Jurnal Pustaka Cendekia Hukum dan Ilmu Sosial
Volume 3, No. 3, October 2025 - January 2026, pp. 462-479
E-ISSN: 2987-4475
https://pchukumsosial.org/index.php/pchs

Digital Customs Systems and State Revenue Accountability: A Literature Review on CEISA 4.0 and NLE

Andi Samsu[1*]

[1]Management Science Doctoral Program, Halu Oleo University, Kampus Hijau Bumi Tridharma, Anduonohu, Kec. Kambu, Kota Kendari, Sulawesi Tenggara
andii.samsu@gmail.com

Abstract

This study examines the role of digital customs systems in strengthening state revenue management with a focus on CEISA 4.0 and the National Logistics Ecosystem. The method used is a qualitative literature study through the synthesis of findings from national and international sources to assess the contribution of digital transformation to public financial management. The results of the study show that digitalization drives service efficiency through process standardization and automation of administrative stages, strengthens supervision through data-based verification and risk assessment support, and increases transparency through audit trails and process traceability. The integration of services and information exchange supported by CEISA 4.0 and the National Logistics Ecosystem strengthens cross-stakeholder coordination, reduces procedural barriers, and improves data consistency that affects the accuracy of levy determination. The study also emphasized that the benefits of accountability are influenced by implementation readiness, including data governance, human resource capacity, inter-agency coordination, and regulatory adjustments. Overall, digital customs systems contribute to a more orderly, transparent, and accountable management of state revenues within the framework of public financial management.

Keywords: Digitalization, State Revenue, Public Financial Management

Abstrak

Studi ini meneliti peran sistem kepabeanan digital dalam memperkuat manajemen pendapatan negara dengan fokus pada CEISA 4.0 dan Ekosistem Logistik Nasional. Metode yang digunakan adalah studi literatur kualitatif melalui sintesis temuan dari sumber nasional dan internasional untuk menilai kontribusi transformasi digital terhadap manajemen keuangan publik. Hasil studi menunjukkan bahwa digitalisasi mendorong efisiensi layanan melalui standardisasi proses dan otomatisasi tahapan administrasi, memperkuat pengawasan melalui verifikasi berbasis data dan dukungan penilaian risiko, serta meningkatkan transparansi melalui jejak audit dan ketertelusuran proses. Integrasi layanan dan pertukaran informasi yang didukung oleh CEISA 4.0 dan Ekosistem Logistik Nasional memperkuat koordinasi lintas pemangku kepentingan, mengurangi hambatan prosedural, dan meningkatkan konsistensi data yang memengaruhi akurasi penentuan pungutan. Studi ini juga menekankan bahwa manfaat akuntabilitas dipengaruhi oleh kesiapan implementasi, termasuk tata kelola data, kapasitas sumber daya manusia, koordinasi antar lembaga, dan penyesuaian peraturan. Secara keseluruhan, sistem kepabeanan digital berkontribusi pada pengelolaan pendapatan negara yang lebih tertib, transparan, dan akuntabel dalam kerangka manajemen keuangan publik.

Kata kunci: Digitalisasi, Pendapatan Negara, Manajemen Keuangan Publik

✉Corresponding author: Andi Samsu
Email Address: andii.samsu@gmail.com (Kampus Hijau Bumi Tridharma, Kota Kendari, Sulawesi Tenggara)
Received 01 January 2026, Accepted 07 January 2026, Published 13 January 2026

INTRODUCTION

Digital transformation in customs administration is developing into a prominent reform agenda in public administration. The growth of trade flows, increased complexity of documents, and rapid service demands are driving customs agencies to strengthen technology-based systems. Digital customs is understood as the use of information technology to speed up service processes, improve data quality, and strengthen supervision. The literature shows that customs modernization through

automation and system integration has the potential to improve service performance and minimize the risk of irregularities through more traceable processes (Setyarto et al., 2025).

In Indonesia, the strengthening of digitalization can be seen in the development of CEISA 4.0 and the integration of the logistics ecosystem through the National Logistics Ecosystem. These two initiatives are important because customs and excise not only carry out the function of facilitating trade, but also sustain state revenues that require accountable procedures. The e-government literature emphasizes that digitalization encourages transparency, strengthens public trust, and facilitates supervision, making it relevant for strengthening state revenue accountability (Setyarto et al., 2025; Muttaqin, 2025).

The focus of this study is to place digital customs systems as a driver for improving state revenue governance through strengthening accountability and transparency. The literature states that process automation and the use of information technology improve administrative efficiency, strengthen decision traceability, and reduce the chance of manual errors. At the organizational level, digital systems establish more standardized procedures, clarify the flow of responsibility, and provide activity records that support internal audits and performance evaluations. In this way, digital customs systems act as a governance strengthening tool that emphasizes procedural compliance and process integrity. Additionally, recent literature highlights the importance of data-driven transparency to increase stakeholder trust and strengthen social control. E-government is reported to expand access to service information and clarify the status of processes, so that the public and service users can conduct more effective monitoring (Setyarto et al., 2025). The use of technology to strengthen service orientation is also seen as increasing public sector accountability through improving responsiveness and access to information (Muttaqin, 2025). In the realm of customs, this benefit is crucial because transactions involve many parties, require certainty, and demand high data traceability.

