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Research Article

SIM AKURAT: Transformation of Legal Metrology Service Governance that is Integrated, Accountable, and Focused on Consumer Protection in Purbalingga Regency

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Abstract. This research-based innovation paper proposes SIM AKURAT as a governance reform initiative for legal metrology services in Purbalingga Regency. The system is designed to integrate the identification and history of measuring instruments, volumetric instruments, weighing instruments, and other legal metrology equipment (UTTP), including verification scheduling, test result records, validity notifications, risk mapping, digital archives, QR code verification, complaint management, and action dashboards. This study aims to analyze service problems, develop an innovative system design, and formulate implementation strategies with measurable benefits. A qualitative descriptive case study approach was applied, combined with design science principles during the conceptual design phase. Data were collected through participatory observation, regulatory and document reviews, official government information, previous studies, and benchmarking of related innovations. Analysis was conducted using process mapping, gap analysis, root cause analysis, stakeholder analysis, and theory of change. The findings reveal several challenges, including fragmented data, inefficient instrument history tracking, non-automated reminders, repetitive reporting processes, limited spatial data utilization, and inconsistent access management. SIM AKURAT addresses these issues through unique UTTP identification, integrated service processes, automated notifications, risk-based supervision, audit trails, dashboards, and future interoperability with SPBE and Satu Data Indonesia. Implementation is recommended through a minimum viable product and pilot testing, followed by evaluation of functionality, security, user acceptance, and service benefits. SIM AKURAT is expected to improve data accuracy, operational efficiency, compliance with re-verification requirements, monitoring effectiveness, transparency, and public trust through consistent organizational and technological transformation.

Keywords: Data Governance; Digital Public Services; Legal Metrology; Regional Innovation; SIM AKURAT.

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1. Introduction

Legal metrology is a branch of metrology that regulates units of measurement, measurement methods, measuring instruments, and measurement results that relate to the public interest and have legal consequences. In commercial transactions, consumers generally do not have comparison tools and cannot independently verify the accuracy of the scales, meters, or volume measuring devices used by businesses. This information asymmetry places consumers at a disadvantage because losses may be small in each individual transaction but accumulate due to high transaction frequency. The government is therefore obligated to ensure the accuracy of measurement results through calibration, recalibration, supervision, enforcement, and education. The function of legal metrology extends beyond technical compliance; it serves as an instrument for consumer protection, business certainty, fair competition, safety, and trust in the market (Republic of Indonesia, 1981; Sandela et al., 2022).

The benefits of legal metrology are felt by the general public because almost everyone engages in transactions that rely on measurement results whether when purchasing food, fuel, gas, water, packaged goods, or certain services. Accurate measuring instruments ensure that

consumers receive the quantity they paid for and that compliant businesses are not disadvantaged by competitors who use instruments that do not meet regulations. For local governments, accurate UTTP data helps determine service schedules, the scope of oversight, priorities for capacity building, and the evaluation of consumer protection. For the local economy, the reliability of measurement results fosters a climate of fair trade and reduces disputes. Thus, the quality of legal metrology services is directly linked to everyday economic justice, not just to government administration.

The development of legal metrology services in Purbalingga Regency has highlighted a real need to bring these services closer to the public and businesses. The Purbalingga Regency government began preparing the institutional framework and resources in 2016 after businesses complained that the re-calibration process required a trip to Yogyakarta and could take two to three months. Independent calibration and re-calibration services were then launched on February 25, 2019, after the institutional framework, authorized personnel, and local regulations were in place. These changes shortened the service chain and affirmed the transfer of authority for UTTP services and oversight to regency and city governments. This history serves as empirical evidence that the reform of metrology services in Purbalingga arose from issues of access, time, and the need for service certainty not merely a desire to adopt technology (Purbalingga Regency Government, 2025).

These institutional advances have yielded achievements that must be sustained through increasingly robust governance. In 2025, Purbalingga Regency once again received the "Daerah Tertib Ukur" (Metrology-Compliant Region) award for the fourth consecutive time. The award evaluation covered the Legal Metrology Index, the Metrology Compliance Index, the Public Awareness Index, and the " " Service Innovation Index. The local government also stated that services are provided at offices and through outreach services at markets and in various areas, while the innovations developed include the SIM AKURAT system, e-certificates, the training of measurement and weighing officers, and assistance for "Measurement Compliance Markets." These facts demonstrate that digitization has become an integral part of the strategy to maintain service quality and consumer protection in Purbalingga (Purbalingga Regency Secretariat, 2025).

