www.pwc.com/taxdisruption

Tax disruption and international trade

A whitepaper on customs technology

pwc

Microsoft

Executive summary

The world of tax administration is changing fundamentally. As tax authorities digitally transform, traditional processes are being redefined by disruptive technologies. Direct connections to business information systems, real-time auditing using large language models and automated cross-border data reconciliation are not the future. They are the present reality.

This whitepaper focuses on a specific component of tax administration: customs. The reason for this focus is simple: customs authorities and processes are in the throes of a paradigm shift. In the past, customs authorities conducted targeting and profiling based on risk assessments to selectively inspect products at the border at the time of importation. In other words, customs authorities needed to justify why certain products were inspected at the border. Now the information systems of the businesses that produce and/or trade these products are increasingly inspected before and/or after importation. Put another way, businesses now need to continuously justify why their products do not need to be inspected at the border. This shift from a transaction-based approach to a systems-based approach is accompanied by the accelerating digitalisation of customs authorities.[1]

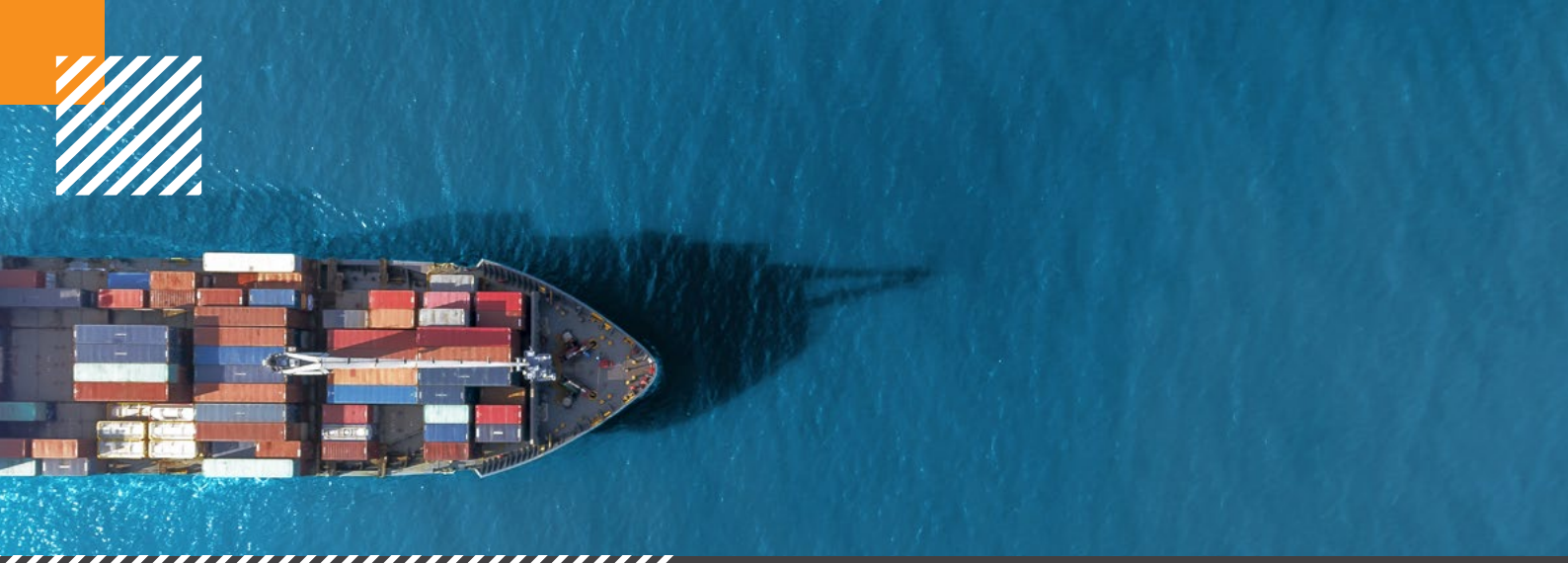
- **Around the world, customs authorities have been investing in the digitalisation of their processes because[2]:**
  1. the volume of international trade has been growing,
  2. international trade has become both more digital and more "parcelised", and
  3. international trade regulation has become more complex and interconnected.

- **In response to these developments, customs authorities are increasingly:**
  1. adopting digital technologies and processes,
  2. integrating with other tax and government departments nationally and internationally, and
  3. linking directly with business systems.

- **For businesses, the digitalisation of customs processes is resulting in:**
  1. increased transparency,
  2. improved efficiency, and
  3. new opportunities to generate value for stakeholders.

- **To benefit from the digitalisation of customs, businesses should:**
  1. upgrade the digital skills of their customs and supply chain functions,
  2. integrate their customs and supply chain functions with other business processes, and
  3. implement digital technologies in their customs and supply chain functions.

This whitepaper is organised as follows. Part 1 explores in more detail the factors driving the digital transformation of customs. Part 2 first provides an overview of global digitalisation trends in customs and then highlights nine specific country examples. How this digital transformation of customs might affect businesses and how businesses ought to respond is discussed in Parts 3 and 4 respectively. Part 5 showcases how PwC and Microsoft support businesses in the new, digital world of customs and supply chain processes.



Content

1 Why are customs authorities investing in the digital transformation of their processes now?

Tax authorities are leading the way in terms of the digital transformation of civil government bodies. As predicted and empirically supported in earlier reports on tax disruption, tax authorities are uniquely placed to drive this digital transformation because they have access to large databases (that can be used to train algorithms), perform structured tasks (that can be automated) and are under pressure to collect revenue (for which they receive ample funding).[3]

This is also, and in particular, true for customs authorities – the focus of this whitepaper. Customs authorities do indeed have access to large volumes of cross-border transactional trade data, follow precise customs clearance procedures and receive considerable funding owing to their importance for national border security. In addition, however, there are at least three more specific reasons as to why customs authorities are now investing in the digital transformation of their processes.[4]

1.1 The growing volume of international trade

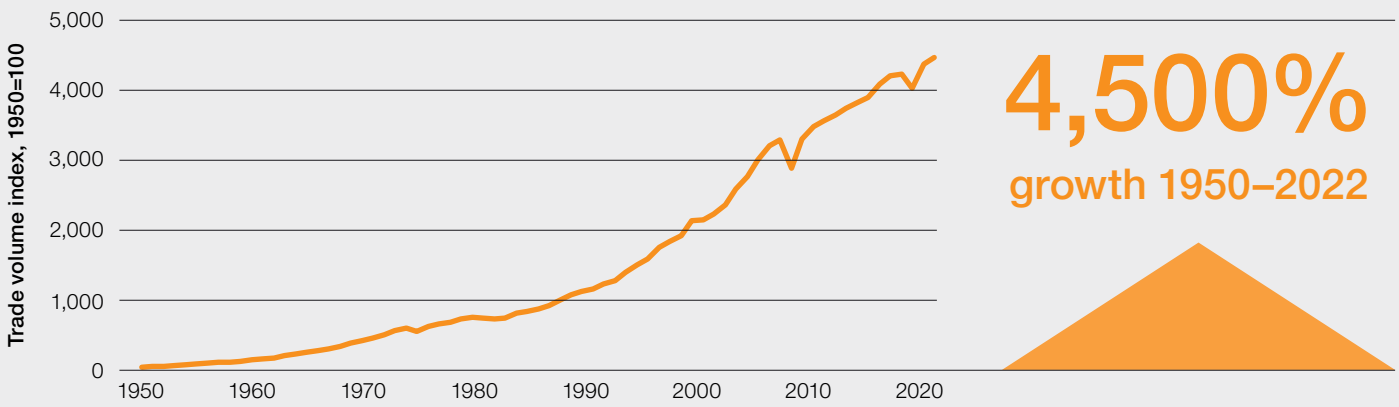
The first reason is related to the growing volume of international trade, which started accelerating particularly during the mid-1990s (Figure 1). On average, world trade volume has grown by 4% a year since 1995[5]. Of course, both export and import volumes vary considerably between countries and from year to year.

Between 2000 and 2020, for example, the average annual growth rate of imports in China was around 10%, in the United States around 2% and in Switzerland around 4%. After the volume of imports fell during the 2008-09 global financial crisis, all three countries experienced large import growth rates in 2010. In that year, the volume of imports to the United States grew by 15%, China by 21%, and Switzerland by 12%.[6]

25%

growth in global trade in the last 10 years

Figure 1: The growing volume of international trade, 1950–2022



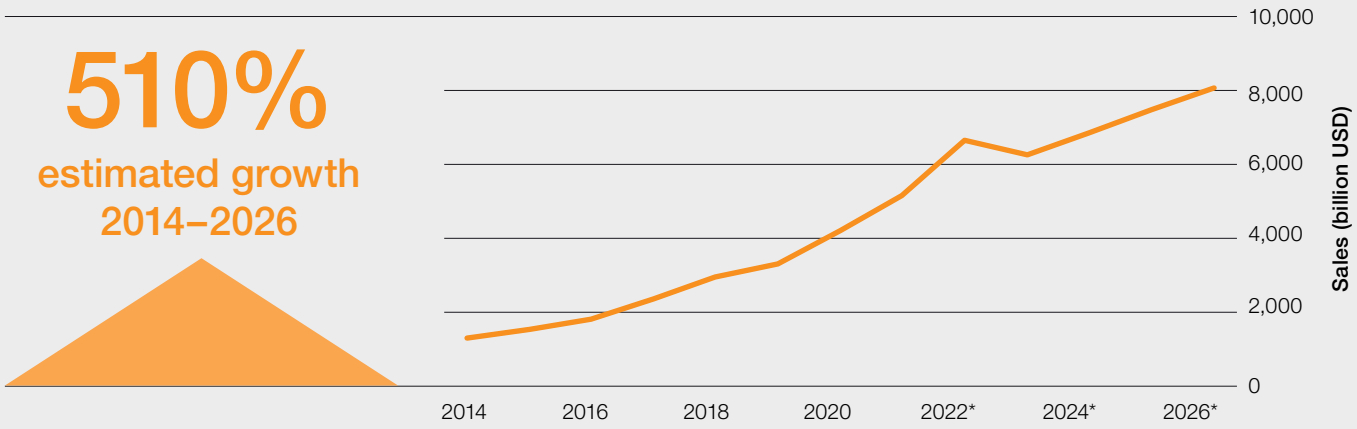
Source: Calculation and illustration based on World Trade Organisation (2023b).

In summary, customs authorities around the world have been confronted with an overall increase in the volume of international trade over the past decades. Owing to different and constantly changing patterns of trade, however, this may have presented more of a challenge for some customs authorities than for others. In addition, customs authorities may face sudden but temporary surges in trade volumes that they have to process. These developments are particularly evident now, as the world is experiencing a shift away from globalisation and offshoring to regionalisation and reshoring.[7]

1.2 The increasing digitalisation and parcelisation of international trade

The second reason is related to a change in the nature of international trade. First, international trade has become more digital. Global retail electronic commerce (e-commerce) sales almost quadrupled between 2014 and 2021 and are predicted to grow by another 56% by 2026 (Figure 2).

Figure 2: The digitalisation of international trade, 2014–2026



Source: Calculation and illustration based on Statista (2023a). *Estimate.

Second, the rise of e-commerce and micro-trading has led to what the then-deputy director-general of the World Trade Organisation (WTO) called the "parcelisation" of international trade.[8] Between 2013 and 2021, the number of parcels shipped worldwide more than quadrupled. It is forecast that the number of parcels shipped will grow by another 60% by 2027 (Figure 3).