Research on customs digitization is extensive, but many publications still emphasize operational indicators such as service acceleration, reduced processing time, and increased user satisfaction. The direct relationship to state revenue accountability is often conveyed implicitly and not always elaborated through clear mechanisms. As a result, the contribution of CEISA 4.0 and the National Logistics Ecosystem to state revenue accountability has not often been mapped as a structured series of cause-and-effects, for example through data traceability, audit strengthening, leak reduction, and compliance improvement. In terms of the theoretical gap, accountability and governance studies are often discussed at the level of public administration in general, while the customs and excise sector has special characteristics in the form of asymmetry of information on value and type of goods, risk of undervaluation, and the need for strong risk management and enforcement. Common solutions that have been widely researched are usually in the form of strengthening service automation, increasing cross-agency system integration, implementing risk management, increasing human resource capacity, and strengthening information security (Bayazidnezhad, 2025). However, the synthesis that incorporates such solutions within the framework

of receipt accountability with a focus on CEISA 4.0 and the National Logistics Ecosystem is still limited.

This study closes the gap through a literature study with a thematic synthesis that connects digital customs systems with state revenue accountability through three governance pathways. The first path is the standardization and automation of processes that strengthen procedural discipline and reduce service variations, so that the determination and collection process is more orderly. The second path is to strengthen transparency through documented process records, so that actions and decisions can be traced and support internal audits and controls. The third path is the integration of cross-stakeholder data that improves the consistency of transaction information and strengthens the quality of supervisory decisions and levy determination (Setyarto et al., 2025).

On the implementation path in Indonesia, CEISA 4.0 is positioned as a pillar of process automation and data management of customs services, while the National Logistics Ecosystem is positioned as a pillar of logistics ecosystem integration and cross-agency data sharing. The literature on CEISA shows improvements in the regularity of document receipt and increased involvement of service users in service units, which are related to improving the quality of administrative processes (Putri & Syamsuddin, 2021; Oktaviani & Baturohmah, 2025). The literature on logistics integration emphasizes that cross-stakeholder coordination and information sharing strengthen the smooth process and quality of supervisory decisions (Dewi, 2023; Reza, 2023). With this thematic mapping, the core concept of digital customs systems can explain the mechanisms that lead to strengthening revenue accountability, not just service improvement.

This study focuses on Indonesia's customs administration developing digitalization through CEISA 4.0 and strengthening the integration of the logistics ecosystem through the National Logistics Ecosystem. The implementation environment involves many actors such as government agencies, port and airport operators, import and export business actors, logistics companies, and customs service providers. The involvement of many parties increases the need for data integration and procedural alignment, as the quality of information across systems affects the accuracy of levy determination, speed of service, and the effectiveness of supervision. In addition to the service aspect, the sector is also faced with compliance challenges and the risk of violations that can lead to revenue leakage. The literature on customs fraud and illegal trade suggests that technology reinforcement and data integration support the detection of violation patterns and receipt recovery (Kalizinje, 2018; Kim et al., 2020). Therefore, the focus of the study on CEISA 4.0 and the National Logistics Ecosystem is relevant to map the contribution of digital transformation to strengthening state revenue governance in the customs and excise sectors.

The purpose of this literature study is to synthesize national and international research findings regarding the influence of digital customs systems on state revenue accountability with a focus on CEISA 4.0 and the National Logistics Ecosystem. The study also aims to map the main contribution paths that often appear in the literature, including process standardization, data-driven transparency,

strengthening audit trails, stakeholder integration, and strengthening information-based supervision. In addition, the study identified implementation challenges that affect the success of digitalization, including infrastructure, human resource capacity, stakeholder engagement, and data governance (Muñoz et al., 2016; Bayazidnezhad, 2025).

The contribution of this study is both theoretical and practical. The theoretical contribution is in the form of a synthesis framework that connects the customs digitization literature with the literature on governance and state revenue accountability, so that the mechanism of influence becomes clearer and more structured. Practical contributions are in the form of recommendations for strengthening the implementation of CEISA 4.0 and the National Logistics Ecosystem, especially in the aspects of data interoperability, process record quality, internal control, strengthening supervision, and increasing human resource capacity, so that digital transformation supports more orderly services and more accountable state revenue.

Digital Customs Systems, Governance and State Revenue Accountability

Digital customs systems are understood as an information technology-based transformation of customs administration that emphasizes process automation, standardization of procedures, and strengthening data management. The public administration literature places digitalization as an instrument of reform that strengthens governance through increased process traceability and reduced opportunities for deviations. Kim and Kim (2020) explain that the application of the ICT framework to customs services can simplify processes, increase efficiency, and reduce the risk of corruption because service activities are easier to monitor and inspect. In the framework of public financial management, the accountability of state revenues depends on the certainty of procedures, auditable process records, and the ability of institutions to demonstrate the basis for determining and collecting revenues in an orderly manner.

The e-government literature also emphasizes that digitalization supports accountability through increasing information disclosure, improving access to services, and strengthening public trust. Setyarto et al. (2025) show that e government initiatives play a role in increasing transparency and strengthening public trust in public institutions through better access to data. Findings in other public sectors also show that digitalization encourages accountability through more responsive service orientation and wider access to information for service users (Muttaqin, 2025). This synthesis leads to the understanding that digital customs systems contribute to state revenue accountability through strengthening process discipline, establishing service track records, and increasing internal control capacity.

Transparency, Audit Trail, Interoperability and System Integration

Transparency is a prerequisite for accountability because accountability requires information that can be accessed and verified. The literature assesses that digital systems increase transparency through recording process stages, recording data changes, and facilitating audits. Naz (2026) emphasized that the principle of digital governance supports the use of technology that produces data

records that are difficult to manipulate, so that the reliability of public information increases. In the realm of logistics, Wang et al. (2022) show that blockchain and IoT can strengthen supply chain transparency through end-to-end tracking and secure logging, while Saha et al. (2022) affirm that traceability increases transparency and accountability in supply chain practices.

