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DIGITAL TRANSFORMATION IN VIETNAM CUSTOMS MANAGEMENT

TRANSFORMAÇÃO DIGITAL NA GESTÃO ADUANEIRA DO VIETNÃ

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Abstract
Digital transformation in Vietnam's customs management is an inevitable trend aimed at modernizing customs operations, meeting the demands of global economic integration and trade development. The application of digital technologies like Artificial Intelligence (AI), Big Data analytics, electronic management systems, and the national single window connection has helped enhance inspection and supervision efficiency, shorten clearance times, and reduce costs for businesses. Simultaneously, digital transformation contributes to improving risk analysis capacity, detecting fraud, and ensuring correct and sufficient state budget revenue. However, this process also faces numerous challenges, including unsynchronized technological infrastructure, a lack of human resources with digital skills, and high requirements for information security and data protection. The synchronous implementation of digital transformation will be the key to enhancing Vietnam's customs management capacity in today's digital age.

Keywords: Customs Management. Digital Transformation. Vietnam.

Resumo
A transformação digital na gestão aduaneira do Vietnã é uma tendência inevitável que visa modernizar as operações aduaneiras, atendendo às demandas da integração econômica global e do desenvolvimento comercial. A aplicação de tecnologias digitais como Inteligência Artificial (IA), análise de Big Data, sistemas eletrônicos de gestão e a conexão da janela única nacional tem contribuído para aumentar a eficiência da inspeção e supervisão, reduzir os tempos de desembaraço e os custos para as empresas. Simultaneamente, a transformação digital contribui para aprimorar a capacidade de análise de riscos, detectar fraudes e garantir a arrecadação correta e suficiente do orçamento estatal. No entanto, esse processo também enfrenta inúmeros desafios, incluindo infraestrutura tecnológica dessincronizada, falta de recursos humanos com habilidades digitais e altos requisitos de segurança da informação e proteção de dados. A implementação sincronizada da transformação digital será fundamental para aprimorar a capacidade de gestão aduaneira do Vietnã na era digital atual.

Palavras-chave: *Gestão Aduaneira. Transformação Digital. Vietnã.*

1 INTRODUCTION

In the context of increasing globalization and international trade development, the modernization and digitization of customs operations have become an inevitable trend. Digital transformation in customs management is not merely the application of IT to automate professional processes, but a comprehensive change in management methods, operation, and decision-making based on digital data. Globally, many nations and international organizations, especially the World Customs Organization (WCO), have been pioneering the promotion of digital transformation in this field. This is intended to enhance efficiency, transparency, and security in customs management for cross-border trade activities.

One of WCO's important contributions to digital transformation is the development and dissemination of the WCO Data Model. This is a global standardized data framework that helps countries build interoperable and connected electronic customs systems. Adopting this model not only simplifies administrative procedures and reduces clearance time but also helps enhance supervisory capacity, risk analysis, and detection of trade fraud. By digitizing processes, many countries have significantly reduced reliance on paper records while improving the quality of public services and the experience of import/export businesses.

Furthermore, the application of new technologies such as Artificial Intelligence (AI), Big Data, Blockchain, and the Internet of Things (IoT) is becoming increasingly popular in customs management. These technologies support risk analysis and forecasting, automated cargo inspection, and transparent and efficient supply chain management. Many modern customs systems also integrate Single Window portals, which help connect customs agencies with other related organizations, creating a seamless and convenient working environment.

However, the digital transformation process in customs management also poses many challenges. Countries need to invest heavily in technological infrastructure, develop digital human resources, and ensure information and personal data security. Additionally, harmonizing standards, procedures, and legal frameworks between countries is crucial to ensuring compatible connectivity in the global trade environment. In summary, digital transformation in customs management is the key to helping countries enhance competitiveness, promote sustainable trade, and protect national security. With support

from the WCO and the collective efforts of the international community, the future of digital customs promises to unlock many important opportunities and breakthroughs.

2 STATUS OF DIGITAL TRANSFORMATION IN GLOBAL CUSTOMS MANAGEMENT

According to an IMF report, customs agencies worldwide are moving from "digitization" to "digitalization" (digital transformation). Modern digital customs systems not only help shorten clearance times and reduce logistics costs but also enhance risk control capacity, increase transparency of administrative procedures, and combat trade fraud. However, the development level of digital transformation in this field varies significantly between developed and developing countries, reflecting differences in technological capacity, infrastructure, and investment resources.