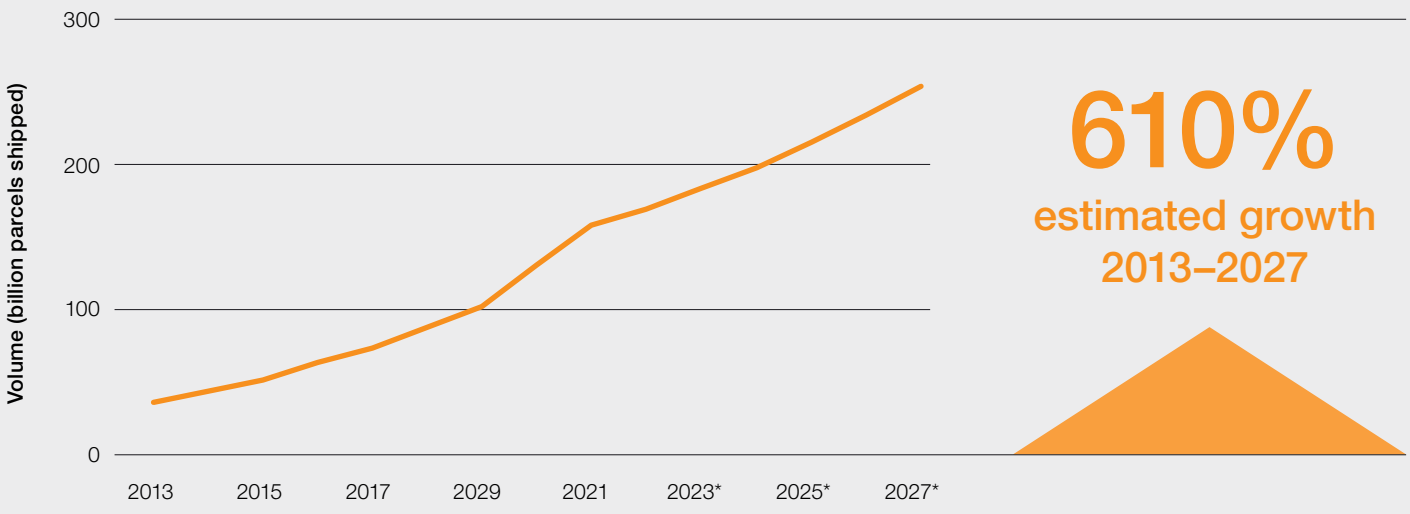
"Take the so-called 'parcelisation' of trade. As the number of cross-border online B2C transactions increases, their average value is decreasing, generating more frequent international flows of lighter and cheaper parcels. That trend poses big challenges for border agencies, whose clearance systems are often designed to tackle large container shipments, not small parcels. The increase in the volume of shipments is sure to stretch border agencies around the world, especially in places where infrastructure is outdated, and may heighten the risk of illicit trade in the absence of adequate controls."

WTO Deputy Director-General Anabel González

Governments around the world are reacting to this development with new legislation that will ultimately need to be enforced by tax and customs authorities. The European Union (EU), for example, changed the value-added tax (VAT) rules on cross-border business-to-consumer e-commerce activities in 2021 to abolish existing distance sales thresholds and VAT exemptions related to the value of imported goods (the de minimis) – essentially broadening the range of businesses and consignments subject to VAT obligations.[9]

In summary, the nature of international trade has changed considerably over the last few years. The rise of e-commerce has been accompanied by a trend towards a larger number of relatively small and low-value shipments. For customs authorities, this presents a number of challenges as highlighted above by the WTO's deputy director-general and reflected in recent legislative developments.

Figure 3: The "parcelisation" of international trade, 2013–2027

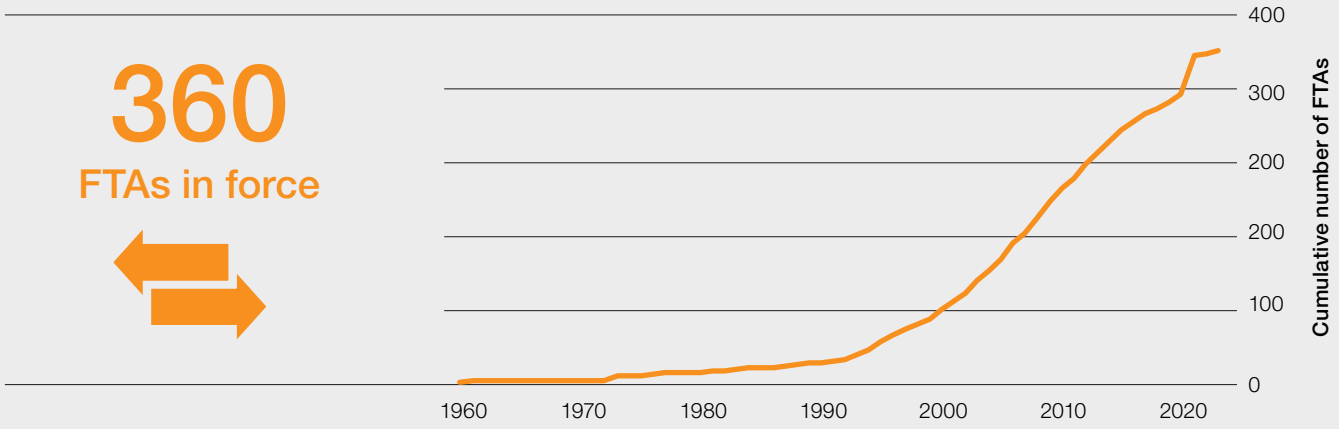


Source: Calculation and illustration based on Statista (2023b). *Estimate.

1.3 The accumulating complexity and interconnectivity of international trade regulation

The third reason is related to the increased complexity of international trade regulation and its interconnectivity to other, often domestic, regulatory domains. This direct link between domestic and international policy is established through free trade agreements (FTAs). FTAs started to become a popular international trade policy tool in the 1990s and have mushroomed since then (Figure 4). Currently, around 360 FTAs are notified to the WTO and in force, covering a total of 213 territories worldwide.[10] The European Union alone is a member of 46 such FTAs. Switzerland has signed 35 FTAs, China 16 and the United States 14. By definition, many of these FTAs overlap – making this so-called spaghetti bowl of FTAs difficult to navigate for both trading businesses and customs authorities.[11]

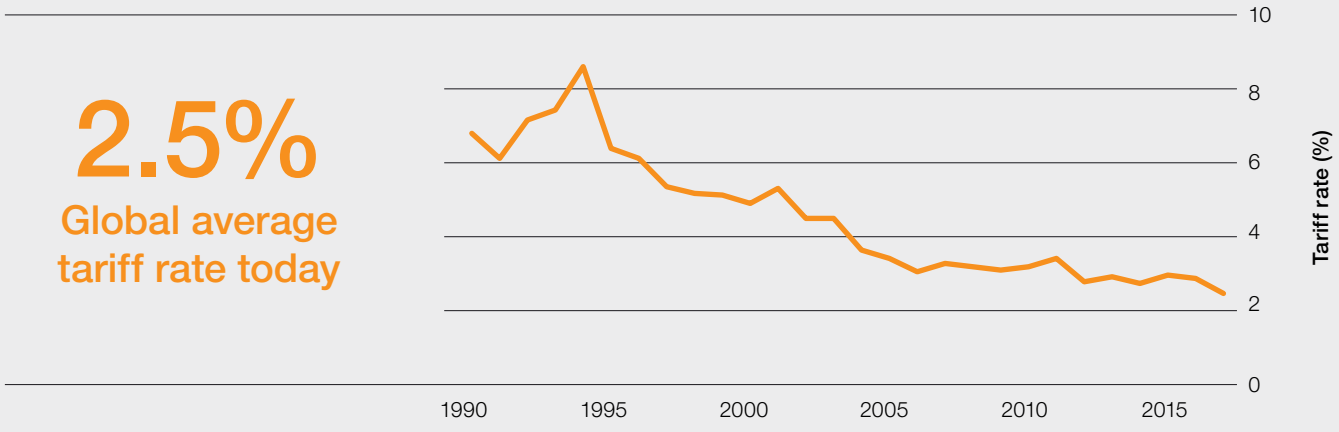
Figure 4: The rise of free trade agreements, 1960-2023



Source: Calculation and illustration based on World Trade Organisation (2023d).

The implementation of FTAs at the multilateral and plurilateral levels has led to a decline in the global average tariff rate from around 7% in 1990 to around 2.5% today (Figure 5). This development, however, has been accompanied by the rise of so-called non-tariff measures, formally defined as "policy measures, other than ordinary customs tariffs, that can potentially have an economic effect on international trade in goods, changing quantities traded, or prices or both".[12]

Figure 5: The decline in the global average tariff rate, 1990-2022



Source: Calculation and illustration based on World Bank (2023b).

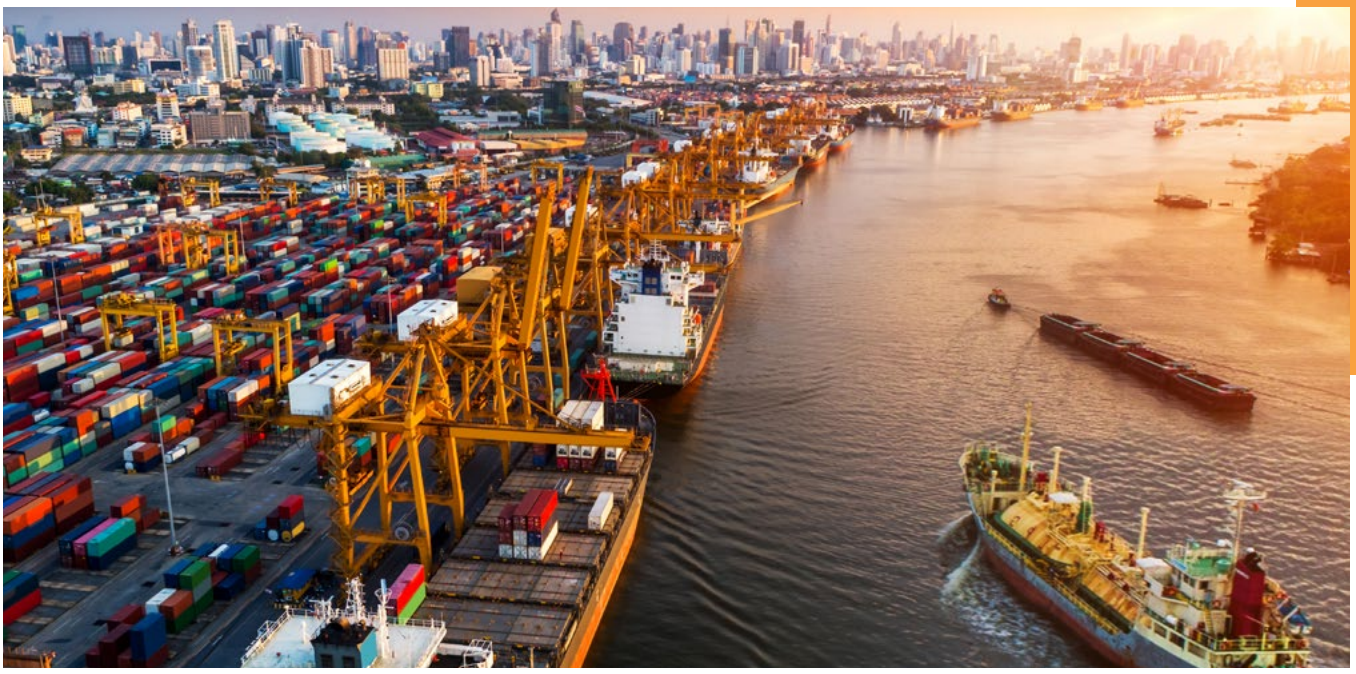
Such non-tariff measures fall, broadly speaking, into three categories:

