Asia-Pacific
Economic Cooperation

Advancing Free Trade
for Asia-Pacific Prosperity

Virtual Workshop: Leveraging New Technology for Tax Administration in the Post-COVID Era

28 September 2023

APEC Finance Ministers' Process

December 2023

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Economic Cooperation

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APEC Project: FMP 01 2022A

Produced by

Ministry of Finance (Chinese Taipei)

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APEC#223-OT-04.1

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Abbreviations and Acronyms

ADB	Asian Development Bank
APEC	Asia-Pacific Economic Cooperation
APIs	Application Programming Interfaces
ATO	Australian Taxation Office
AI	Artificial Intelligence
B2B	Business-to-Business
B2C	Business-to-Consumer
CRA	Canada Revenue Agency
FIA	Fiscal Information Agency
FMP	Finance Ministers' Process
GST	Goods and Services Tax
IT	Information Technology
MOF	Ministry of Finance
NTA	National Tax Agency
NTBCA	National Taxation Bureau of the Central Area
NTBT	National Taxation Bureau of Taipei
OECD	Organisation for Economic Co-operation and Development
QR	Quick Response
RPA	Robotic Process Automation
STEM	Science, Technology, Engineering, and Mathematics
SGATAR	Study Group on Asia-Pacific Tax Administration and Research
SMEs	Small and Medium-sized Enterprises
TFN	Tax File Number
TIN	Tax Identification Number
VAT	Value-added Tax

Executive Summary

The COVID-19 pandemic has accelerated digitalization of business operations, which may present challenges to tax administration. Therefore, it is crucial to leverage new technologies for tax administration, such as digital identity, digital tax payment, big data analysis, Robotic Process Automation (RPA), Artificial Intelligence (AI), blockchain technology, etc., so as to enhance the efficiency of compliance risk analysis and investigation of tax evasion cases.

This project has conducted a virtual workshop with the objective to assist Asia-Pacific Economic Cooperation (APEC) economies in capacity building through sharing policies and practices regarding leveraging new technologies for tax administration. The workshop has assisted participants in increasing knowledge and identifying best practices of how emerging technologies have improved the efficiency and effectiveness of tax administration in different tax categories.

Ms. Pi-Lien Ding, Director General of the Department of International Fiscal Affairs, Ministry of Finance (MOF) (Chinese Taipei), delivered the opening remarks. She stated that it will be important for tax authorities to consider introducing new technologies into tax investigations to correspond to the fast-changing environment. By applying new technologies, tax authorities can evaluate taxpayers' compliance more efficiently and detect potential tax avoidance and evasion cases more effectively.

Afterwards, Ms. Yi-Chun Chen, Revenue Officer, National Taxation Bureau of Taipei (NTBT), MOF (Chinese Taipei), made a presentation titled “Outcome of the ex-ante survey on Leveraging New Technology for Tax Administration in the Post-COVID Era.” She pointed out that regarding the opinions of applying emerging technologies, 93% of respondents highly agreed with the following points: 1) the importance of applying technologies for tax administration; 2) constructing and training AI is a long-term process; 3) applying new technologies can improve work efficiency; and 4) their economies have already adopted new technologies or will adopt them in the next five years.

In Session 1, Dr. Esther A.P. Koisin, Chair of the Study Group on Asia-Pacific Tax Administration and Research (SGATAR) Taskforce, moderated this session

focusing on the importance of new technology in tax administration, emphasizing its role in enhancing efficiency, accuracy, compliance, transparency, and cost reduction for tax authorities. The first speaker, Dr. Richard Stern, Senior Consultant at the Asian Development Bank (ADB), opened the first session with an insightful presentation titled “Tax Administration of the Future: what is here, what to expect.” The second speaker, Dr. Wen-Hsi Chang, Director General of the Fiscal Information Agency (FIA), MOF (Chinese Taipei), delivered an engaging presentation titled "Blueprint of Leveraging New Technology for Tax Administration.”

As for Session 2, Mr. Silvano Tocchi, Assistant Commissioner and Digital Transformation Officer, Canada Revenue Agency (CRA), was the moderator. Essentially, the objective of this session was to identify new technologies that may enhance the collection or administration of income tax. The first speaker, Mrs. Elissa Walker, Chief Digital Officer and Deputy Commissioner for Digital Delivery, Australian Taxation Office (ATO), made the presentation titled “Australian Taxation Office Digitalization of Taxation Processes.” The second speaker was Mr. Hidetaka Ota, Deputy Director of International Operations Division, Commissioner’s Secretariat, National Tax Agency (NTA) of Japan. Mr. Ota’s presentation was titled “Digital Transformation of Tax Administration in Japan–Future Vision of Tax Administration.”

With regard to Session 3, Dr. Richard Stern, Senior Consultant, ADB, served as the moderator. In this session, speakers and participants would discuss current strategies and obstacles in the Value-added Tax (VAT) or Goods and Services Tax (GST) collection and administration, and further explore the integration of new technologies to enhance these processes. The first speaker, Ms. Saowakon Meesang, Director of Tax Policy and Planning Division, the Revenue Department, MOF of Thailand, made a presentation titled “Application of New Technology on VAT Administration in Thailand.” The second speaker, Ms. Ling-Chia Chang, Revenue Officer, National Taxation Bureau of the Central Area (NTBCA), MOF (Chinese Taipei), made a presentation titled “Adopting AI in Case Examination Selection System for VAT: Analysis of Transaction Network among Business Entities.”

