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Analysis of Governance and Digitalization of Processes Import Technical Trace Verification (VPTI) in Indonesia: (Study on Efficiency, State Data Security, CLN-SLN Integration, and Digital Transformation Roadmap towards the ISO 17020 and ISO 9001 Standard VPTI System)

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Abstract

Background. Technical Import Verification (VPTI — Verifikasi Rechercheran Teknis Impor) is a strategic import control mechanism implemented at the country of origin as the primary compliance gateway before goods enter Indonesian customs territory. Since the liberalization of VPTI services to private operators—following its previous exclusive assignment to the KSO SCI-SI joint operation as the government's sole designee—state revenue from VPTI services has paradoxically declined by more than 50% of market potential.

Aims. This phenomenon is driven by service fragmentation, operational inefficiency, data security vulnerabilities, and system disconnects between domestic processing and overseas activities conducted by Foreign Surveyors (SLN) and Foreign Collectors (CLN).

Methods. This study employs a qualitative-quantitative systems analysis approach using business process mapping, gap analysis against ISO 17020:2012 and ISO 9001:2015 standards, and process cost modeling to identify root causes and formulate a comprehensive VPTI digitalization architecture.

Result. Findings indicate that implementing an integrated digital VPTI platform—incorporating e-Registration, e-Inspection, e-Report, e-Payment, and e-Monitoring modules based on Government Data Sovereignty principles—has the potential to improve average process efficiency by 65%, secure 100% of technical import data within the state system, recover revenue potential to 85-90% of the existing market, and accelerate VPTI turnaround time from an average of 7-12 working days to 2-4 working days.

Conclusion. This study proposes a 36-month, three-phase VPTI digitalization roadmap with an estimated digital infrastructure investment of IDR 85-120 billion and a projected positive return on investment within 18-24 months.

Keywords: VPTI; Technical Import Verification; Digitalization; ISO 17020; ISO 9001; Data Sovereignty; CLN; SLN; KSO SCI-SI; Process Efficiency; Government Service Transformation

INTRODUCTION

Indonesia, as a country with a large volume of imports—the value of imports exceeds USD 230 billion per year (BPS, 2024)—has very high strategic importance to ensure that every item entering its territory meets applicable technical, security, and standard requirements. Import Technical Tracing Verification (VPTI) is an import policy instrument intended to answer this need: a verification mechanism that is carried out in the country of origin of goods, before goods are loaded and shipped to Indonesia, to ensure technical suitability, document correctness, and compliance with applicable import regulations (Ministry of Trade of the Republic of Indonesia, 2020).

In its history of implementation, VPTI has had a very specific institutional structure. The Government of Indonesia—through the Ministry of Trade and the Ministry of Industry—appointed KSO SCI-SI (Operational Cooperation between Sucofindo and Surveyor Indonesia) as the only institution authorized to implement VPTI. This single designation gives KSO SCI-SI a monopoly of services that, on the one hand, guarantees uniformity of standards and data control, but on the other hand creates capacity limitations and potential inefficiencies that accompany monopolistic structures (Ministry of Industry, 2021).

Policy changes that open the VPTI faucet to other private actors—with the aim of increasing capacity, encouraging competition, and improving services—resulted in a paradox that became the starting point of this study: instead of increasing state revenue from VPTI services, this liberalization resulted in a decrease in revenue of more than 50% of the existing market potential. Service fragmentation among multiple providers, standard inconsistencies, the inability of systems to integrate data from various operators in real-time, and security vulnerabilities in imported technical data are symptoms of this poorly managed transition (Sucofindo, 2023; Ministry of Industry, 2024).

On the other hand, there is a strong push from various stakeholders to accelerate and tighten the VPTI process: (1) importers demand faster and more transparent processes to improve the certainty of delivery times; (2) the government demands import technical data that is centralized, safe, and can be analyzed in real-time for policy purposes; (3) surveyor institutions—both domestic and foreign—need an integrated and operationally efficient system; and (4) the international standards ISO 17020:2012 (Inspection Bodies) and ISO 9001:2015 (Quality Management Systems) demand documentation, traceability, and process

control that are difficult to meet consistently in manual-conventional systems (ISO, 2012; ISO, 2015).

This research systematically analyzes the root of the paradox, identifies the gap between current conditions and the ideal conditions mandated by international regulations and standards, and formulates a comprehensive VPTI process digitization architecture as a solution that addresses all dimensions of the problem simultaneously. The novelty of this research lies in integrating analysis from four perspectives that have been studied separately: operational efficiency, state data security, the integration of the CLN-SLN system, and ISO standard compliance.

Literature Review

Legal And Regulatory Framework of VPTI in Indonesia

VPTI is implemented within a regulatory framework comprising several main legal instruments. The Regulation of the Minister of Trade (Permendag) concerning Provisions on the Import of Goods imposes an obligation on business actors to obtain a surveyor's report (LS) before goods can be imported for certain commodities. The Regulation of the Minister of Industry (Permenperin) sets out the technical specifications and SNI (Indonesian National Standards) that must be met by imported goods. The Minister's Decree appointing verification institutions—both single and plural—defines the scope of authority and responsibilities of VPTI implementers (Ministry of Home Affairs, 2020; Ministry of Industry, 2021).

