0 using Laravel, PostgreSQL, and Nginx. The prototype includes six module groups covering monitoring, planning, measurement, reporting, evaluation, and supporting documentation. SAKINA integrates indicators, targets, realization data, evidence, evaluation results, and follow-up actions through centralized storage, role-based access, process status, and activity logging. Further testing is required to assess usability, security, acceptance, interoperability, and implementation effects.

Keywords: Digital Governance; Electronic SAKIP; Legal-Entity State University; Performance Accountability; System Prototype.

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INTRODUCTION

Digital government has evolved from the automation of isolated administrative tasks into an organizational transformation that connects data, processes, institutions, public value, and decision-making. Janowski conceptualizes this evolution as a progression from digitization toward transformation and contextualization, while later studies emphasize that genuine digital transformation requires changes in organizational arrangements, relationships, capabilities, and service logic rather than the simple conversion of paper documents into electronic files [1], [2], [3]. Digital government research therefore intersects directly with public management because information quality, institutional coordination, and technology-enabled work practices increasingly shape how public organizations formulate policy, deliver services, and demonstrate performance [4], [5]. Empirical work further shows that the success of digital government transformation depends on the interaction of technological capacity, organizational readiness, leadership, and the removal of institutional barriers [6].

The performance implications of digital transformation are particularly relevant to accountability systems. Technology can accelerate access to information and service delivery [7], but its public-sector value is realized only when digital arrangements restructure workflows, clarify responsibility, and improve the relationship between information and managerial action [8], [9], [10]. The OECD Digital Government Index reported in Government at a Glance 2025 records an average score of 0.61 across OECD countries, indicating continuing international challenges in integrated governance, data use, and cross-organizational coordination [11]. Recent evidence also indicates that digital transformation can support government performance and operational agility when technology is connected to organizational processes and service management rather than implemented as a stand-alone application [12], [13].

Data integration is central to this transformation. Public organizations require consistent information structures, shared data assets, and mechanisms that allow evidence to be reused across planning, implementation, monitoring, and evaluation. Knowledge management research demonstrates that fragmented information weakens the strategic effect of digitalization [14], while data-governance studies stress the importance of architecture, institutional rules, and human capability in a data-driven public sector [15]. At the same time, the outcomes of digital transformation must be assessed beyond the availability of online services by examining process quality, organizational performance, transparency, and public value [16], [17]. Studies of document-management systems and national public-administration reforms similarly show that successful transformation requires regulatory alignment, process redesign, interoperability, and sustained institutional coordination [18], [19], [20].

The literature also warns against technologically deterministic assumptions. Comparative cases show that public-sector digital transformation can be constrained by fragmented governance, weak implementation capacity, and discontinuity between strategic plans and operational practice [20], [21]. Readiness problems include inadequate infrastructure, limited digital competence, resistance to change, and the marginal involvement of information-technology functions in organizational decision-making [22]. Digital service teams and institutional entrepreneurs can help bridge these gaps by translating policy and organizational needs into workable digital services [23], [24]. Leadership is therefore critical:

current research associates public-sector digital leadership with vision, collaboration, employee guidance, and public-value orientation [25], [26]. Digitalization also creates new accountability, audit, privacy, and algorithmic-governance concerns that must be considered alongside efficiency [27], [28], [29], [30], [31]. A recent systematic review confirms that implementation barriers remain multidimensional, encompassing technology, organization, regulation, capability, inclusion, and user trust [32]. Open-data research further demonstrates that transparency produces stronger accountability when information is linked to process redesign and actionable monitoring rather than merely disclosed [33].

In Indonesia, performance accountability is institutionalized through the Government Agency Performance Accountability System (SAKIP), which integrates strategic planning, performance agreements, measurement, data management, reporting, and evaluation [34]. Despite this regulatory foundation, implementation quality remains uneven. The 2024 national evaluation reported average SAKIP scores of 64.23 for district and city governments and 70.75 for provincial governments, with the district and city average increasing by only 0.18 points from the previous year [35]. Research in Paser Regency found that implementation remained oriented toward document compliance and was constrained by leadership commitment, coordination, human-resource capacity, and integrated data management [36]. A user-experience study in the Selayar Islands Regency similarly identified late reporting, lengthy manual procedures, and unclear reporting information; its e-SAKIP prototype achieved a System Usability Scale score of 81.125, but focused primarily on interface design rather than end-to-end integration [37]. The 2025 performance report of Brawijaya University also noted that its SAKIP application had not been optimally integrated with other performance-data applications [38].