2.1 Developed countries-cases of Singapore, South Korea, and the European Union (EU)

In developed countries such as Singapore, South Korea, and the European Union (EU), digital transformation in customs has achieved comprehensive progress, with electronic systems integrated and synchronized at the national and regional levels:

1. Singapore pioneered the implementation of an electronic customs declaration system early on through the TradeNet system, established in 1989. This was one of the world's first electronic "Single Window" systems, connecting businesses with over 35 government agencies related to trade. TradeNet has helped reduce average clearance time to just a few minutes, allowing nearly 100% of electronic declarations to be processed automatically. (Jonathan, 2010)
2. South Korea implemented the UNI-PASS system, a fully integrated electronic platform for declaration, tax calculation, payment, inspection, and risk analysis. This system not only serves the domestic market but has also been exported to many countries, such as Ecuador, Cameroon, and Tanzania, as a typical model of electronic customs. Furthermore, South Korea has integrated Blockchain and Artificial Intelligence (AI) to detect fraud and shorten inspection times. (Cho & Nam, 2016)

3. The European Union (EU) is moving toward a comprehensive digital customs ecosystem through the Customs 2025 initiative, aiming to build a unified e-Customs platform across 27 member states. Systems like Import Control System 2 (ICS2) and the EU Customs Data Model allow real-time data sharing, application of Big Data-based risk management, and more effective cross-border supervision. (European Commission, 2023)

2.2 Developing countries: cases of ASEAN and Central Asia

In the ASEAN and Central Asian regions, many countries are striving to modernize their customs systems through the application of IT, the establishment of national single windows, and the development of electronic declaration systems. However, they still face many challenges regarding technical infrastructure, legal frameworks, and implementation capacity.

The ASEAN region, countries like Vietnam, Thailand, and Indonesia, have deployed electronic customs systems and are moving towards building smart customs:

Vietnam is a typical example with the operation of the VNACCS/VCIS system, supported by Japan since 2014, allowing for automatic processing of declaration, channeling, clearance, and tax payment stages. Vietnam has also connected the National Single Window with 13 ministries and sectors and participates in the ASEAN Single Window, contributing to a reduction of 30–50% in clearance time.(Thái Bình, 2023)

In Thailand, the e-Customs system has been fully digitized from registration and declaration to licensing and cargo supervision. The country is also pushing the application of Big Data analytics and AI to assess risk and prevent smuggling. However, a major obstacle remains the lack of synchronization between databases of different ministries and the system's incomplete connection with the private sector.(APEC, 2023)

Indonesia is gradually implementing the Indonesia National Single Window (https://insw.go.id) to simplify trade procedures and increase control over import/export goods. Despite progress, the country still faces overlapping issues among specialized inspection agencies and an uneven rate of electronic procedure implementation across different localities.

Meanwhile, countries in Central Asia, like Kazakhstan, Uzbekistan, and Kyrgyzstan, are also striving to modernize customs with support from the Eurasian Economic Union and international organizations:

Kazakhstan has implemented the Automated Customs Clearance System with the goal of minimizing manual intervention and increasing transparency. However, uneven technological infrastructure and a shortage of IT experts are major challenges.(ESCAP, 2022)

Uzbekistan recently adopted a customs modernization strategy for the 2020–2024 period, emphasizing the application of risk management systems, non-intrusive inspection, and tariff procedure reform. Nevertheless, the country still lacks the resources for nationwide synchronous implementation and relies heavily on external technical assistance.(Central Asia Regional Economic Cooperation, 2008)

Overall, developing countries in ASEAN and Central Asia clearly recognize the role of digital transformation in customs as a strategic tool to promote economic integration and sustainable growth. However, achieving true effectiveness requires stronger investment in technological infrastructure, institutional reform, and enhanced regional cooperation to share experiences and synchronize systems.

3 STATUS OF DIGITAL TRANSFORMATION IN VIETNAM CUSTOMS MANAGEMENT

In the context of international economic integration and the development of the digital economy, digital transformation in customs management in Vietnam has become a key task, aiming to modernize customs, improve the effectiveness of state customs management, and facilitate trade, logistics, and investment. In recent years, Vietnam has made significant strides in applying IT and developing electronic customs systems, although some challenges remain in completing technical infrastructure, synchronizing data, and improving human resource capacity.