The closing remarks were made by Ms. Pi-Lien Ding, Director General, Department of International Fiscal Affairs, MOF (Chinese Taipei). She took this opportunity to thank the APEC Secretariat, the moderators, the speakers, and

all the participants, as their participation and contribution were significant and made the workshop successful. In addition, she believed that after the discussions, all the participants had increased their comprehension about the trend and benefits of applying new technologies to tax administration. Although each economy had its unique situation and would face many different challenges in terms of making and implementing relevant policies, she hoped that with the assistance of international organizations and the close collaboration with each other, APEC economies may maintain their fiscal revenues, enhance domestic resource mobilization, and promote inclusive and sustainable growth. She also anticipated that APEC economies will continue to promote equal gender participation in this field.

Introduction

The COVID-19 pandemic has accelerated digitalization of business operations, which may present challenges to tax administration and thereby worsen the fiscal situation of APEC economies, especially after implementing unprecedented fiscal policies over the past few years. In most jurisdictions, taxes are literally the main source of fiscal revenues. In order to sustain fiscal revenues to support inclusive and sustainable recovery, it is crucial to leverage new technologies for tax administration, such as digital identity, digital tax payment, big data analysis, RPA, AI, blockchain technology, etc., so as to enhance the efficiency of compliance risk analysis and investigation of tax evasion cases. Thus this project has been developed, in order to build the APEC economies' capacity to leverage new technologies for tax administration.

Background

This project has contributed to the implementation of the economic drivers "Innovation and Digitalization" and "Strong, Balanced, Secure, Sustainable and Inclusive Growth" under APEC Putrajaya Vision 2040, as well as "digitalization for digital economy" under the 2022 priorities of the Finance Ministers' Process (FMP). Specifically, it seeks to assist APEC economies to sustain fiscal revenues by adopting emerging technologies for tax administration. APEC economies will be able to promote sound fiscal policies that are calibrated to combat the negative impact resulting from the COVID-19 pandemic and support an inclusive and sustainable recovery. In addition, this may also provide the ability in administrating taxation in a way that traditional tax audit techniques would typically fail or find hard to achieve so as to increase tax compliance and would therefore help address the issue of illicit financial flows.

Therefore, this project has conducted a virtual workshop with the objective to assist APEC economies in capacity building through sharing policies and practices regarding leveraging new technologies for tax administration. The target participants include tax revenue officers, Information Technology (IT) programmers, and policy makers of APEC economies. This project, as a platform, has assisted participants in increasing knowledge and identifying best practices of how emerging technologies have improved the efficiency and effectiveness of tax administration in direct and indirect taxes, and has further

explored the possibility of applying approaches beyond the tax administration field.

The virtual workshop was attended by 13 APEC economies and the ADB. A total of 117 participants were in attendance which consisted of 69 females and 48 males. It can be inferred that the aim to have a balanced gender representation has been achieved.

Workshop Summary

1. Opening Remarks

Ms. Pi-Lien Ding, Director General of the Department of International Fiscal Affairs, MOF (Chinese Taipei), delivered the opening remarks. She stated that she was honored to welcome all the participants to the virtual workshop. Following the greetings, Ms. Ding stated that it was fortunate that the pandemic was gradually receding, but two phenomena emerged alongside it since 2020. First, the pandemic surge accelerated digitalization of people's daily lives in various aspects, presenting both challenges and opportunities for tax authorities. Second, containment measures and economic stimulus packages implemented during the pandemic have worsened fiscal situations with budget deficits and public debt.

She further mentioned that given the recovery from the pandemic was well underway, it will be necessary to reconsider relevant fiscal and tax policies from the perspective of sustaining tax revenues to support inclusive and sustainable growth. To this end, it will be important for tax authorities to consider introducing new technologies into tax investigations to correspond to the fast-changing environment. By applying new technologies, tax authorities can evaluate taxpayers' compliance more efficiently and detect potential tax avoidance and evasion cases more effectively.

Ms. Ding then briefly introduced the agenda of the virtual workshop. She then introduced that her colleague would present the results of the ex-ante survey, providing an overview of the current status and expectations related to today's main topic in the APEC region. Moreover, she stated that there would be three sessions. The first session would be an overview of how new technologies applied to tax administration. Ms. Ding also related that in most economies, both direct and indirect taxes formed the main source of fiscal revenues. Thus the second and third sessions would give some illustrations on the application of new technologies in income tax, as well as in VAT or GST.

2. Introduction of the ex-ante survey result

Ms. Yi-Chun Chen, Revenue Officer, NTBT, MOF (Chinese Taipei), made a presentation titled “Outcome of the ex-ante survey on Leveraging New Technology for Tax Administration in the Post-COVID Era.” She stated that her presentation included the following areas: 1) basic information of the respondents; 2) their experiences in applying new technologies for tax administration; 3) their opinions on the basic requirements that were needed for successfully adopting new technologies; and 4) their findings regarding gender equality in their economies.