The need for integration is more pronounced in legal-entity state universities because institutional autonomy is accompanied by multilayered organizational structures, diverse work units, distributed data ownership, and accountability requirements at both university and unit levels [39]. At Universitas Negeri Surabaya (UNESA), the preliminary needs analysis conducted for this study identified separate management of targets and realization data, dispersed supporting documents, extensive manual file exchange, repeated communication during validation, and the absence of a single view of process completion and unit performance. These findings were translated into five user groups—university leadership, central administrators, monitoring and evaluation teams, work-unit leaders, and work-unit operators—and six functional areas: monitoring, planning, measurement, reporting, evaluation, and supporting documentation. The intended design also follows the principles of the Electronic-Based Government System, One Data Indonesia, and government data interoperability by adopting centralized data management, consistent indicator and work-unit identities, metadata, access control, and traceable transactions [40], [41], [42].

Existing Indonesian studies provide important evidence on organizational readiness and the usefulness of electronic performance systems. Research on e-SAKIP implementation has highlighted the roles of support, capacity, and perceived value [43], while the development of performance-accountability information systems has demonstrated the practical need to connect reporting and managerial monitoring [44]. Nevertheless, prior studies generally address selected implementation factors, interface experience, or reporting functions. They do not provide a complete design that connects planning, measurement, reporting, evaluation,

follow-up, evidence documents, user roles, validation states, and activity records within the organizational structure of a legal-entity state university. The technical gap is therefore the absence of an end-to-end architecture and workflow, whereas the theoretical gap concerns the limited positioning of e-SAKIP as a digital-governance infrastructure that integrates regulation, organizational process, accountability, and technology.

This study addresses these gaps by developing the initial prototype of the UNESA Government Agency Performance Accountability System, named SAKINA. It answers three design questions: what user, functional, non-functional, and regulatory requirements must be met; how those requirements can be translated into system architecture, modules, access rights, interfaces, and workflows; and how the resulting prototype demonstrates process integration, data traceability, and support for performance monitoring. The contribution is deliberately positioned at the prototype level. The study does not claim that SAKINA has improved accountability or organizational performance; instead, it provides an institutionally grounded design and functional foundation for subsequent usability, security, acceptance, interoperability, and implementation testing.

METHODS

Research Design and Scope

This study employed a research and development approach using the 4D model of Thiagarajan, Semmel, and Semmel, limited to the define, design, and develop stages [45]. The limitation was intentional because the research objective was to produce and technically describe an initial electronic SAKIP prototype rather than to evaluate its full institutional effectiveness. The define stage generated a documented set of user, functional, non-functional, regulatory, and user-experience requirements. The design stage translated these requirements into architecture, data relationships, module structure, role allocation, interfaces, and validation workflows. The develop stage converted the design into a web-based functional prototype. Development proceeded iteratively through design, internal review, correction, and re-verification.

Each stage had an explicit transition criterion. The define output was considered complete when the mandatory SAKIP components, actors, evidence sources, and system obligations had been mapped. The design output was considered internally consistent when every prioritized requirement had a corresponding module, responsible actor, data object, process state, and verification method. The prototype was considered ready for the present article when the core requirements could be traced to implemented or specified features, workflows, access rights, and outputs. This threshold represents design feasibility and initial functional verification, not effectiveness, practicality, or organization-wide readiness.

Research Setting and Case Selection

UNESA was purposively selected as a single analytical case because it is a legal-entity state university with a multilayered organizational structure, numerous work units, management autonomy, and performance-accountability obligations at university and unit levels. A single-case design enables close examination of the relationship among regulation, organizational process, user authority, and information-system requirements [46]. UNESA was not treated as

a statistical representation of all legal-entity state universities. Consequently, transfer to other institutions requires adaptation to their organizational structures, internal regulations, data architecture, technological capacity, and accountability mechanisms.

The research was conducted from July 2023 to June 2026. This period covered the review of existing SAKIP processes and documents, requirements elicitation, architecture and interface design, development of the initial application, and internal functional verification. The temporal scope is reported to distinguish the system-development process from later implementation testing, which was outside this study.

Participants and Data Sources

Primary data were obtained from 30 purposively selected informants who were directly involved in SAKIP management at UNESA. They represented university leadership, university-level SAKIP management, monitoring and evaluation teams, work-unit leadership, and work-unit operators. Selection was based on experience, formal authority, and direct involvement in entering, validating, monitoring, evaluating, or using performance information. The study reports only role categories and aggregate numbers; it does not introduce demographic characteristics that were not collected for the system-design purpose.

Secondary data comprised 80 documents, including SAKIP and electronic-government regulations, performance-accountability evaluation guidelines, UNESA planning and reporting documents, work procedures, and scientific literature on digital governance, public-sector performance management, information-system development, access control, and system evaluation. These sources were used to identify obligations, current practices, terminology, process dependencies, evidence requirements, and constraints.