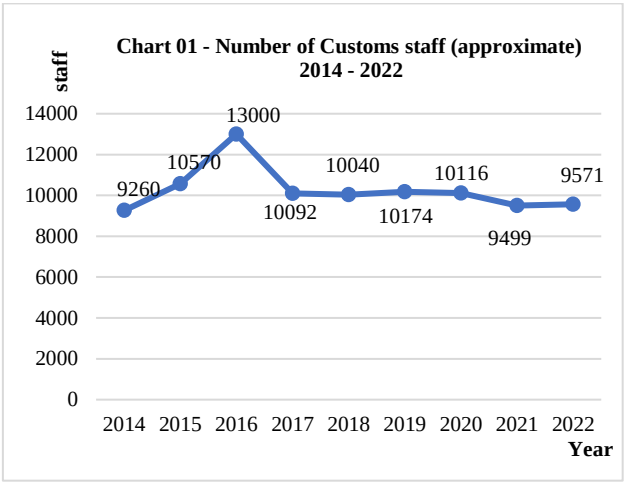
One of the outstanding achievements of Vietnam Customs is the deployment of the VNACCS/VCIS since 2014, supported by the Japanese government. This system allows businesses to perform electronic customs declarations and automatically processes channeling, tax calculation, and cargo clearance steps. By the end of 2024, the VNACCS/VCIS automated clearance system in Vietnam had processed over 15 million

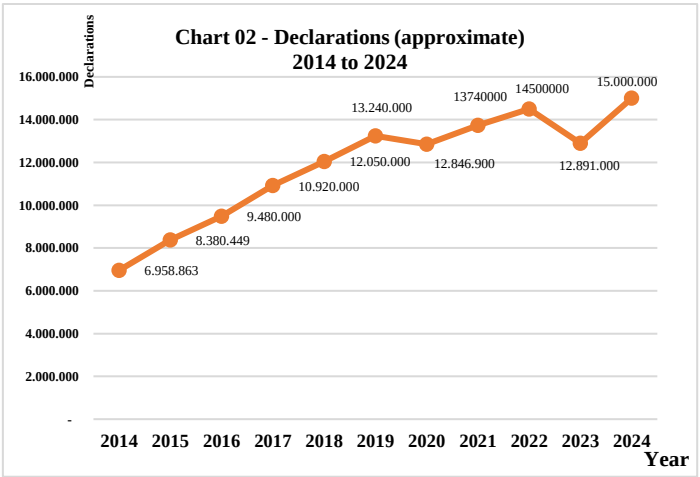
customs declarations for more than 80,000 businesses involved in import/export activities since its official deployment on April 1, 2014. The system has been applied at all customs units nationwide, with the electronic declaration processing rate reaching over 99%. (Đỗ Quyên, 2025)

Regarding clearance time, for green channel declarations, the VNACCS/VCIS system can complete procedures in about 1 to 3 seconds, saving time and costs for businesses.(Lê Hồng Vân, 2022)

Figure 1

Number of Customs staff (approximate) 2014 – 2022 and Declarations (approximate) 2014 to 2024





Source: The author collected data in Vietnam Customs Annual reports from 2014 to 2024 and (World Customs Organization, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022)

Observing the data summarized over the years, the number of processed customs declarations has increased significantly annually (Chart 02). From nearly 7 million

declarations/year in 2014, when VNACCS/VCIS was officially implemented, the number of declarations increased more than twofold to over 15 million in 2024 (Đỗ Quyên, 2025). Meanwhile, in terms of human resources, the average staffing level remains around 10,000 personnel/year, with no mechanical increase despite the doubled workload (Chart 01) and Vietnam Customs has continued to maintain the same number of staff (with periodic recruitment to compensate for losses due to retirement or transfers), in line with the restructuring direction from the Party's Resolution No.18-NQ/TWThis demonstrates the initial success of the digital transformation policy in customs management, affirming the goal of efficient use of human resources.

Additionally, Vietnam has successfully built and operated the National Single Window (NSW), connecting 13 ministries and sectors with over 250 administrative procedures. According to the General Department of Customs, the number of processed dossiers through the NSW connected over 75,400 businesses by the end of 2024. Vietnam is also one of the first countries in the ASEAN region to successfully implement the ASEAN Single Window (ASW) connection, allowing the exchange of electronic documents such as the C/O form D with 09 member countries. (Anh Minh, 2024)

The Government of Vietnam has shown strong political determination by issuing the Customs Development Strategy to 2030 (Decision 628/QĐ-TTg dated May 20, 2022), aiming to build Smart Customs, based on digital technology, towards a "paperless customs" model and data-driven management. This strategy directs the strong application of advanced technologies in risk analysis, automated cargo monitoring, and inter-agency data integration, and provides level 4 online public services for the entire customs process.

