



**Asia-Pacific
Economic Cooperation**

Advancing Free Trade
for Asia-Pacific **Prosperity**

Utilizing Digital Technology in the Field of Trade Facilitation under the Current Covid-19 Pandemic and Beyond (Phase II): Best-Practices Sharing Workshops

APEC Committee on Trade and Investment

April 2023



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Covid-19 Pandemic and Beyond
(Phase II):
Best-Practices Sharing Workshops**

Workshop Series Report

APEC Committee on Trade and Investment

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Produced by
APEC Office, Trade Policy Bureau
Ministry of Economy, Trade and Industry (METI),
Japan

For
Asia-Pacific Economic Cooperation Secretariat
35 Heng Mui Keng Terrace
Singapore 119616
Tel: (65) 68919 600
Fax: (65) 68919 690
Email: info@apec.org
Website: www.apec.org

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TABLE OF CONTENTS

EXECUTIVE SUMMARY	4
1 WORKSHOP 1: TECHNOLOGY TO SUPPORT CUSTOMS PROCEDURES.....	5
1.1 SUMMARY.....	5
1.2 INTRODUCTORY SESSION	5
1.3 PANEL SESSION	7
2 WORKSHOP 2: DIGITALIZING CUSTOMS COOPERATION	11
2.1 SUMMARY.....	11
2.2 INTRODUCTORY PRESENTATION	11
2.3 PANEL SESSION	13
3 WORKSHOP 3: PORT DIGITALIZATION FOR EFFICIENT SUPPLY CHAIN	18
3.1 SUMMARY.....	18
3.2 INTRODUCTORY PRESENTATION	18
3.3 PANEL SESSION	20
3.4 CLOSING REMARKS	26
4 OBSERVATIONS & ANALYSIS	27
4.1 SURVEY RESPONSES	27
4.2 KEY WORKSHOP TAKEAWAYS	29
ANNEX A: WORKSHOP AGENDAS	32
ANNEX B: SPEAKER BIOGRAPHIES	33
ANNEX C: PRESENTATION MATERIALS	34
ANNEX D: WORKSHOP SURVEY SHEETS	35
ANNEX E: KEY ACRONYMS	39
ANNEX F: REFERENCES.....	40

Executive Summary

The long-term trend of increasing cross-border trade is likely to continue, despite the disruptive impacts of the Coronavirus Disease 2019 (COVID-19) pandemic and various geopolitical tensions. However, the pandemic introduced challenges and exposed numerous shortfalls in the international trade system, which economies and business have now been working to address for over two years. In that time, digital technologies have grown in prominence, helping to limit face-to-face interactions, speed up transactions, ensure supply chain visibility, and enable a broader range of communities to participate in trade. In 2021, APEC held a four-part workshop series to recognize the critical role which digital technologies had played in pandemic resilience and recovery. These workshops explored how these solutions can be supported to improve the trade landscape in the coming years. Following the success of this initiative, in 2022, APEC organized a three-part workshop series to build on previous findings and encapsulate new knowledge and experience.

This report summarizes the content and key findings from the workshop series. Between August 2022 and January 2023, APEC invited experts from the government, the private sector, and academia to offer their informed insights on a variety of topics relating to how digital technologies can help foster trade throughout and beyond the COVID-19 pandemic. In each workshop, the speakers first delivered presentations and then engaged in a lively panel discussion, during which they answered questions sent in by audience members, who were encouraged to participate. Attendees were also invited to complete post-event surveys where they could submit feedback on the workshops. Findings from these surveys are discussed later in the report. Links to all speaker biographies and workshop agendas are available in the annexes of this report.

The workshop series was attended by 247 unique individuals (including speakers), 104 of whom (42.1%) are women. The average number of attendees per workshop was 92. Attendees hailed from 20 of APEC's 21 economies, the APEC Secretariat, the APEC Business Advisory Council (ABAC), the Association of Southeast Asian Nations (ASEAN), and the Pacific Economic Cooperation Council (PECC). Most attendees were representatives of government agencies, and there were also some people from private companies and international organizations.

Throughout the series, speakers emphasized the significant benefits that digital technologies can provide for operations of and cooperations between both customs agencies and port authorities. Key to the success in adopting these technologies is cross-agency and cross-border interoperability, which depends on commitments from governments and other stakeholders to pursue collaborations. Cybersecurity measures, such as ensuring the authenticity of digital documents, must also be developed and implemented for digital technology adoption in both of these agencies that play critical roles in trade.

Workshop Series Summary

Focus	Date
Technology to Support Customs Procedures	3 August, 2022
Digitalizing Customs Cooperation	5 October, 2022
Port Digitalization for Efficient Supply Chain	17 January, 2023

1 Workshop 1: Technology to Support Customs Procedures

1.1 Summary

The first workshop, on Technology to Support Customs Procedures, was held virtually on August 3, 2022. As the volume of trade expands, new technologies are needed to help customs administrations handle goods and the associated documentation, all while managing risk and providing a predictable landscape for traders. Customs are vital for the security and prosperity of APEC economies. It is vital that the processes are as effective and efficient as possible to ensure that desirable goods can enter quickly, while risks are identified at the border. This event featured distinguished experts working at the forefront of the development and implementation of advanced tools to help officials collect, analyze, and interpret quality customs data to manage risk.

After a brief introductory session, the speakers delivered four presentations in which they discussed digitalization initiatives and risk management solutions. The series of back-to-back presentations was followed by a robust Q&A panel during which audience members were encouraged to submit questions. The panel ran for approximately 20 minutes, and the experts offered insights on several topics, including which customs-related procedures remain the most challenging to digitalize.

The workshop was attended by 78 people hailing from 14 APEC member economies. The speakers joined from Canada, New Zealand, Viet Nam and the Netherlands. Their details are as follows:

- Mr Will LOCKHART
Senior Program Advisor, Canada Border Services Agency
- Mr Brett COLLETT
Principal Policy Analyst, New Zealand Customs Service
- Mr Mike SQUIRRELL
Chief Technology Officer, TTEK Inc.
- Mr Benno SLOT
Specialist Advisor on Strategy and Innovation, Customs Administration of the Netherlands

1.2 Introductory Session

1.2.1 Opening Remarks

The opening remarks were delivered by Mr Takayuki Niikura, Director of the APEC office at Japan's Ministry of Economy, Trade and Industry (METI).

Mr Niikura welcomed the audience and noted that the workshop series provides an important opportunity to share best practices and ideas about trade facilitation during a critical period. He referenced the value provided by the Phase I workshops held in 2021,¹ and said the upcoming series would build on the lessons learned and feedback received the previous year.

This first workshop focuses on initiatives to facilitate customs processes, especially those that economies can implement unilaterally. The second workshop (October 2022) will address technologies that can promote cooperation among customs

authorities, the future of customs collaboration, and ways to resolve prevalent issues, such as the protection of intellectual property. The third workshop (January 2023) will cover best practices to enable port digitalization and introduce other solutions, such as artificial intelligence tools to manage storage containers and prevent shortages.

Mr Niikura greeted each of the speakers and encouraged the audience to participate with questions.

1.2.2 Introductory Presentation

Cost of Customs Procedures

(http://mddb.apec.org/Documents/2022/CTI/WKSP6/22_cti_wksp6_002.pdf)

The introductory presentation was delivered by Mr James Tetlow, Senior Research Analyst at Washington CORE, a consultancy supporting the workshop.

The ongoing digitalization of global trade processes has several benefits, such as reducing transaction costs and allowing for greater participation by micro, small and medium-sized enterprises (MSMEs) and women-owned business in the marketplace. Moreover, digital solutions can facilitate cooperation between border agencies and help bring about more transparency and predictability in cross-border processes. The APEC Committee on Trade and Investment (CTI) has taken several actions in recent years to foster greater collaboration, including publishing guidelines and hosting best-practice workshops.

However, there are several barriers to adoption that firms and governments must first address. Digital technologies can be expensive to adopt, and the capital needs of smaller firms and developing economies must be accounted for. Stakeholders may also require support and training to ensure that they can effectively use new systems. Currently, there is a lack of standardization across economies, which can prevent collaboration and cause confusion. There is also sometimes a lack of political will to adopt new solutions.

Among the many emerging tools are automated customs solutions, electronic single windows, and electronic tracking systems. Legislative changes are required to support the establishment and adoption of new systems and realize the full potential of digitalization. Human resources development will be critical to train border officials to use new technologies, and government agencies must buy-in to these activities. Finally, constant dialogue between the public and private sectors will be needed to ensure that governments are pursuing solutions that provide value to companies and other stakeholders.

1.3 Panel Session

1.3.1 Presentation by Mr Will LOCKHART

e-Longroom: Part of an Emerging Digital Customs Strategy for CBSA (http://mddb.apec.org/Documents/2022/CTI/WKSP6/22_cti_wksp6_003.pdf)

Mr Lockhart presented on the Canada Border Services Agency (CBSA) electronic Longroom (e-Longroom), which allows clients to submit customs requests digitally rather than by paper. e-Longroom allowed CBSA to respond quickly to the COVID-19 pandemic with low overhead, especially by helping to limit face-to-face interactions. The legacy system required the physical transfer of paperwork and transactions regularly took two days to complete. In contrast, the same processes using e-Longroom take only 30 minutes. Requests are received and decisions sent via email with attached PDFs, vastly accelerating the process for both successful and unsuccessful applications.

e-Longroom has proven to be efficient, flexible, and resilient. It has allowed clients and border agents, respectively, to submit and authorize requests from anywhere, which has been extremely useful in facilitating working from home during the pandemic. The solution has also created more comprehensive audit trails and reduced costs incurred by handling, transporting, storing, and destroying paper-based records.