Data Collection

Data were collected through document study, regulatory analysis, semi-structured interviews, focus group discussions, and observations of work processes. Document and regulatory reviews identified mandatory SAKIP components, decision points, document types, data relationships, and reporting outputs. Interviews and focus group discussions explored user responsibilities, recurring problems, information needs, access restrictions, validation practices, and desired outputs. Work-process observations traced how performance agreements, action plans, quarterly realization data, performance reports, evaluation worksheets, evaluation results, and supporting evidence moved among actors and storage locations.

The instruments consisted of interview and discussion guides, business-process mapping sheets, and functional and non-functional requirement matrices. Information from each source was recorded with its associated problem, actor, regulatory basis, data object, required function, priority, and verification method. Conflicting statements were not resolved by assumption; they were rechecked against the relevant regulation, the main SAKIP process, and the actual division of authority at UNESA.

Data Analysis and Requirements Traceability

Data were analyzed descriptively and qualitatively. The analysis followed systematic familiarization, coding, category development, review, and interpretation while remaining focused on system requirements rather than personal experience [47]. Findings were grouped into user, functional, non-functional, regulatory, and user-experience requirements. Similar requirements were consolidated, whereas distinct requirements were retained when they represented different actors, data objects, or control points.

A requirements traceability matrix linked every accepted requirement to its evidence source, identified problem, regulatory basis, user role, priority, module, workflow state, expected output, and verification method. Requirements traceability was used to maintain alignment between organizational needs and the resulting design and to reduce the risk of implementing features that could not be justified by the source data [48]. The matrix also served as the basis for checking consistency across the define, design, and develop stages.

Define Stage

The define stage established the problem and requirement baseline. The analysis confirmed that targets, realization data, and supporting documents were stored across different units and media; planning, measurement, reporting, and evaluation were not connected in one digital flow; document status was difficult to monitor; and leadership lacked an integrated view of performance progress. These findings were translated into the requirements summarized in Table 1.

Table 1. System Requirements and Design Responses

Category	Finding or Evidence	System Requirement	Design Response
User	Leadership requires integrated university and unit information.	Provide achievement summaries, process status, and progress monitoring.	Executive dashboard
User	Central administration manages accounts, work units, indicators, scenarios, and authority.	Provide master data, organizational settings, accounts, periods, and access rights.	Administration and master-data functions
User	Monitoring and evaluation teams inspect documents and provide review results.	Provide monitoring, verification, evaluation, recommendation, and follow-up functions.	Monitoring and evaluation functions
User	Work-unit leaders inspect and approve unit submissions.	Provide tiered validation, rejection notes, and approval states.	Leader validation interface
User	Work-unit operators enter targets, realizations, analysis, and evidence.	Provide editable forms, draft storage, uploads, submission, and revision functions.	Operator interface
Functional	SAKIP stages and documents are managed separately.	Connect planning, measurement, reporting, evaluation, and follow-up in one workflow.	Integrated SAKIP modules

Category	Finding or Evidence	System Requirement	Design Response
Functional	Evidence is dispersed across storage media.	Link named and classified evidence documents to indicators, achievements, and evaluation components.	Supporting-document repository
Non-functional	The system is used by multiple units and device types.	Provide browser-based responsive access and centralized data management.	Web application and centralized database
Regulatory	SAKIP requires clear authority, evidence, validation, and traceability.	Implement role-based access, tiered validation, process status, and activity records.	Access control and audit trail
User experience	Users have different functions and need visible document status.	Present role-specific menus, actions, notifications, and status labels.	Role-based interface and process indicators

Design Stage

System Architecture

The system architecture uses three layers. The interface layer contains dashboards, input forms, monitoring pages, validation views, reports, and role-specific navigation. The application layer manages authentication, authorization, SAKIP business rules, input validation, achievement processing, status transitions, approval flows, evaluation, and follow-up. The data layer stores users, work units, objectives, indicators, targets, realizations, evidence documents, evaluation results, document states, and activity records in a centralized relational database.

This separation was selected to maintain a clear relationship between user interaction, business logic, and persistent data. The architecture also supports subsequent development of application interfaces and interoperability because core entities are assigned consistent identities and relationships. Figure 1 presents the relationship among the three layers.