The growth of services has led to an increase in the volume and diversity of data. The Legal Metrology Technical Implementation Unit (UPTD) must manage the identities of UTTPs, owners or users, locations, instrument types, serial numbers, test results, validity periods, documents, schedules, follow-up histories, and reporting requirements. When this information is stored in different sources, staff members take longer to trace histories and verify instrument status. Due-date reminders that rely on manual checks risk being late, while compiling reports from multiple sources can result in discrepancies in figures. Similar conditions have also been identified in metrology studies in other regions, particularly in the form of manual management, data fragmentation, conventional services, and limited monitoring (Aldi et al., 2024; Miftahuzzamal & Ardan, 2023; Ulum et al., 2024).

The concept of SIM AKURAT arose from the need to transform service data into a tool for control and decision-making. The name SIM AKURAT is an acronym for the Legal Metrology Information System that is Accountable, Competent, Excellent, Responsive, Trustworthy, and Integrated. Accountability is realized through audit trails and evidence of actions; competence through process standards and knowledge support; excellence through continuous improvement; responsiveness through notifications and follow-up lists; trustworthiness through data protection and proportional transparency; and integration through a single identity and a single history per UTTP. SIM AKURAT was chosen because standard record-keeping applications are insufficient to meet the needs for end-to-end services, risk-based oversight, public verification, and reporting from a single data source.

SIM AKURAT is not only aimed at resolving operational issues in legal metrology services but also supports the achievement of Purbalingga Regency's vision and development direction. These contributions are realized through the strengthening of the local economy, the sustainable utilization of digital infrastructure, public service reform, and the enhancement of human resource capacity.

Recent research on digital transformation in the public sector confirms that outcomes are not determined by the number of features, but rather by changes in processes, organizational capacity, collaboration, data governance, user-centricity, and sustainability (David et al., 2023; Haug et al., 2024; Kitsios et al., 2023; Latupeirissa et al., 2024). Data stewardship is essential to ensure that cross-process data remains trustworthy, while user trust is influenced by system quality, usability, security, privacy, and risk perception (Gupta et al., 2025; van

Donge et al., 2022). Therefore, the AKURAT MIS must be developed through process mapping, role definition, data standards, security by design, user engagement, phased implementation, and benefit measurement. This approach is crucial to ensure that digitization does not merely transfer forms from paper to a screen. This paper is intended to provide an analytical foundation for the development of this innovation.

2. Literature Review

Digital Transformation of Public Services

As from simple digitization and digitalization. Digitization converts analog information into a digital format, whereas digitalization uses technology to support existing processes. s the way organizations operate, allocate roles, use data, and interact with users. Recent studies emphasize user-centricity, process changes, collaboration, leadership, competencies, and sustainability as key factors (David et al., 2023; Haug et al., 2024; Kitsios et al., 2023; Latupeirissa et al., 2024). In the context of the AKURAT MIS, this means that service processes must be simplified before they can be automated.

Digital services must also be inclusive and proactive. Users should not be forced to reenter data that is already available, while groups with limited digital literacy or access still require assistance. Systems can shift from a reactive to a proactive approach through due-date notifications, action lists, and risk-based monitoring. The 2024 UN E-Government Survey and the OECD Digital Government Index identify human-centered services, a data-driven public sector, "government as a platform," and proactiveness as the foundations of digital government (OECD, 2024a; United Nations, 2024). These principles underpin the design of SIM AKURAT as a working platform, not merely an information portal.

Data Governance and Interoperability

Data governance determines who has the authority to establish definitions, generate, validate, correct, use, and publish data. Data stewardship is necessary to maintain data quality and facilitate data exchange within an ecosystem involving multiple units (van Donge et al., 2022). Within the One Data Indonesia framework, data must meet standards, include metadata, ensure interoperability, and utilize reference codes and master data. Therefore, the SIM AKURAT system requires unique UTTP identifiers, a data dictionary, validation rules, deduplication, change logging, and designated responsible parties. New integrations should only be implemented once the quality of the core data has stabilized.

System Success and User Acceptance

The DeLone and McLean model assesses system success through system quality, information quality, service quality, usage, satisfaction, and net benefits (DeLone & McLean, 2003). UTAUT explains that acceptance is influenced by performance expectations, ease of use, social influence, and supporting conditions (Venkatesh et al., 2003). A recent meta-analysis shows that trust influences intentions and usage of e-government, while system, information, and service quality are associated with success (Hooda et al., 2022, 2023). Consequently, the AKURAT SIM must provide tangible benefits in daily tasks, be easy to learn, have leadership support, and be equipped with the necessary devices, connectivity, training, and technical assistance.