Substantively, VPTI includes verification: (1) the conformity of the technical specifications of the goods with the import requirements; (2) the correctness of the value and price of goods (price verification); (3) the authorization of the quantity and type of goods; (4) compliance with applicable safety and SNI standards; and (5) the conformity of documents (bill of lading, invoice, packing list, certificate of origin) with physical goods. The results of the verification are outlined in the Surveyor's Report (LS), which is a mandatory document in the customs process (Customs, 2022).

Overseas Service Concept: CLN and SLN

In the VPTI implementation structure, there are two types of entities operating abroad. First, an Overseas Surveyor (SLN) is an individual or team of surveyors who are sent or recruited to conduct a physical inspection of goods in their country of origin, i.e., verify the physical condition, technical specifications, and documents of goods before goods are loaded.

SLN operates directly at the exporter's warehouse, loading port, or production facility in the country of origin and serves as the spearhead of the entire VPTI process (Sucofindo, 2023).

Second, an Overseas Collector (CLN) is an entity or agent in charge of collecting international trade documents required for the VPTI process—including commercial invoices, packing lists, bills of lading, certificates of origin (Certificate of Origin (CoO), technical certificates, and insurance documents—from exporters or shipping agents in the country of origin. CLN has networks in various countries of origin and serves as the first interface between the international trade ecosystem and Indonesia's VPTI system (Sucofindo, 2023; Surveyor Indonesia, 2024).

The relationship among SLN, CLN, and VPTI teams in Indonesia forms a complex process chain and is prone to communication interruptions, document transmission delays, and data inconsistencies if not managed through an integrated system. In the current manual-conventional system, communication between CLN/SLN and the head office in Indonesia relies on email, WhatsApp, and the delivery of physical documents, which creates bottlenecks, data leakage risks, and uncertainty about turnaround times (Surveyor Indonesia, 2024).

ISO 17020:2012 — Inspection Body Requirements

ISO 17020:2012 is an international standard that sets out the requirements for the competence of the institution conducting the inspection, including the inspection of imported goods as carried out in the VPTI. This standard identifies three types of inspection bodies (Type A, B, and C) based on their level of impartiality and independence, with Type A being the most independent. Key requirements relevant to VPTI include: (1) comprehensive, searchable documentation for each inspection activity; (2) verified and documented personnel competencies; (3) a management system that ensures consistency and objectivity; (4) records control that ensures the integrity and availability of data; and (5) transparent complaint and appeal handling mechanisms (ISO, 2012; KAN, 2020).

In the context of digitalization, ISO 17020 requires that the information systems used to document inspection activities must meet the requirements of data integrity, confidentiality, and availability. This means that VPTI digital platforms must be designed with these requirements in mind from the outset (KAN, 2020; BSN, 2022).

ISO 9001:2015 — Quality Management System

ISO 9001:2015 sets out requirements for a quality management system that can be implemented by all organizations, including institutions that provide VPTI services. Its key principles—customer focus, leadership, people engagement, process approach, improvement, evidence-based decision-making, and relationship management—can all be significantly strengthened through process digitalization. Digitalization enables real-time collection of operational data to support evidence-based decision-making, iterative process automation to improve consistency (process approach), and increased responsiveness to importer needs (customer focus) (ISO, 2015).

Theory of Digitization of Public Services and Government Data Sovereignty

The digitalization of public services in the context of international trade supervision has dimensions that go beyond just operational efficiency. The concept of Government Data Sovereignty—which refers to the right and ability of governments to control, access, and utilize data generated by public services within their jurisdiction—is becoming increasingly relevant in an era when data is a strategic asset (Aaronson, 2019; Leal-Millán et al., 2021). In the context of VPTI, imported technical data generated from the verification process has a very high intelligence value for trade, industry, and national security policy—but currently, most of the data is scattered in private operators' systems that cannot be accessed in real-time by the government (Ministry of Home Affairs, 2024).

The theory of Process Digitalization in the context of B2G (Business-to-Government) and G2G (Government-to-Government) developed by Janssen et al. (2017) identifies three levels of digital transformation: (1) digitization—the transformation of physical documents into digital; (2) digitalization—the use of digital technology to change the way business processes are run; and (3) digital transformation—the fundamental transformation of the organization's operating model based on digital data. This study targets the second and third levels for the VPTI process (Janssen et al., 2017; Vial, 2019).

METHODS

This study uses a mixed-methods approach that integrates four analytical instruments. First, Business Process Mapping (BPM) uses the BPMN 2.0 notation to fully document the existing VPTI process (as-is) from the beginning of submitting an importer's application to the issuance of a Surveyor Report (LS), covering all points of interaction between importers,

CLNs, SLNs, VPTI institutions, and government agencies. Second, a Gap Analysis based on ISO 17020:2012 and ISO 9001:2015 to identify gaps between current practices and standard requirements, and to identify potential improvements through digitalization. Third, Process Cost Modeling uses Activity-Based Costing (ABC) to quantify costs at each stage of the VPTI process and identify the most significant inefficiencies. Fourth, Comparative Analysis with electronic import verification systems that have been successfully implemented in other countries, including China's Single Window System, Singapore's e-COO, and Australia's TradeNet.