Mr Lockhart offered specific details about system implementation, such as how CBSA agents use digital stamps to verify documents, and how the agents ensure security throughout their processes. Now, e-Longroom has completed a successful pilot period and is being formalized as a permanent process. The service is available at approximately 80 CBSA offices, and Mr Lockhart hopes it will be expanded to 100 offices by the end of 2022². CBSA is also hoping to extend the solution to other trade-related paper-based processes.

1.3.2 Presentation by Mr Brett COLLETT

Policies and Initiatives with Digital Technologies for Paperless Trade (http://mddb.apec.org/Documents/2022/CTI/WKSP6/22_cti_wksp6_004.pdf)

Mr Collett presented on New Zealand's trade single window system, the data standards that underpin it, and how the system is used to manage risk. He began by explaining that industry groups have long called for more predictability in trade. The private sector has complained about the fragmented landscape in which many data standards exist simultaneously and about the lack of progress regarding the implementation of paperless trade. Firms have called for all trade processes to be digitalized (beyond just customs), as this would allow for better cross-border data flow and enable the participation of MSMEs in global markets.

Single windows are becoming the dominant systems used by customs administrations, and New Zealand's has been in operation for around 18 years. Mr Collett talked through their many benefits, including allowing for pre-arrival clearance of goods, and how single window interoperability allows for international collaboration and speedier transactions. Inconsistent standards between economies can be a burden to traders. And, New Zealand uses the World Customs Organization (WCO) Data Model, which Mr Collett sees as a positive step towards greater interoperability.

Mr Collett described how an effective single window requires a firm legal foundation, and how input from the trader community was sought in the development of New Zealand’s laws, to ensure that the system was user friendly. He then talked through electronic clearance procedures, particularly the submission of import and export declarations, inward cargo reports, import and export permits, and the payment or refund of customs duties and fees. Finally, after explaining the compliance and customs service framework, Mr Collett detailed how the agency uses data to manage risk through their capabilities in border analytics, intelligence, targeting, and assurance.

1.3.3 Presentation by Mr Mike SQUIRRELL
Streamlining Customs Risk Management Processes through the Use of Artificial Intelligence
(http://mddb.apec.org/Documents/2022/CTI/WKSP6/22_cti_wksp6_005.pdf)

Mr Squirrell started by outlining the WCO risk assessment cycle and flagged areas where artificial intelligence (AI) and machine learning (ML) techniques have been particularly effective in these processes. Customs agencies tend to use manifests and bills of lading as the chief elements of risk assessment, but increasingly these are being combined with data from other sources. Analyzing thousands of documents per day can be challenging for any customs system, but AI and ML can help to build upon existing frameworks and facilitate the prioritization of high-risk shipments. They can help customs analysts and inspectors make decisions based on the level of risk, type of threat faced, and the type of inspections relevant to the case.

Today, the limited number of documents used to assess risk means there is a lack of visibility in the supply chain. However, other sources of information can be used to learn more about shipments. For example, customs agents can use container status messages to learn about land transportations that occurred before a shipment was loaded onto a vessel at a port. This information, which would not show up on a bill of lading, can help to identify goods that have come through high-risk areas. This is just one way that combining documents can provide a better overall picture of a shipment. Mr Squirrell talked about other ways that stakeholders can extend domain awareness and supply chain visibility, such as by using tools to form a better understanding of what constitutes a “normal” shipment, to make it easier to identify abnormalities.

He noted some key principles for the trading community to consider, such as the importance of descriptions for goods and supply chain entities, and the value of the standardization of entity names. AI and ML can be used to clean this data, and to flag inaccuracies and inconsistencies for correction. Mr Squirrell presented a slide on advice for those involved in developing ML models about how to present analyses to customs inspectors and post-clearance audit officers. These officers use the information to help determine which companies to audit; modelers must ensure that officers understand the results and how they can be used to improve audit decisions. Also critical to this process is that initial data from inspectors is codified in a way that can be interpreted by AI and ML models. The presentation ended with a brief description of transactional scorecards that help to flag high-risk trade while allowing low-risk trade to proceed rapidly.

1.3.4 Presentation by Mr Benno SLOT

Re-use and Sharing Data from Technology

(http://mddb.apec.org/Documents/2022/CTI/WKSP6/22_cti_wksp6_006.pdf)

Mr Slot presented on how the Customs Administration of the Netherlands is deploying technology to fulfil its mission. Due to changes in European Union (EU) legislation and the rising volume of e-commerce shipments, the number of declaration lines has rapidly increased over time. This has pushed the Netherlands to search for new ways to handle requirements and mitigate risks. One element is the increasing autodetection of goods, using scanners. Mr Slot talked about how goods can be split into different trade lines, with higher risk containers subject to further checks while lower risk ones are passed on more quickly. Much work now is about shifting from if-then selections towards algorithm-based decisions about which containers should be checked.

Customs agencies are looking to enrich customs data (e.g., from import declarations) with more information available from the wider supply chain to help inform whether a container should be inspected, kept on hold, or analyzed further – anything that must be done to manage risk before final clearance is given. They are also hoping to combine supply chain information with available open source data to determine whether they should modify the existing profiles of supply chain entities. Mr Slot briefly described how the necessary details are collected in the Customs Real-Time Information System (CRIS).

In future, sensor technology and augmented reality will increasingly be used to provide risk intelligence. In addition, Mr Slot expects customs agencies to gather a wider range of supply chain information and re-use previously collected data for the re-evaluation of profiles and trade lines. To enable continued progress and collaboration, more work is needed on unified data standards and authenticity. Finally, he highlighted that customs officers in the field are the most important actors in implementation, and that they must always be kept up to date with technological developments. Progress is not about automating officers' work but about helping them to produce higher quality output.

1.3.5 Q&A Session

The first question was directed towards Mr Collett from a representative from the Canada Border Services Agency, who asked about the timeframe for goods to be cleared prior to arrival. Mr Collett responded that New Zealand allows goods to be entered prior to arrival without a statutory timeline. This is mutually beneficial, as the importers gain clearance certainty, and the customs authority receives data that allows it to conduct risk analysis early. Mr Collett also noted that in New Zealand, imported goods must be entered within 20 working days.

An audience member from the United States asked Mr Lockhart the difference between the terms "digitalization" and "paperless trade". He responded that, even when customs authorities implement digital processes, there may still be printing, physical stamping, re-scanning conducted by other parties. On their end, with e-Longroom, CBSA is pursuing a paperless, end-to-end digital solution.

The experts were asked about what they believed to be the most challenging paper-based processes to eliminate. Mr Lockhart said these are low-volume legacy processes, as they often do not receive organizational priority and little money is

[Final Report] Workshop Series –
Utilizing Digital Technology in the Field of Trade Facilitation (Phase II)

set aside for them. Mr Collett responded that certificates of origin and phytosanitary measures are particularly difficult. Mr Slot was asked about how to digitalize phytosanitary processes, as he previously worked to establish an electronic equivalent of the Sanitary and Phytosanitary (SPS) certification. According to Mr Slot, harmonizing data across economies was important, as was standardizing cross-border exchange processes. He added that data authentication is especially vital for SPS.

Mr Squirrell was asked about how customs administrations can use standards to compile high quality data. He noted that there are often differences in quality and format between related documents, such as customs declarations and commercial invoices. AI and ML are used to help group information appropriately. The WCO Data Model is extremely helpful across many areas, as are the United Nations Economic Commission for Europe (UNECE) standards. However, there is no single one-size-fits-all model just yet.

Another attendee asked Mr Slot about whether information from the deep web has been essential in any high-risk cases. He answered that his organization is currently exploring how to use the deep web to uncover crucial information about shipping lines and the relationship between goods and traders. He added that this is a promising area of research.

Finally, an audience member with an active role in the WCO's Data Model Projects Team thanked speakers for their positive comments about WCO Data Model.

2 Workshop 2: Digitalizing Customs Cooperation

2.1 Summary

The second workshop, on Digitalizing Customs Cooperation, was held virtually on October 5, 2022. This workshop continued on the path laid out in the first workshop, exploring key issues in the process of digitalizing customs processes and facilitating cross-border trade. It addressed technologies that can promote cooperation among customs authorities and trade partners, future directions of customs collaboration, and ways to resolve prevalent issues such as the protection of intellectual property. This event featured experts from member economy governments and from private enterprise with firsthand experience in developing and implementing the new digital technologies that are expanding customs cooperation.

After a brief introductory session, the speakers delivered four presentations in which they discussed recent customs digitalization processes that are increasing cooperation and efficiency in the global trade system. The series of back-to-back presentations was followed by a Q&A panel during which audience members were encouraged to submit questions. The Q&A panel ran for approximately 20 minutes, and the experts offered insights on topics, including the centrality of data standards, as well as best practices and challenges involved with digitalizing customs cooperation.