Data Security and Protection

Government digital services process data on identity, contact information, location, documents, transactions, and activity logs. User trust may decline if risks, privacy, and security are not effectively managed (Gupta et al., 2025). The principles of "security and privacy by design" mean that data classification, access restrictions, activity logging, backup, recovery, and incident response are defined from the requirements phase. The NIST Cybersecurity Framework 2.0 positions governance alongside identify, protect, detect, respond, and recover as risk management functions (National Institute of Standards and Technology, 2024). In the AKURAT SIM, QR codes must distinguish public information from personal data and internal documents.

Regional Innovations and Policy Foundations

Local innovation refers to reforms in governance that benefit both the community and the government. These reforms do not necessarily have to involve technology that has never existed before. Novelty can stem from a combination of processes, governance, functional integration, or new applications within a local context. Government Regulation No. 38 of 2017 requires innovations that provide benefits, do not impose undue burdens, and are accountable. The AKURAT SIM meets these requirements if it can demonstrate improvements in performance, consumer protection, and organizational sustainability.

3. Proposed Method

This document is a research-based innovation paper, not a full implementation report or an impact evaluation report. A qualitative descriptive approach using a case study strategy was employed to analyze the state of legal metrology services in Purbalingga Regency. The study was conducted at the Legal Metrology Technical Implementation Unit (UPTD) under the Purbalingga Regency Department of Trade, Cooperatives, and Small and Medium Enterprises (DindagkopUKM). The primary data were derived from the author's participatory observations. The observations covered data entry points, document use, history searches, scheduling, recording of results, report compilation, and follow-up requirements. The analysis is conducted in stages. First, process data is broken down into activities, actors, inputs, outputs, time, documents, and decision points. Second, a gap analysis compares the current state with the desired state. Third, a root cause analysis categorizes causes into human factors, processes, technology, and data and governance. Fourth, benchmarking compares innovation capabilities with similar initiatives and prior research. Fifth, the theory of change examines the logical relationship between interventions and benefits. Sixth, the design is validated for consistency with regulations, user needs, security, and implementability. The validity of the analysis is ensured through source triangulation and methodological triangulation.

4. Results and Discussion

Results of the Analysis of the Existing Conditions and Initial Findings

Institutional strengthening since 2016, the launch of self-service options in 2019, and the achievement of "Metrology-Compliant Region" status in 2025 demonstrate that the Purbalingga Regency Legal Metrology Technical Implementation Unit (UPTD) has the institutional foundation to continue its service transformation. In this chapter, these historical facts are used to provide context for the organization's readiness, while the analysis focuses on gaps in processes and data governance that need to be addressed through innovation (Purbalingga Regency Government, 2025; Purbalingga Regency Secretariat, 2025).

The results of the process analysis indicate that the primary need lies in data connectivity throughout the service cycle. The UTTP identifier must be consistently linked to the owner, location, schedule, test results, validity period, documents, public status, and follow-up actions. The use of separate summaries increases the risk of identifier discrepancies and slows down the compilation of medical histories. Similar patterns were found in studies in Subang and Jombang Regencies; therefore, solutions must be tailored to the context, capacity, and service objectives of Purbalingga (Aldi et al., 2024; Miftahuzzamal & Ardan, 2023).

Table 1. Current Conditions and Desired Conditions.

Area	Current Conditions	Desired Conditions
UTTP Data	Data sources and elements are not always consistent.	A single database with unique identifiers, validation, change history, and designated personnel.
Requests and schedules	Information and records may be distributed across multiple channels.	A single workflow for requests, verification, scheduling, assignment, and status.
Service history	Tracking documents requires manual searches.	A digital timeline for each UTTP that links results, staff, marks, photos, and documents.
Validity period	Monitoring relies on lists and manual checks.	Tiered notifications before expiration and follow-up escalations.
Supervision	Prioritization does not yet fully utilize location and history data.	Risk scoring to determine priority objects and areas.
Transparency	Status verification and complaints are not yet handled through a single channel.	A QR code containing basic public information and a complaint channel.
Reporting	Compilation requires reprocessing.	Dashboard and automated reports from the same source transactions.
Governance	Updates, access, and change audits need to be standardized.	Data owners, data stewards, access matrices, quality SOPs, and audit trails.

Source: Compiled by the author based on observations of work processes and previous studies, 2026.

The analysis at this stage is still qualitative because a formal baseline is not yet available. Therefore, performance improvement figures are set as proposed targets and can only be declared as achievements after the pilot produces verifiable evidence.

Root Cause Analysis

A root-cause analysis shows that suboptimal performance is not caused by technology

alone. On the human side, digital literacy, data ownership, and the division of roles are not yet evenly distributed. On the process side, record-keeping, tracking, status updates, and follow-up are not yet integrated from start to finish. On the technology front, an integrated platform and field-mode support are not yet fully available. Regarding data and governance, standards, validation, access, and change audits remain inconsistent. Adding new applications without addressing these four aspects will merely shift the problem to a new medium.