Basic Information of the Respondents

Regarding the basic information, 15 responses from 12 economies were collected, in which 11 respondents were from the tax administration. Two respondents were from the policy office. One respondent was from the IT department and one was from the customs administration. As for the experiences in applying new technologies for tax administration, about 90% of respondents believed that their economies were currently applying new technologies for tax administration. For specific types, 100% had used E-filling and electronic tax payment; over 70% had utilized big data analysis and digital identity verification; and 50% had adopted RPA and AI services.

Experiences in Applying New Technologies for Tax Administration

With respect to the opinions of applying emerging technologies, 93% of respondents highly agreed with the following points: 1) the importance of applying technologies for tax administration; 2) constructing and training AI is a long-term process; 3) applying new technologies can improve work efficiency; and 4) their economies have already adopted new technologies or will adopt them in the next five years. Furthermore, 86.7% of the respondents agreed that: “We should have a comprehensive understanding of the limitations and utilities of the technology before adopting it.”

Opinions on the Basic Requirements

On the subject of respondents’ opinions on the basic requirements that were needed for successfully adopting new technologies, Ms. Chen showed in her presentation the top five requirements from the responses, among which the top three of the five were as follows: 100% of the respondents considered that “Establishing active atmosphere and culture within an organization” is very

important; more than 90% agreed that “Prospective planning in government policy” and “Adequate confidentiality and data safeguards” are equally crucial. On the other hand, when the respondents were asked about the most urgent requirements for their economies, the results were different from the previous ones. The top three responses changed to “Readiness in digital environment in both software and hardware,” “Sufficient budgets,” and “Establishing active atmosphere and culture within an organization.”

The survey also asked respondents about the necessary conditions before officially adopting a certain new technology. Ms. Chen presented that around 90% believed that the conditions are “Understanding the new technology to be applied,” “Identifying the problems to be solved,” and “Equipping digital environment for applying such new technology.” Other necessary conditions chosen were “Interdepartmental collaboration between administrative sections and IT departments” and “Equipped with necessary database.” Nevertheless, followed by the previous question, when asking the respondents to choose only two necessary conditions to successfully implement a certain new technology, the top two answers chosen by 53% of the respondents were “Identifying the problems to be solved” and “Equipping digital environment for applying such new technology.” Furthermore, more than 90% agreed that when adopting a new technology, “Adequate confidentiality and data safeguards” can improve the business continuity management of an organization as well as increase public trust.

Findings Regarding Gender Equality

Ms. Chen stated that the purpose of this part was to understand the gender participation rate in applying new technologies for tax administration in the respondents’ economies. She mentioned that 46.7% of the respondents replied that the gender participation in their economies was balanced. However, 26.7% expressed that women participated at a rate higher than men, while another 26.7% expressed the opposite. In addition, Ms. Chen indicated that the APEC has been promoting women’s participation in the fields of Science, Technology, Engineering, and Mathematics (STEM), which was related to the theme of this virtual workshop. She further elaborated that to effectively promote women to apply new technologies for tax administration, the top two agreed methods were “Providing sufficient and equitable training opportunities” and “Ensuring equal opportunities for women to develop and to be promoted in STEM career fields.”

Moreover, Ms. Chen related that the survey collected some experiences about women successfully participating in STEM fields. Some respondents mentioned that in their economies, female employees were serving as data scientists and business analysts in which they were using data or machine learning for improving efficiency in tax administration. One economy's project and changing management team in charge of the online tax administration system were all powered by women. It was evident that women can act as team leaders to handle big data and application of predictive algorithms. It was also worthy to note that some economies had strong policies to support the education and employment of women in STEM fields.

3. Session 1: Overview - new technology for tax administration

Dr. Esther A.P. Koisin, Chair of the SGATAR Taskforce, moderated this session focusing on the importance of new technology in tax administration, emphasizing its role in enhancing efficiency, accuracy, compliance, transparency, and cost reduction for tax authorities. She highlighted that this digital transformation benefits both tax authorities and taxpayers by improving the overall effectiveness and user-friendliness of the tax system. The COVID-19 pandemic had accelerated the adoption of these technologies, prompting policymakers to recognize their significance. This session aimed to provide an overview of post-COVID-19 tax administration technology adoption, with two speakers taking the floor following the introduction by Dr. Koisin.

Dr. Richard Stern, Senior Consultant, ADB
"Tax Administration of the Future: what is here, what to expect"

Dr. Richard Stern, Senior Consultant at the ADB, opened the first session with an insightful presentation titled "Tax Administration of the Future: what is here, what to expect." In the beginning part of his address, he underscored the profound impact of the COVID-19 pandemic as an accelerant for digital transformation among tax authorities worldwide. The swift transition to digitalization vividly exemplified the potential benefits that arise when tax authorities wholeheartedly embrace technology and foster an environment that encourages their workforce to explore innovative strategies and approaches.

Dr. Stern emphasized that in the pre-COVID-19 era, many organizations tended to prioritize immediate operational needs at the expense of long-term benefits, resulting in the emergence of silos and impediments to seamless technology integration. However, the pandemic served as a stark reminder of the importance of strategic technology investments, particularly in facilitating remote work and enhancing digital services. It underscored the imperative of dismantling these silos and modernizing regulatory processes. Significant catalytic changes had subsequently reshaped the landscape of government operations and service delivery, largely driven by technological advancements. These changes not only improved citizen interaction and enabled remote work within government agencies but also addressed the pressing need for sustainable revenue generation.