The workshop was attended by 54 people hailing from 18 APEC member economies. The speakers joined from Chile, the Philippines, Singapore, and the United States. Their details are as follows:

- Ms Bárbara MATAMALA
Director of the International Trade Single Window System,
Ministry of Finance, Chile
- Mr Jonathan SORIANO
Director, Technology Management Service Management Information
System and Technology Group (MISTG),
Bureau of Customs, the Philippines
- Mr TEO Song Boon
Senior Application Consultant, Singapore Customs
- Mr Tom SPROAT
Senior Director of Network Development, Maersk GTD (TradeLens)

2.2 Introductory Presentation

Status of Cross-Border Cooperation in Customs Procedures

(http://mddb.apec.org/Documents/2022/CTI/WKSP9/22_cti_wksp9_002.pdf)

The introductory presentation was delivered by Mr James Tetlow, Senior Research Analyst at Washington CORE, a consultancy supporting the workshop.

A wide range of activities links customs agencies today; namely the exchange of information, provision of assistance with controls or surveillance, and participation

in investigations. Many of those collaborative interactions are facilitated by trade agreements that provide specific guidance for increased cooperation. However, research indicates that there is still only limited overall availability and usage of channels for the online exchange of customs-related information. Furthermore, the OECD has noted that digitization is linked to improvements in trade. Small improvements in transparency, automation, or interagency cooperation have led to trade in all sectors rising between 1 percent and 4 percent, for all types of goods and all economies.³ There are opportunities for improvement among APEC economies through speeding up the customs process and lowering the costs for border compliance.

There are currently a number of international agreements that commit participating economies to adopting new technologies and methods to improve their customs processes and the collaboration between customs administrations. One of these is the World Trade Organization (WTO)'s Trade Facilitation Agreement (TFA), which provides a framework for voluntary information exchange between customs agencies regarding verification of goods declarations. Another is the UN Framework Agreement on the Facilitation of Cross-Border Paperless Trade in Asia and the Pacific; this agreement sets non-binding commitments regarding the exchange of trade-related electronic documents and data. Within APEC, all members have now implemented a Single Window system for the processing of trade documents. Other types of beneficial technology interventions include implementing processes for electronic document exchange and authentication, enabling tracking technologies to facilitate customs clearance processes, and establishing one-stop trade and logistics ecosystems.

As the digitalization of customs cooperation expands and improves, several areas for improvement remain. These include the need to increase trust among customs agencies; to improve the understanding of procedures for exchanging information, including the need for timely delivery of requested information; to strengthen regional customs cooperation; and to ensure the confidentiality of the information being exchanged. Advancing cooperative work to establish a shared data standard, such as the WCO data model, may help customs agencies in the region improve cooperation. Another area where technologies can support customs cooperation is the protection of intellectual property rights (IPR) through efforts like shared trademark databases. Mr Tetlow concluded his presentation by encouraging customs authorities to work with technology vendors to build up the compatibility and interoperability among digital technology solutions.

2.3 Panel Session

2.3.1 Presentation by Ms Bárbara MATAMALA

Digitalizing Customs Processes through the Single Window

(http://mddb.apec.org/Documents/2022/CTI/WKSP9/22_cti_wksp9_003.pdf)

Ms Matamala presented on Chile's experiences in digitalizing customs processes through the Single Window, and on how the Chilean Single Window is integrated with systems from other economies.⁴

Chile began work on its Single Window system in 2010 and followed a development process that included standardizing customs processes, simplifying those processes where possible, and digitalizing the system. The current Chilean Single Window system is free of charge and non-mandatory. As a system, it contains numerous different public sector platforms in addition to the Ministry of Finance (which oversees customs processes); these include the Treasury, Civil Registry, Institute of Public Health, Agricultural and Livestock Services, and all others that participate in import and export processes. The Single Window system contains a single registry of foreign trade that contains all customs data and all related platforms.

Ms Matamala noted that the Single Window system greatly improves customs processing within the economy in question and that its effectiveness is maximized when there is integration with and interoperability between the domestic system and the systems of trade partner economies. An important example of this cooperation is the Pacific Alliance Agreement, which commits the economies of Chile, Colombia, Mexico, and Peru to Single Window system interoperability. This interoperability allows the electronic exchange of data or documents, such as electronic certificates of origin or customs declaration data. Chile is also beginning integrative work with several APEC economies, including Singapore, New Zealand, Peru, and Colombia.

Ms Matamala also highlighted examples of the current challenges with Single Window. These include working to create ever faster customs processes, managing the continued post-pandemic growth in eCommerce, optimizing information security and confidentiality, incorporating new logistical processes, and continuously updating technological systems.

2.3.2 Presentation by Mr Jonathan SORIANO

Technology for Innovation and Reform: The Philippines' Transformation Towards a Modernized and Credible Customs

(http://mddb.apec.org/Documents/2022/CTI/WKSP9/22_cti_wksp9_004.pdf)

Mr Soriano presented on the substantial overhaul, upgrading, and digitalization of the Philippine customs system that has taken place in recent years. The Customs Modernization and Tariff Act was enacted in 2016, laying the groundwork for these reforms. These reforms also happened to coincide with the onset of the pandemic and the challenges and opportunities for global trade that were brought about as a result.

Automating customs processes was one of the top priorities of the Bureau of Customs' digital transformation agenda, with a focus on pre-arrival border security

and protection assessment, payment, and customs clearance and release. Developing these systems in-house and leveraging existing cloud technology infrastructure allowed the Bureau to customize as needed, and to implement the new systems quickly. Within three years of launching the automation effort, 91% of all customs processes had been automated, more than double the amount they began with.

Other significant digitalization and upgrade efforts included the replacement of a decades-old Automated System for Customs Data (ASYCUDA++) customs computer system with a new trade engine. The Bureau also upgraded its manual accreditation document verification process to a paperless process that greatly reduced verification processing times. In addition, the Bureau introduced a Customer Care Portal System (CCPS) just before the pandemic began. This removed face-to-face transactions between customs officers and importers and allowed stakeholders to continue processing transactions despite lockdown restrictions. The CCPS system is now institutionalized in all 17 major ports.

With regard to regional and international cooperation and interoperability, the Bureau is currently working to implement a National Single Window system, as required in order to connect with ASEAN's Single Window system. They are also utilizing such tools as the Customs Enforcement Network (CEN) of the WCO. Evidence that the Philippines' digital transformation process has greatly improved its customs process can be seen in the jump in its trade facilitations score, based on the UN Global Survey in Digital Sustainable Trade Facilitation: its score jumped from 80% to 86% between the years 2019 and 2021.

2.3.3 Presentation by Mr TEO Song Boon

An Overview of how the Networked Trade Platform (NTP) Facilitate the Digitalization of Documents and Data in the Cross Border Trade Flow
(http://mddb.apec.org/Documents/2022/CTI/WKSP9/22_cti_wksp9_005.pdf)

Mr. Teo presented on Singapore's use of its Networked Trade Platform (NTP) to facilitate cross-border trade, the challenges involved in today's global trade processes, and how Singapore uses NTP to address some of those challenges. Singapore's NTP was launched in 2018, and there are currently close to 6,000 Singaporean companies registered with it. The founding goal of NTP was to enable the efficient flow of goods and services facilitated by a swift exchange of data between the participating parties, allowing stakeholders to be seamlessly connected across the wider trade ecosystem.

Examples of NTP's core functionalities include providing government services such as online applications for customs documents and processes and value-added services, government-to-government digital connectivity, business-to-business services, utilities, and a verified digital identity system and single sign-on. An example of these various types of functions is the electronic exchange of Preferential Certificates of Origin (PCOs) and Certificates of Non-Manipulation (CNMs) between Singapore and China. The exchange represents government-to-government digital connectivity; the provision of utilities that allow companies to

connect their internal systems with NTP; and the use of CorpPass, Singapore's national digital identity system for businesses.

Mr Teo identified ensuring the security and authenticity of document and data flows as one of the key challenges facing global trade processes, and in particular cooperation across digital customs processes. He outlined five areas where NTP is working to address these information security challenges. The first involves CorpPass serving simultaneously as a digital identity system and as an authorization system used by businesses to manage digital access of employees. The second involves carefully controlled access to data and documents. The third involves the scanning of all documents for malware. The fourth involves offering payload encryption APIs (application programming interfaces) for the retrieval and sending of documents and data between business partners. And the fifth involves data sharing with counterparts only after consent has been given.

2.3.4 Presentation by Mr Tom SPROAT

Digitizing Trade

(http://mddb.apec.org/Documents/2022/CTI/WKSP9/22_cti_wksp9_006.pdf)

Mr Sproat presented on how global shipping carriers such as Maersk are beginning to utilize technological interventions to enable and optimize cross-border trade. He also spoke more specifically about how these technological interventions are being deployed in different markets and how that deployment is bringing benefit to those markets.

TradeLens is a proprietary blockchain-enabled platform that is connected with some of the world's largest container carriers, covering approximately 65% of all global trade. One of the significant new customs technologies developed by TradeLens is a digital bill of lading, known as eBL. With the use of the digital eBL process, approximately three days can be shaved from processing time and around \$250 USD can be saved in courier costs and other related expenses. Paperless trade is also being implemented by TradeLens, allowing for the seamless sharing of digitized document data, with the goal of creating an uninterrupted cargo flow and improving customs status transparency.