Primary data were collected through: (a) in-depth interviews with 18 resource persons from three groups: executives and operations of VPTI institutions (8 people), officials of the Ministry of Trade and the Ministry of Industry (5 people), and importers who use VPTI services (5 people); (b) direct observation of the VPTI process at the head office of the surveyor institution; (c) review of the applicable VPTI standard operating procedural documents (SOP). Secondary data includes import statistical data from BPS, VPTI revenue data from surveyor institutions' financial statements, and benchmarking of international inspection service standards.

Discussion

Existing Conditions: Process Mapping And Problem Identification

Existing VPTI Process Flow (As-Is Process)

The VPTI process under current conditions can be mapped into seven main stages involving a minimum of five different entities with dozens of interaction points that are still mostly manual or semi-manual. This complexity is one of the main sources of inefficiencies and error risks identified in this study.

Table 1. Mapping of Existing VPTI Processes: Stages, Actors, Duration, and Communication Modes

No.	Process Stages	Main Actors	Actual Duration	Current Fashion	Main Problems
1	VPTI Application Submission	Importer → VPTI Institution	1–2 business days	Email + web upload portal not integrated	Incomplete documents, repeated re-uploads, no automatic notifications

2	Verification of Completeness & Payment of Fees	Admin VPTI	1–2 business days	Manual document checks; Confirm payment via email	Bottlenecks in the admin team; Payment is not real-time verified
3	Assignment to CLN in the Home Country	Operations Manager → CLN	1 business day	WhatsApp + email; not recorded in the system	Timezone communication delay; No assignment tracking
4	Collection of Export Documents by CLN	CLN in the country of origin	2–3 business days	Physical documents are scanned + emailed	Poor scan quality; documents are lost; No version control
5	Physical Inspection of Goods by SLN	SLN in the country of origin	1–3 business days	Paper inspection form; photos via cellphone cameras; Reports via email	There is no photo standard; non-standardized forms, and unstructured reports
6	Preparation & Review of Surveyor Report (LS)	VPTI Technical Team	2–4 business days	MS Word template; manual review; Revision via email	Duplication of data entry, format inconsistencies, and high risk of human error
7	LS Issuance & Transmission to Importers	Importer → Signer Manager	1 business day	Wet signature + scan + send email	There is no digital signature; LS is not digitally authenticated
TOTAL DURATION	**End-to-End VPTI**	**Multi-actor**	**7–16 business days**	**Manual/Semi-digital**	**Inefficient, unstandardized, scattered data**

Sources: Results of observations and field interviews; Author's Work (2024)

The process map above reveals the fundamental characteristics of existing VPTI systems that are the source of the problem: highly sequential processes (each stage must be completed completely before the next stage begins), heavily reliant on non-standardized person-to-person communication, and resulting in data scattered across various systems and media that are not connected to each other. In Lean Manufacturing terminology, this process

is full of waste in the form of waiting time, over-processing, and defects (Womack & Jones, 2003).

> ⚠ **Critical Findings: Seven Categories of Waste in Existing VPTI Processes**
> Based on process mapping and field analysis, seven categories of waste (7 wastes) were identified: (1) Waiting — the total waiting time between stages reaches 40-60% of the total lead time; (2) Over-processing — the same data is re-entered an average of 3-4 times at various stages; (3) Defects — the level of incomplete/inappropriate documents when they were first submitted reached 35-45%; (4) Transportation — physical documents are still sent by international courier to some countries of origin; (5) Inventory — the backlog of VPTI submissions that have not been processed averages of 150-200 cases during the peak season; (6) Motion — the average staff moves between 5-7 different applications to resolve a single VPTI case; (7) Overproduction — an interim report made but not used by any party.

Analysis of Post-Liberalization Income Decline

The phenomenon of declining state revenue from VPTI after the liberalization of services to the private sector requires a more in-depth analysis than just market sharing. The data collected in this study illustrate the complex dynamics of the post-liberalization VPTI market.

Table 2. Market and Revenue Analysis of VPTI Before and After Liberalization

Parameters	The Monopoly Condition of KSO SCI-SI (Before Liberalization)	Post-Liberalization Conditions (Multi-Provider)	Differences/Changes
VPTI's mandatory import volume per year	~180,000 LS/year (estimated)	~180,000 LS/year (constant volume)	0% (unchanged)
Coverage rate (LS issued vs liability)	75–80% (compliance rate)	45–55% (significant decrease)	Down 25–35 percentage points
Average service rate per LS	IDR 8–12 million	IDR 5–8 million (competition lowers tariffs)	Down 30–40%
Total revenue of the VPTI industry/year	~Rp 1.2–1.5 trillion (estimated)	~Rp 450–650 billion	Down >50%
State revenue (PNBP from VPTI)	IDR 120–150 billion/year	IDR 45–70 billion/year	Down ~55%
Number of VPTI operators	1 (KSO SCI-SI)	6–8 registered operators	Up 6–8×

LS compliance rate according to ISO 17020 standard	Certified (KSO SCI-SI)	Varies; 2–3 operators not yet certified	Standard inconsistencies
Centralized import technical data in the country system	~85% (via KSO system)	~30–40% (spread across various private platforms)	**Drastic decline — data sovereignty risk**

Source: Interview with Ministry of Home Affairs officials; annual report of the surveyor board; Estimated Author (2024)

Table 2 reveals that the decline in state revenue from VPTI is not solely due to market sharing among more players, but rather due to three structural factors: (1) declining coverage rate—more importers are able to escape VPTI's obligations or use the services of unregistered operators; (2) competitive pressures that lower tariffs unfairly that are not balanced by increased efficiency; and (3) data sovereignty erosion where imported technical data that should be accessible to the government for policy purposes is spread across various private platforms that are not integrated with the government system.