The literature on interoperability emphasizes that the benefits of digitalization become stronger when data exchange between systems goes well. Lai (2025) shows that data fusion platforms on cross-border services can reduce processing times and improve process monitoring by stakeholders. Firdausy et al. (2022) emphasized that interoperability in enterprise architecture is important to support orderly data sharing and prevent accountability issues due to weak data management. The governance literature also reminds that data integration requires clear arrangements so that data exchange does not cause uncertainty of compliance and ethical risks, because technology requires governance that maintains consistency of standards, security, and responsibility for data management (Al Ababneh, 2025; Turan et al., 2025).

CEISA 4.0 and NLE in Indonesian Literature, Opportunities and Challenges

Indonesian literature places CEISA as a digital platform that integrates customs processes such as declaration management, tariff classification, and compliance monitoring, so that communication between authorities and business actors becomes more efficient (Putri & Syamsuddin, 2021). Oktaviani and Baturohmah (2025) show that the implementation of CEISA 4.0 can improve the receipt of documents in service units and increase the involvement of service users, which supports the regularity of administrative processes. These findings are in line with the argument that process automation and standardization strengthen state revenue accountability through procedural traceability and clearer record of the levy determination process.

The National Logistics Ecosystem is presented as a logistics integration framework that encourages collaboration across agencies and business actors to harmonize processes and information flows. Purwana et al. (2020) emphasized the role of cross-stakeholder collaboration in strengthening process efficiency and procedural certainty, while Dewi (2023) highlighted the integration of logistics processes from entry to distribution as a competitiveness enhancer. Reza (2023) added that better information sharing supports transparency and quality of decisions in the examination process. In terms of supervision, the literature shows that digitalization and cross-agency collaboration can strengthen the prevention of violations, including surveillance of smuggling, through increasing information capacity and coordination (Kamarulah et al., 2023).

On the other hand, the literature also notes implementation challenges that affect accountability achievement. Barriers that often arise include infrastructure readiness, skills gaps, and uneven stakeholder engagement (Muñoz et al., 2016; Bayazidnezhad, 2025). Legal and institutional challenges are also considered important because digital systems demand adjustments to regulations and procedures to suit new practices, including strengthening legal certainty in the tariff and administrative processes (Purwana et al., 2020). In addition, the risk of revenue leakage due to fraud

remains a concern, so digitalization needs to be combined with strong supervision. The literature on customs fraud and illegal trade suggests that a data-driven approach can improve the detection of violations and support the recovery of receipts (Kalizinje, 2018; Kim et al., 2020), while on the issue of excise, enforcement of illegal cigarettes is reported to be related to an increase in excise revenue (Ardana et al., 2025; Aringga, 2025).

METHOD

This research uses a qualitative approach with a literature study design. The data sources come from scientific publications searched through Google Scholar and ScienceDirect with a focus on the topics of digital customs systems, state revenue accountability, transparency, governance, CEISA 4.0, and the National Logistics Ecosystem. The search was conducted using a combination of relevant keywords such as digital customs, customs digitalization, e customs, CEISA 4.0, National Logistics Ecosystem, accountability, transparency, governance, public financial management, revenue administration, customs risk management, and audit trail. Literature is selected based on the relevance of the topic, credibility of the source, and novelty of the publication, and then screened through the reading of titles, abstracts, and full manuscripts to ensure fit with the focus of the study.

Data analysis was carried out through thematic synthesis with the steps of extracting the main findings from each article into a summary matrix containing the author and the year, objectives, methods, findings, and implications for state revenue accountability. The findings are then grouped into core themes including service efficiency, process transparency and traceability, strengthening data-based supervision, stakeholder integration, and implementation challenges such as human resource readiness, data quality, and information security. The results of the synthesis are presented in a structured narrative that shows patterns of similarities, differences, and research gaps in the literature, and then the most consistent theme-based conclusions and recommendations emerge.

RESULTS AND DISCUSSION

Results

Digital Customs Systems Strengthen Receipt Accountability Through Process Standardization and Risk Reduction Of Irregularities

Digital customs systems strengthen state revenue accountability through process standardization, service automation, and risk reduction of deviations in customs administration. The literature places digitalization as part of public administration reform that changes the way institutions carry out the functions of revenue collection, document verification, levy determination, and compliance supervision. Standardization of procedures is the most common initial benefit, because digital systems limit the variation in work implementation through standard process flows, uniform fill forms, and validation rules embedded in the application. This condition reduces dependence on personal interpretations that previously often gave birth to differences in service treatment.

Standardization also clarifies the boundaries of responsibility at each stage of processing, making the chain of accountability easier to trace in internal checks and external evaluations.

Automation of service stages strengthens administrative discipline and minimizes the chance of errors that affect the accuracy of receipts. The literature confirms that manual processes are prone to input errors, processing delays, as well as duplication of documents which ultimately reduces the quality of the receiving data. The digital system moves some of the work to rule-based processing mechanisms, such as completeness checks, data matching, and calculations that follow the tariff parameters and conditions available in the database. Kim and Kim (2020) emphasized that the application of the information technology framework in customs services can simplify processes, increase efficiency, and reduce the risk of corruption through a more orderly and easier to supervise process. These findings are relevant for revenue accountability, because the decision to determine the levy and document verification status are not only produced faster, but also documented systematically so that they can be retested based on the same data.