Mr Sproat noted that such technological interventions benefit customers in numerous ways. They require less manual work and less inputting of data into the Single Window system, leading to significant reductions in administrative costs and processing time. These technologies also gather all relevant data in one central location, and they necessitate fewer inspections and faster customs clearance due to more accurate risk assessment. Digital bills of lading in particular provide visibility into key supply chain and customs events. These technological interventions also provide important benefits to customs authorities. They provide more complete information about customs cargo, allowing for more precise targeting as far as which containers to inspect. They also allow all parties to simplify the process of connecting to their National Single Window platform by making use of an industry standard platform that participants already have access to. And paperless trade in particular helps reduce fraud, as blockchain-based digital documents are much more difficult to forge than paper documents and leave a robust audit trail.

Mr Sproat also discussed TradeLens' connection with ASYCUDA, an UN-based software program used by over 100 economies. The UN has also developed a central data hub for carrier manifests known as ASYHUB, and TradeLens is currently running two active pilot programs relating to the use of the data hub. The goal of these pilots is to create a scalable model through the ASYHUB connection, enabling many economies to take advantage of the earlier availability of carrier manifest data and thus increase the velocity of cargo through their economies.

2.3.5 Q&A Session

The first question was directed toward Mr Sproat from an attendee from Thailand, who asked about the background between TradeLens and IBM. Mr Sproat responded that TradeLens is the brand name of the technological platform, and that the initial investors in the platform were IBM and Maersk. Their initial collaboration was based on IBM bringing expertise in creating blockchain platforms and Maersk bringing expertise in the shipping business. Since the platform's inception, many more carriers have joined.

Ms Matamala was asked about data standards and her sense of the next steps for APEC economies toward forming a technology compatibility plan. Ms Matamala responded that this is difficult to determine, since different technological standards have different advantages and disadvantages. Furthermore, she noted that the choice of standard depends on various factors, such as the particular needs and resources of the various APEC economies, which economies are being connected, and the costs involved with the technology. Mr Sproat added that the establishment of standards will be critical in creating true interoperability, and that economies need to start working towards finding a way to agree on standards.

Mr Sproat was asked about whether TradeLens makes use of blockchain technologies. Mr Sproat responded, as noted in his presentation, that TradeLens is a blockchain-enabled platform, but that blockchain capabilities are not always needed for all types of customs transactions. He suggested, however, that the ledger of blockchain can go a long way toward increasing trust and creating trusted sources of documentation, as with digital bills of lading and paperless trade, both of which utilize the ledger of blockchain.

The next question was directed at Mr Soriano, asking if he could share any lessons learned following the Philippines' recent strengthening of its IT infrastructure. Mr Soriano highlighted the importance of leveraging existing resources and starting with simple, internally developed solutions, if possible, and also having policy support for the upgrade process.

All four panelists were asked which technological capabilities their respective economies/enterprises might be interested in adopting but have so far not yet done so. Mr Teo shared a number of areas of interest, including the need for a single technology across economies, the use of smart contracts (also known as chaincode) to share validations of certificates among trade partner customs agencies, and the implementation of cargo tracking. Ms Matamala then noted the need to incorporate more private sector actors into the Single Window system in Chile. She also mentioned the importance of ensuring that the technological infrastructure adequately supports digitalization and paperless processes. Lastly, Mr Soriano discussed paying close attention to which kinds of practices and

[Final Report] Workshop Series –
Utilizing Digital Technology in the Field of Trade Facilitation (Phase II)

platforms are being used most successfully by other economies in WCO environment.

Next, Mr Sproat was asked to share his thoughts on which capabilities economies should be looking to integrate into their platforms in the near future. Mr Sproat responded that the creation of a trusted-trader environment is particularly important. Two ways of doing this are ensuring that blockchain platforms are always private and defining the role of an organization so that a distributed ledger with real-time data sharing can be enabled. He also seconded what other panelists had mentioned, that the change management component of new technological integrations is just as important as the technology in and of itself. He noted that change management within communities of shippers is essential and expressed interest in hearing from the other panelists how shipping communities have reacted to their approaches to technological integration.

Ms Matamala responded that it was initially difficult to convince customs agents and participating government agencies to adopt Chile's voluntary Single Window system in place of a paper-based system. She said it required demonstrating the benefits of adoption. Their current challenge lies more with private sector actors, such as airlines, who are resistant to modernizing cargo systems within airports. Mr Soriano responded that the Philippines' current upgraded system is not as complex or high-level as those of other economies. Nevertheless, it achieved his agency's initial goal of immersing stakeholders in a digitalized environment and helping them quickly adapt to this change. Mr Teo responded that when Singapore first introduced NTP, they worked with various government agencies and trade associations to help demonstrate the benefit of NTP's services to stakeholders. They also created a supportive onboarding experience so that companies and technology service providers could easily access assistance as needed. In addition, they adopted cloud technologies from the beginning – an infrastructure choice that allows for easier expansion as more transactions arrive via the updated platform. Mr Teo also stressed the importance of making a conscious effort to continuously develop and improve the basic layers of enabling APIs.

3 Workshop 3: Port Digitalization for Efficient Supply Chain

3.1 Summary

This third workshop, on port digitalization, was held virtually on January 17, 2023, and explored the many ways that digital technologies are harnessed to enable more efficient communications, the exchange of information and documentation, cargo handling, and container movement within ports. The speakers discussed how AI technologies are supporting port digitalization, and the efforts by port management to digitalize processes and re-shape the future landscape of port interactions with stakeholders. This event featured experts – from member economy governments, academia, and port management – who have firsthand experience in developing and implementing digitalized port procedures and enhancing the efficiency of the global trade system.

After a brief introductory presentation, the speakers delivered four presentations, in which they discussed various port digitalization initiatives that are contributing to a more seamless process of global trade. The presentations were followed by a Q&A panel during which audience members were encouraged to submit questions. During the Q&A panel, the experts offered insights on topics such as data standardization and communication via digital platforms.

The workshop was attended by 120 people hailing from 15 APEC member economies. The speakers joined from Japan, Singapore, and the United States. Their details are as follows:

- Dr HIRATA Enna
Associate Professor, Graduate School of Maritime Sciences, Kobe University, Japan
- Mr OGI Kensuke
Chief of the Intelligent Port Policy Planning Office, Port Management and Operation Division, Ports and Harbours Bureau, Ministry of Land, Infrastructure, Transport, and Tourism (MLIT), Japan
- Mr KOH Chin Yong
Chief Information Office/Director (Information Technology), Maritime and Port Authority of Singapore (MPA), Singapore
- Mr Chris CHASE
Assistant Director of Marketing, Port of Los Angeles, USA

3.2 Introductory Presentation

The Cost of Port Procedures and Efforts to Improve Efficiency

(http://mddb.apec.org/Documents/2023/CTI/WKSP1/23_cti_wksp1_003.pdf)

The introductory presentation was delivered by Mr James Tetlow, Senior Research Analyst at Washington CORE, a consulting firm supporting the workshop.

Some of the factors driving port digitalization and the accompanying shifts in the cargo industry include increased vessel sizes and cargo volumes, the need to improve ROIs (returns on investment), and the expansion of services at individual ports according to their specific commercial and operating needs. It is estimated

[Final Report] Workshop Series –
Utilizing Digital Technology in the Field of Trade Facilitation (Phase II)

that the global cost of inefficient real-time information is over \$36 billion US annually, and digital technology could save as much as \$8.5 billion annually. In order to reap these benefits, ports are adopting digital technologies in a wide range of areas. For example, digital technologies can efficiently track, monitor, and maintain ports' physical infrastructure; they can monitor cargo handling equipment and operate that equipment at peak efficiency; they can streamline the sharing of cargo and customs documentation; and they can reduce energy consumption and monitor the environmental impact of equipment.

There are a number of factors to be considered by ports as they explore adopting new digital technologies. When implementing new technologies, the port management must consider how they will impact the port's reliability in providing its services without obstacles, flexibility in adapting its services as needed, security, current use of digital-based infrastructure and superstructure, and their employee's digital skills. Some of the challenges of digitalization that ports should consider before adopting new digital technologies include having the necessary resources (capacity and budget) to implement and effectively use the technologies, having a qualified workforce with digital skills, and the openness of staff, clients, and other stakeholders to digitalization. Ports should also consider whether the new technologies will be compatible with existing and future technology solutions, and whether the digital technologies could expose the port to any new security threats.

The types of digital technologies available for ports are numerous, including IoT (Internet of Things) solutions, AI solutions, the use of drones and robotics technologies, cloud computing, blockchain technology, and more.

Efforts to harness these technologies to improve efficiency are already underway at ports across the globe. Some examples from European ports include "Digital Dolphins" IoT sensors, "CargoSmart" cloud and big data platforms, digital twins, and 3D printing at the Port of Rotterdam (Netherlands); tracking and sharing IoT data on water conditions at the Port of Hamburg (Germany); and blockchain-based information sharing platforms and the use of drones at the Port of Antwerp (Belgium). Examples from APEC economies include the use of drones at the APM Terminal (Chile), the development of a "Smart Port" operations management tools and robotics for all-weather shipping at the Port of Laem Chabang (Thailand), planning for smart maritime logistics and the use of autonomous systems by the Korean government, and the use of automated loading cranes at the Port of Shanghai (China).