The Root of the Problem: Why Does Liberalization Without Digitalization Create a Paradox?

The paradox of post-liberalization income decline can be explained by the theory of market failure in public services arising from regulatory control. When controlled monopoly services (KSO SCI-SI) are replaced by multiple providers without an integrated data platform, three market failures occur simultaneously: (1) Information asymmetry—the government does not have real-time visibility into which cases are processed by which operators; (2) Adverse selection — importers tend to choose operators whose processes are less stringent; (3) Moral hazard — new operators who lack capital operate below par to gain more clients. The solution is not to return to monopolies, but to create a 'regulated marketplace' based on a government digital platform that sets uniform rules of the game and gives full visibility to regulators.

Gap Analysis: Existing vs. Existing Conditions ISO 17020 and ISO 9001 requirements

Table 3. Gap Analysis of Existing VPTI Processes against ISO 17020:2012 and ISO 9001:2015 Requirements

Standard Clauses	Existing Compliance Levels	Main Gap	Solutions through Digitalization
ISO 17020 §4: Independence requirements	Medium — depending on the operator	Some operators are not independent of importers	Digital platforms require a declaration of digital independence on a case-by-case basis

ISO 17020 §5: Structural requirements	Low-Medium	Not all operators have a documented organizational structure	e-Profiling operator: structure & personnel must be uploaded and verified KAN
ISO 17020 §6: Resources (HR & equipment)	Low	The competence of CLN/SLN personnel is not systematically documented	e-Competency module: certificates, training records, and real-time assignment tracking
ISO 17020 §7: Process (inspection method)	Medium	Inspection SOPs are not standardized between operators; Inspection forms vary	e-Inspection module: mandatory standardized digital form, geotagged photo, mandatory checklist
ISO 17020 §8: Management systems	Low	Process records are not systematically archived; Some are still physical	e-Document management: all records are digitized, indexed, and searchable
ISO 9001 §8.4: External party controls (CLN/SLN)	Very Low	No real-time CLN/SLN performance monitoring system	e-Vendor portal: CLN/SLN fills out real-time monitored digital reports
ISO 9001 §9.1: Monitoring and measurement	Low	Process KPIs are not measured systematically; No operational dashboard	e-Dashboard: KPI (TAT, defect rate, coverage rate) is automatically monitored
ISO 9001 §10: Continuous improvement	Very Low	There is no systematic feedback loop mechanism of operational data	AI-driven analytics: automatically identify patterns, anomalies, and improvement opportunities

Source: Audit of procedural documents; interviews; ISO 17020:2012 reference; ISO 9001:2015; CAN (2020)

VPTI Digitization Architecture: Integrated System Design

VPTI Digital System Design Principles

The architectural design of the VPTI digital system in this study is built on six fundamental principles that directly answer the problems identified in the gap analysis. First, Government Data Sovereignty First: all data generated from the VPTI process—by both state and private operators—must be centralized in real-time within the government data

infrastructure (Government Cloud/National Data Center), not just on the respective operator's systems. The government must have full, real-time access to all VPTI data, without relying on periodic reports from operators.

Second, Unified Platform, Multiple Operators: digital systems must be designed as a marketplace platform that provides a single interface for importers while connecting multiple operators within it. This model—similar to the LKPP e-procurement platform or the OSS system—allows for healthy competition among operators while ensuring uniform standards and government visibility. Third, Process Parallelization: digital architecture should enable the stages of the process that are currently running sequentially to be executed in parallel, where possible, significantly reducing lead time. Fourth, ISO-Compliant by Design: each system module must be designed to inherently meet the requirements of ISO 17020 and ISO 9001—not ISO compliance as an additional layer, but as a built-in feature of the system. Fifth, End-to-End Digital—No Paper Required: the entire process from submission to the issuance of the LS must be completed without a single physical document. Sixth, Interoperability: the digital VPTI system must be able to interoperate with the Customs (CEISA), National Single Window (INSW), and other e-Government systems (Janssen et al., 2017; Vial, 2019).

VPTI Digital Platform Module Architecture

Table 4. VPTI Digital Platform Module Architecture: Functions, Users, and Benefits

Modules	Name & Function	Key Users	Key Features	Measurable Benefits
M-01	e-Registration & e-Payment	Importer, VPTI Admin	24/7 online registration; upload mandatory documents with auto-validation; multi-bank payment gateway; automatic notifications; Real-time status tracking	Registration time: 4 hours → 30 minutes; Payment Confirmation: Instant; Zero Reject due to incomplete documents
M-02	e-Assignment & Scheduling (CLN/SLN Assignment)	Ops Manager, CLN, SLN	Auto-assignment based on availability and location; calendar scheduling; acceptance confirmation; Digital briefing with mandatory checklist	Assignment delay: 1 day → 15 minutes; zero miscommunication assignments; Complete trail audit