Traceability of administrative decisions is the main bridge between digitalization and accountability. Revenue accountability not only demands the final result in the form of a receipt deposit, but also demands proof of process that shows how decisions were made, who processes, what data changes occurred, and the basis for determining the levy used. Digital systems generate activity records that store the sequence of actions and processing times, so that the agency can provide stronger evidence at the time of the audit. This trail makes it easier to trace the cause of differences in determination results, makes it easier to identify vulnerable points, and accelerates correction if errors are found. With an organized process record, the space for unrecorded discretion becomes narrower, so the chance of deviation is reduced. At this stage, digital customs systems function as an internal control tool that clarifies procedural accountability while improving the quality of administrative evidence.

The reduction in the risk of deviations is also influenced by the increased openness of the service process to stakeholders. E-government literacy shows that digital services increase access to information and strengthen social supervision, as service users gain visibility into process status and service requirements. Setyarto et al. (2025) emphasized that the e government initiative plays a role in increasing transparency and strengthening public trust through better access to data. In Indonesia's public sector, digital transformation is also linked to strengthening accountability through more user-focused service orientation and more accessible service information (Muttaqin, 2025). The implications for customs can be seen through the potential for a reduction in unofficial practices that often arise from unclear procedures and lack of access to information. Transparent, rules-based, and easy-to-track processes improve service users' ability to assess procedural suitability, while increasing the incentive for apparatus to comply with standards as every step is recorded in the system.

However, the literature emphasizes that strengthening accountability through digitalization still depends on the quality of implementation governance. Barriers such as infrastructure limitations,

competency gaps, and change management capacity can reduce the benefits of standardization and automation, especially if systems are unstable, procedures are not yet uniform across units, or service users have difficulty keeping up with new mechanisms. Muñoz et al. (2016) highlight that e-government strategies can expand access to services, but there are still gaps that hinder effective governance. On the governance side, Bayazidnezhad (2025) emphasizes the importance of stakeholder involvement so that governance initiatives run well, because the success of administrative reform requires the cooperation of internal and external actors. The findings strengthen the argument that digital customs systems need to be accompanied by strengthening human resource capacity, structuring procedures, and data governance so that process standardization really results in a reduction in the risk of irregularities.

Overall, the literature synthesis shows that digital customs systems strengthen revenue accountability through three mutually reinforcing mechanisms. First, standardization of procedures results in consistency of services and clarifies work responsibilities. Second, process automation reduces manual errors and improves administrative efficiency that supports accurate collection. Third, traceability of decisions results in audit-ready process evidence and minimizes undocumented discretionary space, so that the risk of irregularities decreases. With the support of strong implementation governance, digitalization is becoming a key driver of more orderly, more auditable, and more accountable state revenue accountability (Kim & Kim, 2020; Muttaqin, 2025; Setyarto et al., 2025).

Increased Transparency Through Audit Trails, Data Sharing, and Interoperability That Strengthens Process Monitoring

Transparency in customs services is significantly improved through audit trails, data sharing, and interoperability that strengthen process monitoring capabilities by stakeholders. The results of the literature synthesis show that digitalization transforms transparency from a condition that relies on physical documents and limited communication to a traceable data-based transparency. In the digital system, each stage of service is recorded through electronic recording, so that the process records the processing time, data changes, inspection status, and administrative decisions taken at each stage. The record forms an audit trail that provides detailed evidence of the process, so that internal and external parties can assess procedural consistency and detect control weak points. From the perspective of state revenue, the audit trail strengthens transparency because it clarifies the basis for levying, document verification processes, and transaction compliance status, so that decisions related to revenue can be re-examined based on recorded evidence.

The e-government literature emphasizes that digitalization strengthens government transparency through wider and easier access to information. Setyarto et al. (2025) show that e-government initiatives play a role in increasing transparency while strengthening public trust, because service information is available more clearly for the public and service users. In customs services, increased visibility of the process reduces the uncertainty that is often a source of complaints and

triggers unofficial practices. The availability of service status information also allows business actors to better manage logistics and assess whether procedures are running according to standards. System-based transparency supports a more balanced relationship between service providers and service users because information is no longer just monopolized by the authorities, but is available in a system that can be accessed according to authority. This condition strengthens the accountability of admissions because accountability requires sufficient openness so that institutional actions can be monitored and verified.

A strong audit trail also relates to the reliability of public records and the ability to prevent data manipulation. The digital governance literature emphasizes that effective transparency is not just about openness, but also the reliability of the information displayed. Naz (2026) highlights that technologies such as blockchain can generate records that are difficult to manipulate, resulting in increased transaction traceability and stronger evidence quality. In the realm of logistics and supply chain, Wang et al. (2022) showed that the combination of blockchain and IoT supports end-to-end transparency through secure recording and real-time tracking, so that related parties gain visibility over the flow of goods and documents. Saha et al. (2022) emphasized that this technology strengthens traceability and increases transparency, leading to increased accountability between actors in the ecosystem. Although these discussions often appear in the supply chain, their relevance to customs can be seen in the need for reliable recordkeeping, because any manipulation of data on the value of goods, classification, or origin of goods has the potential to have an impact on state revenue.

In addition to strengthening the audit footprint, transparency is getting stronger when there is integrated cross-system data sharing. Data sharing reduces information asymmetry between institutions and between actors in the service ecosystem, making it easier to check the process status and validity of documents from various sources. Interoperability is an important prerequisite for data exchange to run smoothly and consistently. Lai (2025) discusses data fusion platforms that support cross-border data exchange, resulting in reduced processing time as well as increased process monitoring capabilities by stakeholders. These findings show that transparency is not only shaped by internal systems, but also by the ability of systems to interact with other systems in the service chain. In customs, interoperability connects declaration data, licensing data, manifest data, and logistics data, so that the inspection can be based on more complete and consistent information. With good data exchange, potential discrepancies between documents are detected faster, resulting in increased information transparency and narrower room for manipulation.