1. Technical measures: sanitary and phytosanitary measures, technical barriers to trade, and environmental protection measures
2. Commercial measures: quotas, price controls, export restrictions and contingent trade protective measures
3. Behind-the-border measures: competition, trade-related investment measures, government procurement measures and distribution restrictions

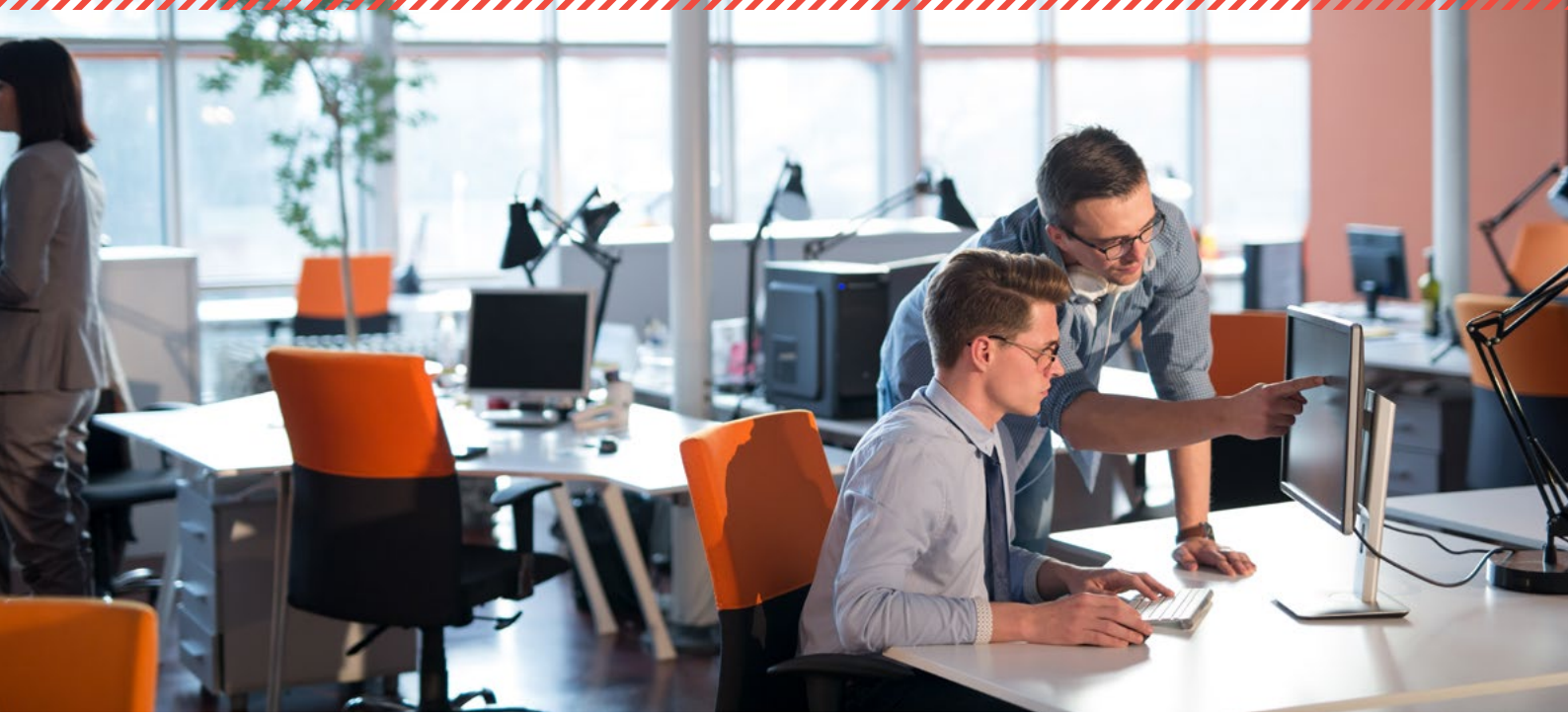
For customs authorities, such non-tariff measures present a difficult challenge as they are required to enforce a wide variety of complex regulations. In addition to the non-tariff measures that are already in place, an increasing number of sustainability regulations are entering into force that will also require customs authorities' attention. In October 2023, for instance, the European Union introduced a Carbon Border Adjustment Mechanism (CBAM) to equalise the price of carbon between domestic and imported products and to ensure that the EU's climate objectives are not undermined by so-called carbon leakage – the relocation of production to non-EU territories with less ambitious carbon policies than the EU.[13] The CBAM system is directly linked to the Union Customs Code (UCC) National Import Systems, the Integrated Tariff (TARIC) System and the Economic Operators Registration and Identification (EORI) System and will therefore directly affect the work of customs authorities.[14]

Finally, increasing and sustained geopolitical tensions are complicating the administration of international trade flows. The US has only recently updated its export controls on advanced computing and semiconductors to China[15] (initially launched in October 2022) and the European Union maintains sanctions worth EUR 44 billion on exports to Russia and EUR 91 billion on imports from Russia[16] (initially launched in February 2022). These are just two recent examples of export controls and sanctions implemented and enforced by the respective customs authorities.[17]

In summary, international trade regulation has become more complex and more interconnected with domestic policy objectives over the past years. Customs authorities play an important role in the enforcement of international and national regulations that go far beyond traditional tariffs and the collection of taxes. An increasing number of stricter and deeper regulations are on the horizon, particularly in the sustainability and advanced technology space.



2 How do customs authorities transform and digitalise their processes?



To address these three and other developments, customs authorities around the world have embarked on a journey of digital transformation.[18] As predicted and empirically supported in earlier publications, tax authorities around the world are on the same trajectory but are moving at different speeds and taking a different direction here and there.[19] This is also true for customs authorities. When it comes to their digital transformation, we observe the following three key trends.

134

customs authorities use automated systems

2.1 The adoption of digital technologies

The first key trend relates to the adoption of digital technologies. Before outlining specific examples, a number of general, global patterns are worth highlighting. Figures 6 to 13 illustrate how eight core technologies have recently been implemented by customs authorities around the world.[20] For all technologies, an upward trend can be observed. Over time, more and more customs authorities have either started the planning stage or have partly or fully implemented these technologies. The most recent available data indicates that automated customs systems have been partially or fully implemented by 134 customs authorities around the world. Other widely implemented technologies include electronic single window systems and systems for the electronic submission of customs declarations and the electronic payment of customs duties and fees. Upward trends can also be observed in the implementation of electronic systems for the application and issuance of import and export permits, the electronic application of certificates of origin and the electronic submission of air and sea cargo manifests. Finally, more and more customs authorities are implementing systems for the electronic application and exchange of sanitary and phytosanitary measure certificates – one important type of non-tariff measures as previously discussed.

Figure 6: Automated customs systems

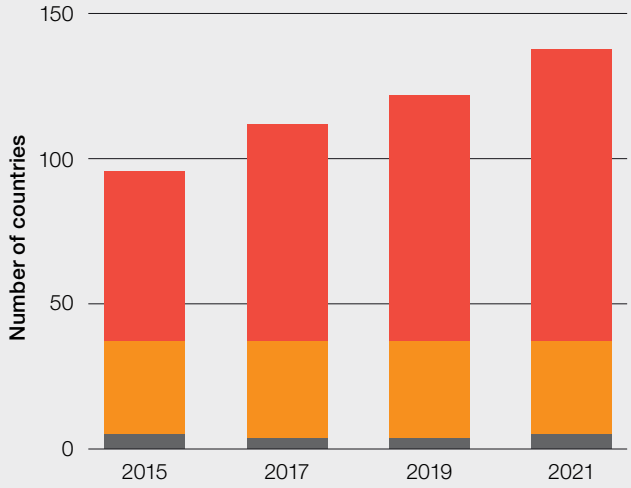


Figure 7: Electronic single window system

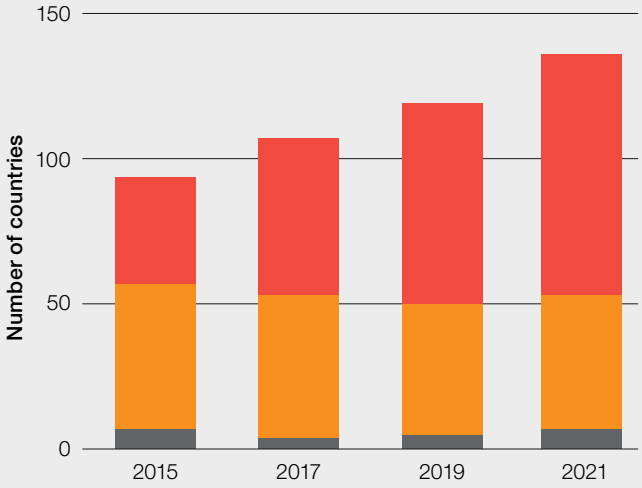


Figure 8: Electronic submission and exchange of customs declarations

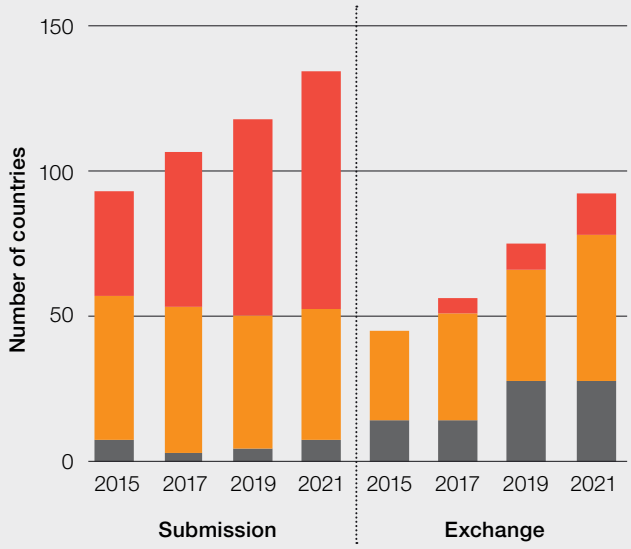


Figure 9: Electronic payment of customs duties and fees, and application for customs refunds