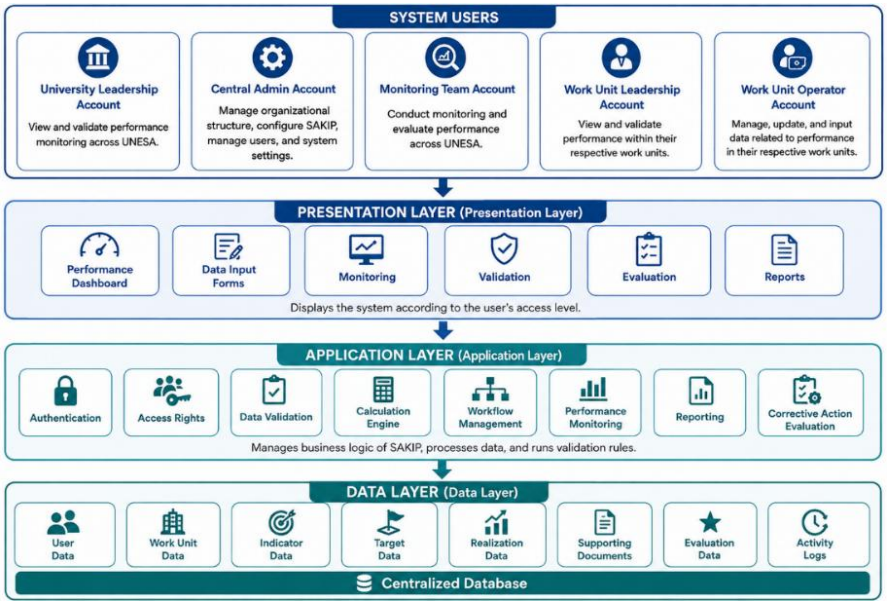


Figure 1. Three-Layer Architecture of the SAKINA Prototype

Module Structure

The design comprises six module groups. The Home module provides an executive dashboard and process monitoring. Performance Planning contains initial and revised performance agreements and action plans. Performance Measurement manages cumulative quarterly targets, achievements, achievement analysis, constraints, and follow-up plans. Performance Reporting manages quarterly and annual reports. Performance Evaluation accommodates follow-up on prior evaluation results, the Evaluation Worksheet, and the Evaluation Results Sheet. Other Documentation stores the strategic plan, performance tree, RKAT, SKP or role-result documents, regulations, technical guidelines, standard operating procedures, meeting records, internal and external achievements, and other supporting materials identified in the source documents.

Workflow Design

Eight workflows were specified from the existing procedures. To improve readability without removing procedural content, Table 2 consolidates the actors, control rules, and outputs that were previously described as long nested lists. Every workflow retains draft, submission, correction, validation or verification, completion, and printable-output states where applicable.

Table 2. SAKINA Workflow Specifications

Workflow	Principal Actors	Key Control Rules	System Output
Initial performance agreement	Central administrator; operator; work-unit leader; university leadership	Indicators are published to units; operators enter targets and budgets; rejected drafts return with notes; verification and final approval are tiered.	Completed agreement with electronic-signature provision
Revised performance agreement	Central administrator; operator; work-unit leader; university leadership	Indicator targets are not revised without university-leadership approval; budget adjustments and tiered validation follow the agreement process.	Completed revised agreement
Action plan	Central administrator; operator; work-unit leader	Quarterly targets are cumulative; the fourth-quarter target must equal the annual target; rejected drafts return with notes.	Completed action plan
Quarterly performance measurement	Central administrator; operator; work-unit leader	Published action-plan data populate the measurement template; operators enter cumulative achievement, supporting programs, constraints, and follow-up.	Completed quarterly measurement
Quarterly and annual reporting	System; operator; central administrator	The system generates upload templates; operators upload reports; central administrators verify or return documents with notes.	Verified quarterly and annual reports

Workflow	Principal Actors	Key Control Rules	System Output
Follow-up on evaluation results	System; operator; work-unit leader; central administrator	Recommendations are read-only; operators enter follow-up; leader and central verification are tiered; corrections return with notes.	Completed follow-up document
Evaluation Worksheet	System; operator; work-unit leader; central administrator	Components, subcomponents, weights, and values are controlled; operators enter answers, notes, and tagged evidence; validation is tiered.	Completed Evaluation Worksheet
Evaluation Results Sheet	System; operator; work-unit leader; central administrator or validator team	Operators enter component notes; leaders validate; the central team enters recommendations and validates the final result.	Completed Evaluation Results Sheet

Interface Design

The interface was designed around role-specific tasks and visible process status. The Home page presents an executive summary, a table of thirteen SAKIP process stages, progress indicators, and graphical monitoring for the current year. Status is represented as completed, in process, or not started. Planning and measurement pages use structured tables for objectives, indicators, units, annual and quarterly targets, achievements, budget allocations, achievement analysis, constraints, and follow-up. Reporting and documentation pages provide templates, uploads, save and submit functions, verification status, and summary tables. Evaluation pages combine controlled components and weights with editable notes, recommendations, and tagged supporting evidence.

The design avoids presenting all functions to every account. Operators receive data-entry and submission functions; leaders receive review and approval functions; monitoring and evaluation teams receive inspection and assessment functions; central administrators receive verification and configuration functions; and university leadership receives strategic monitoring and final approval. This interface logic follows the role allocation established during requirements analysis.