The enterprise architecture literature adds that interoperability needs to be governed through clear data governance guidelines so that data sharing does not create new accountability issues. Firdausy et al. (2022) emphasized that interoperability in enterprise architecture is important to support data sharing that is in line with the principles of data sovereignty, because conflicts of data ownership and unclear access rights can trigger the risk of misuse. In other words, transparency requires arrangements that ensure data can be shared and verified without violating data protection

and compliance principles. Turan et al. (2025) also emphasized that transparency in data management requires strong governance so that data exchange runs ethically, consistently, and accountably. In customs services, data governance determines who has the right to change data, who has the right to read, how corrections are made, and how audits ensure that data changes have a clear basis.

While transparency is improved through audit trails and data integration, the literature also emphasizes the risks that need to be managed so that transparency does not turn into vulnerabilities. Increasing access to information requires strengthening system security and controlling access rights, because customs data contains sensitive trade information. If governance is not strong, data sharing can cause information leakage, misuse of access, or conflicts between institutions related to data authorities. Therefore, quality transparency requires a balance between adequate information disclosure for monitoring and adequate protection to maintain information security and regulatory compliance. The governance literature emphasizes that the design of rules, data exchange standards, and accountability mechanisms for data management must go hand in hand with the development of technology.

Overall, the literature synthesis shows transparency increases through three interrelated mechanisms. Audit trails strengthen the traceability of service processes and provide verifiable evidence for audits. Data sharing expands the visibility of cross-agency processes and reduces information asymmetry between stakeholders. Interoperability ensures that data exchange runs consistently so that information on process status and document validity can be checked from multiple sources. This strengthening of transparency supports state revenue accountability because decisions related to verification, levy determination, and supervisory actions are supported by clear evidence of process and more consistent data (Setyarto et al., 2025; Naz, 2026; Wang et al., 2022; Saha et al., 2022; Lai, 2025; Firdausy et al., 2022; Turan et al., 2025).

CEISA 4.0 and NLE Improve Efficiency, Oversight, and Coordination, But Accountability Benefits Are Affected By Implementation Barriers

CEISA 4.0 and the National Logistics Ecosystem demonstrate complementary roles in improving service efficiency, strengthening oversight, and cross-party coordination, but the literature also confirms that the benefits of revenue accountability are strongly influenced by implementation barriers. The results of the synthesis show that CEISA 4.0 functions as a reinforcement of the automation of customs administration processes through the integration of declaration services, tariff classification, and compliance monitoring, so that communication and data exchange between authorities and business actors becomes more orderly (Putri & Syamsuddin, 2021). These improvements impact service efficiency because workflows are more standardized, manual errors are lower, and document processing is faster. Studies on service units show that the implementation of CEISA 4.0 supports improved document acceptance and increases service user engagement, which is related to improving service quality and the regularity of administrative processes (Oktaviani & Baturohmah, 2025). The regularity of the process strengthens the accountability of the revenue

because administrative decisions related to the verification and determination of levies have a process record that is more readily examined.

The role of CEISA 4.0 also appears in strengthening supervision through the use of data for verification and risk assessment. The automation system supports information-based checks, strengthens the ability to sort transactions that need more attention, and clarifies the compliance status of documents. The literature that discusses the digitalization of surveillance emphasizes that strengthening information systems supports the prevention of smuggling and circulation of illegal goods through capacity building surveillance and data-based response (Kamarulah et al., 2023). The findings are important for revenue accountability because the risk of revenue leakage often stems from non-compliance and trade violations. More targeted supervision helps institutions maintain their revenue base and reduces the chances of manipulation of the value of goods and violations of customs provisions. Thus, CEISA 4.0 not only accelerates services, but also strengthens the quality of control necessary for revenue collection to be accounted for through organized data and traceable processes.

In terms of ecosystem integration, the National Logistics Ecosystem is presented as a collaborative framework that harmonizes logistics processes across stakeholders and encourages information exchange to reduce procedural barriers. The literature confirms that NLE strengthens logistics efficiency and supports process integration from entry to distribution (Dewi, 2023). Such integration is relevant for customs administration because the smooth running of services is determined not only by the internal processes of the authority, but also by the integration of licensing, port services, transportation services, and logistics services. Information exchange in the NLE ecosystem helps officers make more data-driven inspection decisions and increases the transparency of the clearance process through the connection of document information and the flow of goods (Reza, 2023). With more complete and consistent information between parties, document verification decisions can be made more accurately and faster, so that efficiency is increased and the accuracy of levy determination is more maintained.

Although the benefits of CEISA 4.0 and NLE are quite strong in the literature, a number of implementation barriers are considered to reduce the impact on revenue accountability. Infrastructure bottlenecks are an initial factor that is often associated with service stability and consistency of data exchange, as system disruptions can lead to delays, data incompleteness, and increased alternative processing practices that weaken traceability. Muñoz et al. (2016) emphasize that the implementation of digital services often faces gaps that hinder effective governance, including limitations in technical capacity and gaps in service utilization. Skills barriers also have an effect because digital systems demand operational competence, an understanding of data governance, and the ability to read information for risk-based supervision. If competencies are uneven, the quality of data input and the quality of utilization of system features can decrease, so that the resulting process footprint is not fully reliable for audit needs.