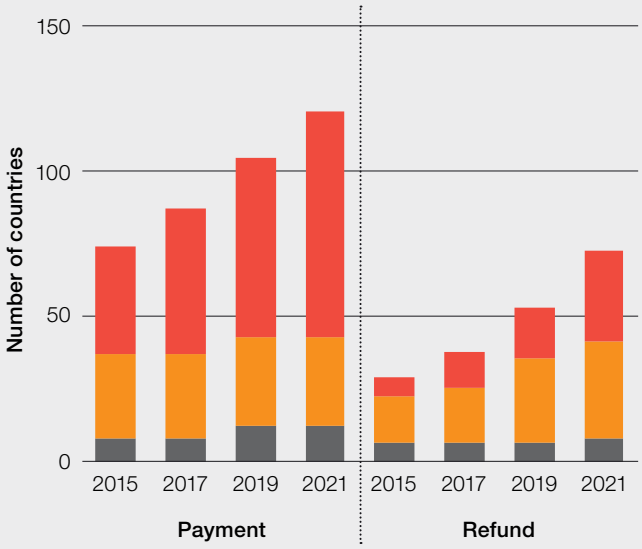


Figure 10: Electronic application and issuance of import and export permits

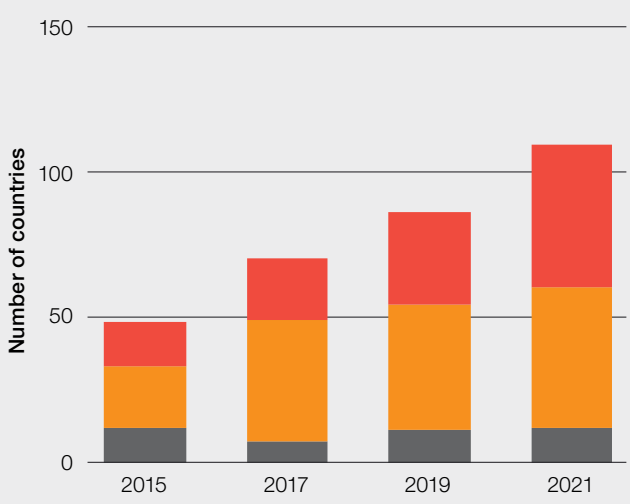


Figure 11: Electronic application and exchange of certificates of origin

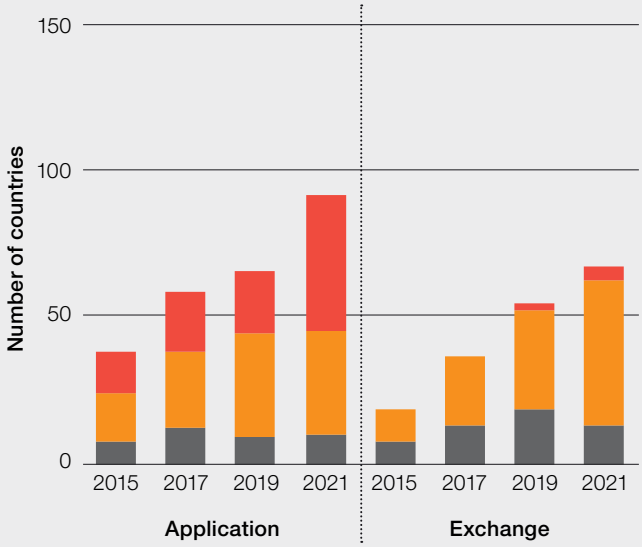


Figure 12: Electronic submission of air and sea cargo manifests

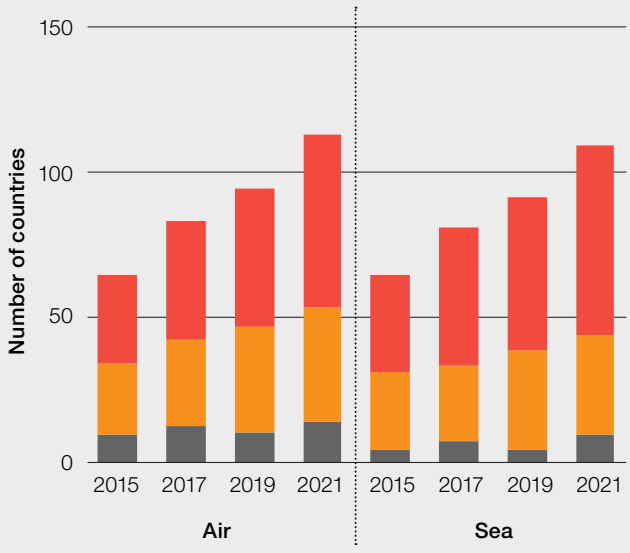
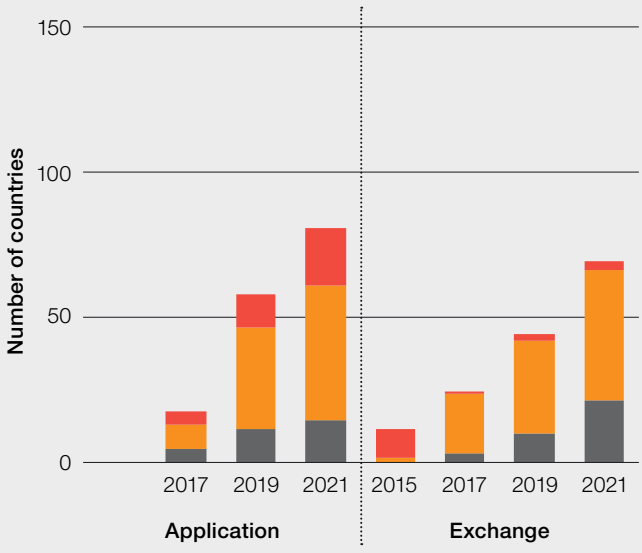


Figure 13: Electronic application and issuance, and exchange of sanitary and phytosanitary measures



The following three examples illustrate in more detail what kind of digital technologies customs authorities have recently implemented or are currently planning.

2.1.1 DaziT | Switzerland

Switzerland's Federal Office for Customs and Border Security (FOCBS) launched the digital transformation project DaziT, with a budget of CHF 400 million, in 2018 and aims to complete it by the end of 2026. The overall objective is to simplify, optimise and digitalise customs processes, road tax collection and controls.

As part of DaziT, the FOCBS is gradually implementing a new goods traffic system called Passar to fully digitalise all processes related to transit, exportation, importation, special customs clearance and the collection of other levies. Documents for transit and exportation declarations can be transmitted electronically directly to Passar and digital keys, so-called tokens, are used for data exchange via the technical business-to-business (B2B) application program interface (API).

DaziT also entails the implementation of the Import Control System 2 (ICS2) to collect data on all goods from third countries before they are imported into the common security area of Switzerland, the EU, Norway and Northern Ireland. Finally, the FOCBS is the first European customs authority to test the use of telematics technology to fully automate the activation of goods declarations at the border.

400m

CHF budget for the DaziT project

With more than three years left to complete DaziT, the FOCBS has already launched more than 30 systems including smartphone apps, specialist applications and technical services as well as setting up 64 geofences along the Swiss border that have enabled more than 130,000 automatic activations so far. At this point, the FOCBS centrally manages 33 million customs master datasets – a world record in the field of customs.[21]

2.1.2 SMART | Japan

Launched in 2020, Japan Customs operates a SMART Customs Initiative focused on solution, multiple-access, resilience, and technology and talent. In terms of technology, Japan Customs employs, for example, artificial intelligence (AI)-based big data analysis for import declarations and the examination and inspection selection process for post-clearance audits. AI is also used in combination with X-ray images to automatically conduct risk assessments. Robotics are used to automate customs officers' routine tasks. Most recently, Japan Customs has introduced the use of smart glasses for cargo-checking customs officers, has started testing underwater drones, and has intensified cooperation with e-commerce operators through information-sharing agreements.[22]

2.1.3 INVNT | United States

United States Customs and Border Protection (CBP) created an Innovation Team (INVNT) in 2018 to deliver new and disruptive technologies within CBP. To do so, INVNT engages actively with innovation and start-up communities to identify commercial technology that can be quickly adapted to CBP needs. Since 2018, 39 projects worth USD 62 million have been completed, and another 34 projects worth USD 58 million are ongoing. INVNT focuses on six areas:

120m

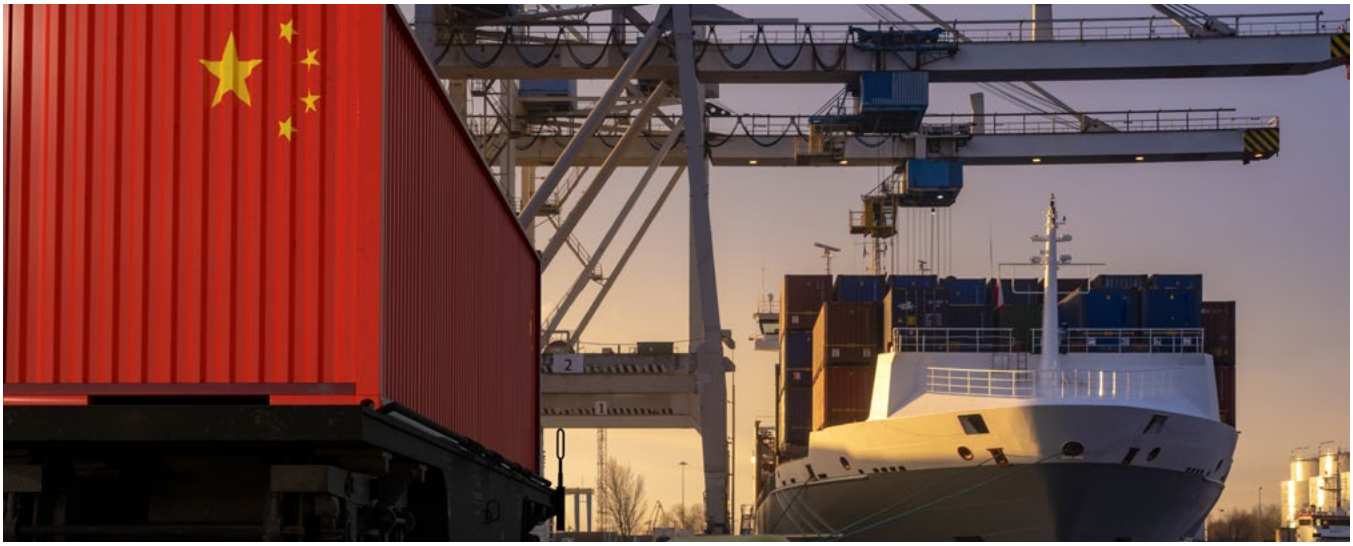
USD budget for 73 INVNT projects

1. **Information technology (IT) infrastructure:**
   Novel cloud applications and edge computing
2. **Autonomy:**
   Autonomous systems that reduce cognitive load and the number of required system operators
3. **Human performance and resiliency:**
   Capabilities to improve operator wellness, resilience and performance
4. **Artificial intelligence and analytics:**
   Automating workflows, exposing anomalies, deriving greater insight from data
5. **Sensors and data:**
   Next-generation low-cost, size, weight and power sensors; commercial data streams, supply chain awareness, identity intelligence
6. **Communications:**
   Mobility of IT infrastructure

One recent project includes the establishment of the Advanced Trade Analytics Platform (ATAP), which collects, structures and analyses publicly available supply chain data from various areas around the globe.[23]

2.2 Integration with other tax and government departments nationally and internationally

The second key trend enabled by the adoption of digital technologies relates to the integration of data sources at the national and international levels. As customs authorities are increasingly complementing transaction-based inspections with system-based inspections, collaboration with other government departments with specific expertise on particular parts of the supply chain is becoming ever-more important. The previously discussed CBAM regulation is a case in point. While customs authorities play a key role in the enforcement, they are also closely integrated with the so-called national competent CBAM authorities. The fact that these differ between EU member states illustrates the variety of government departments



that customs authorities are required to integrate with. In Austria, for instance, the Office for the National Emissions Trading System has been established within the customs authority. In the Netherlands, customs will have to closely collaborate with the Dutch Emissions Authority. In Czechia, the Ministry of Environment is the national competent CBAM authority and in France it is the Directorate-General for Energy and Climate.[24]

The following three examples show that the integration between customs and other government departments is not a European phenomenon but can also be observed in other parts of the world.