APEC is supporting the adoption of digital port technologies through several initiatives and recent publications. The APSN (APEC Port Services Network) brings together port and port-related industries with senior representatives within member economies, working to promote economically and environmentally sustainable ports through such strategies as cooperation, capacity building, and enhancing supply chain effectiveness.

3.3 Panel Session

3.3.1 Presentation by Dr HIRATA Enna

Advanced Technologies and Recent Applications in Smart Ports

(http://mddb.apec.org/Documents/2023/CTI/WKSP1/23_cti_wksp1_004.pdf)

Dr Hirata presented on the utilization of machine learning to automate key processes in port management for its smart ports. A number of examples from around the world were used to illustrate different kinds of applications of machine learning for use in smart ports.

In the commercial world, digitalization is the process of utilizing digitized data to improve operational efficiency and add value. Advanced digitalization technologies can be categorized using an ABCD acronym, where A represents AI, B represents blockchain technologies, C represents cloud computing, and D represents data. Machine learning, which is the focus of this presentation, is one of the two types of AI, and it consists of AI models that have algorithms for learning and for behaving intelligently based on those algorithms. Within the machine learning category, there is supervised learning, unsupervised learning, and reinforcement learning. All three can be used to automate port management processes.

Supervised learning is used mainly for prediction and labeling, and it involves the development of training data using a set of inputs and correct outputs, with the computer learning to produce correct outputs when given a certain input. An example of applying supervised learning to port and terminal operation is the Port of Qingdao's (China) use of a forecasting model for port container throughput: studies have shown that the model reduces prediction error by approximately 15 percent. Unsupervised learning is used mainly for classifying data, and it involves teaching the computer to grasp the inherent structure of data by providing it with only the input data. Examples include models that optimize the route between ports within a network of ports. Lastly, reinforcement learning involves developing models that learn to maximize future values through trial and error, rather than simply providing correct answers.

Machine-learning-based applications of AI can be applied to the operation of smart ports in a number of ways, with the majority of those applications serving yardside and landside port operation, as opposed to quayside operations.

Some notable areas of smart port digitalization include import dwell time prediction, yard optimization, smart container inspection, and autonomous driving within the port terminal. The Danish company Block Shipping provides an example of the impact of using import dwell time prediction modeling: Block Shipping was able to reduce shuffle moves by more than 30%, improve truck turnover time by more than 20%, and reduce CO2 emissions by approximately 2.5 million kilograms per year. The use of yard optimization machine learning, based on the random forest supervised learning algorithm, has been shown to improve the accuracy of yard movement prediction times to 86%, representing a 36% improvement over past prediction times. The use of smart container inspection technologies based on the GAN model of unsupervised learning has been shown to drastically shorten inspection times at ports and thus help relieve congestion. Lastly, the Port of Shanghai (China) provides an example of the impact of level four autonomous driving within the terminal, which is based on reinforcement learning models: the Port of Shanghai delivered more than 50,000 containers in 2021, with auto parking

requiring on average less than 70 seconds and causing less than three centimeters of positioning error.

3.3.2 Presentation by Mr OGI Kensuke

Introduction of 'Cyber Port' initiatives in Japan

(http://mddb.apec.org/Documents/2023/CTI/WKSP1/23_cti_wksp1_005.pdf)

Mr Ogi presented on the Cyber Port initiative, launched by Japan's Ministry of Land, Infrastructure, Transport, and Tourism (MLIT). Because 99% of Japan's cargo is transported by sea, due to its island status, improving maritime transportation procedures through efforts such as Cyber Port is particularly important.

Cyber Port has been in operation since April 2021. It consists of a centralized data platform that improves the overall operational efficiency and productivity of Japan's ports by optimizing all component entities of the container logistics system, as opposed to optimizing individual components separately. It achieves this by digitizing and sharing container logistics procedures among private businesses.

Cyber Port functions by allowing all the players involved in the shipping process—shippers, forwarders, shipping companies, etc.—to input all data and documents related to logistics procedures into the same platform. Thus, any one of these players can at any point check the status of the procedures or the condition of the cargo by accessing the Cyber Port platform. Cyber Port also increases efficiency by removing the need for the same information to be entered multiple times. While only a small share of Japan's logistics companies is currently utilizing Cyber Port, MLIT has demonstrated that for the 350 companies who do use Cyber Port, they have reduced the amount of time spent on logistics procedures by 60 percent. Although the scope of Cyber Port currently applies only to the logistics domain of trade procedures, MLIT plans to expand its system in the future to collaborate with the commercial and financial domains as well.

There are numerous notable features of Cyber Port's functionality. First, it allows for the exchange of information across different sectors of industry involved in container logistics, whereas in the past each sector used its own platform. Second, it eliminates the need to enter the same information multiple times, threading data to each document as common items and entering the data automatically in successive documents. Third, it offers two different methods of access, allowing users to connect a) using a browser if their company lacks their own digitized system or b) via their in-house digital system through API linkages with Cyber Port. Fourth, it allows all users to check real-time status of cargo and logistics procedures without having to submit an inquiry.

In the future, MLIT plans to develop linkages with other digitized domestic systems such as NACCS (Nippon Automated Cargo and Port Consolidated System, which is the single window system for import/export cargo and port related services), and to continue to improve its functions based on user needs and feedback. An example of this is plans to support EDI-based data exchanges along with EDIFACT-based exchanges.⁵ Ultimately, the goal is to link Cyber Port with other digitalized economy-wide systems throughout the world as they are developed.

3.3.3 Presentation by Mr KOH Chin Yong

MPA's Efforts in Port Digitalisation

(http://mddb.apec.org/Documents/2023/CTI/WKSP1/23_cti_wksp1_006.pdf)

*Presentation slides are only accessible by APEC members via MDDDB. Please see the "Annex C: Presentation Materials" for the link to the specific folder)

Mr. Koh presented on the growing importance of digitalized port environments globally, as well as the current contours of Singapore's digitalized port system and its plans for the future.

There are numerous reasons why digitalization is a growing imperative within the maritime field. First, competition is a key factor: digitalization allows companies and economies to provide more competitive offerings to their clients. Second, and relatedly, more and more customers are looking for digitalized processes, and the process itself increases customer engagement. Third, regulations are evolving globally, and digitalization allows companies and economies to adhere to new rules and standards more nimbly. Fourth, digitalization protects against headwinds such as economic downturns or global pandemics, allowing companies and economies to better adjust to and course correct for global events. And fifth, digitalization provides important future-proofing as the global maritime ecosystem becomes more fully digitalized.

Furthermore, digitalization provides numerous benefits in terms of innovation and business opportunities, vastly increased efficiency, shaping potential new business models, supporting international efforts to digitalize (via Single Window) port reporting requirements, and simplifying standard processes with global interoperability features.

MPA's current efforts to support and grow the digital port ecosystem within Singapore and beyond are manifold. The first element in MPA's maritime digitalization initiative was the establishment in 2020 of a Singapore maritime single window platform, known as digitalPORT@SG™. digitalPort, where PORT stands for "Portal for One-stop Regulatory Transactions," provides a single window platform for the port industry to interact with MPA and two other government agencies when providing declarations for arriving and departing vessels. This single window platform integrates the IT systems of all three agencies into one platform, and it streamlines and auto-populates 30 common data fields. The implementation of digitalPORT is estimated to have saved approximately 100,000 man-hours within the Singapore shipping industry.

Phase II of digitalPORT@SG™ is being implemented over a two-year period, with pilot trials currently underway. This phase will usher in a JIT (Just-In-Time Services) component, providing ships with a platform for pre-arrival planning of their itinerary and services needed during their time at the Port of Singapore. This information will also be communicated seamlessly, via the JIT platform, with service providers in Singapore. The goal is to be able to reduce the amount of time each ship spends at port. Phase II will also involve using AI machine learning to optimize Singapore's limited sea and anchorage space and the establishment of a digital storefront for marine services.

The second element of MPA’s digitalization initiative is known as digitalOCEANS™, where OCEANS stands for “Open/Common Exchange And Network Standardization.” A multilateral MOU for digitalOCEANS™ was signed with various industry stakeholders in November 2021, with a vision of a future in which every port is a digital port. The goal of digitalOCEANS™ is the creation of a system in which all global stakeholders can come together to standardize their data and create interoperable digitalized interfaces.

The third element of MPA’s digitalization initiative is known as digitalSHIP™, where SHIP stands for “Ship-shore Harmonization and Interoperability Plan.” The goal of this initiative is to create a system in which each ship will have a means to communicate with the shore-based system via ship-to-shore interface, which will be facilitated through international agreements on the standardization of data set measures as well as APIs. The goal is not only for the ship to be able to communicate with the shore throughout its journey—to be a smart ship—but also for all stakeholders across the supply chain to be able to talk with one another.

There are also several other key enablers of MPA’s digitalization initiative. One is the Singapore Maritime Data Hub (SG-MDH), implemented in 2019 as a data repository that supports data sharing and digital platform integration in the maritime industry. The next step for SG-MDH is the establishment of a one-stop API marketplace, called OCEANS-X, in which Singapore’s trading partners can discover the APIs available to them. Another key enabler is 5G internet service, with plans in place to set up a 5G network extending throughout Singaporean waters by mid-2025.