Figure 1. Root Cause Analysis of Legal Metrology Services.

Table 2. Root Cause Analysis.

Aspect	Root Causes	Required Interventions
People	Digital literacy varies, the role of data is not yet clearly defined, and the benefits of the system are not yet directly felt.	User engagement, task-based training, support, and role definition.
Process	Workflows and statuses are not yet end-to-end; inputs and summaries may be repetitive.	Service blueprint, simplification, SOPs, SLAs, and a follow-up list.
Technology	No integrated platform yet; field connectivity is not always stable.	Mobile-first MVP, temporary storage, synchronization, and monitoring.
Data and Governance	Data is scattered; standards and identities are not yet standardized; access and auditing are not yet consistent.	Data dictionary, unique identifiers, validation, deduplication, access matrix, and audit trail.

Source: Compiled by the author based on fishbone analysis and process review, 2026.

The results of this analysis are consistent with studies on digital transformation in the public sector. Haug et al. (2024) show that digital transformation is influenced by organizational capacity, collaboration, resources, leadership, and service needs. David et al. (2023) also found that local government adoption strategies must balance technological opportunities with organizational and societal constraints. Therefore, the AKURAT SIM strategy must be broader than simply procuring software. The primary focus should be on processes and data, with technology following to meet the agreed-upon needs.

System Requirements, Concepts, and Value Propositions of SIM AKURAT

Root causes related to people, processes, technology, data, and governance must be translated into system requirements before features are defined. This step prevents the development of features that are technically appealing but do not solve service problems. The following matrix shows the traceability between problems, requirements, and the AKURAT SIM design responses.

Table 3. Traceability of Root Causes, Requirements, and Features of the AKURAT SIM.

Root Causes	System Requirements	Design Response/Features
Data is scattered, and UTTP identities are not yet standardized.	Unique identifiers, data validation, and deduplication.	UTTP master data, unique identifiers, data dictionary, and quality rules.
Service history and documents are slow to retrieve.	Integrated history that tracks each UTTP.	Service timeline, digital archives, search, and document relationships.
Expiration date monitoring and follow-up are still done manually.	Proactive monitoring and measured escalation.	Tiered notifications, due date lists, responsible parties, and deadlines.
Service information and status are scattered across multiple channels.	A single, easy-to-understand channel for information and status updates.	Requests, service status, notifications, public QR codes, and complaints.

Location and history of non-compliance are not yet optimized for prioritization.	Location-based, due date-based, and risk-based monitoring.	Distribution mapping, risk scoring, and a list of priority objects.
Reporting requires recompilation, and figures may vary.	A single data source for operations, dashboards, and reports.	Dashboard for actions and automated reports on the same transactions.
Access rights, data changes, and user readiness are not yet standardized.	Governance, security, and user support from the design phase onward.	Access matrix, audit trail, data classification, prototyping, and training.

Source: Compiled by the author based on the results of root cause analysis and user needs, 2026.

This traceability forms the basis for feature selection and the development sequence. Core features are prioritized if they are directly related to the main issues, can be tested in a pilot, and demonstrate tangible benefits. Advanced features are developed once processes, data quality, and user acceptance reach an adequate level.

SIM AKURAT offers the value proposition of "one device, one identity, one history, and one trusted data source." Each UTTP is assigned a unique identity that links technical data, owners or users, location, validity period, inspection history, test results, documents, and follow-up actions. The same data is used for services, oversight, dashboards, and reports according to authorized access levels. Public information is separated from internal and personal data. This value proposition shifts the system from a data repository to an infrastructure for action and accountability.

Table 4. AKURAT SIM Design Principles.

Principle	Meaning in Design
Process First, Technology Second	Workflows, authority, status, and data standards are agreed upon before development.
Minimum viable product	The initial phase prioritizes core features that provide value and can be tested.
Mobile-first and inclusive	The system supports field use while still providing non-digital assistance.
Enter once, share widely	Validated data is reused according to authorized access.
Single data source	Dashboards and reports are derived from the same transactions.
Security and privacy by design	Security, privacy, and audit capabilities are defined from the requirements analysis stage.
Phased interoperability	Standards and interfaces are prepared without forcing integration before the data is ready.
Measure what matters	Features are linked to benefit indicators and decision-making.

Source: Adapted by the author from OECD (2024a, 2024b)*, NIST* (2024)*, and digital transformation studies.*

Table 5. Value and Benefit Components.