In the initial phase, digital transformation in Vietnam customs achieved many positive results, playing an important role in administrative procedure reform and international trade integration. Nevertheless, to move towards building Smart Customs, Vietnam needs to continue perfecting its technical infrastructure, improving the quality of its human resources, and strengthening coordination among relevant specialized management agencies.

3.1 Benefits of digital transformation in customs management: creating public value for the community

In the Industry 4.0 era, digital transformation is an inevitable trend to modernize public administration, especially in customs, a key sector in the international supply chain and cross-border trade control. Digital transformation not only optimizes professional processes but also enhances the effectiveness of state management, increases transparency, and creates value for the community.

One of the prominent benefits is the simplification of administrative procedures, reduction of clearance time, and cost savings for businesses. Systems like the National Single Window (NSW), ASEAN Single Window (ASW), and VNACCS/VCIS allow businesses to perform declaration, tax payment, and progress tracking entirely online. Specifically, results recorded from the Trade Facilitation Project (TFP) coordinated by USAID and the General Department of Customs showed positive results in the five years from 2018 to 2023:

Cargo clearance time at border gates significantly reduced: imported goods clearance time dropped from 103.68 hours to 54.8 hours, and exported goods dropped from 95.78 hours to 38.4 hours.

Costs for completing cross-border procedures for imported goods fell by 45% (from $569 to $313), and for exported goods by 20% (from $420 to $338).

Vietnam completed 84% of its commitments under the WTO Trade Facilitation Agreement (TFA), aiming for 100% by 2024.

This demonstrates the positive impact of digital technology on the efficiency of public service delivery by Vietnam Customs. (C.Thành, 2023)

Furthermore, the application of digital technology helps enhance supervision capacity, risk control, and prevention of violations in import/export activities. Technologies such as Artificial Intelligence (AI), Big Data analytics, and risk management algorithms have been deployed for smart cargo channeling, helping detect trade fraud, smuggling, and tax evasion early. This contributes not only to protecting national economic interests but also to ensuring a fair and safe trade environment.

Additionally, digital transformation in customs plays a crucial role in increasing the transparency and accountability of public authorities. Information regarding tariffs, procedures, and inspection processes is publicly available on electronic portals, making

it easy for citizens and businesses to look up and monitor. As a result, community trust in the administrative system improves, contributing to building a modern, transparent, and service-oriented public administration. The determination to succeed in digital transformation for Vietnam Customs improves operational and supervisory efficiency and creates sustainable public value. It promotes administrative reform, enhances transparency, and improves the quality of public services —essential factors for meeting socio-economic development requirements in the context of global integration and the digital technology revolution.

3.2 Challenges in digital transformation of customs management in Vietnam

Digital transformation in customs management is a vital part of modernizing public administration and promoting international trade. Despite Vietnam's positive achievements in deploying digital systems like VNACCS/VCIS, NSW, and ASW, this transformation process still faces numerous institutional, technological, and resource challenges, specifically:

- *Problem of Synchronization and Integration of Information Systems among Related Agencies:* Many ministries and sectors still use different technology platforms, making data sharing and connectivity difficult. This reduces the effectiveness of the single window mechanism and affects the speed of procedure processing. Furthermore, the lack of uniformity in professional procedures, data standards, and the legal framework governing digital data also poses a major obstacle to operating the electronic system effectively and transparently.
- *Issues related to IT Infrastructure and Information Security:* Many border gates, especially in border areas, still lack adequate investment in equipment, transmission lines, and network security. This increases the risk of data leakage, system disruption, and creates bottlenecks in online dossier processing. Simultaneously, the technological application capacity of customs officials is uneven, especially at border gate areas, leading to difficulties in adopting and implementing new digital tools.
- *Problems related to the Current Institutional Foundation:* New policies and regulations in the customs sector are shaping Vietnam Customs toward a modern public management model: effective, customer-centric, and leveraging the power

of digital technology. This is an essential path for Vietnam Customs to achieve its strategic goals by 2030 and become a reliable partner. However, with rapid global economic changes, Vietnam Customs faces many difficulties in state management when considering factors such as results-based and efficiency-oriented management, and customer-centricity:

Efficiency-Oriented and Results-Based Management: The institutional foundation of Vietnam Customs allows for the effective application of risk management. Instead of traditional 100% cargo inspection, legal regulations allow Customs to channel, focusing resources on high-risk shipments, thereby minimizing manual intervention and facilitating compliant businesses. However, the evaluation of the effectiveness of risk management activities within the automated clearance system by Vietnam Customs is still in the early stages of application. Criteria such as accurate channeling rate, violation detection rate, or feedback from the business community have not been given adequate attention.