Develop Stage

The design was translated into SAKINA version 1.0, an initial web-based prototype developed with the PHP programming language and Laravel framework. PostgreSQL was used as the relational database management system, and Nginx was used as the web server in the execution environment. The relational structure connects users, work units, objectives, indicators, targets, realizations, evidence documents, evaluation results, document states, and activity records. Development was conducted in a Windows environment and deployed in an Ubuntu production environment.

Initial development verification focused on login, role-based menus, access restrictions, data storage and retrieval, document upload, validation-state changes, movement between workflow states, and relationships among core modules. The prototype implements user authentication, role-based access control, input validation, document-access restrictions,

activity logging, and session management. The allocation of permissions to organizational roles is consistent with established role-based access-control principles [49]. The design also follows the SAKIP provisions applied within the Ministry of Higher Education, Science, and Technology and the national technical guidance for performance agreements, reporting, review, and evaluation [48], [49], [50].

Quality Assurance and Validation Boundaries

Design credibility was maintained through source triangulation, requirements traceability, and repeated comparison of problems, regulatory obligations, actors, functions, and outputs. Design-science principles were used to ensure that the artifact addressed a relevant organizational problem and that its structure could be examined through explicit requirements and design decisions [49], [50]. Internal consistency was checked by confirming that each core requirement appeared in the corresponding architecture, module, workflow, interface, access rule, or output.

The present validation boundary is deliberately narrow. The study verifies design consistency and the availability of initial functions; it does not test system success, user acceptance, or net organizational benefits. These later outcomes should be assessed using established dimensions such as system quality, information quality, service quality, use, satisfaction, and net benefits [51], [52]. User acceptance should also be examined through perceived usefulness, ease of use, social influence, and facilitating conditions [51], [52], [53] [54], [55]. Evidence from e-government research indicates that acceptance and net benefits depend on both technical quality and organizational leadership [56], [57]. Load testing, penetration testing, certified electronic-signature testing, disaster recovery, interoperability, comprehensive calculation verification, and organization-wide user acceptance testing were not conducted and are therefore not presented as results.

RESULTS AND DISCUSSION

Results

Prototype Architecture and Technical Configuration

The primary result is the initial SAKINA prototype, which operationalizes the requirements identified at UNESA in a web-based system with a centralized database. The prototype establishes a direct relationship among user identity, organizational unit, performance objective, indicator, target, realization, evidence, document state, evaluation result, and activity record. This structure allows the same performance information to be reused across the SAKIP cycle rather than re-entered in disconnected files.

At the technical level, the prototype runs through a Laravel-based application layer, PostgreSQL database, and Nginx server. Login and authorization determine the interface, accessible records, and permitted actions for each account. The prototype supports data entry, draft storage, submission, return with notes, validation, verification, approval, document upload, status display, and activity logging. These results demonstrate the availability of the intended functional foundation; they do not demonstrate production-level performance or security. Figure 2 shows the login interface.



Figure 2. SAKINA Login Page

Module Configuration and User Roles

The prototype contains six integrated module groups: Home, Performance Planning, Performance Measurement, Performance Reporting, Performance Evaluation, and Other Documentation. The module arrangement mirrors the formal SAKIP cycle while providing a common repository for supporting evidence and governance documents. Planning contains initial and revised agreements and action plans; measurement contains quarterly achievement and analysis; reporting contains quarterly and annual reports; evaluation contains follow-up, Evaluation Worksheets, and Evaluation Results Sheets.

The role model translates the organizational division of responsibility into system permissions. It does not remove the existing hierarchy; it makes responsibility and process position explicit. Table 3 summarizes the five account categories and their main system rights.

Table 3. Account Role Matrix

Account Type	Scope	Main Responsibility	Principal System Rights
University leadership	All UNESA work units	Strategic control and final approval	View university and unit dashboards; review reports; approve or reject; perform final validation
Central administrator	Entire system and all work units	Master data, configuration, verification, and system administration	Manage accounts, units, indicators, periods, workflows, permissions, verification, notes, and configurations
Monitoring and evaluation team	All work units	Monitoring, review, evaluation, and recommendations	Access performance data and documents; monitor progress; record review and evaluation; issue recommendations; monitor follow-up
Work-unit leader	Led work unit	Control, inspection, and unit validation	View unit dashboard; inspect operator submissions; approve or reject; provide correction notes; approve unit documents

Account Type	Scope	Main Responsibility	Principal System Rights
Work-unit operator	Assigned work unit	Data entry, updating, evidence upload, and submission	Enter targets and realizations; upload evidence; save drafts; submit; revise; download unit documents

Integrated Workflow and Data Traceability

Integration is visible in the dependency between modules. Indicators and annual targets established in Performance Planning become controlled reference data for action plans and measurement. Cumulative quarterly targets provide the measurement baseline. Achievement entries are linked to supporting programs, constraints, follow-up plans, and evidence documents. Measurement results inform reporting, while evaluation recommendations are carried forward to follow-up. Document state and activity records preserve the sequence of submission, correction, validation, and completion.