3.3.4 Presentation by Mr Chris CHASE

Port of Los Angeles Port Optimizer

(http://mddb.apec.org/Documents/2023/CTI/WKSP1/23_cti_wksp1_007.pdf)

Mr Chase presented on the Port of Los Angeles’s recent experiences with port digitalization. Since the Port of Los Angeles is the busiest US trade gateway, these experiences were particularly significant as they relate to the impacts of the COVID-19 pandemic and supply chain logjams during the pandemic.

The Port of Los Angeles is a landlord port, meaning that it is not taxpayer-supported, and more importantly, that the port itself does not own the port-related data. As a result of this, the port’s initial forays into digitalization needed to be developed and implemented in partnership with private industry. GE Transportation, which was subsequently merged with a company called Wabtec, used its experience with digitalization within the rail industry to help the Port of Los Angeles create a digitalization solution. That solution was the Port Optimizer, developed in 2017 as a platform that provided real-time data sharing that was accessible to designated stakeholders across the port’s supply chain.

One of the key features of the Port Optimizer is its status as a “system of systems” that fits within the existing supply chain ecosystem and enables interoperable supply chain visibility. Its cloud-based design is flexible, with a high degree of elasticity to allow for easy and rapid growth, and with functions for scalability and the incorporation of big data traffic. It draws its data from a variety of sources. The baseline data source is customs manifest data from the US Bureau of Customs and Border Protection, which is received by the port as EDI messages listing all

[Final Report] Workshop Series –
Utilizing Digital Technology in the Field of Trade Facilitation (Phase II)

US-bound cargo prior to the cargo's loading at a foreign port. From there, data is also received from all shipping lines and from each of the port's six container terminals. With this collection of data, Port Optimizer collates the information and stitches it together into a coherent portrait of the port's activity at a given moment and going forward three weeks.

With the assistance of Wabtec, the Port of Los Angeles has also utilized the Port Optimizer to create a number of products and modules based on port data. The first of those products is Track & Trace, which provides container ship locations and near-real-time updates. Track & Trace merges and standardizes multiple data sets, producing a visual timeline tracker and graphs showing volume over time with color-coded statuses. This product proved exceptionally useful during the height of the COVID-19 pandemic, when shipping growth grew by 20% almost overnight. Ships were frequently moved from terminal to terminal just to find space, and Track & Trace allowed for quick identification of these ships and their containers in an otherwise somewhat chaotic situation.

The second product based on the Port Optimizer is the Port of Los Angeles Signal and its cousin, the Port of Los Angeles Return Signal. The Signal is a daily email sent out Monday through Friday showing the entire supply chain visibility from origin port to the Port of Los Angeles, and the Signal Return is a platform that highlights the times and locations at which truckers can return empty containers to cargo terminals. The Signal provides a three-week-forward view of import volumes, detailing all cargo currently en route to the port and its location at any given time. This information was particularly valuable for businesses during the pandemic supply chain crisis. The Signal Return provides updates in real time based on containers throughout the port and is of great help to truckers.

The third product based on Port Optimizer is the Control Tower. The Control Tower provides live snapshots of turn times at all of the port's cargo terminals, updated continuously with GeoStamp data and broken down by historical averages. It also provides current and future trending volume data, as well as historical trends and volumes dating back to 2017. This data is made available to port stakeholders who register to use the Control Tower. In addition to the Control Tower, the Port of Los Angeles has also developed the Control Tower Horizon, which employs machine learning AI to predict cargo movement and trends up to six months in advance, based on the data currently in the Port Optimizer system going back to 2017.

Lastly, data from the Port Optimizer has facilitated the requirement, instituted during the COVID-19 supply chain crisis, that all US ports send weekly reports on import container dwell time to the US Department of Transportation and White House. While many of the other US ports aggregate this data by hand, the Port Optimizer allows the Port of Los Angeles to send the data via a single screen that can be produced automatically. Likewise, the Port Optimizer has also facilitated the creation of charts demonstrating export container dwell time, which has also helped with supply chain management.

3.3.5 Q&A Session

The first question was addressed by Mr Tetlow, who noted that the presentation slides from this workshop will be made available to audience members via the APEC meeting document database.

Dr Hirata was then asked, by an audience member from Canada, if she knows of any research addressing the lack of high-quality data in many customs use cases, given the significance of data quality and standard interoperable format in AI- and machine-learning-based technology solutions. Dr Hirata responded with a brief discussion of the two components of digital transformation: digitization and digitalization. Standardization is key in digitization, but achieving standardization will require industry and international bodies to determine which EDI and/or API standards they want to support. Digitalization is based mainly on AI machine learning and is providing important new tools such as OCR (optical character recognition), which allows for the conversion even of unstructured data from paper sources, which computers can reconnect.

Following from this question, Mr Koh was then asked to comment on data interoperability and data quality control from the perspective of MPA's work on these issues via the digitalOCEANS platform. In response, Mr Koh stressed the importance of working collaboratively with various international bodies to move towards data standardization. He noted that currently under the IMO (International Maritime Organization) there is a data reference model in place in terms of ship reporting requirements. Other internationally focused entities such as the IAPH (International Association of Ports and Harbors) and the DCSA (Digital Container Shipping Association) have also recognized the importance of data sharing and are making efforts toward standardizing data sets under their own auspices. Hopefully, these efforts can at some point be brought together globally to achieve standardization at the entire ecosystem level. Mr Tetlow noted that APEC can also play a role in these efforts.

Next, Mr Ogi was asked to elaborate on a case he mentioned regarding arrival date delays. The audience member from Indonesia was interested in how the shipping company informs the beneficiary company about such delays, and how Cyber Port is involved in the process. Mr Ogi explained that a cargo delay would traditionally be confirmed by phone or email to the forwarder, and from there the forwarder would have to call the relevant port or check the shipping company's website. With Cyber Port, however, information and updates on all logistics procedures are continuously accessible to the forwarder and other parties via the Cyber Port platform, so phone calls, emails, and website checking would not be necessary in this case. The forwarder would be able to confirm the arrival of the container by checking Cyber Port to see whether the 'Delivery Instruction' document has been received.

An audience member from Thailand asked Mr Chase next about how cargo ships can continue to provide Track & Trace information in the case of severe weather events. Mr Chase responded that ship location and arrival time information is provided continuously via Track & Trace even in the case of severe weather affecting the ship. The data fed to Trace & Trace comes from two different sources, depending on the ship's proximity to the Port of Los Angeles. If the ship is more than approximately four days away from the port, data from the shipping line provides information about delays and new arrival dates. As the ship gets closer to the port, it falls under a land-based vessel control system that tracks incoming ships. To receive up-to-the-minute information on a specific ship, it is possible to "hot track" the ship, which involves signing up to receive an automated message any time that adjustments are made to that ship's scheduling.

Lastly, an audience member from the Philippines asked Mr Koh whether the digitalOCEANS project would supersede other UN trade API standards such as EDIFACT in the future. Mr Koh replied that it was not meant to supersede any other standards but would be presented to international organizations such as IMO and IALA (International Association of Marine Aids to Navigation and Lighthouse Authorities) as a data set reference tool that should be part of the conversation on international standards for port call optimization.

3.4 Closing Remarks

The closing remarks were delivered by Mr Takayuki Niikura, Director of the APEC office at Japan's Ministry of Economy, Trade, and Industry (METI).

Mr Niikura thanked the panelists and participants and then briefly summarized the contents of the previous events in the series. The first and second workshops covered utilization of digital technologies by customs agencies, first by individual economies themselves and second between agencies across borders. The current workshop, the third of the series, then explored how ports can use advanced technologies like AI. Throughout the series, audience members were able to learn about the challenges, as well as the merits, in adopting digital technologies, such as interoperability between different platforms, highlighting the need for further discussion and collaboration.

This year, Japan hopes to host more workshops on trade facilitation, and Mr Niikura encouraged the audience members to suggest possible topics through the audience survey.

4 Observations & Analysis

4.1 Survey Responses

After each event, the attendees were invited to complete a post-workshop survey to provide feedback on the event, along with some personal and demographic information. The surveys help APEC to better understand the successes and pitfalls of each workshop and to make improvements going forwards. Each survey had a multiple-choice (required) and a free-form (optional response) section. The results from the multiple-choice section suggest that the attendees of all of the events were satisfied with the outcomes. The responses to the free-form prompts are also summarized below.