M-03	e-Document Collection (Overseas CLN Portal)	CLN in the country of origin	Upload export documents (invoices, BL, CoO, etc.); Automatic OCR for data extraction; version control; AI-based completeness check	Document delivery: 3 days → 4–6 hours; data accuracy: increased by 40%; All Terversioning Documents
M-04	e-Inspection (SLN Digital Inspection Platform)	SLN in the country of origin	ISO 17020 standardized digital inspection form; mandatory photo with geotag + timestamp; short videos are optional; real-time upload to the server; Auto-generated reports	Reporting duration: 2 days → 3 hours; authenticated photos; Consistent reporting between operators
M-05	e-Report & Digital Signature (LS Compilation & Publication)	Technical Team, Director/Manager	Auto-populated LS draft from M-03 and M-04 data; AI-assisted review; BSrE certified digital signature; QR code authenticity verification; Multi-level approval workflow	LS Preparation: 3 days → 4 hours; zero document forgery; Instant authenticity verification
M-06	e-Monitoring & Analytics (Government Dashboard)	Ministry of Trade, Ministry of Industry, Customs	Real-time dashboard of KPIs across operators; automatic anomaly alert; analysis of import trends by commodity/country of origin; API data to INSW and CEISA systems	Country data visibility: 30% → 100%; Policy Response Time: Week → days
M-07	CLN-SLN Integration Hub (Integrasi Layanan Luar Negeri)	All actors	Secure E2E encrypted messaging; shared workspace per case; multi-timezone notification; Offline-capable mobile app for limited connectivity conditions	Elimination of unaudited WhatsApp/email communications; 100% recorded communication
M-08	e-Compliance Engine	System (automatic)	Auto-check the conformity of the product with the applicable	Regulatory errors: down 90%; Regulation Updates: Real-

		Permendag/Permenperin; alert of regulatory changes; integration of SNI-BSN and Lartas INSW databases	Time vs Manual (Days)

Source: Author's design based on gap analysis and benchmarking of international digital systems (2024)

Digital VPTI (To-Be Process) Process Flow

With the implementation of the 8-module digital platform described above, the VPTI process flow undergoes a fundamental transformation from sequential to parallel processing, with automation at previously bottlenecked points. Processes that, under existing conditions, require 7-16 working days are projected to be completed in 2-4 working days, with an average lead-time reduction of 65-75%.

Table 5. Lead Time Comparison: Manual (As-Is) vs. Digital (To-Be) VPTI Process

Process Stages	**Duration of As-Is (weekdays)**	**To-Be Duration (working hours)**	**Time Reduction (%)**	**Technology Enabler**
Document Registration & Validation	1–2 days	1–2 hours	≥85%	e-Registration + AI doc validation (M-01)
Payment Confirmation	1 day	Real-time (<5 minutes)	≥98%	Automated payment gateway (M-01)
CLN/SLN Assignment	1 day	15–30 minutes	≥97%	Auto-assignment algorithm (M-02)
Document Collection (CLN)	2–3 days	4–8 hours	≥75%	e-Document portal + OCR (M-03)
Physical Inspection (SLN)	1–3 days	4–8 hours (physical inspection still required)	0–30% (fixed physical inspection)	e-Inspection form + geotag (M-04)
LS Compilation & Review	2–4 days	3–5 hours	≥85%	Auto-draft + AI review (M-05)

LS Issuance & Transmission	1 day	<1 hour	≥90%	Digital signature + QR code (M-05)
TOTAL LEAD TIME	**7–14 business days**	**2–4 business days***	**≥65%**	*Includes physical inspections that cannot be eliminated

*Assumption: 1-day physical inspection in the home country is still required according to the requirements of ISO 17020 | Source: author's calculation

Data Security: Government Data Sovereignty Architecture

The data security architecture of the VPTI digital platform is designed in layers: (1) Government Cloud Tier-1 in the National Data Center (PDN) as primary storage—all real-time VPTI data is stored in the country's infrastructure; (2) AES-256 end-to-end encryption for all data transmissions between overseas CLN/SLN and central servers; (3) Role-based access control (RBAC) that restricts each operator's access to only their own case data, while the government has real-time aggregate access; (4) Blockchain-based audit trail for any data changes—no one can delete or modify records without a trace; (5) Authenticated gateway APIs for integration with INSW, CEISA Customs, and other e-Government systems; (6) Data residency within Indonesia (onshore data center)—no VPTI data is stored on overseas servers.

Digitalization Impact Analysis: Efficiency, Revenue, And Data Sovereignty

Projected Improvement in Operational Efficiency

The implementation of the VPTI digital platform is projected to result in an increase in efficiency, which can be quantified across three main dimensions. The first dimension is time efficiency: reducing total lead time from an average of 10 working days to 3 working days is equivalent to a 233 an increase in system throughput capacity without significant additional human resources. This means that one unit of a VPTI institution can serve more than three times as many cases as the existing human resources (Womack & Jones, 2003; Slack et al., 2019).

The second dimension is cost efficiency: eliminating repetitive manual processes—especially data re-entry, document printing, physical delivery, and informal communication—is projected to reduce per-case operational costs by 35-45%. In the context of the VPTI industry, with a volume of 180,000 LS per year, aggregate operational savings are estimated at Rp 150-250 billion per year across industries. The third dimension is quality efficiency: the automation of document validation and standardization of digital inspection forms is projected

to reduce the defect rate (incomplete documents, non-standard reports) from 35-45% to <5%, directly reducing rework costs and the impact of delays on importers.

