

I. Introduction: “disruptive...” or (just) “emerging” technologies?



When we talk about “disruptive technologies”, what exactly do we mean? According to the Cambridge Dictionary, a disruptive technology is a new technology that completely changes the way things are done. Even though we cannot be certain which technologies will accomplish this in the future, the public has over the past years broadly accepted “disruptive technologies” as a term which refers to blockchain, the Internet of Things, artificial intelligence, virtual reality, drones, 3D printing and other cutting-edge technologies, which are the subject of this Study Report.

The term emerged from an examination of the failure of once dominant corporations, when the technology their dominance was based upon changed. The authors Clayton M. Christensen and Joseph L. Bower introduced this idea in their 1995 Harvard Business Review article “Disruptive Technologies: Catching the Wave.” They examined the hard-disk-drive industry to illustrate their point. They focused on the challenges faced by a corporation as they attempted to introduce a new technology which often struggled against the existing dominant force in the market place. In subsequent work, it was argued that disruptive technology did not disrupt at a single point in time, but that what was disruptive was the path the technology followed from a fringe product to the mainstream.

When we speak of disruptive technologies or disruptive innovation we are not talking about a negative reaction within a certain market, but rather the natural evolution of technology. Our lives are

enriched in many respects by disruptive technologies. History is full of technologies that transformed the way we do business or live our lives.

According to the WTO World Trade Report 2018, we are entering a new era in which a series of innovations that leverage the Internet could have a major impact on trade costs and international trade. The Internet of Things (IoT), artificial intelligence (AI), 3D printing and blockchain have the potential to profoundly transform the way we trade, who trades and what is traded. This comes as a consequence of a number of forces. The past half-century has seen a massive increase in processing and computing power, an equally enormous decline in its cost, and widespread adoption of personal computers. This has been accompanied by an equally rapid increase in bandwidth – the carrying capacity of a communication system – that has proved to be an important catalyst for the swift growth of the Internet and mobile networks. Finally, the ability to turn many forms of information that once existed solely in analogue form into digital information, and to collect, store and analyse it, has expanded enormously.

Today, we are also seeing the rise of quantum computing, which harnesses the phenomenon of quantum mechanics to deliver a huge leap forward in computation to solve certain types of problems. Namely, quantum computers and algorithms are being designed to solve complex problems that today’s most powerful supercomputers cannot solve, and never will. These complex problems have lots of variables interacting in complicated



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ways, for example, sorting out the ideal routes for a few hundred tankers in a global shipping network or finding the prime factors of a large number. Since quantum computing is good for solving certain types of problems but not others, it is not expected to replace classical computing, but to extend and complement it.¹

Customs authorities are key actors in international supply chains. The extent to which they leverage disruptive technologies to improve Customs processes can, as a result, have an important impact on cross-border trade processes and supply chain operations. The key understanding must be how Customs reacts not only to the use of technology by its stakeholders, but also how it utilizes the emergence of new technologies which itself changes the manner of conducting business. The challenge for Customs administrations, like any consumer, is that the fervour which surrounds an emerging technology can dominate any discussions on reform and renewal.

However, paramount to Customs administrations is the ability to ensure that efficiency and effectiveness are constantly improved, and the latest technologies are in most cases aimed at achieving these goals.

It should also be noted that disruptive technologies can be a catalyst for strategic decision-making, with an administration having to review the emergence of a technology and to make a strategic decision on its use in the short to medium term. Having direct frontline interaction with trade, Customs must be aware of, and adapt to, the way trade innovates and develops. This can be observed through the development of supply chains and the manner in which information is created and stored, which is evident in the emergence of blockchain technology and the manner in which it has caught the imagination of many.

Blockchain technology is a prime example of where a Customs administration must be aware of how trade is adapting to a new environment.

For a Customs administration to be able to interact with their primary stakeholders, they must be able to share information in the most efficient way possible, both for the administration itself as well as for trade. While this particular technology is being heralded as the future of information security, as well as of the accessibility of information, it is crucial that Customs administrations observe it, and inform themselves as to how this technology works.