Tax Administration in the Future

To seize this unique opportunity, Dr. Stern asserted that tax authorities must actively foster innovation, swiftly adapt regulations to the evolving technological landscape, deploy cutting-edge technologies, and promote skill development alongside adaptable working practices among their personnel. By doing so, they can significantly enhance their effectiveness and responsiveness, enabling them to better meet the ever-changing needs of their constituents.

He emphasized that digitalization was now an indispensable tool for revenue generation, and the COVID-19 pandemic had acted as a catalyst in hastening its widespread adoption. According to him, tax authorities were increasingly compelled to modernize their operations by integrating digital technology, a move that promised several significant advantages. These benefits encompassed enhanced tax collection and improved compliance, cost reduction through automation, mitigation of risks related to revenue leakage and corruption, timely and precise data provision to support decision-making, and the expansion of the tax base through the formalization of businesses.

However, he also mentioned that embarking on this digital transformation journey was not without its challenges. Tax authorities must grapple with concerns such as securing budget allocations for the replacement of legacy IT systems and investing in staff training. Additionally, there was a pressing need for effective coordination among various departments, unwavering political support, and the establishment of robust monitoring and supervision mechanisms to ensure the successful execution of this transformative agenda.

What a Digital Tax Administration Can Do in Practice

Dr. Stern further highlighted the potential of a digital tax administration to usher in a series of transformative improvements in practice. To begin with, it can substantially enhance speed and efficiency by digitizing various data collection processes, encompassing filing, matching, filtering, and risk assessment. Moreover, it had the capacity to fortify tax administration precision by amplifying the volume and diversity of data sources, thereby enabling the creation of more precise taxpayer profiles using data fabrics. Additionally, it can elevate risk assessment and audit selection through the integration of predictive technologies and artificial intelligence. Besides, it was poised to fortify taxpayer services by providing round-the-clock connectivity, inclusive of interactive chatbots and access to smart documents. Beyond that, it introduced innovative tools to tackle persistent challenges such as non-compliance, the shadow economy, and transfer mis-pricing, marking the dawn of a new era in tax administration capabilities.

He underscored the complexity of transitioning to a digital tax administration, describing it as a multi-step journey. This journey began with the existing baseline and advanced through a transformation process marked by several pivotal elements. These elements encompassed process adjustments, changes in legislation, skill upgrades within the workforce, improvements to foundational systems, technological advancements, and the incorporation of new data sources and their expanded utility. Collectively, these phases culminated in the realization of what can be referred to as the “new tax administration.”

He stated that digitization served as a potent catalyst for tax administration, significantly enhancing their efficiency in tax assessment and collection. This transformation involved converting analog or physical information into digital formats, allowing for real-time or near-real-time transmission. The comprehensive digitization effort encompassed various aspects of tax authorities’ operations, including digital transaction tracking, secure management of taxpayer data, streamlined monitoring of commercial activities, digital payment data utilization, historical data preservation for trend analysis, electronic tax compliance reporting, remote enrollment options, and support services. With regard to services for taxpayers, the digitization effort also involved issuing e-invoices, using digital accounting registers, online

declaration submissions and payments to reduce paperwork, as well as conducting electronic reviews and audits for improved accuracy and efficiency.

He offered that tax digitization had brought about a significant transformation in tax administration, offering a range of benefits and improvements. This included the introduction of e-invoicing tools and a free e-invoicing platform, enhancing invoice management and reducing costs. Taxpayer services were improved substantially, with attention to data-based needs and a shift to online services. Tax intelligence was elevated through automated VAT refunds and risk detection, while an integrated risk platform aids in focused audits. Effective communication was facilitated via a complaint management platform, training solutions, and digital obligations micro sites. The solution suite encompassed a free e-accounting solution, streamlined payroll data reconciliation, prefilled tax returns, and online monthly payments, collectively promoting efficiency and transparency in tax administration.

He presented an end-to-end tax administration cycle which involved several stages. Registration was streamlined using smart portals, mobile apps, and data integration tools. Assessment benefits from e-filing, online payments, and e-accounting systems, simplifying tax calculation and submission. Auditing included e-audit techniques, data matching, and case management for better oversight. Enforcement was improved with predictive modeling, automated mechanisms, and cross-border tax collection. Objections were addressed through structured appeals workflows, a single taxpayer file, and multi-channel communication for dispute resolution and taxpayer-tax authority interaction.

In summary, digitization empowered tax authorities to modernize processes, enhanced service quality, and optimized revenue collection in the contemporary digital age, marking a fundamental transformation of global tax systems.