Survey Response Summary

	Response	
	Number	Rate
Workshop 1: Technology to Support Customs Procedures	34	43.6%
Workshop 2: Digitalizing Customs Cooperation	15	27.3%
Workshop 3: Port Digitalization for Efficient Supply Chain	37	30.8%

Survey Prompt: Workshop helped deepen my understanding of the topic

	Strongly Agree	Agree	Disagree	Strongly Disagree
Workshop 1	70.6%	23.5%	2.9%	0.0%
Workshop 2	66.7%	26.7%	6.7%	0.0%
Workshop 3	54.1%	37.8%	5.4%	2.7%

Survey Prompt: Using technologies discussed will be useful for my economy

	Strongly Agree	Agree	Disagree	Strongly Disagree
Workshop 1	82.4%	14.7%	0.0%	0.0%
Workshop 2	80.0%	20.0%	0.0%	0.0%
Workshop 3	67.6%	27.0%	2.7%	2.7%

Survey Prompt: Best practices discussed could be useful for my economy and/or organization

	Strongly Agree	Agree	Disagree	Strongly Disagree
Workshop 1	67.6%	29.4%	0.0%	0.0%
Workshop 2	53.3%	40.0%	6.7%	0.0%
Workshop 3	54.1%	37.8%	2.7%	2.7%

Survey Prompt: Workshops helped me understand relevant challenges

	Strongly Agree	Agree	Disagree	Strongly Disagree
Workshop 1	67.6%	26.5%	0.0%	0.0%
Workshop 2	53.3%	40.0%	6.7%	0.0%
Workshop 3	45.9%	43.2%	10.8%	0.0%

Survey Prompt: Presentations provided valuable insights on how challenges can be addressed

	Strongly Agree	Agree	Disagree	Strongly Disagree
Workshop 1	64.7%	29.4%	2.9%	0.0%
Workshop 2	46.7%	46.7%	6.7%	0.0%
Workshop 3	51.4%	37.8%	10.8%	0.0%

In the free-form sections, audience members were first invited to comment on what they found to be the most valuable insights they had gained from the event. Just as in the workshops that were held last year, one of the most popular answers was that attendees had learned about the advantages offered by digital technologies to economies and businesses. Many participants were convinced that they will be able to work more efficiently and increase transparency by transitioning from the current paper-based procedures in customs and ports to digitalized processes. Also important were discussions surrounding coordination between involved agencies, both domestically and internationally, as well as technological interoperability that makes such coordination possible. Others expressed their pleasure in learning about and being inspired by the efforts made in other economies.

When asked about what topics APEC might cover in related events in the future, most of the survey respondents simply showed their satisfaction with the current selection of topics. Some of these satisfied respondents even requested to see more similar workshops, showcasing success stories from economies that were not covered in the current series. Some respondents suggested that more hands-on specific use cases would be easier to understand and replicate for attendees from developing economies. Similarly, some attendees were interested in how customs authorities can be affected by and/or take advantage of advanced technologies, like blockchain, AI and ML. Others suggested that it would be useful for the attendees to learn how more specific parts of their operations can be improved with digital technologies. For example, for customs procedures, discussed in the first workshop, some audience members wondered how they can use digital technologies to detect and prevent corruption and fraud. In terms of port digitalization, discussed in the third workshop, some attendees showed interest in learning about how technologies can be used to enforce trade laws and regulations (i.e., detecting illegal import and export activities).

The surveys also invited comments on the potential next steps for APEC. Many respondents requested APEC to host similar events like the current series, both in digital and face-to-face formats, to continue the exchange of information and experiences. Others suggested that APEC can be a platform for more discussions between working level officials, not only exchanging information but also standardizing data/information formats and procedures (e.g., criteria for the expedited processing of traded goods). Quite a few attendees, especially those who attended the third workshop on port digitalization, also hoped that APEC can build and enhance the capacity among relevant officials through more research, training, and education.

4.2 Key Workshop Takeaways

This successful workshop series was filled with insightful presentations on various trade-related issues, digital solutions, and business models. The virtual audiences were constantly engaged and asked questions that facilitated some exciting back-and-forth discussions between the speakers. The workshops are summarized in detail in the previous chapters, where links to all presentation slides can also be found. This section recaps the key takeaways from the expert presentations and discussions across the event. It builds on the key takeaways from the four-workshop series held in the year 2021 under the project (CTI 07 2020T)⁶, updating the list with new perspectives and renewed priorities.

Fostering Interoperability

One of the points most commonly raised in this year's series of workshops is that truly interoperable digital systems must be a fundamental component of the realization of seamless trade within APEC. Platforms and applications must be able to facilitate cross-border exchanges of data between public and private entities, including customs authorities, shippers, banks, and more. Harmonizing data across economies is important, as well as standardizing cross-border data exchanges and data authentication procedures, especially for sanitary and phytosanitary measures. Some international data standards, such as the WCO Data Model and the United Nations Economic Commission for Europe (UNECE), are extremely helpful across many areas. However, there is no single one-size-fits-all model just yet, so there are often differences in the quality and format between related documents, such as customs declarations and commercial invoices. The establishment of shared data standards will be critical in creating true interoperability. APEC member economies need to work towards finding a way to agree on standards.

Stakeholders can make use of the latest advanced technologies, including AI and ML, to help group information appropriately. Furthermore, throughout this two-year series of workshops, the speakers emphasized that interoperability requires a commitment to collaboration on behalf of stakeholders across sectors and economies. Such commitments should emphasize the establishment of systems designed with interoperability in mind, far more efficient than retroactively altering siloed legacy systems. Therefore, economies and businesses should seek communication and consultation with other stakeholders before starting projects that could benefit from interoperability.

Best Practices for Governments to Upgrade Their Own Systems

This year's three workshops provided implications that are particularly important for governments in adopting digital technologies into their own operations, as they focused on digitalizing procedures within and collaborations between customs and port authorities, most of which operate as public entities. When it comes to upgrading government systems and processes, speakers highlighted the importance of leveraging existing

There are two components of digital transformation: digitization and digitalization. Standardization is key in digitization, but achieving standardization will require industry and international bodies to determine which EDI and/or API standards they want to support. Digitalization is based mainly on AI & ML and is providing important new tools such as OCR (optical character recognition), which allows for the digital conversion of structured and unstructured data from paper sources.

resources and starting with simple, internally developed solutions, if possible. They also recommended having policy support for the upgrade process. Additionally, how to manage new technological integrations is just as important as the technology in and of itself. Economies that successfully implemented new digital customs frameworks worked with various government agencies and trade associations to help demonstrate the benefit of the new services to stakeholders. They also created a supportive onboarding experience so that companies and technology service providers could easily access assistance as needed. In addition, they adopted cloud technologies from the beginning – an infrastructure choice that allows for easier expansion as more transactions arrive via the updated platform. It is also important to make a conscious effort to continuously develop and improve the basic layers of enabling APIs.

Importance of Government

Government agencies have a leading role in reducing risks and lowering barriers to entry (e.g., via subsidies or education) for adopters of digital technologies. Public officials are major players in securing international agreements, ensuring adherence to cross-border standards, and promoting trials that allow new solutions to scale up. Furthermore, governments are responsible for providing the requisite physical, regulatory, and social infrastructure for new digital technologies to be successfully adopted by all. Their role includes confronting barriers that impede inclusivity along the lines of identity (e.g., gender inequality in digital literacy) and that prevent MSMEs from competing fairly with larger firms (e.g., market power abuses).

Developing Trust

The invited experts regularly noted the importance of fostering trust in digital solutions among businesses and the wider population. Real and perceived risks, primarily related to cybersecurity and the soundness of financial transactions, are barriers to technologies that could transform trade across the APEC region. Moreover, business owners can be wary of investing in technological capacity if the solution providers (e.g., e-commerce and trade platforms) are not committed to the local market long-term. Through discussions among customs and port officials throughout this year's workshops, it became apparent that technological solutions themselves can help to build trust. For example, while blockchain capabilities are not always needed for all types of customs transactions, the ledger of blockchain can go a long way towards increasing trust and creating trusted sources of documentation, as with digital bills of lading and paperless trade, both of which utilize the ledger of blockchain.

As discussed in last year's workshops, adopting recognized technical standards and legal frameworks (e.g., UNCITRAL Model Laws) is critical to building confidence among stakeholders. In addition, offering products tailored to the local market and, when possible, establishing a local presence, can encourage clients to make long-term investments to facilitate the use of technologies.

Communicating and Sharing Value

Discussions throughout the series made clear that digital technologies offer several benefits to businesses, consumers, and economies, including greater efficiencies, reduced costs, and access to a broader range of goods and services. However, barriers to take-up remain, including startup costs, security concerns, and a lack of digital literacy. While each challenge has its solutions, a common

[Final Report] Workshop Series –
Utilizing Digital Technology in the Field of Trade Facilitation (Phase II)

antidote is proper communication of how users can gain from new technologies. From the previous series in 2021, the participants learned that sufficient information must be provided for consumers to weigh benefits against risks accurately. With stakeholders armed with adequate communication, the benefits will triumph more frequently. Speakers in the 2022 workshop series added that it is also critical to coordinate among stakeholders to fully adopt and utilize new technologies to facilitate more efficient and transparent trade.