Projected State Revenue Recovery

Table 6. Projected Revenue Recovery of VPTI Post-Digitalization (3-Year Scenario)

Parameters	Current Conditions	Year 1 (Pilot Phase)	Year 2 (Escalation)	Year 3 (Full Deployment)
LS volume issued/year	~90,000 LS (50% of potential)	~115,000 LS (63%)	~148,000 LS (82%)	~171,000 LS (95%)
Coverage rate	45–55%	60–70%	78–85%	90–95%
Average service rate/LS	IDR 5–8 million	IDR 7–9 million (value increased due to quality)	IDR 8–10 million	IDR 9–12 million
VPTI industry revenue	IDR 450–650 M	Rp 800 M – 1.0 T	Rp 1.2–1.5 T	Rp 1.5–2.0 T
National PNBP from VPTI	IDR 45–70 M	IDR 100–130 M	IDR 150–200 M	IDR 200–280 M
Operator meets ISO 17020	2–3 of 8	5 of 8	7 of 8	8 of 8 (mandatory)
Centralized VPTI data in the country system	30–40%	**75%**	**90%**	**100%**
Importer satisfaction (Net Promoter Score)	~25 (low)	~55	~70	**~80–85**

Source: Author's projections based on benchmarking and analytical models (2024)

The projections in Table 6 show that the successful digitization of VPTI has the potential to restore industry revenue to the level of Rp 1.5-2.0 trillion per year in FY3, approaching and even exceeding the optimal level identified as full market potential. The projected tariff increase is not a forced increase, but rather a reflection of a real increase in service value: 65% faster turnaround times, higher report quality, and greater regulatory certainty for importers.

Cost-benefit analysis of VPTI digitization

Table 7. Cost-benefit analysis of VPTI Platform Digitalization: 5-Year Estimate

Cost & Benefit Components	Year 0–1 (Investment)	Year 2	Year 3	Years 4–5 (Cumulative)
COST: Platform (software) development	IDR 45–60 Billion	IDR 10–15 M (maintenance)	IDR 10–15 Billion	IDR 25–35 Billion
COST: Server & cloud infrastructure	IDR 20–30 Billion	IDR 8–12 Billion	IDR 8–12 Billion	IDR 20–28 Billion
COST: System integration (INSW, CEISA, BSrE)	IDR 10–15 Billion	IDR 3–5 Billion	IDR 2–3 Billion	IDR 5–8 Billion
COST: Training & change management	IDR 8–12 Billion	IDR 3–5 Billion	IDR 1–2 Billion	IDR 3–5 Billion
COST: Cybersecurity & audit	IDR 5–8 Billion	IDR 4–6 Billion	IDR 4–6 Billion	IDR 10–15 Billion
TOTAL COST (cumulative)	**IDR 88–125 M**	**IDR 28–43 Billion**	**IDR 25–38 Billion**	**IDR 63–91 Billion**
BENEFITS: Increase in the country's PNBP	IDR 55–75 Billion	IDR 105–145 M	IDR 155–215 M	Rp 380–530 M
BENEFITS: Industrial operational efficiency	IDR 30–50 Billion	IDR 80–120 M	IDR 110–160 M	IDR 280–420 M
BENEFITS: Value policy intelligence data	Not directly measurable	Significant	Very Significant	Very Significant
TOTAL MEASURABLE BENEFITS (cumulative)	**IDR 85–125 M**	**IDR 185–265 M**	**IDR 265–375 M**	**IDR 660–950 M**
NET BENEFIT & BREAKEVEN	**Breakeven: 18–24 months**	**Net positive benefits**	**ROI: 250–300%**	**Cumulative ROI: 550–750%**

Source: Author's estimate based on benchmarking of similar e-Government projects; numbers in billions of rupiah

Digital Integration of CLN and SLN In The Global VPTI Ecosystem

Operational Challenges of CLN-SLN in Conventional Systems

Overseas Collectors (CLNs) and Overseas Surveyors (SLNs) operate in very challenging conditions in conventional VPTI systems. The main obstacles include: (1) time zone differences that create a very limited window of communication with the head office in Indonesia; (2) the varying quality of internet connectivity in the countries of origin of goods—especially in the case of Africa, the Middle East, and remote regions of Asia—which makes it difficult to send large digital documents; (3) the absence of a system that allows CLNs/SLNs to see the status of cases in real-time, so they often follow up via unaudited phone or WhatsApp; and (4) the inability of conventional systems to validate uploaded documents automatically, so CLN/SLN must wait for manual confirmation from Indonesia before proceeding with the process.

In the context of data security, conventional systems create very significant risks. International trade documents communicated via email and WhatsApp—which often contain sensitive commercial information such as prices, volumes, and buyer-seller identities—do not use adequate encryption and are therefore potentially intercepted or leaked. This is not only a matter of commercial data security, but also the security of trade intelligence data, which should be the exclusive right of the state (Aaronson, 2019; Janssen et al., 2017).

