FROM E-CUSTOMS TO DIGITAL CUSTOMS: INFORMATION TECHNOLOGY APPLICATIONS IN VIETNAM'S CUSTOMS REFORM

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Abstract: ***The article examines the transition from electronic customs to digital customs, with a particular emphasis on the application of information technology. Drawing on data from the Ministry of Finance and the General Department of Customs, the study evaluates the achievements to date and identifies the institutional, technological, and human resource challenges associated with the implementation of information technology in pursuit of a digital customs model. Based on these findings, the article proposes four strategic groups of solutions aimed at contributing to the national objective of digital government and advancing towards a smart customs system in accordance with international standards.***

• Keywords: *electronic customs, digital customs, information technology application, digital transformation.*

Date of receipt: 27th Feb., 2026
Date of delivery revision: 08th Mar., 2026
Date of receipt revision: 20th Mar., 2026
Date of approval: 31th Mar., 2026
DOI: https://doi.org/10.71374/jfar.v26.i3.26

1. The differences between electronic customs and digital customs

In the process of modernizing customs administration, the transition from the electronic customs model to the digital customs model is an inevitable trend in order to meet the requirements of the Fourth Industrial Revolution and the national digital transformation strategy. Electronic customs is understood as the implementation of customs procedures based on information technology, in which the declaration, receipt, processing, and response of information are conducted electronically through the customs authority's data processing system. Clause 17, Article 4 of Government Decree No. 08/2015/NĐ-CP clearly states: "*Electronic customs refers to the performance of customs procedures, information exchange, data processing, and decision-making in electronic form through the customs authority's electronic data processing system*." At the same time, Circular No. 38/2015/TT-BTC (amended and supplemented by Circular No. 39/2018/TT-BTC) stipulates that electronic customs dossiers are submitted, received, verified, and approved through electronic systems; electronic documents hold the same legal validity as paper documents when digitally signed in accordance with regulations. Therefore, electronic customs is a legally recognized management model under Vietnamese law, which plays a role in automating administrative procedures, reducing paperwork, enhancing clearance efficiency, and aligning with WCO standards.

Vietnam has successfully implemented the electronic customs model, creating a foundation for the next stage of development digital customs. In the context of global digital transformation, the term "digital customs" was first introduced by the WCO in 2015 and officially developed into a core concept in 2016 when the WCO declared it the "Year of Digital Customs." By 2018, the WCO announced the definition of digital customs as a new development model in which digital technology and data are central elements for redesigning the entire customs operation. In Vietnam, the term digital customs has been officially adopted in strategic documents such as Decision No. 2106/QĐ-TCHQ (2019) and Decision No. 97/QĐ-BTC (2021) regarding the policy of outsourcing IT services to implement digital customs. More importantly, Decision No. 628/QĐ-TTg dated 20 May 2022 on the Customs Development Strategy to 2030 sets the objective of fundamentally accomplishing digital customs by 2025, with a vision towards establishing a modern and globally comparable Vietnamese customs system by 2030.

Digital customs is understood as a modern, comprehensive customs management model that operates entirely in a digital environment, based on digital data and digital technologies of the Fourth Industrial Revolution, such as artificial intelligence (AI), big data, blockchain, cloud computing, and the Internet of Things (IoT). This model not only digitizes existing procedures but also restructures operational workflows based on centrally governed databases, real-time analytics, interconnected systems with ministries,

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agencies, enterprises, and cross-border integration in accordance with WCO standards.

It can be seen that digital customs and electronic customs have the following fundamental differences:

In terms of operational procedures, electronic customs remains fragmented, with separate processing stages that are not fully integrated from declaration and document inspection to clearance decision-making. In contrast, the digital customs model features an integrated, end-to-end process design, allowing automation of compliance management, risk management, and post-clearance audit based on big data.

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In terms of technology, electronic customs utilizes traditional information technology systems with centralized databases, but does not allow for multi-source data exploitation and intelligent analytics. Digital customs employs a unified digital platform that integrates all level-4 online public services, enabling real-time data extraction and supporting automated decision-making.

In terms of data, the electronic customs model primarily uses data for administrative procedures, which is still fragmented and not deeply analyzed. Meanwhile, digital customs regards data as a strategic asset, managed centrally and analyzed using big data and artificial intelligence to forecast trends, assess risks, and facilitate rapid and accurate decision-making.

In terms of the level of automation, electronic customs only automates certain processes, with many stages still dependent on the decisions of customs officers. The digital customs model aims at comprehensive automation, enabling the system to autonomously make clearance decisions and issue risk alerts without manual intervention.