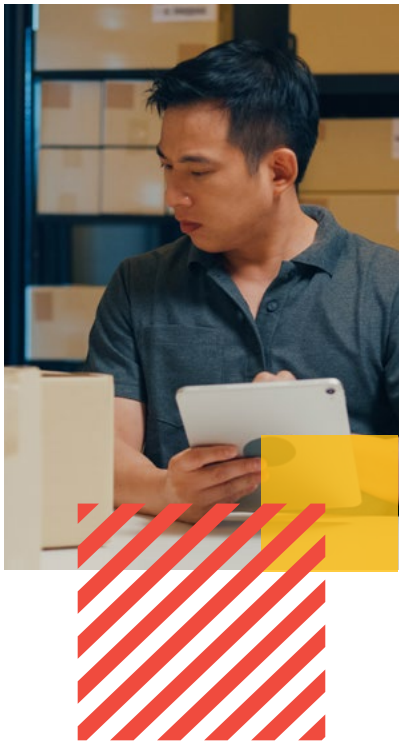
2.2.1 3S & EODES | China

In 2021, China launched the Smart Customs, Smart Borders and Smart Connectivity (3S) initiative. Smart Customs focuses on smart infrastructure, customs control and internal management. The initiative promotes the application of 5G communications, big data, AI and other technologies in customs clearance, risk management, customs control and other areas.

Smart Borders relates to cross-agency collaboration and cross-border cooperation. This entails, for example, the mutual recognition of customs control results, the promotion of so-called green channels or fast lanes and the connection of customs information networks along and across borders. In this context, China Customs has developed an Electronic Origin Data Exchange System (EODES) which enables China and its FTA partners to exchange electronic data on proof of origin for goods being traded under a preference claim. Rather than submitting and exchanging certificates, trading businesses only need to indicate their certificate number on their declaration, allowing the customs authority to cross-check this data against the information recorded in EODES. Smart Connectivity is designed to encourage the interconnection and compatibility of standards as well as cooperation among supply chain stakeholders using Authorised Economic Operator (AEO) mutual recognition and the blockchain-based verification of electronic certificates.[25]

2.2.2 CADENA | Latin America

CADENA is a blockchain solution that allows Chile, Colombia, Costa Rica, Peru, Guatemala, Ecuador, Bolivia and Mexico to exchange data and share information about businesses certified as AEOs. AEOs sign mutual recognition arrangements/agreements (MRAs) with customs authorities and benefit from a reduction in physical and documentary inspections and, ultimately, faster customs procedures in the origin and destination country. Using smart contracts, AEOs are automatically validated and their certificates are shared across the participating customs authorities in an automated, secure and real-time exchange. AOEs, which receive a globally unique Trader Identification Number (TIN), benefit not only from faster customs procedures but also from increased transparency, as they can access information related to their certificate at any time.[26]



40%

of FTA products are currently covered by EODES

>35

government departments are involved in the STS

145

IT systems are used in cross-border trade in Australia

2.2.3 STS | Australia

Australia has recently launched the Simplified Trade System (STS), a whole-of-government reform to create a simpler, more effective and sustainable cross-border trade environment. The STS involves the Department of Home Affairs, the Border Force, the Department of Agriculture, Fisheries and Forestry, the Taxation Office, the Trade and Investment Commission, and the Department of Foreign Affairs and Trade as well as another 30 government agencies.

The STS Taskforce found that more than 145 information and technology (ICT) systems are currently used in cross-border trade, 75% of them using aging technologies. 80% of the systems do not run on modern cloud platforms and do not use modern technologies such as web services and APIs. Trading businesses use 20 separate user portals across the trade system, often having to re-enter the same information. The STS therefore envisages the introduction of a Trade Single Window (TSW) that also connects with international trading partners. The data that may be shared among national and international partners may include:

1. Identifiable data collected for regulatory purposes, including identification, compliance, and permit and licensing
2. Identifiable and de-identified data resulting from trade processes (e.g. identification, compliance and risk assessments)
3. Identifiable unstructured data, including multi-media and X-rays
4. De-identified and aggregated data to inform policy, programme and service delivery
5. De-identified data for statistics and research
6. Reference data, metadata and information that supports data reuse, integration and harmonisation[27]

2.3 The direct link with business

The third key trend relates to customs authorities' shift from a transaction- to a system-based approach. Businesses are increasingly encouraged to directly link their information systems to customs processes to reduce the burden of inspection at the border.

2.3.1 Customs Reform & PROFILE | European Union

In 2023, the EU proposed *"the most ambitious and comprehensive reform of the EU Customs Union since its establishment in 1968".*[28] The reform, which is closely linked to another initiative on VAT in the Digital Age (ViDA)[29], which is expected to save businesses up to EUR 2.7 billion per year and customs authorities up to EUR 2 billion per year in IT operating costs, is centred on three pillars:

1. **A new partnership with business:**
   So-called Trust and Check Traders (AEOs) will interact with only one customs authority and one data hub and be able to import goods with no active customs intervention needed.
2. **A smarter approach to customs checks:**
   Customs authorities will have a 360-degree overview of individual supply chains and the movement of goods.
3. **A modern approach to e-commerce:**
   E-commerce platforms will become the official importers, will have to be compliant with the relevant customs obligations, and will be responsible for ensuring that customs duties and value-added taxes (VAT) are paid at purchase.

A new EU customs authority will be established to allow EU-level risk management and manage the new, yet-to-be-established EU Customs Data Hub. The Data Hub will replace the 111 separate IT systems of the 27 national customs authorities currently used. The data collected, processed, connected and stored in the Data Hub will be accessible not only by the EU Customs Authority, national authorities and the European Commission, but also by the European Anti-Fraud Office (OLAF), the European Public Prosecutor's Office (EPPO), Europol, and Frontex.

Trading businesses and other actors involved in moving goods, such as transporters or warehouse operators, will also be required to enter their relevant data elements into the Data Hub. Trust and Check Traders will additionally benefit from "green lanes" without formal customs interaction and will be free of administrative burden if they comply with certain criteria such as a clean legal record, a high level of control of their operations and supply chain, and financial solvency. Importantly, these Trust and Check Traders will also be required to operate an electronic system that shares available real-time data on the movement of consignments and their compliance with all relevant requirements through the Data Hub.[30]

The EU Customs Reform may also benefit from the recently concluded PROFILE project, funded by the European Commission under the Horizon2020 programme to the tune of around EUR 5 million. Five customs authorities (Belgium, Estonia, Netherlands, Norway and Sweden) have partnered with a number of technology providers, universities, and research institutes to build solutions based on machine learning, graph-based analytics and natural language processing (NLP) technologies. More specifically, supervised and unsupervised deep learning models have been developed for price checks, autoencoder models have been programmed for anomaly detection, and NLP and random forest models have been used for Harmonised System (HS) code accuracy prediction. In addition, semantic data and graph models have been implemented for customs risks, data cleansing and linking models introduced for external data import, and machine learning models tailored for pre-processing.[31]

111

IT systems exist among 27 EU customs authorities

5 countries are involved in the b-Connect blockchain

2.3.2 b-Connect | MERCOSUR

The b-Connect blockchain project, initially launched in 2020, connects the customs authorities of the MERCOSUR countries Argentina, Brazil, Bolivia, Paraguay and Uruguay. Its primary use is information on AEOs such as business identification, business address, business country of origin, the type of accreditation and the accreditation status. The technical foundation is a so-called permissioned blockchain through which data flows in an encrypted tunnelling channel between customs authorities according to their respective smart contract. Similar to the previously outlined CADENA project, participating AEOs benefit from faster customs clearance processes and more transparent management of certificates.[32]

2.3.3 NTP | Singapore

Established back in 2018, Singapore Customs operates a Networked Trade Platform (NTP) as a digital, one-stop trade and logistics system for business-to-government (B2G) and business-to-business (B2B) services. Businesses register with the NTP using Corppass and SingPass (digital identities used for transactions with more than 200 government digital services) to benefit from features such as:

1. Advanced HS code search
2. Customs application advice
3. Declaration and permit management
4. Inventory management
5. Schemes and licence management
6. Trade registration and management

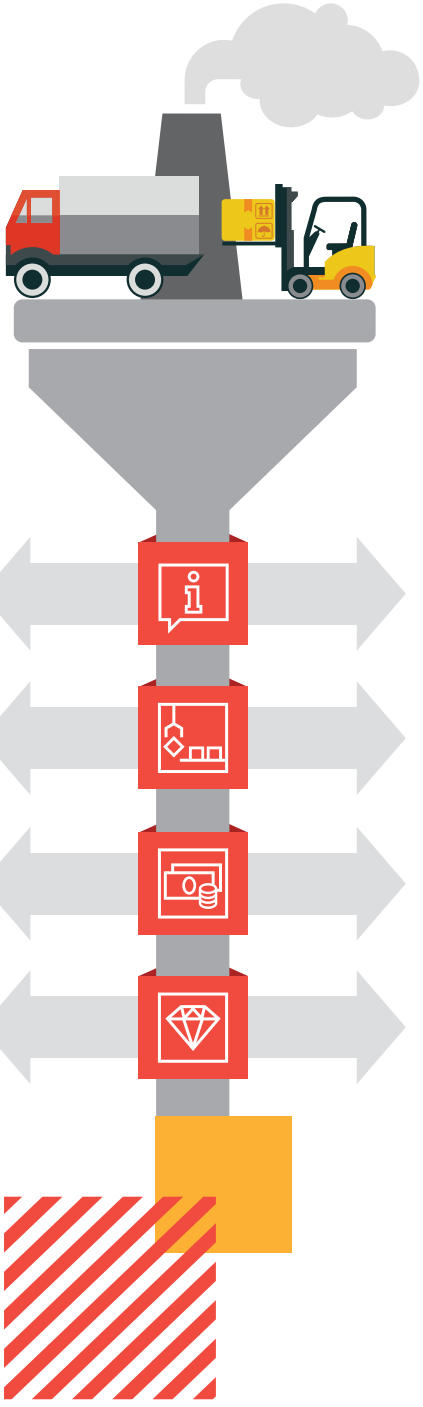
100m

SGD budget for Singapore's Networked Trade Platform

Other features include e-certificates for sanitary and phytosanitary measures, electronic data exchange with members of the Association of Southeast Asian Nations (ASEAN) and container tracking and tracing. The NTP also offers a platform for third-party commercial providers of digital trade services such as arranging shipment, declaring customs, financing trade, insurance, international connectivity, market insights, permit preparation, reports and payment, sourcing customers, tracking shipments and trade compliance. When the NTP was initially rolled out, the programme was expected to cost around SGD 100 million (CHF 65 million) and save businesses around SGD 600 million (CHF 392 million) per year.[33]

3 How does the digital transformation of customs processes affect businesses?

The accelerating digitalisation of tax administration, and customs processes more specifically, may result in a number of challenges but also opportunities for businesses.



3.1 The increased transparency

A first result of the digital transformation of customs authorities is the increased transparency of businesses and their supply chains – and the potential risks and benefits associated with this. Indeed, as the above examples indicate, customs authorities are increasingly able to collect data on the four key flows of supply chains:

1. Information flow
2. Product flow
3. Financial flow
4. Value flow

As this data is increasingly integrated with other government departments both nationally and internationally, businesses may become more concerned about data privacy and data security concerns. On the flipside, however, the increased digital transparency of customs processes may result in enhanced supply chain visibility for businesses as real-time tracing and tracking of shipments becomes more feasible. Finally, businesses may benefit a reduction in bribery and corruption as a result of increased digital transparency.

Overall, the increasing level of digital transparency represents a broader paradigm shift. In the past, businesses were required to share their data upon an inspection by the customs authorities. Now, and even more so in the near future, businesses are required to share their data to avoid an inspection by the customs authorities.