Tackling the Shadow Economy

Dr. Stern offered that addressing shadow economy challenges through technology involved the following four categories of solutions: 1) Digital transformation building blocks and technologies, such as adopting mandatory Tax Identification Numbers (TINs), integrating data sources with data fabrics, employing blockchain-based Application Programming Interfaces (APIs) for data sharing, and modernizing legacy systems. 2) Expanding the data net, in the forms of introducing data collection standards, automation from financial

institutions and electronic payments, promoting e-invoicing and utilizing tools like chatbots, prefilled returns, and electronic registration to boost taxpayer compliance. 3) Techniques and processes, which aimed to employ AI for dynamic profiling and behavioral insights to enhance targeted taxpayer communication via electronic apps and consider non-final withholding tax in sectors like construction. 4) Reforming instrument, containing reforming instruments by imposing taxes at the partnership level and introducing turnover-based taxes for micro-businesses and Small and Medium-sized Enterprises (SMEs) to tackle shadow economy issues.

In conclusion, Dr. Stern emphasized that leveraging technology solutions to address tax administration challenges represented the future path forward, especially for longstanding issues that had resisted conventional solutions. The initial conditions in a jurisdiction significantly influenced the journey and decision-making process, particularly in terms of adapting or utilizing legacy technology. When contemplating the adoption of an end-state technology, careful consideration of the implementation process was essential. To ensure success, jurisdictions can benefit from a thorough assessment of their building blocks, ensuring that all necessary foundations were in place. Ultimately, digitization became a more compelling choice when the problems facing by a tax authority can be effectively addressed or resolved through technological solutions, marking a shift towards a more efficient and innovative approach.

Questions and Answers

Dr. Koisin stated that Dr. Stern had mentioned there was a need for tax authorities to improve on compliance through the use of technology, so as to increase revenues. Dr. Koisin further related that one tool was e-invoicing and hoped that Dr. Stern could elaborate on whether or not e-invoicing itself can capture compliance issues even in the shadow economy. Dr. Koisin further indicated that tax authorities often face challenges in bringing the shadow economy into the formal tax system. Therefore, she also invited Dr. Stern to explain if there was any help that the ADB could provide for developing economies.

Dr. Stern conveyed that e-invoicing was only one of the solutions. In order to enable e-invoicing, it would be important to have unique tax identifiers, data matching and data filtering ability. Dr. Stern further explained that a mistake governments often make is looking for technological solutions before

considering the condition of the infrastructure and the environment. He suggested that a tax administration needed to have a holistic plan before using the technological support. In addition, Dr. Stern mentioned that the ADB can assist economies to do a vision setting exercise through figuring out the baseline and then building an implementation plan. Furthermore, the ADB could assist with determining the technology, human resources, and procurement for transforming a digital tax administration.

Dr. Wen-Hsi Chang, Director General of the FIA, MOF (Chinese Taipei)
"Blueprint of Leveraging New Technology for Tax Administration"

Subsequently, Dr. Wen-Hsi Chang, Director General of the FIA, MOF (Chinese Taipei), delivered an engaging presentation titled "Blueprint of Leveraging New Technology for Tax Administration." During his address, Dr. Chang emphasized the profound impact of the COVID-19 pandemic as a catalyst for expediting digital transformation across various sectors, including tax information systems.

In his presentation, Dr. Chang shared valuable insights into the FIA's visionary approach to incorporating cutting-edge technologies. He elaborated on the FIA's strategies, challenges faced, and noteworthy achievements, all while charting a course towards embracing digital transformation.

Digitalization of Tax Administration

Dr. Chang underscored the noticeable surge in demands for the digitalization of tax administration, largely spurred by the COVID-19 pandemic. This shift had necessitated tax officers to adapt to remote work conditions, often contending with constrained human resources at physical service counters. In response to people's increasing preference for minimal human interaction, the FIA had been compelled to explore avenues for enhancing the efficiency and effectiveness of tax administration. The FIA's focus was twofold: first, to streamline operations for greater efficiency and effectiveness, and second, to expand its online and mobile service offerings with an eye toward optimizing operational costs.

Dr. Chang proceeded to introduce the blueprint for tax digital transformation, which stood on three fundamental pillars: hyper-automation, integrated AI support tools, and mobile tax services. In pursuit of this transformation, the FIA had harnessed RPA to establish an uninterrupted, 24/7 operational environment.

This was further fortified with various detection models, utilizing machine learning techniques to identify suspicious tax avoidance behavior.

Additionally, the FIA had pioneered the development of mobile tax functionalities, offering a contactless service option, eliminating the need for physical visits to service counters during the pandemic. Dr. Chang emphasized that RPA significantly streamlined manual processes, while mobile services ensured that tax information remained accessible irrespective of one's location. Intelligent chatbots had also been integrated into the system, serving the dual purpose of providing technical support and delivering customer services to taxpayers.

Dr. Chang articulated that the adoption of new technology necessitated an increased allocation of IT human resources. As a response, the FIA established a dedicated AI team, notable for its commitment to gender equality, with over half of its members being female. This diverse team, comprised of tax officers, data scientists, and programmers, played an indispensable and pivotal role in the development of AI applications.

With regard to the well preparation for digital transformation, the FIA recognized the need for on-the-job training to benefit its staff with the skills required to adopt and use new technologies effectively, and workshops were organized to facilitate knowledge sharing and the creation of useful tools and applications for tax officers. Given the critical importance of cybersecurity and personal information protection, the FIA ensured that all new technologies adhered to the principles of safeguarding all personal information when implementing in data cleansing, data analytics, and application development to mitigate potential risks.