Value Components	Benefits
Digital identity and QR codes	Speeds up history searches and allows for public status verification without revealing personal data.
End-to-end service	Connects applications, verifications, schedules, assignments, results, documents, and closures.
Tiered notifications	Provides reminders before deadlines and escalates if there is no follow-up.
Risk-based monitoring	Uses due dates, location, UTTP type, results, and compliance for prioritization.
Responsive field mode	Supports mobile data entry and temporary storage when connectivity is limited.
Action dashboard	Displays items, priority reasons, responsible parties, and deadlines.
Audit trail and data quality	Records changes, actors, times, reasons, and evidence.
Phased interoperability	Reduces data re-entry and supports SPBE and Satu Data.

Source: Compiled by the author, 2026.

Architecture, Modules, and Service Workflow

The functional architecture positions the AKURAT SIM as a link between users, processes, and data sources. Business entities interact through registration, applications, status updates, reminders, and documents. The public uses QR code verification and complaint submission. Officials access histories, receive assignments, record results, and follow up on cases. Coordinators and leaders use action dashboards and reports. External systems are positioned as sources or destinations for data exchange, which is implemented in phases.

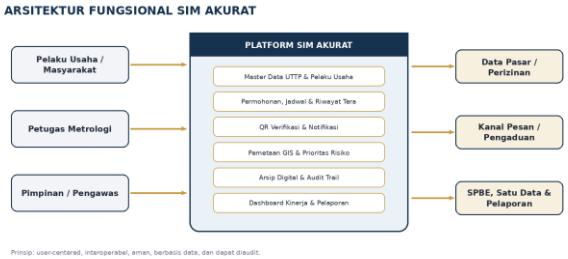

Figure 2. Functional Architecture of SIM AKURAT.

Table 6. Users and Access Rights.

Users	Main Requirements and Access Rights
System Administrator	Configuration, accounts, references, and technical monitoring without improperly altering test results.
Data steward/operator	Validation, evidence-based correction, deduplication, and updating of master data.
Authorized Officers/Employees	Assignments, access history, recording of results according to authority, and document uploads.
Coordinator/Head of UPTD	Schedule approval, workload distribution, risk assessment, and follow-up monitoring.
Department/Regional Leaders	Strategic dashboard, achievements, risks, and policy needs.
Business operators	Restricted profiles, applications, status, reminders, and documents to which they are entitled.
Public	Verification of public information and complaints.
Auditors/Supervisors	Reports and audit trails in accordance with assignments and on a need-to-know basis.

Source: Compiled by the author based on the principle of least privilege, 2026.

Table 7. Main Modules of the AKURAT SIM.

Module	Primary Function
UTTP Master Data	Unique identity, specifications, owner, location, status, validity period, and documents.
Business Entities and Locations	Business profile, contact information, permit references, markets, regions, coordinates, and relationship with UTTP.
Requests and Scheduling	Applications, verification, queues, schedules, assignments, and notifications.
Calibration/recalibration services	Checklists, inspection/test results, marks, notes, photos, documents, and follow-up.
History and digital archives	Timeline per device, minutes, letters, photos, and searchable documents.
QR verification	Minimum identification, validity status, expiration date, renewal date, and complaint channel.
Notifications	Reminders for validity periods, schedules, completeness, status changes, and escalations.
Mapping and Risk	Maps showing distribution, coverage, due dates, non-compliance history, and priorities.
Dashboards and reporting	Data quality, volume, service time, due dates, compliance, complaints, and actions.
Complaints and Feedback	Reports, evidence, location, follow-up status, and satisfaction.
Integration and export	Data exchange, metadata, standard formats, and integration activity logs.

Source: Compiled by the author based on process and user needs, 2026.

The service process begins with the inventory or registration of UTTPs. The data is verified, deduplicated, assigned a unique identifier, and mapped. The system sends reminders or receives requests, after which an operator verifies that the information is complete. A coordinator sets the schedule, assigns staff, determines the location, and identifies equipment needs. Staff members access the history, conduct inspections or tests, record the results, and upload evidence. Documents and statuses are linked to the UTTP, while items that do not yet meet the requirements are added to the follow-up list.

Table 8. AKURAT Driver's License Service Workflow.

Stage	Processes and Targets
1. Registration/ Inventory	Data is recorded, deduplicated, validated, assigned a unique identifier, and mapped.
2. Reminder/ Application	The system sends a reminder, or the business owner submits a service request; the completeness of the submission is verified.
3. Scheduling	The coordinator sets the time, location, staff, and equipment requirements.
4. Execution	Staff members access the history, record the results, upload evidence, and set the status.
5. Documentation	Documents and records are linked to the UTTP; public information is updated.
6. Follow-up	The object does not yet meet the criteria for inclusion on the list for repair, retesting, or monitoring.
7. Reporting	The dashboard and reports are updated from the same source transactions.
8. Evaluation	Usage, satisfaction, data quality, delays, risks, and benefits are reviewed.