3.2 Improved efficiency

The second result of the digital transformation of customs authorities is the increased efficiency that businesses can benefit from – either directly or indirectly – primarily in the form of time savings. As the previous examples show, businesses may benefit directly if they register as AOEs and cross borders using so-called green lanes or fast track lanes with no or only limited administrative burden. Businesses may also benefit indirectly from customs authorities' more advanced risk management systems. As these systems become more efficient at identifying high-risk shipments, low-risk shipments are less likely to be inspected and held up at customs.

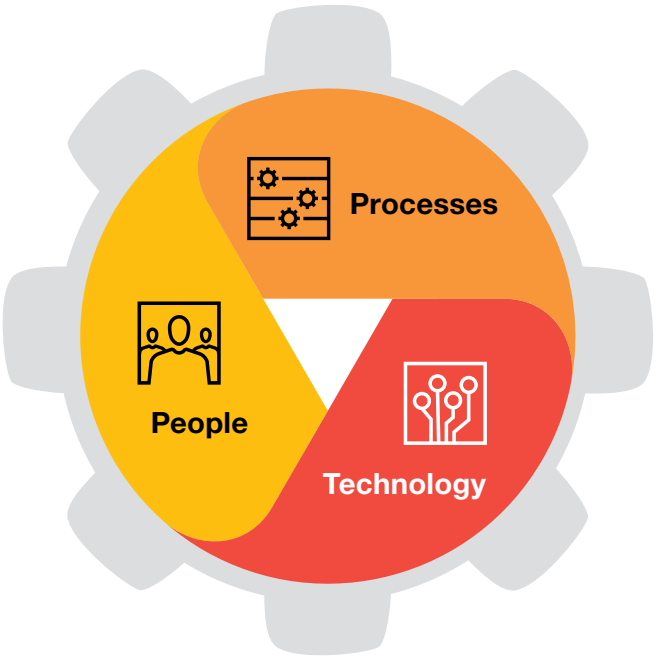
Broadly speaking, customs authorities' shift away from paper-based to digital processes will reduce businesses' administrative burden, lead to more accuracy and provide a more predictable trade environment – ultimately saving businesses time and money.

3.3 New opportunity to generate value for stakeholders

The third result of the digital transformation of customs authorities relates to the enhanced value businesses can bring to their different stakeholders. For supply chain professionals, key performance indicators (KPIs) such as forecast accuracy, lead time accuracy, perfect order rate and backlog levels may be easier to meet as one major actor in the supply chain – the customs authority – becomes more digital. The formulation of a supply chain strategy may also become more accurate as data analysts can rely on customs process data to move increasingly from **descriptive analytics** (what happened?) to **predictive analytics** (what is likely to happen?) and **prescriptive analytics** (how to make it happen?). Finally, businesses are able to provide enhanced value to their clients and customers in the form of improved product quality (think perishable goods stuck in customs), faster responses to demand changes (think lengthy application processes for export and import permits) and less volatile prices (think non-compliance-related penalties or delays). In summary, the digital transformation of customs processes may contribute to supply chain resilience and ultimately the value businesses can deliver to their stakeholders.

4 What should businesses do to benefit from the digital transformation of customs?

The digital transformation of customs authorities results in both challenges and opportunities for businesses. To ensure that the opportunities outweigh the challenges, businesses should actively adapt their technology, processes and people.



4.1 Upskill people

The first step is the upskilling of people. New digital technologies cannot be introduced and business processes cannot be integrated successfully without onboarding, training and hiring qualified people.

Customs authorities have certainly added new job profiles to their career websites over the past years. Data analysts, data managers, data engineers and data scientists are becoming increasingly sought after. In addition to hiring new talent, customs authorities are also investing more and more in digital skills. For example, the United Kingdom's HM Revenue and Customs (HMRC), which has its own Chief Digital Information Office (CDIO), has recently spent over GBP 150 million on training more than 4,000 full-time technology staff and has launched 15 new academies to train employees in cloud computing and data science.[34] Another example is the European Commission's recently launched 2024 Flagship Technical Support Projects, including a project on the Digital Transformation of Tax and Customs Administrations.[35] EU member states can benefit from technical support and training in IT governance and services (e.g. digital transformation strategies, enterprise architecture and data governance), specific data-driven solutions (e.g. VAT digital reporting requirements, real-time reporting, advanced data analytics tools, and data-driven tax audits and customs controls) and change management and communication strategies.

In summary, customs authorities are upgrading their people for a successful digital transformation. Businesses should do the same. Logistical and technical knowledge remains a core requirement but analytical and problem-solving skills as well as the ability to collaborate cross-functionally with a technology-savvy mindset will become increasingly important for businesses' customs and supply chain functions.

O2C: Order-to-cash

P2P: Procure-to-pay

P2D: Procure-to-distribute

R2R: Record-to-report

4.2 Integrate processes

The second step relates to the digital integration of business processes. Indeed, a considerable part of the future customs-relevant data will have to be sourced from business processes other than customs or supply chain. The seamless digital integration of **O2C** (order-to-cash), **P2P** (procure-to-pay), **P2D** (procure-to-distribute) and **R2R** (record-to-report) processes is therefore paramount.[36] As businesses' supply chain data is increasingly shared across different government departments nationally and internationally, businesses should also ensure a coherent indirect tax and transfer pricing profile.

To facilitate this integration process, businesses should consider the appointment of a chief trade and technology Officer (CTTO). In contrast to a trade compliance officer (TCO), a CTTO's tasks are more strategic and broader in scope and may range from trade policy development and technology integration to cross-functional collaboration and partnership management. Operational responsibilities such as regulatory compliance and risk mitigation ought to remain in the hands of the TCO.[37]

4.3 Introduce digital technologies

The third step is introducing or updating digital technologies. Broadly speaking, digital supply chain technologies can be grouped into data-driven technologies, knowledge-based technologies and decision-oriented technologies. Data-driven technologies enable the collection, processing and exchange of data. This data then flows into technologies such as big data analytics tools and AI to generate knowledge. Together with technologies such as the Internet of Things (IoT), this data informs decision-making processes.[38] Data is the key prerequisite and should have the following five characteristics:

Volume

The amount of data should be sufficient to meet the demands of customs authorities.

Velocity

The speed at which data is collected and reported should be high enough to meet the requirements of customs authorities.

Variety

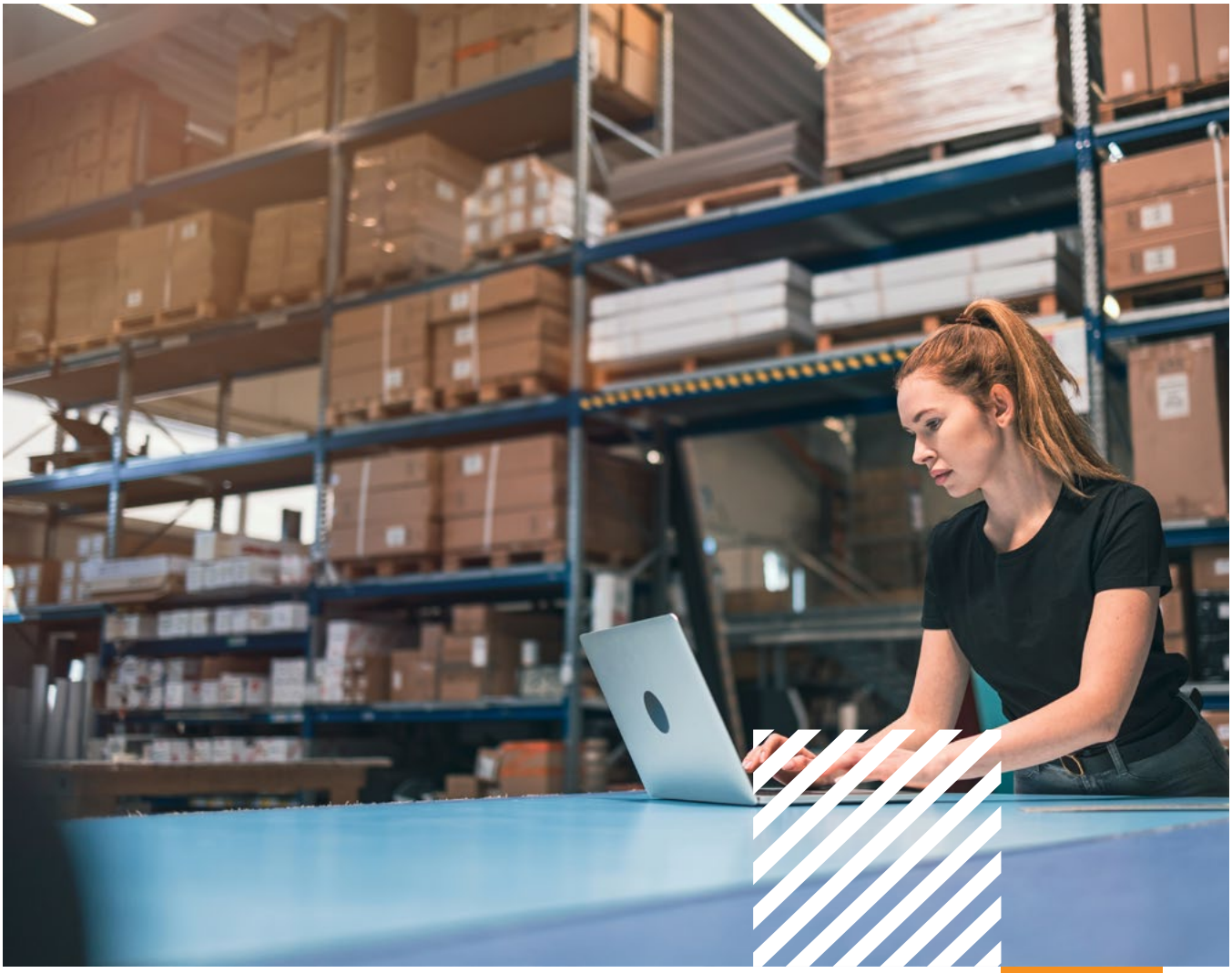
Customs authorities may request data in a variety of formats. While most requested data will be structured, unstructured data, such as from images or videos, is also increasingly collected.

Veracity

The data transmitted to the customs authorities should be accurate, reliable, and trustworthy.

Value

The data collected for customs purposes should also be used for other value-creating business processes such as analytics.