The prototype therefore treats traceability as both a data relationship and an accountability relationship. A target can be connected to its realization, evidence, report, evaluation, and follow-up, while each transaction can be associated with the responsible role and process state. Table 4 summarizes the main integration relationships implemented or specified in the initial prototype.

Table 4. Prototype Integration Matrix

Source Process	Core Data	Connected Process	Traceability Mechanism	Output
Performance planning	Objectives, indicators, annual targets, budget allocation	Action plan and measurement	Common indicator and work-unit identifiers; controlled target data	Approved performance agreement and action plan
Performance measurement	Quarterly targets and realization data	Reporting and monitoring	Cumulative achievement linked to analysis and evidence	Quarterly measurement document and dashboard status
Performance reporting	Verified measurement information and uploaded report files	Evaluation and leadership monitoring	Report status, verification notes, and centralized storage	Quarterly and annual performance reports
Performance evaluation	Components, weights, evidence, notes, and recommendations	Follow-up	Tagged documents, tiered validation, and recommendation linkage	Evaluation Worksheet and Evaluation Results Sheet

Source Process	Core Data	Connected Process	Traceability Mechanism	Output
Follow-up	Prior evaluation recommendations	Subsequent monitoring and improvement	Recommendation-to-action relationship and completion status	Follow-up document
Cross-module governance	Users, units, permissions, status, and activity records	All modules	Role-based access, process-state control, and audit trail	Traceable digital workflow

Interface Outputs

The Home dashboard presents process progress and achievement information in a concise view intended for monitoring across work units. It displays the status of the main SAKIP stages and enables management to identify completed, ongoing, and outstanding processes without tracing separate files. Figure 3 presents the dashboard interface.

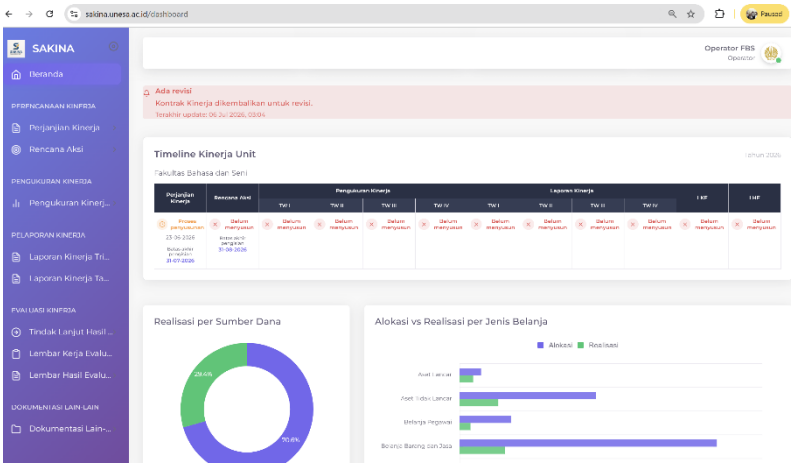


Figure 3. SAKINA Home Dashboard

The planning interface organizes objectives, indicators, units, targets, and budget allocation in a structured page and supports the movement of drafts through operator, leader, central-administrator, and university-leadership actions. The interface is designed to keep controlled fields separate from editable entries and to display the current process state. Figure 4 shows the Performance Planning module.

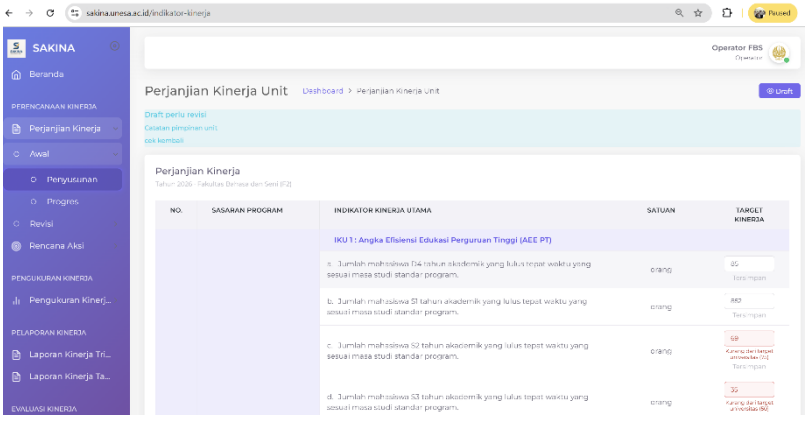


Figure 4. SAKINA Performance Planning Module

Prototype Readiness

The initial prototype has uneven readiness across functions. Login, role allocation, data input, evidence upload, tiered validation, document-state changes, activity recording, and dummy electronic-signature display are available in the initial build. The main module structure, actor allocation, validation rules, and data relationships are documented. Full intermodule automation, automatic achievement calculation, notifications, certified electronic signatures, technical-security hardening, and interoperability with other UNESA applications require further development.