Source: Compiled by the author, 2026.

Novelty and Innovation Position

Benchmarking shows that digital metrology services have developed across various regions and research areas. Therefore, the claim that the AKURAT SIM is new simply because it offers online registration, QR codes, or a mobile app cannot be sustained. SETRO Bantul, Si ITEM MESEM Semarang, TERA-OCE Serdang Bedagai, SIMJAK DKI Jakarta, and the Ministry of Trade's reporting portal have already provided certain functions. Research conducted from 2023 to 2026 has also addressed data management, customer applications, mobile officer applications, digitization of calculations, and business processes. The novelty of SIM AKURAT lies in the integration of function configuration with data governance, risk management, auditing, and action dashboards within the context of Purbalingga.

Table 9. Comparison of Similar Innovations and Differentiation.

Comparison	Key Capabilities	SIM AKURAT Differentiation
SETRO Bantul	Calibration/recalibration services and complaint channels.	Unique identity, end-to-end history, risk, audit trail, and action dashboard.
Si ITEM MESEM Semarang	Registration, digital test results, seal documentation, and complaints regarding vehicle measuring tanks.	Multi-UTTP with configurable modules.
TERA-OCE Serdang Bedagai	Online calibration requests.	Connecting applications through evaluation, reporting, and monitoring.
SIMJAK DKI Jakarta	Portal for information, education, service transparency, and metrology portfolio.	Transparency regarding UTTP status and local follow-up based on instrument identification.
Ministry of Trade Reporting Portal	Reporting on oversight, data collection, monitoring, and education.	Export/API of local transaction data to reduce re-entry.
Miftahuzzamal & Ardan, 2023	UTTP data management.	Data integration across the entire service and supervision cycle.
Aldi et al., 2024	Customer service and re-calibration requests.	Tiered notifications, risk management, audits, public QR codes, and action dashboards.
Ulum et al., 2024	Mobile app for field staff.	Multi-user coverage and cross-process data governance.
Simanjuntak, 2026	Analysis of service business processes.	Translating processes into architecture, modules, indicators, and governance.

Source: Compiled by the author based on public benchmarking and prior research, 2026.

This novelty must be empirically tested. The required evidence includes comparisons of pre- and post-implementation processes, task completion times, data quality, actual usage, compliance, complaint resolution, and user satisfaction. If the pilot does not show any changes, the combination of features does not automatically constitute a successful innovation. This position aligns with the system success model that assesses net benefits rather than the mere existence of an application (DeLone & McLean, 2003). Claims of innovation are thus treated as hypotheses that must be proven.

Data Governance, Security, and Transparency

Data governance forms the foundation of the AKURAT Information System. Data owners establish policies and accountability; data stewards maintain definitions and quality;

data producers generate transactions; while the Department of Communication and Information Technology (Dinkominfo) or the data custodian supports standards, metadata, interoperability, and security. This division of roles prevents a situation where anyone can modify data but no one is held accountable. Quality rules cover completeness, format, uniqueness, location consistency, timeliness, and evidence of changes. The audit trail must record the user, time, before-and-after values, reason, and supporting documents.

Table 10. AKURAT SIM Data Governance.

Component	Provisions
Data Owner	Establishes policies, access, usage, retention, and accountability for data.
Data Steward	Maintaining the definition, quality, validation, deduplication, and updating of master data.
Data producers	Generating transaction data in accordance with assigned tasks and SOPs.
Data custodian/Department of Communication and Information Technology	Supporting standards, metadata, interoperability, security, and publication.
Quality Rules	Completeness, format validity, uniqueness, consistency, timeliness, and evidence.
Change Audit	User, time, old-to-new values, reason, approval, and documentation.
Data classification	Public, internal, restricted, and personal data.
Retention and archiving	Retention, destruction, and archiving schedules in accordance with regulations.
Integration	Exchange based on purpose, authority, metadata, and activity logging.

Source: Compiled by the author from Presidential Regulation No. 39 of 2019, Law No. 27 of 2022, and van Donge et al. (2022).

Security is implemented through the principle of least privilege, adequate authentication, communication encryption, backups, recovery testing, audit logs, account management, vulnerability testing, and incident response. NIST CSF 2.0 adds a "govern" function to ensure that cyber risk is the responsibility of the organization, not just technical managers (National Institute of Standards and Technology, 2024). QR codes must not provide access to personal data, contacts, internal documents, or restricted technical results. Public pages should only include minimal identifying information, the type of tool, its valid status, expiration date, update date, and a reporting channel. Appropriate transparency builds trust, whereas excessive transparency actually creates risks.