To collect customs-relevant data with these five characteristics, businesses should increasingly employ digital warehouse management systems, transportation management systems and IoT devices such as sensors, radio frequency identification (RFID) tags, digital twins and Global Positioning System (GPS) trackers. Indeed, as indicated by the previous examples, customs authorities increasingly collect data to trace (upstream supply chain information) and track (downstream supply chain information).[39]

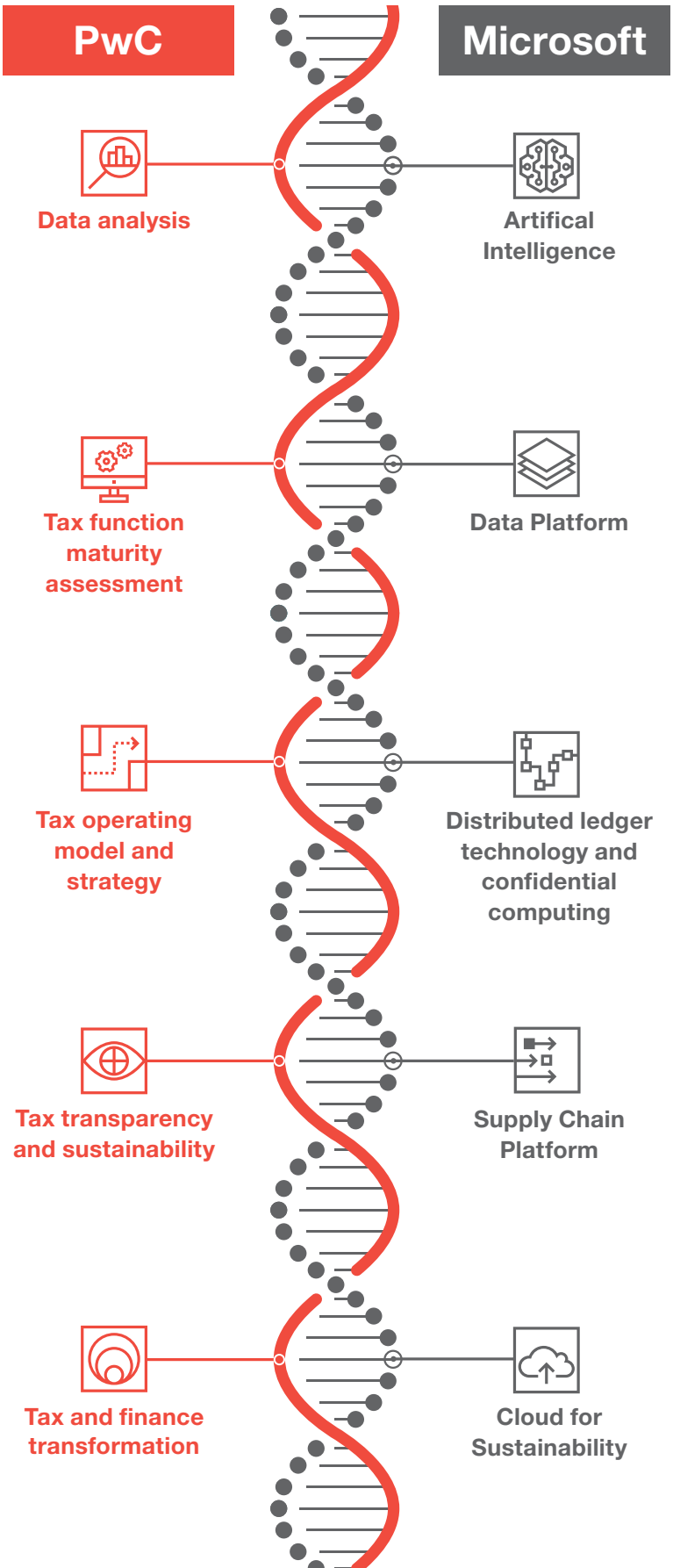
To report this data to customs authorities, businesses should follow certain standards and obtain, for instance, a Legal Entity Identifier (LEI), a Global Trade Item Number (GTIN),and a Global Location Number (GLN). Other relevant standards are provided by GS1, the International Organisation for Standardisation (ISO), the United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT), the United Nations Economic Commission for Europe (UNECE) and the World Customs Organisation (WCO).

As previously mentioned, the data collected for customs purposes is likely to also be valuable for other business processes such as analytics. To generate insights from data, businesses should increasingly move from descriptive analytics (e.g. spreadsheets, data visualisation tools and structured query language (SQL)) to predictive analytics (e.g. machine learning (ML), data mining, and big data analytics) and prescriptive analytics (e.g. cloud computing, optimisation and simulation tools, and decision trees).

5 How do we support clients?

The global partnership alliance between PwC and Microsoft brings together leading digital technology, deep industry knowledge and vast expertise in transformation projects. Together we help clients navigate the challenges and seize the opportunities associated with an increasingly digital world of customs processes.

Any digital transformation starts with an analysis of the status quo. Harnessing Microsoft's Intelligent Data Platform and AI and data analytics portfolio, PwC supports clients with a detailed analysis of their customs and supply chain processes. Using Microsoft's Intelligent Data Platform, for instance, PwC helps clients uncover patterns, make predictions and gain actionable insights. Microsoft Purview enables seamless data governance, ensuring data quality, compliance and accessibility across the organisation.



The recent release of Microsoft Azure OpenAI and Microsoft 365 Copilot further revolutionises the way business data is captured, analysed and understood. By harnessing the power of artificial intelligence, PwC is already unlocking deep insights, enhancing operational efficiencies and transforming clients' products and services. More specifically, Microsoft AI is helping PwC augment human expertise, automate repetitive tasks and allow clients to focus on higher-value responsibilities. In the particular case of customs, PwC uses AI to help clients improve customer service, enable trusted "green corridors" in international trade and improve investigations into data errors by focusing on AI-identified anomalies. In summary, Microsoft AI not only transforms the way data is captured and analysed, but also empowers informed decision-making, process optimisation and the creation of innovative solutions – all through interactions in a natural language.

Based on these data-driven insights, PwC offers maturity assessments of clients' customs and supply chains functions as well as assisting clients in the review and realignment of tax operating model and strategy more broadly.

Once the current challenges and bottlenecks are identified and a problem-solving approach is formulated, PwC supports clients in their digital transformation journey and the implementation of Microsoft technologies such as Digital Twins, the Supply Chain Platform and the Cloud for Sustainability.

The complementarity of PwC's services and Microsoft's technology allows us to approach challenges holistically and generate strategic insights, practical solutions and tangible value for our clients.

Outlook

Digital technologies are developing at a rapid speed. The latest breakthroughs in large language models such as ChatGPT are only one of many examples. As the technological frontier is pushed further, practical applications are becoming more readily available to businesses, but also to tax authorities. The use case of machine learning and large language models, for instance, has already been identified for customs authorities.[40]

As this whitepaper outlines, customs authorities are in the midst of a paradigm shift. The traditional transaction-based approach to product inspections at the border is increasingly complemented by a more continuous systems-based approach in which businesses along the product supply chain are inspected. This shift is accompanied by the accelerating digital transformation of customs processes.

For businesses, this accelerating digitalisation of customs processes creates both challenges and opportunities. To make sure that the opportunities outweigh the potential challenges, businesses should actively review and renew the use of digital technologies, the automated integration of different business processes and the tech savvy of their customs and supply chain functions.

At PwC and Microsoft, we will continue to follow the digitalisation of tax administration closely and help our clients adapt their strategy and operations to the new world of customs.

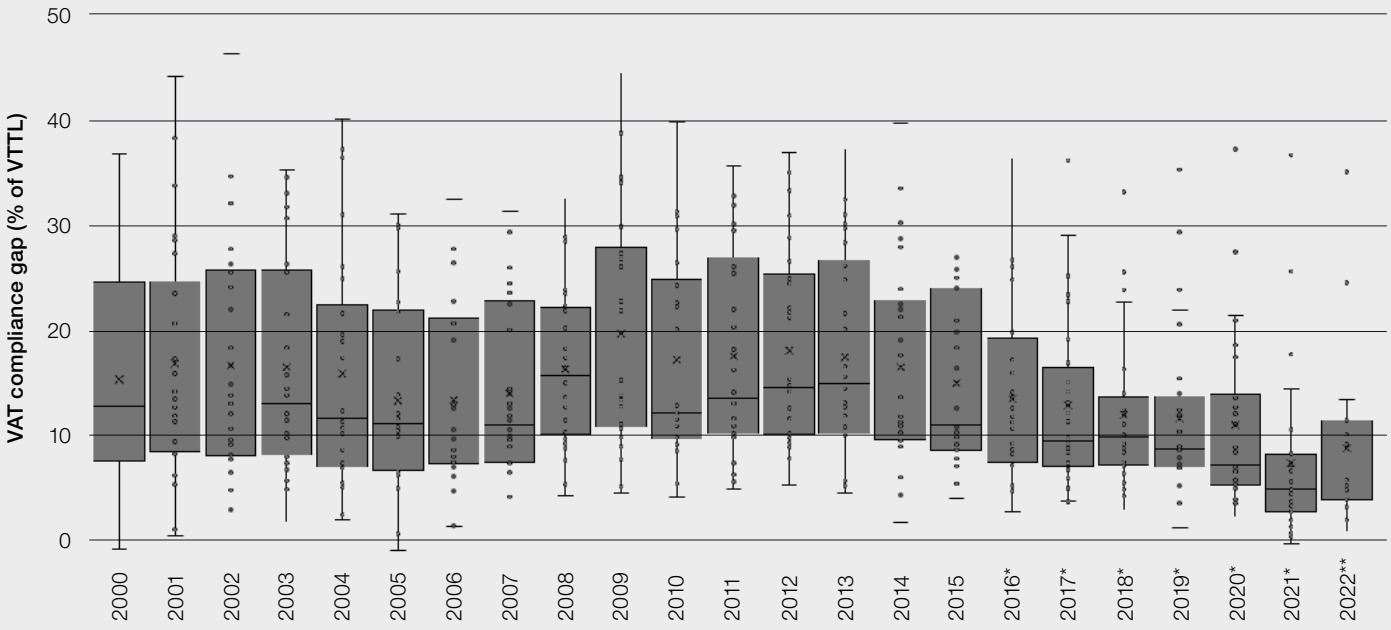
Annex

A1 – The VAT gap

The increase in the volume and the change in the nature of international trade can also contribute to the VAT compliance gap – the difference between the amount of VAT due and collected and more formally measured as a percentage of the VAT total tax liability (VTTL). In its latest VAT Gap Report[41], the EU regards the VAT gap as "a proxy of the performance of national tax administrations in their VAT collection".

Over the last few years, the average VAT gap in the EU has been falling (Figure A1). However, some countries experienced considerable VAT gaps during this time. In 2013, for instance, Italy and Poland had a VAT gap of 30% and 26% respectively. By 2021, these VAT gaps had fallen to 10% and 3% respectively. The digitalisation of tax authorities has been a driving factor in this reduction and will likely continue to be so.[42] While the average VAT gap in the EU has fallen to 7%, countries such as Malta and Romania still have large VAT gaps of 25% and 36% respectively.

Figure A1: The VAT gap in the EU



Source: Calculation and illustration based on European Commission (2023d).
*The years 2000-15 are backcast, 2016-21 are full estimates and 2022 is forecast.

Footnotes

1 See European Commission (2022), Veenstra and Heijmann (2023) and Pauwelyn (2024) on transaction-based and system-based approaches.

2 Points 1 and 2 are closely related to the value-added tax (VAT) gap. See Annex A1.

3 PwC (2018, 2019a, 2019b, 2022).

4 See also Microsoft (2023) on customs challenges including increased fraud and error, cross-border trading safety, the rise of e-commerce, the automation of supply chains, Web 3.0, trade regionalisation vs globalisation and the focus on sustainability.

5 The latest trade forecast estimates the volume of world merchandise trade to have grown by 0.8% in 2023. The growth projected for 2024 is 3.3% (World Trade Organisation, 2023a).

6 Calculations based on World Bank (2023a).

7 The Economist (2023). Interestingly, The Economist (2024) finds that business enthusiasm for regionalisation is now somewhat more tempered compared with the previous year.

8 World Trade Organisation (2023c).

9 PwC (2021).

10 The actual number of FTAs in force is considerably larger as not all FTAs are notified to the WTO (see Dür, Baccini and Elsig, 2014).

11 The “spaghetti bowl” effect was first coined by Bhagwati (1995).

12 United Nations (2023a).

13 On CBAM and its importance for customs, see also Veenstra and Heijmann (2023) and Pauwelyn (2024). Other examples in the area of sustainability that will have an effect on customs authorities work include regulations on fluorinated gases (Veenstra and Heijmann, 2023), forced labour (Veenstra and Heijmann, 2023) and deforestation (Pauwelyn, 2024).