Accordingly, the available evidence consists of requirements specifications, architecture, data relationships, module and workflow designs, interface outputs, and initial functional behavior. It is not evidence of organization-wide effectiveness. SAKINA cannot yet be declared ready for broad operational deployment until functional completeness, accuracy, usability, security, scalability, recovery, interoperability, and user acceptance have been evaluated in controlled and limited implementation settings.

Discussion

From Document Digitization to Digital Performance Governance

The central contribution of SAKINA is the conversion of the SAKIP cycle into an integrated digital workflow. This differs from document digitization, in which paper files are merely uploaded to electronic storage. Digital-government scholarship consistently frames transformation as a change in organization, process, relationships, and decision-making [1], [2], [3], [4], [5], [6]. SAKINA reflects this perspective by linking the production of performance information to authority, validation, process states, evidence, and subsequent use. The artifact therefore represents an early form of digital performance governance rather than a generic repository.

The reuse of planning data in measurement and reporting is particularly important. It reduces the structural separation between target setting and achievement reporting and creates a common data lineage. This design is consistent with data-driven government and knowledge-management research, which emphasizes shared data assets and organizational capability [58], [59], [60]. It also responds to outcome-oriented approaches that distinguish digital-service availability from measurable improvements in organizational processes and public value [16], [17]. However, the prototype cannot yet establish that these benefits occur in practice; this requires implementation evidence.

Organizational Fit in a Legal-Entity State University

Public-sector systems often fail when technical design is separated from institutional arrangements. Comparative studies identify governance fragmentation, discontinuity, capability gaps, and resistance as recurring obstacles [18], [19], [20], [21], [22], [23], [24], [32]. SAKINA addresses organizational fit by deriving roles, module access, validation points, and data ownership from UNESA's actual accountability process. Operators, work-unit leaders, evaluators, administrators, and university leadership are represented as distinct actors rather than interchangeable users.

This fit is especially relevant in a legal-entity state university. Faculties, schools, directorates, institutes, agencies, technical units, and other work units have different

responsibilities but participate in the same accountability cycle. A centralized system must therefore combine common standards with role- and unit-specific access. The prototype provides that structural combination through shared master data and role-based permissions. Nevertheless, transferability is analytical rather than automatic: other universities must remap their organizational structures, performance architecture, internal rules, and data interfaces before adopting the model.

Transparency, Accountability, and Evidence-Based Decision-Making

The dashboard, document states, evidence links, and activity records operationalize transparency and traceability. Open-data research indicates that transparency becomes more consequential when it is connected to process redesign and mechanisms for accountability [33]. In SAKINA, visibility is not limited to final results; it includes whether a document remains a draft, has been submitted, requires revision, has been verified, or has been approved. This makes delay and responsibility more observable within the authorized organizational environment.

Role-based validation also creates an explicit chain of accountability. Operators are responsible for entry and evidence, work-unit leaders for unit control, monitoring and evaluation teams for review, central administrators for verification and configuration, and university leadership for strategic oversight and final approval. This division is supported technically by role-based access control [51]. Activity records further provide a basis for identifying who performed an action and when. The design is therefore aligned with contemporary concerns about digital auditability and accountability [27], while also recognizing privacy and access-control risks [31].

Evidence-based decision-making is supported by presenting targets, achievements, documents, and evaluation results within one information flow. This can potentially reduce the time required to match separate files and enable leaders to identify incomplete processes or weak achievement earlier. The statement remains a design proposition, not an observed impact. A future implementation study should measure report-completion time, data accuracy, correction frequency, document retrievability, management use, and the quality of follow-up decisions before claiming improved performance accountability.

Implementation Implications and Future Validation

Digital leadership and implementation capability will influence whether the prototype becomes an organizational system. Leadership research emphasizes strategic vision, collaboration, operational guidance, and public-value orientation [25], [26]. The implementation phase should therefore include governance ownership, clear data stewardship, user preparation, help arrangements, and staged adoption across selected work units. Digital service teams can support translation between regulatory, managerial, and technical requirements [23].