Innovation Actions and Benefits Dashboard

The SIM AKURAT dashboard is designed as an action dashboard, not a collection of charts. The display should indicate which items or areas require follow-up, why they are a priority, who is responsible, and what the deadline is. The summary can show the number of validated UTTPs, those due within 30 days, completed services, active complaints, and data quality. The action list can be sorted by risk and delay. Thus, operational data is transformed into a work agenda that can be monitored.

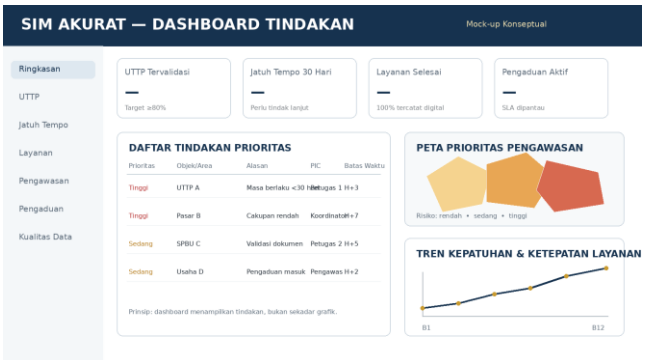

Figure 3. Conceptual mock-up of the SIM AKURAT action dashboard.

Table 11. Benefit Dimensions of the AKURAT SIM.

Dimension	Expected Changes
Data Quality	Data is more complete, unique, consistent, up-to-date, and traceable.
Efficiency	The time spent on searching, processing requests, and compiling reports is reduced.
Compliance	Reminders and due date lists improve follow-up on re-calibration.
Monitoring	Risk mapping and scoring make oversight more targeted.
Transparency	Public status can be verified, and complaints can be monitored.
Accountability	An audit trail shows who took action, when, and based on what evidence.
Decision-Making	Leaders receive information from the same operational transaction sources.
Public Trust	Guarantees of measurement results and data protection reinforce transaction certainty.

Source: Compiled by the author based on the theory of change and a study of system success, 2026.

These benefits cannot be assumed simply because the system is available. Usage and satisfaction are influenced by ease of use, performance expectations, organizational support, and trust (Gupta et al., 2025; Hooda et al., 2022; Venkatesh et al., 2003). Therefore, the dashboard must be actively used in meetings, task assignments, and evaluations. Business operators must receive clear information, not just confusing automated notifications. Staff need to see that the system reduces their workload, rather than adding parallel record-keeping tasks.

Implementation Strategy and Success Metrics

Implementation is carried out in phases to manage risk. The initial phase establishes the mandate, team, baseline, process map, data dictionary, and pilot objects. The next phase produces a prototype and MVP. After testing functionality, security, and user acceptance, the system is deployed for real transactions with limited scope. Scaling is carried out once the core processes are stable, the data is reliable, users can complete tasks, and there are no critical security issues. This approach is safer than building all features at once.

Table 12. AKURAT SIM Implementation Phases.

Phase	Focus	Key Outcomes
Phase 0: Mandate and Baseline	Governance, processes, priority objects, and initial conditions.	Team, initial SOPs, process map, data dictionary, baseline, and pilot.
Phase 1: Design and MVP	User prototype, data standards, and core modules.	MVP ready for testing and requirements documentation.
Phase 2: Limited Pilot	Data migration, training, live transactions, and evaluation.	Proof of use, issues, improvements, and initial achievements.
Phase 3: Expansion	Addition of regions/types of UTTP and advanced features.	Scope expands in a controlled manner.
Phase 4: Integration and Optimization	Data exchange, audits, benefit evaluation, and refinement.	A stable, secure, measurable, and sustainable system.

Source: Compiled by the author, 2026.

Measuring success begins with the baseline. Targets should not be stated as if they have already been achieved if the initial conditions have not yet been measured. The baseline is obtained through data audits, task time measurements, user surveys, and log reviews. After the system is implemented, performance is compared to the initial conditions on the same pilot objects. The following indicators are proposed targets that must be confirmed based on capacity and baseline results.

Table 13. AKURAT SIM Success Indicators.

Indicator	Proposed Targets	Source of Evidence
Validated pilot UTTP data	100% of pilot data; gradual expansion to include priority data.	Database audit and minutes of proceedings.
New services recorded end-to-end	100% in units that have gone live.	Transaction logs.
Reminders sent on schedule	At least 90%.	Notification logs.
Completeness of required data elements	At least 95%.	Data quality report.
History lookup time	Median of no more than 2 minutes.	Task and timestamp verification.
Administration time until scheduling	Reduced by at least 30% from the baseline.	System timestamp.
Compliance with recalibration during the pilot	Increase compared to baseline; initial target 20%.	Status database.
User satisfaction	At least 85% satisfied or very satisfied.	User survey.
Service availability	At least 98.5% outside of scheduled	Technical monitoring.

	maintenance.	
Complaints resolved according to standards	At least 90%.	Complaint system.
Critical security incidents	Zero open incidents without resolution.	Incident logs and reports.