14 European Commission (2023a); Pauwelyn (2024).

15 United States Department of Commerce (2023).

16 European Council and Council of the European Union (2024).

17 See also World Trade Organisation (2023e).

18 See also World Economic Forum and Inter-American Development Bank (2019), International Monetary Fund (2022), World Bank (2022), World Customs Organisation and World Trade Organisation (2022), World Trade Organisation and World Customs Organisation (2022), and World Economic Forum (2020, 2024).

19 PwC (2018, 2019a, 2019b, 2022).

20 Calculations and illustrations for Figures 6 to 13 based on United Nations (2022b).

21 Federal Office for Customs and Border Security (2023).

22 Japan Customs (2020).

23 United States Government Accountability Office (2022); United States Customs and Border Protection (2023).

24 European Commission (2024).

25 General Administration of Customs of the People’s Republic of China (2022).

26 World Customs Organisation (2018); LACNet (2023).

27 Australian Government (2023).

28 European Commission (2023b).

29 European Commission (2022b).

30 European Commission (2023b).

31 PROFILE Project (2023).

32 United Nations (2023c).

33 Singapore Government (2023).

34 Tech Monitor (2023).

35 European Commission (2023c).

36 Cox (2022).

37 PwC (2023).

38 Baziyad, Kayvanfar and Kinra (2022).

39 Chan (2022).

40 Inter-American Development Bank (2023); Inter-American Center of Tax Administrations (2023a, 2023b).

41 European Commission (2023d).

42 Eucrim (2023); Heinemann and Stiller (2023).

Bibliography

Australian Government (2023). Simplified Trade System Implementation Taskforce. Available here. Last accessed on 8 August 2023.

Baziyad, H., Kayvanfar, V., and Kinra, A. (2022). The Internet of Things: an emerging paradigm to support the digitalization of future supply chains. In The Digital Supply Chain (eds. MacCarthy, B.L. and Ivanov, D.). Amsterdam: Elsevier.

Bhagwati, J. (1995). US Trade policy: The infatuation with free trade agreements. Department of Economics, Columbia University Discussion Papers No. 726. Available here. Last accessed on 4 March 2024.

Chan, K.K. (2022). Supply chain traceability systems: robust approaches for the digital age. In The Digital Supply Chain (eds. MacCarthy, B.L. and Ivanov, D.). Amsterdam: Elsevier.

Cox, K. (2022). Digital purchasing and procurement systems: evolution and current state. In The Digital Supply Chain (eds. MacCarthy, B.L. and Ivanov, D.). Amsterdam: Elsevier.

Dür, A., Baccini, L., and Elsig, M. (2014). The Design of International Trade Agreements: Introducing a New Database. The Review of International Organizations, vol. 9, no. 3, pp. 353-375. Version 2.2 (2023). Available here. Last accessed on 15 February 2024.

The Economist (2023). Trade in Transition: Global Report 2023. Available here. Last accessed on 15 February 2024.

The Economist (2024). Trade in Transition: Global Report 2024. Available here. Last accessed on 4 March 2024.

Eucrim (2023). VAT Gap Report 2023: Progress in VAT Compliance. Available here. Last accessed on 15 February 2024.

European Commission (2022a). Putting more Union in the European Customs. Ten proposals to make the EU Customs Union fit for a geopolitical Europe. Report by the Wise Persons Group on the Reform of the EU Customs Union. Available here. Last accessed on 15 February 2024.

European Commission (2022b). VAT in the Digital Age. Available here. Last accessed on 24 January 2024.

European Commission (2023a). Draft Implementing Regulation of the Carbon Border Adjustment Mechanism during the Transitional Period. Available here. Last accessed on 8 August 2023.

European Commission (2023b). A data-driven vision for a simpler, smarter and safer Customs Union. Available here. Last accessed on 8 August 2023.

European Commission (2023c). Flagship support projects templates - TSI 2024. Available here. Last accessed on 8 August 2023.

European Commission (2023d). VAT Gap Report 2023. Available here. Last accessed on 15 February 2024.

European Commission (2024). Provisional list of National Competent Authorities (NCAs) for the Carbon Border Adjustment Mechanism. Available here. Last accessed on 15 February 2024.

European Council and Council of the European Union (2024). EU sanctions against Russia explained. Available here. Last accessed on 15 January 2024.

Federal Office for Customs and Border Security (2023). DaziT transformation programme. Available here. Last accessed on 8 August 2023.

General Administration of Customs of the People's Republic of China (2022). Concept Note on The Smart Customs, Smart Borders and Smart Connectivity Cooperation. Available here. Last accessed on 8 August 2023.

Heinemann, M. and Stiller, W. (2023). Digitalization and Cross-Border Tax Fraud: Evidence from E-Invoicing in Italy. CESifo Working Paper No. 10227. Available here. Last accessed on 14 February 2024.

Inter-American Center of Tax Administrations (2023a). Can ChatGPT be used in tax administrations? Part 1. Available here. Last accessed on 24 January 2024.

Inter-American Center of Tax Administrations (2023b). Can ChatGPT be used in tax administrations? Part 2. Available here. Last accessed on 24 January 2024.

Inter-American Development Bank (2023). Automatic Product Classification in International Trade: Machine Learning and Large Language Models. Available here. Last accessed on 8 August 2023.

International Monetary Fund (2022). Customs matters: Strengthening customs administration in a changing world. Available here. Last accessed on 8 August 2023.

Japan Customs (2020). SMART Customs Initiative 2020. Available here. Last accessed on 8 August 2023.

LACNet (2023). Cadena project. Available here. Last accessed on 8 August 2023.

PROFILE Project (2023). Innovative Data Analytics, Data Sources, and Architecture for European Customs Risk Management. Available here. Last accessed on 8 August 2023.

Microsoft (2023). Digital Customs Immersive data to deliver the Digital Customs of the Future. Available here. Last accessed on 24 January 2024.

Pauwelyn, J. (2024). 21st Century Customs Fraud: How to Effectively Enforce Sustainability Requirements on Imports? Available here. Last accessed on 16 February 2024.

PwC (2018). When the sleeping giant awakes… Available here. Last accessed on 8 August 2023.

PwC (2019a). What happens when the taxwoman gets superpowers? Available here. Last accessed on 8 August 2023.

PwC (2019b). Tax disruption management – How to survive in the new world of tax. Available here. Last accessed on 8 August 2023.

PwC (2021). New e-commerce EU VAT rules as of July 2021. Available here. Last accessed on 14 February 2024.

PwC (2022). Tax Disruption Report 2021/2022. Available here. Last accessed on 8 August 2023.

PwC (2023). Erweiterung des C-Levels – der Chief Trade & Technology Officer. Available here. Last accessed on 14 February 2024.

Singapore Government (2023). Networked Trade Platform. Available here. Last accessed on 8 August 2023.

Statista (2023a). Retail e-commerce sales worldwide from 2014 to 2026. Available here. Last accessed on 8 August 2023.

Statista (2023b). Global parcel shipping volume between 2013 and 2027. Available here. Last accessed on 8 August 2023.

Tech Monitor (2023). HMRC spent over £150m on its digital transformation workforce in 2022. Available here. Last accessed on 8 August 2023.

United Nations (2023a). Classification of NTMs. Available here. Last accessed on 8 August 2023.

United Nations (2022b). Global Survey on Digital and Sustainable Trade Facilitation. Available here. Last accessed on 8 August 2023.

United Nations (2023c). Cross-Border Paperless Trade Database. Available here. Last accessed on 8 August 2023.

United States Customs and Border Protection (2023). CBP Innovation Team. Available here. Last accessed on 8 August 2023.

United States Department of Commerce (2023). Public information on export controls imposed on advanced computing and semiconductor manufacturing items to the People's Republic of China. Available here. Last accessed 15 January 2024.

United States Government Accountability Office (2022). Customs and Border Protection: Innovation Team Has Opportunities to Mature Operations and Improve Performance. Available here. Last accessed on 8 August 2023.

Veenstra, A. and Heijmann, F. (2023). The future role of customs. World Customs Journal, vol. 17, no. 2, pp. 13-30. Available here. Last accessed on 14 February 2024.

World Bank (2023a). World Bank Open Data - Import Volume Index. Available here. Last accessed on 8 August 2023.

World Bank (2023b). World Bank Open Data: Tariff rate, applied, weighted mean, all products. Available here. Last accessed on 8 August 2023.

World Bank (2022). Digital transformation of tax and customs administrations. Available here. Last accessed on 8 August 2023.

World Customs Organisation (2018). CADENA, a blockchain-enabled solution for the implementation of Mutual Recognition Arrangements/Agreements. Available here. Last accessed on 8 August 2023.

World Customs Organisation and World Trade Organisation (2022). Study Report on Disruptive Technologies. Available here. Last accessed on 8 August 2023.

World Economic Forum and Inter-American Development Bank (2019). Windows of Opportunity: Facilitating Trade with Blockchain Technology. Available here. Accessed 17 January 2024.

World Economic Forum (2020). Mapping TradeTech: Trade in the Fourth Industrial Revolution. Available here. Accessed 17 January 2024.

World Economic Forum (2024). TradeTech: Catalysing Innovation. Available here. Accessed 17 January 2024.

World Trade Organisation (2023a). WTO lowers 2023 trade growth forecast amid global manufacturing slowdown. Available here. Last accessed on 23 January 2024.

World Trade Organisation (2023b). Evolution of trade under the WTO. Available here. Last accessed on 8 August 2023.

World Trade Organisation (2023c). DDG González: "Trade facilitation and economic resilience are two sides of the same coin". Available here. Last accessed on 8 August 2023.

World Trade Organisation (2023d). Regional Trade Agreements Database. Available here. Last accessed on 8 August 2023.

World Trade Organisation (2023e). International export regulations and controls: Navigating the global framework beyond WTO rules. Available here. Last accessed on 15 January 2024.

World Trade Organisation and World Customs Organisation (2022). The role of advanced technologies in cross-border trade: A customs perspective. Available here. Last accessed on 8 August 2023.

Authors

Dr. Sebastian Klotz
Manager
Trade & Technology
PwC Switzerland

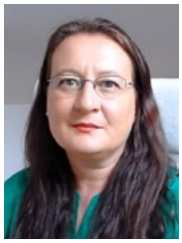
+41 79 891 22 89
klotz.sebastian@pwc.ch

Steve Barr
Director
Industry Strategy
Worldwide Public Sector
Microsoft

+44 796 952 42 07
stbarr@microsoft.com

Christoph Schärer
Partner
Tax and Legal Innovation,
Transformation & Disruption
PwC Switzerland

+41 58 792 42 82
christoph.schaerer@pwc.ch



Valentina Ion
Public Finance Global Lead
Worldwide Public sector
Microsoft

+40 753 072 767
vaion@microsoft.com

Simeon L. Probst
Partner
Customs & International Trade
PwC Switzerland

+41 58 792 53 51
simeon.probst@pwc.ch

Stuart Jones
Director
Tax and Legal Innovation,
Transformation & Disruption
PwC Switzerland

+41 58 792 45 16
stuart.jones@pwc.ch

Acknowledgement

The authors would like to thank Felix Hassine (Kühne + Nagel), Dr Christian R. Ulbrich (University of Basel) and Jimena Sotelo (World Economic Forum) for their valuable comments.

www.pwc.ch/taxdisruption

PwC, Birchstrasse 160, 8050 Zurich, +41 58 792 44 00