Reviewing the detailed examinations contained within this Study Report, it is apparent that technologies such as blockchain and distributed ledger technology (DLT), the Internet of Things (IoT), artificial intelligence (AI) and machine learning (ML) have either already had a significant impact on international trade and Customs, or promise to do so in the future, offering both trade and Customs

administrations multiple opportunities to embrace added efficiencies and effectiveness. There has been a significant uptake of these technologies, in particular since the Study Report was first published in 2019, including in the Customs domain. However, there are still opportunities for broader implementation, which is why the WCO, the WTO and other stakeholders are looking into these and other technologies, with an eye to identifying

the key benefits for supporting international trade and economies more broadly, as well as identifying ways in which they can assist Customs administrations in fulfilling their objectives, such as ensuring trade facilitation, safety, security, and fair revenue collection.

One of the major challenges facing the digital economy is the digital divide between developed and developing countries. This divide remains wide in terms of access to broadband services and e-commerce platforms, quality of infrastructure and legal framework. Therefore, what needs to be taken into consideration are the capacity building programmes which can support a more balanced spread of adoption across the globe.

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¹ The Quantum Decade, IBM Institute for Business Value, 2021, <https://www.ibm.com/thought-leadership/institute-business-value/report/quantum-decade>

a. WCO initiatives

Promoting the findings from the Study Report on Disruptive Technologies

Since the adoption of the Study Report in June 2019, the WCO has shared its findings and the case studies in many different international forums, including with Customs, international organizations, the private sector and academia. The aim has been to continuously and consistently raise awareness of the possibilities and benefits of these technologies for Customs today and in the future, as well as to potentially trigger new initiatives. It has become evident that three groups of technologies in particular, more so than any others, were either already transforming the work of Customs or else promising to play a significant role in its future work, thus supporting the facilitation and security of cross-border trade. These technologies are blockchain/DLT, the Internet of Things, and big data, data analytics, artificial intelligence and machine learning.

Data analytics project (BACUDA)

The [BACUDA data analytics project](#) was launched in 2019 and falls within the remit of the Capacity Building Directorate, with the main purpose of guiding Members in embedding data analytics in their organizations. It is funded by Customs Cooperation Fund (CCF) Korea and is comprised of data analytics experts who use their expertise to collaborate on applied projects. They produce new algorithms and methods specifically tailored to the needs of the Members, in regard to applying data analytics in the Customs domain. By organizing capacity building activities that enable Members to deploy these algorithms and embed them into their current processes, the project aims to provide intrinsic support to the Members. Currently, there are multiple [online courses](#) on the topic of data analytics in the field of Customs, in addition to a practical introduction to the methods provided by the expert team, including the DATE algorithm, which is used to detect fraudulent trade, and the HSearch algorithm, which aims to recommend HS Codes after receiving the commodity description as an input. The team aims to add to the plethora of training programmes. By adding more languages to courses, the courses will be made more accessible to a wider audience. To enrich the skills of already knowledgeable participants in the field of data analytics, more advanced courses with the

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focus shifted towards the application of new algorithms in the field of Customs will be introduced in the future.

Additionally, a [scholarship programme](#) is being conducted for 12 Customs and data experts from each region of the world in collaboration with the Sung Kyun Kwan University in Korea. The curriculum encompasses some of the most relevant topics in the data analytics field and aims to develop the participants into driving forces in transforming their respective organizations into data driven ones.

Five regional workshops have already been held at the management level to raise awareness of data analytics. Specific capacity building activities took place at the national level, such as an assessment of current data analytics capacities in the Member administrations, and pilot tests of algorithms. These were very fruitful for both the expert group and the Members. Further technical assistance to Members via diagnostic missions and accreditation of experts will be executed according to Member requests.

WCO TECH-CONS

In 2020 and 2021, due to the disruptions caused by the COVID-19 pandemic, the WCO held its technology conferences in a virtual mode. The so-called TECH-CONS ([2020 WCO TECH-CON](#) and [2021 WCO TECH-CON](#)) were an attempt to continue the sharing of experiences on the use of latest technologies, amongst others. There was general agreement that the use of technology had accelerated since the beginning of the crisis. The

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speakers echoed the conclusion of consulting firm McKinsey & Company, along with many others, who noted that “responses to COVID-19 have speeded up the adoption of digital technology by several years and many of these changes could be here for the long haul”.²

The same has been seen in Customs. With social distancing measures in place, there has been a need for contactless procedures and we have seen a real momentum in the uptake of many technological solutions, including through the use of disruptive technologies.