In terms of interaction with enterprises, electronic customs allows online submission of documentation but still requires physical presentation at certain stages. Digital customs enables enterprises, banks, insurance companies, government ministries, and international partners to interact entirely on a digital platform 24/7, ensuring seamless, transparent connectivity and deep integration into the global supply chain.

Thus, while electronic customs is an important foundational stage, digital customs represents a higher stage of development that reflects the essence of modern customs administration in the digital era, consistent with international trends, reform strategies, and the requirements of global economic integration.

2. Application of Information Technology in the Transition from Electronic Customs to Digital Customs in Vietnam

The application of information technology (IT) within the Customs authority encompasses two major domains: the application of IT in professional customs operations (including customs inspection and supervision, collection of import and export duties, post-clearance audit, risk management, anti-smuggling investigations, customs inspection, etc.), and the application of IT in internal administrative management (management and circulation of incoming and outgoing documents, personnel management, emulation and commendation activities, etc.). Within the scope of this article, the author focuses on analyzing the application of information technology in professional customs operations.

The application of information technology is an inevitable process aimed at fundamentally and comprehensively transforming the state management of customs within a modern and secure digital environment. This process has been marked by significant milestones, beginning with the pilot implementation of electronic customs procedures in 2005 and their official nationwide deployment in 2013. The electronic customs phase achieved notable success, particularly through the successful implementation of the VNACCS/VCIS automated clearance system. To date, the Customs sector has essentially completed the 5E objectives (E-Declaration, E-Payment, E-C/O, E-Permit, and E-Manifest) in IT application. Specifically, 100% of core customs procedures have been automated, with the processing time for a dossier reduced to merely 1 to 3 seconds. Moreover, since the implementation of the Electronic Tax Payment and 24/7 Clearance Scheme in 2017, enterprises have been able to pay taxes at any time and from anywhere, enabling immediate clearance upon completion of tax obligations and significantly shortening procedural time.

The application of information technology has also been comprehensively implemented across professional operational areas to enhance management efficiency. In the area of customs supervision, the General Department of Customs has deployed the Automated Customs Management System (VASSCM) since 2017, establishing connectivity with port and warehouse operators to facilitate information

exchange, simplify documentation, and address congestion. Risk management has entered a new stage of development with the implementation of an automated risk management system, allowing for the automatic application of risk assessment criteria and the categorization of declarations into Green, Yellow, and Red channels. The application of IT in risk management has significantly reduced the proportion of consignments subject to physical inspection (with the Red channel rate declining from 12.62% in 2011 to 3.45% in 2024, even as total declarations increased from 4.64 million to 580.71 million), while enhancing capacity in combating smuggling and trade fraud.

However, the essence of the electronic customs stage remains primarily focused on digitizing existing processes; data is still dispersed across operational systems, integration and analytical capacity are limited, and many management decisions continue to rely on manual evaluation.

From a strategic perspective, Decision No. 2106/QĐ-TCHQ (2019) approved the project to comprehensively redesign the Customs IT system; Decision No. 97/QĐ-BTC (2021) established the policy of outsourcing IT services to implement digital customs; and notably, Decision No. 628/QĐ-TTg dated 20 May 2022 on the Customs Development Strategy to 2030 set the objective that "by 2025, digital customs will be fundamentally completed, moving towards smart customs," thereby laying the foundation for Vietnam Customs' transition to the digital customs model.

Unlike the E-Customs stage, the Digital Customs stage involves the design of a comprehensive, fully integrated process spanning pre-clearance, clearance, and post-clearance.

Electronic compliance profiles (compliance profiles) are interconnected with risk management and post-clearance audit systems (STQ01), enabling a shift from pre-clearance control to post-clearance supervision, focusing resources on high-risk entities and facilitating early intervention.

Enhanced risk management replaces static criteria with big data analytics and machine learning models to score risks in real time, drawing from historical compliance, valuation data, HS codes, transportation routes, partner networks, and invoice anomalies.

Smart supervision is achieved through the deployment of VASSCM (connecting warehouses, ports, and airports), GPS-enabled container seals, and IoT signals combined with computer vision to detect route deviations, seal tampering, unauthorized stops, or anomalies in scanning images.

Post-clearance audit and compliance management are modernized through IT applications that enable customs authorities to analyze historical data, build enterprise compliance profiles, and forecast fraud risks based on big data analytics algorithms. This transforms the approach from "detection-based inspection" to "prevention-based inspection," in line with WCO recommendations for the smart customs model.

In addition, blockchain technology is being considered for application in verifying the origin of goods, ensuring transparency, preventing document forgery, and reducing the time required for the confirmation of certificates of origin (C/O) in key export markets. Concurrently, the National Single Window (NSW) platform is being upgraded with open API applications to enable automated connectivity between customs authorities, ministries, banks, and logistics enterprises, thereby integrating the entire operational process into a unified digital ecosystem.