Institutional barriers and stakeholder engagement are also important concerns, especially in cross-stakeholder integration which is the main character of NLE. Bayazidnezhad (2025) emphasized that governance initiatives in the customs sector require substantial involvement from all process participants in order for service improvement and transparency to be achieved. In an ecosystem that involves many parties, inconsistent coordination can result in disaligned data, different information exchange standards, and inconsistent processes. This condition has the potential to reduce the benefits of accountability because the accuracy of verification and levy determination depends on the consistency of information across agencies. Legal and institutional barriers are also considered important because regulatory adjustments are needed so that digital procedures, tariff imposition, and licensing governance run consistently (Purwana et al., 2020). Without a clear regulatory basis, there is a risk of procedural uncertainty, differences in interpretation, and implementation gaps that reduce audit certainty.

This synthesis shows that the accountability benefits of CEISA 4.0 and NLE will be maximized if technological transformation is followed by strengthening implementation governance. The strengthening includes data governance that ensures the quality and consistency of information, increasing the capacity of human resources so that the system is used according to design, and harmonizing coordination between institutions so that information exchange is not fragmented. Risk-based supervision also needs to be strengthened so that the use of data from CEISA 4.0 and NLE can be directed towards preventing receipt leakage and improving compliance. With this combination, CEISA 4.0 can serve as the backbone of automation and internal process record, while NLE expands ecosystem integration and improves the quality of information across parties, so that state revenue accountability increases through more orderly services, stronger transparency, and more effective control (Putri & Syamsuddin, 2021; Oktaviani & Baturohmah, 2025; Dewi, 2023; Reza, 2023; Muñoz et al., 2016; Bayazidnezhad, 2025; Purwana et al., 2020).

Figure 1. Strengthening Accountability through Digital Customs Systems

Discussion

This discussion summarizes three main findings from the literature synthesis on digital customs systems and state revenue accountability, with a focus on process standardization mechanisms, strengthening data-based transparency, and the implementation of CEISA 4.0 and the National Logistics Ecosystem and its implementation barriers. These three focuses are interconnected because state revenue accountability demands an orderly service process, traceable information, and effective supervision. The literature emphasizes that digitalization is not just a modernization of technology, but a change in governance that clarifies procedures, strengthens process evidence, and minimizes room for deviation.

Digital customs systems strengthen receipt accountability through process standardization and risk reduction of irregularities. Standardization comes about through workflow standardization, system-based validation, and job responsibility arrangements at each service stage. The digital system forces the process to run according to standard stages, reduces the variation in treatment between officers, and minimizes the opportunity for administrative decisions that are difficult to account. In this framework, accountability is understood as the ability of the institution to show that the determination of levies, document verification, and administrative decisions are carried out consistently according to procedures that can be examined and audited. Kim and Kim (2020) emphasized that the application of the ICT framework to customs services simplifies processes, increases efficiency, and reduces the risk of corruption because the process is more orderly and easy to supervise. The findings show a path to strengthening procedural accountability, as digitization clarifies operational rules of the game and provides evidence to support the evaluation of compliance with procedures. Public sector literature also shows that digital transformation encourages accountability through improved service orientation and better access to information for service users. In the study of the digitization of railway services, digital devices increase accountability through more user-focused services and more accessible service information (Muttaqin, 2025). In the customs service, improved access to information and procedural regularity can reduce unofficial practices that often grow out of service uncertainty, so that the risk of irregularities decreases as process traceability increases and undocumented discretionary space decreases.

The next focus shows increased transparency through audit trails, data sharing, and interoperability that strengthens process monitoring. Audit trails are formed from digital records at each stage of the service, including processing time, data changes, audit status, and the parties taking action. This process record strengthens transparency because decisions and stages of work can be traced, so that stakeholders are better able to monitor the service process. Setyarto et al. (2025) emphasized that e-government initiatives increase government transparency and strengthen public trust because service information is easier to access and check. In customs administration, this kind of transparency strengthens revenue accountability because institutions can show evidence of the processes underlying the decision to determine the levy and document verification more clearly. The

digital governance literature adds that transparency is stronger when public records are highly reliable. Naz (2026) highlights that technologies such as blockchain can generate records that are difficult to manipulate so that transaction traceability increases. In the supply chain realm, blockchain and IoT support end-to-end transparency through secure tracking and real-time data access, which strengthens accountability between parties in the service ecosystem (Wang et al., 2022; Saha et al., 2022). In addition to technology, interoperability and data exchange between systems strengthens transparency as it reduces information asymmetry and clarifies the status of services across agencies. Lai (2025) shows that fusion data-driven platforms lower processing times and improve service monitoring by stakeholders. However, the literature also emphasizes that interoperability needs to be supported by strong data governance. Firdausy et al. (2022) emphasized the importance of enterprise architecture guidelines to maintain data sovereignty and prevent accountability issues due to weak data sharing management. Turan et al. (2025) emphasized that data management transparency requires strong governance so that data exchange remains ethical, consistent, and accountable.