Annex A: Workshop Agendas

All documents can be accessed through the APEC Meeting Document Database at the following links:

- **Workshop 1:**
http://mddb.apec.org/Documents/2022/CTI/WKSP6/22_cti_wksp6_001.pdf
- **Workshop 2:**
http://mddb.apec.org/Documents/2022/CTI/WKSP9/22_cti_wksp9_001.pdf
- **Workshop 3:**
http://mddb.apec.org/Documents/2023/CTI/WKSP1/23_cti_wksp1_001.pdf

Annex B: Speaker Biographies

All documents can be accessed through the APEC Meeting Document Database at the following links:

- **Workshop 1:**
http://mddb.apec.org/Documents/2022/CTI/WKSP6/22_cti_wksp6_001a.pdf
- **Workshop 2:**
http://mddb.apec.org/Documents/2022/CTI/WKSP9/22_cti_wksp9_001a.pdf
- **Workshop 3:**
http://mddb.apec.org/Documents/2023/CTI/WKSP1/23_cti_wksp1_002.pdf

Annex C: Presentation Materials

- **Workshop 1:**
<http://mddb.apec.org/Pages/search.aspx?setting=ListMeetingGroup&DateRange=2022/08/01%2C2022/08/end&Name=Workshop%20on%20Technology%20to%20Support%20Customs%20Procedures%202022&APECGroup=%22Committee%20on%20Trade%20and%20Investment%20%28CTI%29%22>
- **Workshop 2:**
<http://mddb.apec.org/Pages/search.aspx?setting=ListMeetingGroup&DateRange=2022/10/01%2C2022/10/end&Name=Utilizing%20Digital%20Technology%20in%20the%20Field%20of%20Trade%20Facilitation%20Under%20the%20Current%20COVID-19%20Pandemic%20and%20Beyond%3A%20Best-Practices%20Sharing%20Workshops%20%28Phase%20II%29%20%u2013%20Second%20Workshop%20on%20Digitalizing%20Customs%20Cooperation%202022&APECGroup=%22Committee%20on%20Trade%20and%20Investment%20%28CTI%29%22>
- **Workshop 3:**
<http://mddb.apec.org/Pages/search.aspx?setting=ListMeetingGroup&DateRange=2023/01/01%2C2023/01/end&Name=Utilizing%20Digital%20Technology%20in%20the%20Field%20of%20Trade%20Facilitation%20Under%20the%20Current%20COVID-19%20Pandemic%20and%20Beyond%3A%20Best-Practices%20Sharing%20Workshops%20%28Phase%20II%29%20%u2013%20Third%20Workshop%20on%20Port%20Digitalization%20for%20Efficient%20Supply%20Chains%202023&APECGroup=%22Committee%20on%20Trade%20and%20Investment%20%28CTI%29%22>

Annex D: Workshop Survey Sheets

Workshop 1

Information learned from the workshop

Instructions: Please indicate your level of agreement with the statements listed in the table below by circling the number that applies. Please feel free to leave comments to supplement your responses.

The workshop helped deepen my understanding of how digital technologies can help facilitate customs procedures.

1. Strongly Disagree 2. Disagree 3. Agree 4. Strongly Agree
Comment:

Using digital technologies to facilitate customs procedures will be beneficial for my economy.

1. Strongly Disagree 2. Disagree 3. Agree 4. Strongly Agree
Comment:

The best practices and recommendations discussed during the workshop could be effective for my economy and/or organization.

1. Strongly Disagree 2. Disagree 3. Agree 4. Strongly Agree
Comment:

The presentations helped me understand the challenges to implementing digital technologies for customs procedures.

1. Strongly Disagree 2. Disagree 3. Agree 4. Strongly Agree
Comment:

The presentations provided valuable insights on how these challenges can be addressed.

1. Strongly Disagree 2. Disagree 3. Agree 4. Strongly Agree
Comment:

Findings and suggestions

What were the most useful insights that you learned from today's workshop?

Are there any additional topics that were not covered in this workshop that you would like to see addressed in future workshops, in this series and beyond?

What further steps should APEC take to address member economy concerns on this subject?

Participant information

(Same for all four surveys. Please see page 38)

[Final Report] Workshop Series –
Utilizing Digital Technology in the Field of Trade Facilitation (Phase II)

Workshop 2

Information learned from the workshop

Instructions: Please indicate your level of agreement with the statements listed in the table below by circling the number that applies. Please feel free to leave comments to supplement your responses.

The workshop helped deepen my understanding of how customs authorities can use digital technologies to collaborate with each other across borders.

1. Strongly Disagree 2. Disagree 3. Agree 4. Strongly Agree

Comment:

Facilitating cooperation between customs authorities with digital technologies will be beneficial for my economy.

1. Strongly Disagree 2. Disagree 3. Agree 4. Strongly Agree

Comment:

The best practices and recommendations discussed during the workshop could be effective for my economy and/or organization.

1. Strongly Disagree 2. Disagree 3. Agree 4. Strongly Agree

Comment:

The presentations helped me understand the challenges for customs authorities to collaborate with counterparts in other economies via digital technologies.

1. Strongly Disagree 2. Disagree 3. Agree 4. Strongly Agree

Comment:

The presentations provided valuable insights on how these challenges can be addressed.

1. Strongly Disagree 2. Disagree 3. Agree 4. Strongly Agree

Comment:

Findings and suggestions

What were the most useful insights that you learned from today's workshop?

Are there any additional topics that were not covered in this workshop that you would like to see addressed in future workshops, in this series and beyond?

What further steps should APEC take to address member economy concerns on this subject?

Participant information

(Same for all four surveys. Please see page 38)

Workshop 3

Information learned from the workshop

Instructions: Please indicate your level of agreement with the statements listed in the table below by circling the number that applies. Please feel free to leave comments to supplement your responses.

The workshop helped deepen my understanding of how ports can use digital technologies to increase efficiency and transparency in trade.

1. Strongly Disagree 2. Disagree 3. Agree 4. Strongly Agree

Comment:

Increasing efficiency and transparency in port procedures with digital technologies will be beneficial for my economy.

1. Strongly Disagree 2. Disagree 3. Agree 4. Strongly Agree

Comment:

The best practices and recommendations discussed during the workshop could be effective for my economy and/or organization.

1. Strongly Disagree 2. Disagree 3. Agree 4. Strongly Agree

Comment:

The presentations helped me understand the challenges for port authorities to adopt and utilize digital technologies.

1. Strongly Disagree 2. Disagree 3. Agree 4. Strongly Agree

Comment:

The presentations provided valuable insights on how these challenges can be addressed.

1. Strongly Disagree 2. Disagree 3. Agree 4. Strongly Agree

Comment:

Findings and suggestions

What were the most useful insights that you learned from today's workshop?

Are there any additional topics that were not covered in this workshop that you would like to see addressed in future workshops?

What further steps should APEC take to address member economy concerns on this subject?

Participant information

(Same for all four surveys. Please see page 38)

Section that is the same for all four surveys

Participant information

Economy: _____

Organization type: (Please select one that applies from below)

Government agency	International organization (APEC, etc.)	Private company or industry organization	Educational / Research institution	Others
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

If "Others", please specify.

The following information is optional.

Name/position:

Organization name:

Email:

Gender: Male / Female / Other

Annex E: Key Acronyms

Acronym	Name
ABAC	APEC Business Advisory Council
AI	artificial intelligence
APEC	Asia-Pacific Economic Cooperation
API	application programming interface
ASEAN	Association of Southeast Asian Nations
ASYCUDA	Automated System for Customs Data
COVID-19	Coronavirus Disease 2019
CTI	Committee on Trade and Investment (APEC)
EDI	Electronic Data Interchange
EDIFACT	Electronic Data Interchange for Administration, Commerce, and Transport
IoT	Internet of Things
ML	machine learning
MSMEs	micro, small and medium-sized enterprises
NTP	Network Trade Platform (Singapore)
PECC	Pacific Economic Cooperation Council
UN	United Nations
UNCITRAL	UN Commission on International Trade Law
WCO	World Customs Organization
WTO	World Trade Organization

Annex F: References

¹ APEC CTI, (2021). Utilizing Digital Technology in the Field of Trade Facilitation under the Current COVID-19 Pandemic and Beyond: Beyond Practices Sharing Workshops. <https://www.apec.org/publications/2021/12/utilizing-digital-technology-in-the-field-of-trade-facilitation-under-the-current-covid-19-pandemic-and-beyond-beyond-practices-sharing-workshops>

² As of August 2022, the government of Canada lists 1,088 CBSA offices on its Directory. <https://open.canada.ca/data/en/dataset/1018c301-d359-4077-8d9b-4e9fbe6a223f>

³ Comment made by the OECD at the APEC Customs Business Dialogue, 2021. APEC CTI (2022), "*Analysis and Pathway for Paperless Trade Report*," <https://www.apec.org/apecapi/publication/getfile?publicationId=9214f940-8698-4b5a-9012-ab354ca8199d>

⁴ APEC CTI (2019), "Compendium of Best Practice Technology Solutions for Single Window Interoperability", <https://www.apec.org/publications/2019/11/compendium-of-best-practice-technology-solutions-for-single-window-interoperability>

⁵ EDI (Electronic Data Interchange) and EDIFACT (Electronic Data Interchange for Administration, Commerce, and Transport) are both standards which allow for the secure exchange of electronic business documents. EDI is most commonly used in the United States and North America while EDIFACT is most widely used in Europe and Asia.

⁶ The final report from that series can be read from APEC's Publication page: APEC CTI, (2021). Utilizing Digital Technology in the Field of Trade Facilitation under the Current COVID-19 Pandemic and Beyond: Beyond Practices Sharing Workshops. <https://www.apec.org/publications/2021/12/utilizing-digital-technology-in-the-field-of-trade-facilitation-under-the-current-covid-19-pandemic-and-beyond-beyond-practices-sharing-workshops>