Customer-Centric Service (Businesses and Citizens): Regulations on electronic customs, the national single window, and programs like Authorized Economic Operator (AEO) are typical examples that realize this goal by creating a transparent and accessible legal corridor. They simplify customs procedures and provide a friendly, interactive environment, reducing direct contact between customs officials and businesses, thereby limiting negative practices and enhancing transparency. However, when the computer operating system is disrupted due to infrastructure issues (such as software or transmission, congestion), almost all cargo clearance operations nationwide must temporarily cease (manual paper declaration is used as a temporary replacement). This shows that the automated clearance backup system has not been adequately invested in.

4 PROPOSED SOLUTIONS TO PROMOTE SUCCESSFUL DIGITAL TRANSFORMATION IN VIETNAM CUSTOMS MANAGEMENT

Firstly, the current legal framework needs to be adjusted to meet the requirements of comprehensive digitization in the customs sector. This includes standardizing electronic professional procedures, establishing the legal validity of digital documents, and clearly regulating the responsibility for data sharing and protection among related agencies. Additionally, national technical standards for data connectivity and

interoperability should be issued to effectively support the National and ASEAN Single Window mechanisms.

Secondly, the government needs to upgrade its **I**T infrastructure and ensure network security as foundational elements. The current technology system must be expanded in capacity, processing speed, and compatibility with modern technologies such as AI and Big Data. These technologies can effectively support risk analysis, automated monitoring, and rapid decision-making. Concurrently, establishing cybersecurity standards and incident response procedures is necessary to protect the system from increasingly sophisticated cyberattacks.

Thirdly, the human factor plays a central role in all digital transformation initiatives. Specialized and regular training programs are needed for customs officials, especially at border gates, regarding the skills to use and operate digital systems. It is also essential to build a mechanism to attract high-tech personnel to maintain the stability of all digital operations.

Considering the technical aspect and the NACCS/VCIS system management model in Japan, to modernize and optimize Vietnam Customs' IT system, aiming for an effective and transparent governance model, the Vietnamese Government should consider restructuring the Customs IT Management System by adopting a Public-Private Partnership (PPP) model and clearly separating the functions of management, operation, and system development. This organizational model will help reduce the burden on the state budget through the financial autonomy of the operating unit, optimize resources, and leverage technical expertise and innovation from the private sector. The Government will still maintain strategic control and ensure security, thereby improving the quality of public services and promoting international trade.

Finally, close coordination among state agencies and active participation from the private sector will create a sustainable digital ecosystem. Data interoperability between Customs and specialized management ministries like the Ministry of Industry and Trade, the Ministry of Health, the Ministry of Transport, etc., will help shorten procedure processing time. Simultaneously, businesses should be encouraged to use electronic systems through technical support and communication to raise awareness, skills, and compliance. The synchronous implementation of these solutions will contribute to forming an intelligent, efficient, transparent, and internationally compliant digital

customs system, serving as a pillar in Vietnam's public administration modernization and global integration.

5 CONCLUSION

The digital transformation process in Vietnam's customs management has achieved notable results, contributing significantly to the modernization of public administration and enhancing national competitiveness. To date, all basic customs procedures have been digitized, with over 99% of businesses participating in electronic clearance. The VNACCS/VCIS automated clearance system, implemented synchronously nationwide, has significantly reduced clearance time while minimizing costs and administrative procedures for the business community.

However, digital transformation in this sector still faces many difficulties. The VNACCS/VCIS system, implemented since 2014, has shown certain limitations in meeting new digital transformation requirements and the technologies of the Fourth Industrial Revolution. To overcome this situation, Vietnam Customs has proposed building a new, more modern system to replace it, aiming to complete the comprehensive digital customs model. From an overall perspective, digital transformation in Vietnam customs management has made firm progress, creating an important premise for building Smart Customs in the future. Nevertheless, for sustainable development, continued investment in IT infrastructure, completion of the legal framework, and focusing on developing highly skilled human resources are necessary, aligning with the requirements of integration and deep digital transformation in the current context.

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Authors' Contribution

All authors contributed equally to the development of this article.

Data availability

All datasets relevant to this study's findings are fully available within the article.

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