The third focus addresses CEISA 4.0 and the National Logistics Ecosystem which improves efficiency, oversight, and coordination, but the benefits of accountability are influenced by implementation barriers. In CEISA 4.0, the literature describes strengthening the automation of the customs administration process through the integration of declaration services, tariff classification, and compliance monitoring, so that communication between authorities and business actors becomes more orderly and efficient (Putri & Syamsuddin, 2021). Studies on service units show that the implementation of CEISA 4.0 improves document acceptance and increases user engagement, which is related to improving service quality and the regularity of administrative processes (Oktaviani & Baturohmah, 2025). This regularity strengthens receipt accountability because process records are neater and data is more ready to be examined in audits. In terms of supervision, automation supports data-based verification and risk assessment, thereby helping to prevent the smuggling and circulation of illegal goods through strengthening surveillance and information-based response (Kamarulah et al., 2023). Thus, CEISA 4.0 links service efficiency and admission control through more orderly processes and more targeted supervision.

The National Logistics Ecosystem adds a dimension of coordination across logistics stakeholders and government agencies, so that procedures can be harmonized and process barriers can be reduced. The literature emphasizes that NLE strengthens logistics efficiency and process integration from entry to distribution, thereby improving the smooth running of services and trade competitiveness (Dewi, 2023). Better information exchange in the ecosystem helps officers make data-driven inspection decisions and improves clearance transparency (Reza, 2023). However, the literature also identifies implementation barriers that can reduce the impact on revenue accountability. Muñoz et al. (2016) emphasized that limited infrastructure and capacity gaps can hinder effective governance in digital services. Bayazidnezhad (2025) emphasizes that stakeholder involvement is a prerequisite for successful governance in the customs sector, because integration requires the support

of internal and external actors. In terms of regulation, adjustments are needed so that digital procedures, tariff imposition, and licensing governance run consistently and do not cause audit uncertainty (Purwana et al., 2020). This synthesis emphasizes that the accountability benefits of CEISA 4.0 and NLE will be more optimal if supported by strong data governance, adequate human resource readiness, consistent inter-agency coordination, and risk-based supervision that utilizes data integration to maintain the country's revenue base.

CONCLUSION

The conclusion of this study emphasizes that digital customs systems contribute to strengthening state revenue accountability through process standardization, service automation, and traceability of administrative decisions. Standardization of procedures clarifies workflows and responsibilities at each stage of service, while digital recording forms proof-of-process that is ready to be examined in an audit, narrowing the space for undocumented discretion and decreasing the risk of irregularities. Transparency is also increased through audit trails, data exchange, and interoperability that strengthens stakeholder monitoring of processes. At the implementation level in Indonesia, CEISA 4.0 strengthens the orderliness of data-driven administration and supervision, while the National Logistics Ecosystem strengthens cross-stakeholder coordination and information synchronization, so that inspection and verification decisions can be more data-based, more consistent, and more accountable.

The practical implications of these findings emphasize the importance of placing digital transformation as the revenue governance agenda, not just the modernization of services. Suggestions that can be submitted include strengthening data governance through data quality standards, access rights arrangements, and consistent audit mechanisms so that the process footprint is truly reliable for accountability needs. Strengthening human resource capacity through continuous training also needs to be prioritized so that system features can be optimally utilized for verification, risk assessment, and supervision. In addition, inter-agency coordination needs to be strengthened through data exchange agreements and cross-stakeholder process standardization, especially in the NLE ecosystem, so that integration is not hampered by differences in procedures, data sharing resistance, and digital maturity gaps. Strengthening information security is also important to maintain a balance between information disclosure and the protection of sensitive data.

The limitation of this study lies in the use of literature study methods so that conclusions depend on the scope and quality of available publications, and have not tested the impact of implementation empirically on audit acceptance or performance indicators in certain service units. Further research can be directed to in-depth case studies at customs service offices to assess changes in process traceability, the effectiveness of risk-based surveillance, and the quality of data before and after the implementation of CEISA 4.0 and NLE integration. Subsequent research can also combine secondary revenue data analysis and operational indicators to strengthen evidence of the linkage

between digitalization, leakage prevention, and revenue accountability. In addition, studies on organizational readiness factors such as data governance, human resource capacity, and stakeholder coordination can be deepened to map the prerequisites for the success of digital transformation in the customs and excise sectors.

REFERENCES

Al-Ababneh, H. (2025). The impact of blockchain systems on the transparency of international logistics operations. Multidisciplinary Science Journal, 8(6), 2026404. https://doi.org/10.31893/multiscience.2026404

Ardana, B., Ananda, C., & Bintoro, N. (2025). Enforcement of Illicit Cigarettes Increases Excise Revenue in Indonesia., 19(2). https://doi.org/10.55596/001c.144234

Aringga, R. (2025). Legal Implications of Illegal Cigarette Circulation on State Revenue. Jurnal Nawala, 1(12), 85-95. https://doi.org/10.62872/n3hbp104

Bayazidnezhad, M. (2025). Barriers and Challenges to the Applicability of Good Governance in the Customs System of Iran. csjlp, 7(3), 292-307. https://doi.org/10.61838/csjlp.328

Setyarto, D., Alimuddin, A., Mulyaningsih, M., & Judijanto, L. (2025). The role of e-government in increasing transparency and accountability of public administration in the digital era. Edelweiss Applied Science and Technology, 9(2), 1771-1783. https://doi.org/10.55214/25768484.v9i2.4908

Dewi, L. (2023). Kerja Sama Direktorat Jenderal Bea Cukai (DJBC) Dengan The General Administration Of China Customs (GACC) Dalam Upaya Mengatasi Penyelundupan Narkoba Di Indonesia. J. Inter. Relat., 9(1), 324-330. https://doi.org/10.14710/jirud.v9i1.37546

Firdausy, D., Silva, P., Sinderen, M., & Iacob, M. (2022). Towards a Reference Enterprise Architecture to enforce Digital Sovereignty in International Data Spaces., 117-125. https://doi.org/10.1109/cbi54897.2022.00020