From RPA to Hyper-automation

During the pandemic, tax authorities needed to operate without interruption despite social distancing measures. Therefore, the FIA implemented RPA or 24/7 tax services to streamline tax administration processes. Over 100 RPAs have been deployed since the pandemic, facilitating cross-application processes and reducing labor-intensive tasks. The redesign of task processes prioritized the automation of machinable processes. Dr. Chang believed that the FIA would continue to develop RPAs and integrate AI modules into them to enhance adaptability in the event of another crisis similar to the pandemic.

Mobile tax services were one of the aforementioned three pillar directions. Dr. Chang stated that the pandemic increased the importance of mobile tax services, with over 32% of taxpayers preferring to use these services for filing taxes. The FIA will expand its range of mobile applications to meet this growing demand in the post-pandemic era.

Dr. Chang further indicated that data governance was the key to develop new applications. A data governance system was helpful in preparing the data needed. A robust data governance system consisted of three layers: data layer, service layer, and user layer. The data layer was the foundation of preparing data analysis which was the most time-consuming process, accounting for over 80% of working hours. In the service layer, the FIA used data modeling to determine the most suitable algorithms for specific issues. As for the user layer, user experience was the most important consideration.

Foundation of AI

In terms of establishing the foundation of utilizing AI, the first step was to have policy supports and to make relevant preparations accordingly. The FIA thus categorized its main AI work into four parts: data collection, developing intelligent customer services, setting up a data science workshop, and consolidating task management. Dr. Chang stated that acquiring data from external government bodies or departments was both necessary and difficult. He also emphasized the importance of teamwork as any AI job would not be completed by any individuals alone. Dr. Chang also found that the more applications or infrastructure implemented in the system, the more complicated the management, and thus the FIA dismantled an AI project into different tasks as management units for easier control.

Dr. Chang introduced the workflow of AI implementation, which he also emphasized the selected algorithm would impact the results. The workflow consisted of four phases: problem identification, information gathering, alternatives evaluation, and detection model construction. He also mentioned that auditing fraudulent or abnormal behavior through manual inspection was very labor-intensive in the past. Once the FIA used AI techniques to cluster types of trading behavior and graph theory to trace trading logs through e-services, the FIA could depict their relationship explicitly.

As data science was to analyze the FIA's data through AI, the FIA thus created a universal AI platform, which was more user-friendly for its staff to use in practice. In Dr. Chang's speech, the AI platform provided a collaborative environment to conduct content de-identification, preventing possible breaches of personal sensitive information.

Green Strategy

To meet the goal of Environmental, Social, and Governance (ESG), Dr. Chang mentioned that the FIA planned to move some data and applications to public clouds, where the clouds incorporated green concepts into digital transformation efforts for energy saving and reduced infrastructure investments. Moreover, providing public cloud services could offer significant benefits, such as cost reduction, data security, and scalability. Therefore, the FIA started to consider migrating legacy applications from mainframes and backing up data in the cloud instead. He also emphasized that the FIA strived to reduce the potential risks by enhancing data encryption to ensure data security during storage and transmission. Also, the FIA will start rewriting the core program by new programming languages.

In conclusion, the FIA has a vision to create a data-driven environment of new technology to meet the demands of the post-pandemic era, which would optimize operating costs and eventually improve efficiency and effectiveness, as well as save much more time in tax administration. Additionally, the FIA would improve its tax services to be more customer-centric and more accessible to taxpayers, and this required successful on-the-job training for its staff. As digitalization became increasingly prevalent post pandemic, it was imperative for tax administration to proactively adopt new technologies to enhance its service delivery.

Questions and Answers

After Dr. Chang had finished his presentation, Dr. Koisin referred that the FIA had its own training courses provided to its staff, and asked: How did the FIA provide this kind of training courses? Were they provided through outsourcing or in-house training? Dr. Chang answered that the FIA recruited many individuals who were interested in the field of AI. The training course was an in-house program which he believed would be the best way to meet the needs of the FIA. In addition, Dr. Koisin asked: Is it possible to have an exchange of experience and a training program? Dr. Chang welcomed interested economies

to join the training program in the future. Moreover, Dr. Chang stated that a training program can be developed to teach the AI concepts.

Questions raised by the audience: What further new technologies does Dr. Chang believe revenue agencies will be able to use in future to reduce the cost of managing tax compliance in the shadow economy? For example, can AI enhance the cleansing, organization, management, and interpretation of very large data sets? Dr. Chang replied that shadow economy detection was not easy, but the FIA used web crawling to analyze their behavior. Different resources were collected for constructing the detection model. It was better than without any measures. For example, the FIA had constructed an experimental model to depict internet celebrity revenues.

A comment was made by the audience that he currently works with an additive data model that compared collated transaction estimates with business' reported transactions. The big issue was the volume of irrelevant data that was being fed into the model. Issues of relevance made it difficult to get the full productivity benefits from the model. Dr. Chang replied that he totally agreed. That was why they set up a governance system for filtering irrelevant data at the very beginning: Remove redundant data and normalize it, as that can speed up modeling processes.