Future validation should proceed in stages. Functional testing should verify every workflow branch, calculation, permission, document state, and output. Security testing should examine authentication, authorization, session management, upload controls, logging, vulnerability, backup, and recovery. Usability testing should involve all five user groups and examine task completion, error, learnability, and satisfaction. User-acceptance and system-success evaluation should draw on established models [52], [53], [54], [55], [56], [57]. Limited

implementation should then assess operational indicators, including completion time, correction cycles, traceability, information use, and organizational readiness. Only after these tests should broader implementation or cross-institutional replication be considered.

The same caution applies to interoperability and automated decision support. Consistent identifiers, metadata, and centralized relationships provide a foundation for future integration under SPBE and One Data Indonesia principles [40], [41], [42], but no exchange with external applications was tested. Likewise, the prototype organizes performance information but does not introduce artificial-intelligence analysis or automated recommendations. Such features would add privacy, explainability, audit, and governance requirements identified in the digital-public-administration literature [28], [29], [30], [31].

CONCLUSION

This study developed the initial prototype of SAKINA as an electronic-based Government Agency Performance Accountability System for UNESA. Based on evidence from 30 informants, 80 documents, regulatory analysis, and observed work processes collected from July 2023 to June 2026, the study translated fragmented performance-management problems into an integrated architecture, six module groups, five user roles, eight principal workflows, and traceable data relationships. The resulting Laravel, PostgreSQL, and Nginx prototype connects planning, measurement, reporting, evaluation, follow-up, and supporting documentation through centralized data, role-based access, tiered validation, document status, evidence linkage, and activity recording. Its academic contribution lies in positioning e-SAKIP as a digital-governance artifact that integrates regulation, organizational process, accountability, and technology rather than merely digitizing documents. Its practical contribution is an adaptable design framework for managing performance accountability in a complex legal-entity state university. The findings must nevertheless be interpreted at the prototype level. The study demonstrates design coherence and an initial functional foundation, but it does not establish improvements in efficiency, accountability, user satisfaction, security, or decision quality. Subsequent research should complete functional and security testing, conduct expert and user validation, evaluate system success and acceptance, perform limited implementation in selected work units, and measure operational outcomes before broader deployment or replication.

LIMITATIONS

This study is limited to a single institutional setting and an early prototype stage. The requirements and design reflect UNESA's organizational, regulatory, and technological context, so transfer to other legal-entity state universities requires contextual remapping. The study focused on requirements analysis, architecture, workflow design, interface output, and initial functional verification. It did not conduct comprehensive user-acceptance testing, usability testing, load and performance testing, penetration testing, disaster-recovery testing, certified electronic-signature testing, interoperability testing, or full organizational implementation. Consequently, the results support design feasibility and process integration at the prototype level, not claims of implementation effectiveness, accountability improvement, reporting efficiency, or decision-making impact.

AUTHOR INFORMATION

Corresponding Author

Masita Nur Hayati – Department of Education Management, Universitas Negeri Surabaya, (Indonesia);
orcid.org/0009-0000-9515-1167
Email: masitanurhayati@unesa.ac.id

Authors

Masita Nur Hayati – Department of Education Management, Universitas Negeri Surabaya, (Indonesia);
orcid.org/0009-0000-9515-1167
Yatim Riyanto – Department of Education Management, Universitas Negeri Surabaya, (Indonesia);
orcid.org/0009-0002-0233-4189
Sujarwanto – Department of Education Management, Universitas Negeri Surabaya, (Indonesia);
orcid.org/0000-0001-8398-054X
Amrozi Khamidi – Department of Education Management, Universitas Negeri Surabaya, (Indonesia);
orcid.org/0009-0002-4358-6673
Muhamad Sholeh – Department of Education Management, Universitas Negeri Surabaya, (Indonesia);
orcid.org/0000-0002-0869-0451
Karwanto – Department of Education Management, Universitas Negeri Surabaya, (Indonesia);
orcid.org/0000-0002-9062-7602

AUTHOR CONTRIBUTION

M.N.H. led the conceptualization, investigation, requirements analysis, project administration, prototype design, and preparation of the original manuscript. Y.R., S., A.K., and K. contributed to methodological development, regulatory and organizational analysis, research validation, supervision, and critical manuscript revision. M.S. contributed to the system architecture, software development, technical validation, and prototype visualization. All authors participated in interpreting the findings, reviewing and refining the manuscript, approving the final version, and accepting collective responsibility for the integrity of the study.

CONFLICT OF INTEREST

"The authors declare no conflict of interest."

DECLARATION OF USE OF AI IN SCIENTIFIC WRITING

ChatGPT (OpenAI) was used to support language refinement and editorial restructuring. The authors reviewed and approved all revisions and remain fully responsible for the accuracy of the content, data, interpretations, and references.

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