Kalizinje, F. (2018). Combating Customs Revenue Fraud in WCO East and Southern African Region: A Mirror Analysis Through the Lens of Malawi. Global Trade and Customs Journal, 13(Issue 5), 224-233. https://doi.org/10.54648/gtcj2018024

Kamarulah, R., Prakoso, L., & Warka, I. (2023). Peran Direktorat Jenderal Bea Dan Cukai Dalam Pengawasan Dan Pencegahan Penyelundupan Di Wilayah Laut Indonesia. Jurnal Strategi Pertahanan Laut, 9(1). https://doi.org/10.33172/spl.v9i1.1389

Kim, S. and Kim, D. (2020). ICT Implementation and Its Effect on Public Organizations: The Case of Digital Customs and Risk Management in Korea. Sustainability, 12(8), 3421. https://doi.org/10.3390/su12083421

Lai, Y. (2025). Research on Data Fusion-Driven Collaborative Logistics Development in the Bay Area. Information Resources Management Journal, 38(1), 1-22. https://doi.org/10.4018/irmj.383054

Muñoz, L., Bolívar, M., & Alcaraz-Quiles, F. (2016). Policies and Strategies for Digital Inclusion., 1-29. https://doi.org/10.4018/978-1-5225-0047-6.ch001

Naz, A. (2026). Innovations in Digital Governance for Enhanced Accountability and Sustainability., 165-183. https://doi.org/10.1108/978-1-83662-758-620261010

Muttaqin, M. (2025). Digital transformation – the panacea for Indonesian railway. Journal of Public Budgeting Accounting & Financial Management, 38(1), 197-215. https://doi.org/10.1108/jpbafm-12-2024-0268

Naz, A. (2026). Innovations in Digital Governance for Enhanced Accountability and Sustainability., 165-183. https://doi.org/10.1108/978-1-83662-758-620261010

Oktaviani, N. and Baturohmah, H. (2025). Penggunaan Pada Ceisa 4.0 Untuk Meningkatkan Pelayanan Penerimaan Dokumen Pabean Di Kantor Bea dan Cukai kota Bogor. Jurnal Pengabdian Kepada Masyarakat Abdi Putra, 5(3), 295-299. https://doi.org/10.52005/712d3843

Purwana, A., Hidayat, W., & Maulana, M. (2020). Legal Issues Regarding Imposition Of E-Form D As A Basis For Determination Of Preferential Tariffs In Atiga. Jurnal Perspektif Bea Dan Cukai, 4(2). https://doi.org/10.31092/jpbc.v4i2.757

Putri, T. and Syamsuddin, M. (2021). Efektivitas Penggunaan Customs-Excise Information System And Automation (CEISA) Manifes Outward. Journal of Law Administration and Social Science, 1(2), 95-111. https://doi.org/10.54957/jolas.v1i2.115

Reza, T. (2023). Kewenangan Direktorat Jenderal Bea Dan Cukai Dalam Pengelolaan Benda Sitaan. JPHTN, 2(1), 1-10. https://doi.org/10.22373/as-siyadah.v2i1.2606

Muttaqin, M. (2025). Digital transformation – the panacea for Indonesian railway. Journal of Public Budgeting Accounting & Financial Management, 38(1), 197-215. https://doi.org/10.1108/jpbafm-12-2024-0268

Reza, T. (2023). Kewenangan Direktorat Jenderal Bea Dan Cukai Dalam Pengelolaan Benda Sitaan. JPHTN, 2(1), 1-10. https://doi.org/10.22373/as-siyadah.v2i1.2606

Saha, A., Raut, R., Yadav, V., & Majumdar, A. (2022). Blockchain Changing the Outlook of the digital era. Edelweiss Applied Science and Technology, 9(2), 1771-1783. https://doi.org/10.55214/25768484.v9i2.4908

Setyarto, D., Alimuddin, A., Mulyaningsih, M., & Judijanto, L. (2025). The role of e-government in increasing transparency and accountability of public administration in the digital era. Edelweiss Applied Science and Technology, 9(2), 1771-1783. https://doi.org/10.55214/25768484.v9i2.4908

Setyarto, D., Alimuddin, A., Mulyaningsih, M., & Judijanto, L. (2025). The role of e-

Turan, M., Hashimzai, I., & Qiam, M. (2025). A Blockchain-Based Framework for Secure and Transparent Environmental Data Sharing in Smart Cities: Enhancing Trust, Integrity, and Interoperability in Urban Sustainability Systems. Nata Palemahan, 2(2), 70-79. https://doi.org/10.38043/natapalemahan.v2i2.6996

Wang, K., Xie, W., Wu, W., Pei, J., & Zhou, Q. (2022). Blockchain-enabled IoT platform for end-to-end supply chain risk management. Journal of Blockchain Research, 1(1), 1-17. https://doi.org/10.4310/jbr.2022.v1.n1.a1

Turan, M., Hashimzai, I., & Qiam, M. (2025). A Blockchain-Based Framework for Secure and Transparent Environmental Data Sharing in Smart Cities: Enhancing Trust, Integrity, and Interoperability in Urban Sustainability Systems. Nata Palemahan, 2(2), 70-79. https://doi.org/10.38043/natapalemahan.v2i2.6996

Wang, K., Xie, W., Wu, W., Pei, J., & Zhou, Q. (2022). Blockchain-enabled IoT platform for end-to-end supply chain risk management. Journal of Blockchain Research, 1(1), 1-17. https://doi.org/10.4310/jbr.2022.v1.n1.a1