Regional workshops on disruptive technologies (2021 and 2022)

In March 2021, the WCO launched a round of regional workshops on disruptive technologies aimed at further sharing experiences and discussing the different projects and lessons learnt, and drawing possible recommendations for the future, which have also been reflected further in this Report. The first workshop was held in the Asia/Pacific region, followed by the European region in May, the Americas and Caribbean region in November 2021, and the workshop for East African and West and Central African regions in January 2022. The events revealed that existing projects had progressed further and new ones had emerged, but also that the uptake of the technologies varied depending on the region and the level of development.

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b. WTO initiatives

Publications and events

Over the last few years, a series of WTO events and publications have examined the interplay between digital technologies and international trade with a view to spreading awareness about the impact of digital technologies on trade, fostering dialogue among Members of the international community, and catalysing action.

The [2018 World Trade Report](#) (WTR) examined the growing importance of digital technologies – and in particular of the Internet of Things, artificial intelligence, 3D printing and Blockchain – and how they affect trade costs, the nature of what is traded and the composition of trade. The Report discussed how international trade cooperation can help governments both seize these opportunities arising from the development of these technologies and address the challenges.

That same year, the WTO hosted a research workshop on blockchain and international trade in which the WTO publication [Can Blockchain Revolutionize International Trade](#) was presented, followed up by a series of panels on trade finance, Customs and border procedures, and logistics. The workshop drew on insights from a variety of actors across relevant sectors to address the opportunities and implications associated with the widespread adoption of these technologies in the modern trading system.

² <https://www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/how-covid-19-has-pushed-companies-over-the-technology-tipping-point-and-transformed-business-forever>

Indeed, although digital technologies can transform the trading system and bring about new levels of economic prosperity and growth, they also pose new challenges to the multilateral framework – raising questions about regulation, privacy, distortions to productivity, and inequality associated with the digital divide.

As several WTO publications and events have noted, digital trade and information technologies have given countries access to markets that were previously considered unreachable, and consumer choices have largely expanded as e-commerce has expanded the variety of goods available to a local demographic. Following the conclusion of the second phase of the WTO Chairs Programme (WCP)³, a publication, titled [Adapting to The Digital Trade Era: Challenges and Opportunities](#), was released in 2021. The research examined how rapid adoption of digital technologies, alongside domestic policy and greater international cooperation, could offer new opportunities for economic growth and prosperity to developing countries. In 2019 and 2021, the WTO hosted the two Global Trade and Blockchain Forums which brought together Members of the public and private sectors, and highlighted the potential transformative effects and challenges new digital technologies, notably blockchain, could bring about in the global trade system – touching issues from trade finance to transportation and logistics, border procedures, and agriculture. The forums fostered discussions around the role of international organizations in promoting a regulatory and policy framework conducive to the deployment of these technologies while mitigating the risks that may arise.

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Two publications mapping existing DLT projects in trade were released in 2019 and 2020 on the margins of the Forums. Surveys of key actors in the field conducted as part of these studies highlighted the important benefits that DLT can bring in terms of transparency, gains in speed and efficiency, and real-time overview of transactions, as well as the challenges that this technology raises in terms of standardization, governance and regulation. The publications discussed ongoing work aimed at creating digital standards relevant for trade to drive digital interoperability, as well as the impact of the COVID-19 pandemic on digitalization efforts.

A more recent publication, [Accelerating Trade Digitization to Support MSME Financing](#), investigated the potential of advanced technologies, including the Internet of Things, big data analytics, artificial intelligence, quantum computing, and DLT, to facilitate small businesses’ access to trade finance. A new (February 2022) WTO Secretariat publication [Trade in Knowledge - Intellectual Property, Trade and Development in a Transformed Global Economy](#), drawing together contributions from diverse set of scholars, analysts and institutions, provides in-depth discussions of the measurement, impact and regulation of knowledge flows in the global digital landscape, ranging from global value chain analysis in the digital context to the adaptation of trade rules for the age of ‘big data’. The work in this volume is providing the basis a platform for further engagement in this dynamic area.