4. Session 2: New technology considered for assisting the collection/administration of Income Tax

Mr. Silvano Tocchi, Assistant Commissioner and Digital Transformation Officer, CRA, moderated the second session. Mr. Tocchi introduced the two speakers, Mrs. Elissa Walker from the ATO and Mr. Hidetaka Ota from Japan's NTA. Mr. Tocchi related that the experiences of Australia and Japan would be presented. Essentially, the objective of this session was to identify new technologies that may enhance the collection or administration of income tax.

Mrs. Elissa Walker, Chief Digital Officer and Deputy Commissioner for Digital Delivery, ATO
"Australian Taxation Office Digitalization of Taxation Processes"

Mrs. Elissa Walker, Chief Digital Officer and Deputy Commissioner for Digital

Delivery, ATO, made the presentation titled “Australian Taxation Office Digitalization of Taxation Processes.” She mentioned that the ATO is a large organization with around 20,300 employees. In 2022, it collected a net revenue of AUD515 billion. The ATO serves a diverse range of clients, including individuals, small businesses, employers, and super funds. For example, there are 14.3 million individual income tax returns filed annually.

ATO Digital Transformation Journey

Mrs. Walker stated that the ATO was committed to becoming a leading tax and registry administration known for its contemporary service, expertise, and integrity. To achieve this, the ATO took into consideration the government's overall digital strategy, collaborated closely with other government services, and shared data to jointly establish a platform for digital identities. Additionally, the ATO acknowledged its global influence and invested significant efforts in initiatives such as the Organisation for Economic Co-operation and Development (OECD) Tax administration 3.0. It also worked closely with ecosystem partners, such as digital service providers, to drive advancements in technology and data.

With regard to the ATO’s digital transformation journey, as of June 2023, about 14 million individuals had linked with the ATO online, with 97% of individual tax returns being lodged online. About 6 million individuals used “myTax” to prefill and lodge their tax returns. A further 4.4 million people utilized the ATO mobile app.

During the OECD tax administration 1.0 era, Mrs. Walker stated that digitalization and automation were limited. Tax events, reporting, and payments were separate and required manual handling. Today, the ATO was gradually transitioning from tax administration 2.0 to 3.0. It aimed to better leverage digital identity and made more efficient use of data. Take “single touch payroll” as an example, in the past, paper forms were inefficient and costly. While electronic forms had some degree of digitization, they were still based on a cyclical reporting regime and prone to errors. Now, employers can use their payroll software to transfer all information to the ATO system when employees were paid, whether that was fortnightly, monthly, or weekly. This allowed for a more seamless integration of services for those providing and using the services.

ATO Digital Strategy 2022-25

The ATO introduced a digital strategy with the goal of achieving full digitalization by 2030. The strategy comprised four pillars. The first pillar aimed to evolve digital maturity to effectively invest in the right technologies and platforms. The second pillar aimed to leverage the right digital platforms. The third pillar aimed to provide an optimized user experience, emphasizing upgrades not only for clients but also for tools, applications, and systems used by the staff of the ATO, which was a key part of digitalizing services. The final pillar aimed to establish connected and trusted ecosystems with partners, especially in areas like identity verification and fraud prevention. Additionally, under these four pillars, there was a shared focus on four key enablers: data and analytics, technology, law and policy, as well as cybersecurity.

She also related that law and policy were particularly important for streamlining and leveraging existing resources to enable more rapid and efficient tax management. The establishment of digital identities was a cornerstone of realizing the digital vision. The ATO allowed individuals to verify their identity through identity documents or through technology on mobile applications, ensuring that they were real persons, while also verifying their faces against the Australian passport database.

Mrs. Walker further stated that there were five principles that supported the ATO's digital strategy, aimed at fostering a digital culture within the organization and encouraging a rethinking of how things were done in a digital way. These principles included “design for the user,” “imagine the possible,” “leverage natural systems,” “sustainable digitalization and benefits,” and “integrity by design.” They were intended to create an environment where interactions can be easily facilitated through digital devices anywhere and anytime. In addition, to achieve sustainability, it was crucial to detect potential issues in a timely manner using data and to prevent problems from occurring, rather than discovering them only after fraud had taken place.

Enabling Digitalization through technology

To enable digitalization through technology, the ATO continued to evolve towards the digital strategy, as it was essential to understand the technological drivers of change, the growing needs and expectations of clients and partners, and how technology can help provide the right digital solutions. The ATO not only provided applications but also employed technology to deliver common

services that supported and protected these applications. This included enhancing data utilization and sharing, improving security, enhancing system resilience, and optimizing platform performance. The ATO also faced challenges that were common in digitalization efforts, such as budget and capability constraints that required continuous resolution.

The ATO made tax filing and management easier through four channels: “identity and integrity,” “seamless online experiences,” “integrate with natural systems,” and “client and staff digital assistance,” along with various key platform capabilities. Among these channels, “identity and integrity” was particularly crucial because trust in online logins was essential for individuals to have the willingness to manage their taxes online. The ATO relied on technologies such as voice biometrics, cloud authentication, Relationship Authorization Manager (RAM), and government digital identity platforms like “myGovID” for this purpose. In the past, applying for a Tax File Number (TFN) required a physical visit and a 28-day wait to obtain the number. With a strong digital identity, people can now apply online and receive the TFN immediately. This was an example illustrating the importance of digital identity in service delivery.