CLN-SLN Integration Hub Design

Module M-07 (CLN-SLN Integration Hub) in the VPTI digital platform architecture is specifically designed to address CLN/SLN operational challenges abroad. Four features are designed based on field findings. First, Mobile-First, Offline-Capable Application: a mobile application that can run in offline mode and synchronize data automatically when a connection is available—critical for operations in countries with limited connectivity. SLN can fill out inspection forms, take photos, and record videos even without an internet connection, with the data stored locally and encrypted before syncing.

Second, AI-Powered Document Extraction: AI-based Optical Character Recognition (OCR) technology that is capable of extracting structured data from various international trade document formats—invoices in multiple languages (English, Chinese, Arabic, Japanese, Korean), bill of lading from various shipping carrier formats, certificates of origin from more than 50 different formats—and automatically entering it into the system without the need for manual re-entry by CLN (Vial, 2019). Third, Regulatory Intelligence Push: the system automatically pushes the latest regulatory information (Lartas changes, new SNI, the latest Permendag) to the CLN/SLN application in the field, ensuring they always work based on up-

to-date requirements. Fourth, Secure Video Inspection: for specific commodities or special conditions, the platform supports encrypted, recorded video call inspections—allowing supervisors in Indonesia to validate the condition of goods in real-time without physically sending SLNs for initial inspection, saving significant travel costs.

CLN-SLN Operational Standards in the Digital Ecosystem

The digitization of the CLN-SLN process has important implications for operational standardization that has been difficult to enforce in conventional systems. The digital platform enables the implementation of 'digital standard operating procedures' (D-SOP) that are technically non-negotiable: incomplete forms cannot be submitted; photos without geotags are not accepted by the system; Reports that don't list all required fields can't be finalized. This creates compliance by design—operators cannot fail to meet standards because the system does not allow it (ISO, 2012; KAN, 2020).

In the context of ISO 17020, this digital-based D-SOP automatically meets the requirements of Clause 7 (Process): standardized inspection methods, consistent documentation, and traceable records are all guaranteed by the system architecture rather than relying on individual disciplines. This is a paradigm shift from 'compliance through supervision' to 'compliance through design,' which is much more effective and efficient (Slack et al., 2019).

VPTI Digitalization Roadmap: Three Phases Of Implementation 36 Months

Phase I: Foundation & Pilot (Months 1–12)

The first phase focuses on building a technical foundation and launching a limited-scale pilot. The main activities include: (a) the establishment of the VPTI Digital Project Management Office (PMO) involving the Ministry of Home Affairs, the Ministry of Industry, BSSN (cybersecurity), Pusdatin Kominfo (infrastructure), and VPTI operators; (b) development of a minimum viable product (MVP) platform that includes Modules M-01, M-03, M-04, and M-05 (the core of the VPTI process); (c) pilot deployment in the two largest countries of origin of goods (China and South Korea) involving 2-3 VPTI operators and 50-100 volunteer importers; (d) early stage integration with the INSW system for Lartas data synchronization; and (e) intensive training for all CLNs/SLNs involved in the pilot.

The success criteria for Phase I are: VPTI turnaround time in the pilot <4 working days; data coverage rate to government systems >75%; error rate of incoming documents <10%; and

the Net Promoter Score of the importer >50. Estimated budget for Phase I: IDR 55-80 billion (including platform development, infrastructure, and training).

Phase II: Scale-Up & Optimization (Months 13–24)

The second phase expands the deployment to all VPTI operators and the top 15 countries of origin (together accounting for more than 85% of Indonesia's VPTI volume). Key activities include: (a) deployment of Modules M-02 (Auto-Assignment), M-06 (Government Dashboard), M-07 (CLN-SLN Hub), and M-08 (Compliance Engine); (b) full integration with CEISA Customs for real-time exchange of LS data; (c) implementation of the BSrE (Electronic Certification Center) digital signature system for all Surveyor Reports; (d) mandatory programs: all VPTI operators that have not been ISO 17020 certified must be certified by the end of Phase II or their operational licenses are revoked; and (e) comprehensive evaluation and optimization of the system based on the first 12 months of operational data.

Phase Iii: Full Deployment & Ai Enhancement (Months 25–36)

The third phase achieves full deployment to all countries of origin and integrates artificial intelligence (AI) capabilities for predictive analytics and anomaly detection. Implemented AI features include: (1) AI-based risk profiling for importers and commodities—the system automatically prioritizes high-risk cases for more rigorous review; (2) Pattern recognition for the detection of potential document falsification or price manipulation; (3) Predictive analytics to anticipate VPTI volume based on import trends; and (4) Natural Language Processing (NLP) for automatic extraction of technical information from various formats of international product certificates.

Table 8. VPTI Digitalization Roadmap: Milestones, Targets, and Success Indicators

Phase	Period	Key Milestones	Target KPIs	Estimated Budget
I	Months 1–12	MVP platform (M-01,03,04,05); pilot 2 countries; 3 operators; Early INSW integration	TAT <4 days; coverage 75%; NPS >50; Error Rate <10%	IDR 55–80 billion
II	Months 13–24	Full module (M-02,06,07,08); 15 countries; all	TAT <3 days; 90% coverage; NPS >70; 100%	IDR 20–30 billion

		operators; CEISA + BSrE integration; ISO mandatory	ISO 17020 operator	
III	Months 25–36	All countries; AI analytics; predictive risk; NLP extraction; full Government Data Sovereignty	TAT <2 days; 100% coverage; NPS >80; zero paper; Positive ROI	IDR 10–15 billion
TOTAL PROGRAM	**36 Months**	**World-class Digital Indonesia VPTI platform**	**VPTI digital benchmark ASEAN**	**IDR 85–125 billion**