Source: Compiled by the author as proposed targets; final determination must be based on the baseline and pilot.

Go/no-go criteria are used to prevent premature expansion. A system is ready for expansion if the pilot data has been validated, the core scenarios succeed without uncontrolled parallel logging, users can complete tasks, backup and recovery have been tested, there are no critical defects, and there is preliminary evidence of benefits. If these conditions are not yet met, the rational decision is to refine the pilot. Pursuing user numbers or scope before the foundation is stable only increases the risk. This principle aligns with the GovTech approach, which calls for innovation centered on the needs and capacities of the organization (OECD, 2024b).

Sustainability and Replication

The sustainability of the AKURAT Driver's License System depends on institutional frameworks, budgets, human resources, technology, data, policies, and utilization. The system must be integrated into standard operating procedures (SOPs), business processes, role descriptions, and decision-making forums. The budget should cover not only development but also maintenance, security, infrastructure, training, and evaluation. Documentation and knowledge transfer are necessary to ensure the organization does not rely on a single person or provider. Quality and security audits are conducted periodically. Dashboards should be used as the official source for action so that data is continuously updated.

Table 14. Sustainability and Replication Strategies.

Dimension	Strategy
Institutional	Establish SIM AKURAT in SOPs, business processes, role descriptions, and management decisions.
Budget	Include maintenance, security, infrastructure, training, and development in the annual plan.
Human Resources	Establish administrators, data stewards, support staff, and competency development programs.
Technology	Modular architecture, documentation, backups, monitoring, and disaster recovery plans.
Data	Quality audits, reconciliation, metadata, updates, retention, and archiving.
Policies	Translating regulatory or process changes into updates to SOPs and systems.
Utilization	Using dashboards in meetings, task assignments, and evaluations.
Horizontal replication	Expansion to markets, subdistricts, regions, and types of UTTPs once the go criteria are met.
Vertical replication	Gradual integration with licensing, trade oversight, complaints handling, SPBE, and Satu Data.
Replication package	Applications, data dictionary, SOPs, access matrix, indicators, evaluation instruments, and documentation.

Source: Compiled by the author, 2026.

Replication does not mean copying an application without adaptation. Organizational structures, capacity, infrastructure, regulations, types of UTTPs, and user habits vary from region to region. The components that should be replicated are principles, the core data dictionary, SOPs, access matrices, indicators, and evaluation models. The configuration and implementation sequence must be adapted to the specific context. With this approach, the AKURAT SIM can evolve without compromising accountability or quality.

5. Conclusions

The current state of legal metrology services in Purbalingga Regency indicates a need to strengthen data and process connectivity. Key issues include UTTP data that is not yet fully standardized, slow traceability, manual monitoring of validity periods, scattered information, limited use of location data, repetitive report compilation, and inconsistent access management. The root causes lie in human factors, processes, technology, as well as data and governance; therefore, simply developing an application is not a sufficient solution. Previous research, theories of digital transformation, data governance, system success, user acceptance, security, SPBE, Satu Data Indonesia, and legal metrology regulations provide the foundation that innovation must begin with the structuring of processes and data standards. Systems must be user-centric, secure by design, traceable, gradually interoperable, and evaluated based on demonstrable benefits. SIM AKURAT is designed with the value proposition of "one tool, one identity, one history, and one trusted data source." Service requirements are translated

into a unique UTTP identity, end-to-end services, digital archives, tiered notifications, public verification, risk mapping and scoring, audit trails, and an action dashboard. Its novelty is contextual and combinatorial, as it integrates functions, processes, and governance within the context of Purbalingga's legal metrology services. Safe and sustainable use requires role-based access control, an access matrix, data classification, authentication, backups, audit logs, personal data protection, training, technical support, and user engagement. Implementation must be carried out in phases through process design, data standards, prototyping, a minimum viable product, and limited pilot testing. Expanding the " " is only feasible once the core processes are stable, the data is trusted, users are able to complete their tasks, and there are no critical security risks. The benefits of the AKURAT SIM must be measured by comparing the pilot program's performance against the baseline using indicators such as data quality, service time, recalibration compliance, monitoring accuracy, complaint resolution, actual usage, satisfaction, and security. Sustainability requires standard operating procedures (SOPs), designated personnel, a budget, competencies, documentation, maintenance, periodic evaluations, and the use of dashboards in decision-making. Replication should be based on the principles, data dictionary, SOPs, access matrix, and evaluation framework, while adapting to the local context.

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