3 The WCP was a capacity-building project launched in 2010 which sought to enhance knowledge and understanding of the trading system among academics and policymakers in developing countries through research, curriculum development, and outreach activities. The first phase of the programme ran from 2010 to 2013, the second phase ran from 2014 to 2018, and a third phase has been implemented since 2021.

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E-Learning course

The WTO and International Trade Centre jointly developed an online course on [Introduction to Blockchain for Trade](#) that is freely available and aimed at both technical and non-technical participants. It consists of four modules: (1) Why blockchain?; (2) What is blockchain technology?; (3) How can blockchain be used in international trade?; (4) Implementing blockchain for trade.

Work in WTO bodies and facilities

WTO Members have also been discussing trade digitalization and the impact of digital technologies on trade in various WTO bodies and facilities that support developing and LDC Members.

Members are discussing initiatives on electronic commerce in both the Council for Trade in Services (under the 1998 Work Programme) and the Joint Statement initiative.⁴ Discussions address issues such as how to leverage technology to bridge the digital divide; as well as the means to facilitate digital and paperless trade, electronic signatures and authentication, electronic invoicing, and electronic contracts.

In 2022 and 2023 the Technical Barriers to Trade (TBT) Committee will explore the impacts that technical barriers to trade may have on trade in intangible digital products (e.g., artificial intelligence (AI), enterprise applications, cyber security, financial technology, health IT, telecommunications, digital media software, and software as medical devices), and how to minimize those impacts. The Committee members will also share views on cyber security regulation; digital solutions for conformity certificates; and challenges and best practices for conformity assessment of goods obtained through e-commerce.

Funding from the Enhanced Integrated Framework (EIF) has been supporting least developed countries (LDCs) to leverage technologies, particularly frontier technologies, to improve productivity, promote e-commerce and facilitate cross-border paperless trade. The EIF partnered with the UN Technology Bank to conduct a Technology Needs Assessment in selected LDCs, and with UNESCAP to conduct feasibility studies on the application of emerging technologies for digital trade.

c. Joint WCO-WTO initiatives

The WCO and the WTO have a long-standing partnership in which the two organizations have complementary roles, whereby the WTO sets rules in international trade and the WCO develops the relevant standards and tools relating to border formalities. The typical areas of cooperation are in Customs valuation, rules of origin, and trade facilitation, while more recently the two organizations have also embarked on numerous joint initiatives, such as those relating to ways to mitigate the effects of the COVID-19 pandemic, and in the area of paperless trade and technologies. Both organizations provide capacity building and technical assistance aimed at facilitating trade and Customs formalities.

The WCO and the WTO jointly developed a paper “[The Role of Advanced Technologies in Cross-border Trade: A Customs Perspective](#)”. The paper was developed based on the results of the WCO’s 2021 Annual Consolidated Survey and more specifically its chapter on disruptive technologies that provided a snapshot of the level of implementation by Customs administrations of the three groups of technologies that already proved to be extremely useful in the Customs environment or were promising to be game-changers in the future: blockchain/distrib-

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⁴ 86 Members are part of the Joint Statement initiative on e-commerce.

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uted ledger technology (DLT); big data, data analytics, artificial intelligence and machine learning; and the Internet of Things. This paper intends to shed light on the level of implementation, as well as opportunities and challenges faced by Customs in deploying the above-mentioned technologies. The paper may be of particular interest to those WCO and WTO Members in the process of implementing the WTO Trade Facilitation Agreement, which aims to reduce processing time through the use of techniques such as risk management, Single Window, exchange of Customs information, and authorized economic operators, to name but a few. In addition, the paper may further assist

other stakeholders to take well informed decisions under initiatives aimed at facilitating and securing global supply chains.

The WTO also participated in the 2021 WCO TECH-CON and the regional workshops held during the course of 2021 and early 2022. Lastly, the two organizations partnered in updating this Study Report in order to ensure the broader trade perspective and all relevant stakeholders are considered, duplication is avoided and the biggest possible benefits are reaped in developing relevant projects.