Source: Author's draft; estimated budget based on benchmarking of e-Government projects (2024)

International Benchmarks: Lessons from the Digital Import Verification System

Several countries have successfully implemented digital import verification systems that can be referenced: (1) Singapore TradeNet: a single window trade system that integrates 35+ government agencies, processing 98% of import declarations in <10 minutes; the best ASEAN TAT benchmark. (2) Australian Department of Agriculture: an e-Certification system that allows inspection certificates to be issued and verified digitally in <1 hour vs the previous 2–3 days. (3) Korea Customs Service UNI-PASS: an AI-based customs system that automatically performs risk profiling and reduces physical inspections by 70% while increasing compliance rates. (4) China GACC Single Window: full integration of VPTI data with customs, allowing pre-clearance of goods before arriving at the port. All of these systems have three things in common: a single government platform, mandatory participation, and data sovereignty.

Policy Implications And Strategic Recommendations

Recommendations To The Ministry Of Trade And The Ministry Of Industry

First, the issuance of Permendag/Permenperin on Mandatory Digital VPTI requires the entire VPTI process to be carried out through the government's digital platform starting on the set date, with an adequate transition period (12 months). These regulations must be explicit: require all VPTI operators to be connected to the platform; establish a standard data format that all operators must follow; and grant the government the authority to access VPTI data in real time as part of oversight.

Second, the designation of the VPTI digital platform as a 'National Trade Facilitation Infrastructure' whose funding can come from a combination of: the state budget (initial investment), PNBP from VPTI, and proportional contributions from licensed VPTI operators.

This co-funding model reduces the government's fiscal burden while fostering a sense of ownership among operators of the platforms they use.

Third, a review of the VPTI tariff policy in light of increased service value following digitalization. Tariffs currently depressed by unfair competition can be normalized to reflect the real value of services—importers get certainty about time, quality, and compliance; the government gets data; and operators earn a decent income.

Recommendations to VPTI Operators (Including KSO SCI-SI)

KSO SCI-SI, as the operator with the longest experience and the largest capabilities in VPTI, is in the most strategic position to lead this digitalization process—both as a pioneer in implementing digital systems and as a government partner in developing national platforms. Specific recommendations include: (a) immediate investment in developing internal digital capabilities—IT teams, data scientists, and business analysts who understand the VPTI domain; (b) the acceleration of ISO 17020 certification for all CLN/SLN branches and partners; and (c) actively participate in policy consultations to ensure the design of digital platforms accommodates operational realities that can only be understood by field practitioners.

Recommendations to BSSN and Pusdatin Kominfo

The data security of digital VPTI systems must be treated as a national security issue, not just corporate information security. Recommendations include: (a) the establishment of mandatory cybersecurity standards for VPTI platforms published by BSSN; (b) the use of the National Data Center (PDN) infrastructure as the primary hosting VPTI platform; (c) the implementation of a secure data sharing mechanism between the VPTI system and Customs, BIN, and PPATK trade intelligence for the purpose of wider supervision; and (d) periodic cybersecurity audits by an independent team appointed by BSSN.

CONCLUSION

This study has systematically analyzed the paradoxes that have emerged in Indonesia's VPTI ecosystem post-liberalization of services: a decline in state revenue of more than 50% of the market potential, erosion of data sovereignty, persistent operational inefficiencies, and standard inconsistencies across multiple operators. Through the approach of business process mapping, ISO gap analysis, and cost-benefit modeling, the study concludes that the root of the problem lies not in the number of operators—one or many—but in the unavailability of an

integrated digital platform that allows for healthy competition, uniform standards, and full government visibility of the entire VPTI process.

The proposed VPTI digitization architecture—consisting of eight modules integrated with the principle of Government Data Sovereignty First—offers a solution that simultaneously addresses all dimensions of the problem: process efficiency increased by 65%, lead time cut from 7-14 days to 2-4 days, recovery coverage rate to 95%, VPTI industry revenue to Rp 1.5-2.0 trillion per year, and 100% of imported technical data centralized in the state system. The necessary investment—Rp 85-125 billion—can be recovered in 18-24 months through increased PNBP and operational efficiency.

Most strategically, the digitization of the VPTI not only solves technical administrative problems but also transforms the VPTI from a mere verification mechanism to a real-time national trade intelligence system. Imported technical data that has been scattered and cannot be used optimally, when centralized in the country's digital platform, becomes a strategic asset for faster, more accurate, and more impactful trade, industry, and investment policy decision-making.

The most significant implementation challenge is not technical—the technology needed is already available and proven in many countries—but change management: convincing the entire ecosystem of stakeholders (operators, importers, foreign exporters, CLNs/SLNs) to transition from the old way to the new way. Clear government commitments, the right incentives, and strong project leadership are the determinants of success that cannot be replaced by any technology.

Recommended follow-up research includes: detailed technical feasibility studies for the platform technology stack (cloud provider, framework, database architecture); analysis of the impact on employment in the post-digitalization VPTI sector; and legal studies to ensure the validity of BSrE digital signatures in the context of international customs disputes.

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