3. Proposed Solutions for the Application of Information Technology in the Transition to the Digital Customs Model in Vietnam

First: Improving the institutional framework and strengthening digital data governance.

Institutional reform is the core foundation that determines the success of the digital customs model. The completion of the legal framework on data sharing and e-government is a prerequisite. It is essential to amend and supplement provisions in the Customs Law, the amended Law on Electronic Transactions, the Cybersecurity Law, and relevant decrees to grant the Customs authority the right to collect, share, and mandatorily connect data in real time with ministries and sectors such as taxation, banking, public security, agriculture, and transportation. At the same time, data sharing must adhere to two key principles: (i) real-time connectivity, and (ii) protection of national data security and personal privacy.

In parallel, it is necessary to promulgate and mandate the nationwide and ASEAN-wide adoption of a unified API data connection standard. The API standard helps eliminate system fragmentation, reduce integration costs, and ensure cross-border data interoperability. Building a data architecture in accordance with the WCO Data Model and ISO 8000 standards will establish the foundation for lifecycle data management from data collection, classification, storage to exploitation and disposal. This will enable Vietnam Customs to shift from the traditional records management model to a modern data governance model, where data becomes a "digital asset" that supports strategic decision-making.

Second: Developing modern digital infrastructure and digital architecture.

Technological infrastructure serves as the operational backbone of digital customs. The establishment of a centralized Customs Data Hub based on the "data lake – lakehouse" model integrated with cloud computing platforms will facilitate the processing of big data and support intelligent predictive analytics. This data hub will interconnect all operational systems such as VNACCS/VCIS, VASSCM, the electronic tax system, the automated supervision system, the risk management system, post-clearance audit, and anti-smuggling investigation, thereby forming an integrated customs data ecosystem.

The application of artificial intelligence (AI) and machine learning (ML) is a key solution to enhancing risk management capability. These technologies enable the development of behavioral analytics systems to predict violations and detect anomalies in valuation, origin declarations, and cross-border financial flows. Instead of applying static risk criteria, AI/ML models automatically generate alerts based on historical data and global trends. Simultaneously, IoT, AI-powered cameras, GPS, RFID, and blockchain technologies must be deeply integrated into customs supervision operations. IoT sensors installed on containers and means of transport will provide real-time journey data. AI cameras deployed at seaports and border checkpoints will identify vehicles and individuals and send automated alerts. Blockchain ensures the integrity of documents such as electronic invoices, certificates of origin (C/O), and customs declarations, contributing to building trust with customs authorities of other countries.

Third: Developing information technology capacity among customs officers.

Human resources are the decisive factor for the success of digital transformation. Customs officers need to be equipped with digital competencies, including data analytics, cybersecurity, AI/IoT system operations, and big data management. A digital competency framework should be established based on international standards and integrated into mandatory training roadmaps aligned with job positions.

Vietnam Customs should implement a multi-tiered training system that combines e-learning and intensive in-person training modules. Strategic cooperation with technology corporations such as Viettel, VNPT, and FPT, as well as with customs and economic universities, will create a continuous value chain of training, technology transfer, and practical application. The State should introduce preferential policies and mechanisms to attract high-tech experts to participate in building the digital customs system, laying the foundation for a transition from the model of "humans operating machines" to "humans mastering artificial intelligence."

Fourth: Establishing a system for performance measurement and evaluation.

Digital transformation can only be effective when outcomes are measurable. Vietnam Customs needs to develop a set of indicators to assess digital maturity in accordance with WCO and OECD standards, including indicators such as: the proportion of dossiers processed fully automatically, average clearance time, the proportion of contactless dossiers, the detection rate of violations via AI systems, and the level of enterprise satisfaction. This indicator set will serve as the basis for evaluating progress in each phase and for adjusting the digital transformation strategy in line with practical conditions.

In addition, the application of the "data life cycle management" model is a key solution to optimizing data value. Data is collected, standardized, analyzed, exploited, shared, reused, and disposed of through a closed-loop process with periodic auditing and evaluation. This approach ensures that data is not only used for administrative procedures but is also harnessed for forecasting, policy formulation, and participation in the global customs supply chain.

4. Conclusion

The application of information technology in customs operations has shifted from a supportive function to a central and decisive role, laying the foundation for the establishment of the digital customs model. However, to realize the objective of digital customs and move towards smart customs in accordance with the Customs Development Strategy to 2030, the customs sector must prioritize the improvement of the institutional framework, the development of technological infrastructure, the enhancement of information technology capacity for customs officers, and the establishment of a system of performance evaluation indicators. These solutions will enable the customs authority to enhance management efficiency, facilitate trade, and build an information technology system aligned with international standards.

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