The ATO online services were designed with strong accessibility and usability standards, allowing users to access them from anywhere, at any time, and on any device. With the use of myGovID, the available operations had expanded to around 100. Operations that were previously only possible over the phone, such as setting up payment plans, can now be completed online. Specifically, if an individual had debts, the system checks if it met certain criteria, and if so, can set up their own payment plan online.

The “MyTax” service allowed taxpayers to submit their tax returns at any time, on any device. It can be accessed through myGovID and the ATO application. MyTax underwent annual upgrades to improve functionality and enhance usability. It came with many pre-filled features, making it easy for individuals to complete simple tax returns. Their income information, bank interest, dividends from the stock exchange, and more can all be pre-filled, making it easier for them to comply with regulations. Besides using tax agents, an increasing number of people were using this online service for tax filing.

The “ATO mobile application” has been in existence for a decade, and its features have continued to expand over time. Today, individuals can easily check the latest payment information and see if their employers had paid taxes on time. If they wanted to perform more complex tasks, they can seamlessly link to online services. Improvements in the application enabled the ATO to have the foundation for providing new features and a more integrated, seamless experience in the future. It was expected that in the future, there will be more two-way interactions through features like native payments, secure messages, virtual assistant, and more.

Questions and Answers

Mr. Tocchi stated that the ATO digital platform Mrs. Walker described really resonated with him. He asked Mrs. Walker to talk a little about the kinds of consultations or engagement with technology experts outside of the ATO to pull together the roadmap and framework she presented. Mrs. Walker stated that with their digital strategy, there was a lot of engagement within the ATO. Digital strategy was not a technology document in itself. It needed to fit in with business colleagues in what they wanted to do in the future. In terms of engaging with technology experts, they had a good group of people within the ATO. They also leaned heavily on service providers who were helping them with some of the projects and bringing global expertise.

A question was raised by a participant which was about the relationship between technology and the legal framework. The participant wanted to know if laws proceeded the technology or technology informed the development of laws. What is Mrs. Walker’s experience with the tension between the two factors? Mrs. Walker answered that it was a bit of both. There were new technologies that were within the existing laws and can improve a new service or the way the call centers operated. In addition, the development of an app did not require law. However, there were other things that needed law change and policy change. Moreover, when less tax specific laws were added, such as privacy acts and data sharing laws, things became more complicated. In addition, the joining up of services across agencies increase the complication.

Mr. Hidetaka Ota, Deputy Director of International Operations Division, Commissioner's Secretariat, NTA of Japan
"Digital Transformation of Tax Administration in Japan–Future Vision of Tax Administration"

The second presentation was made by Mr. Hidetaka Ota, Deputy Director of International Operations Division, Commissioner's Secretariat, NTA of Japan. Mr. Ota's presentation was titled "Digital Transformation of Tax Administration in Japan–Future Vision of Tax Administration." He emphasized that the NTA has been diligently working towards realizing a more convenient, appropriate, and fair society through the digitalization of tax administration. The promise of digital technology presented them with a significant opportunity to reform the NTA's operations in various ways. The presentation was structured into two key parts: 1) Goals and Direction of Initiatives; and 2) Improvement of Taxpayer's Convenience.

Goals and Direction
Mr. Ota stated that the NTA was actively pursuing necessary measures based on the digital transformation of tax administration. These measures were aligned with the NTA's "Future Vision of Tax Administration," which was initially released in 2017 and regularly updated to accommodate changes in the economic landscape and advancements in digital technologies. The vision was built on enhancing taxpayer convenience, sophisticating taxation and collection, and improving efficiency. The ultimate goal is to create a society where all tax procedures can be completed without the need to visit a tax office physically.

He added that when implementing measures based on the "Future Vision of Tax Administration," the following basic guidelines were followed:

1) Ensure "Taxpayer's Perspective": The NTA aims to create a user-friendly environment where individuals, regardless of their familiarity with tax matters, can easily complete procedures using common digital tools such as smartphones, tablets, and computers. This effort aims to establish a society where taxpayers can handle all necessary tasks without having to visit a tax office in person.
2) Promote Measures Designed for All Types of Taxpayers: The NTA is committed to providing efficient and user-friendly services to all taxpayers, including those unfamiliar with digital procedures, by improving the usability of tools that complement digital procedures.

3) Use Data Thoroughly: The NTA seeks to maximize the organization’s performance by leveraging data to improve administrative efficiency and sophistication.
4) Business Process Re-engineering: The NTA is actively reforming operations by harnessing the benefits of digital technology, focusing on both the nature of operations and staff work.
5) Secure to Handle Taxpayer Information and Information Security: Given the sensitive nature of taxpayer information, the NTA is taking every possible measure to ensure the confidentiality and security of this data.

In addition, Mr. Ota highlighted that the NTA was progressing towards the realization of these goals incrementally. This involved enhancing taxpayer convenience through digital tax filing and payment, alongside the introduction of AI technologies, while continuing to pay attention to the needs of the IT system users, i.e., the taxpayers.

Improvement of Taxpayer Convenience

Efforts to enhance services for taxpayers and improve the efficiency of tax administration included the simplification of tax returns (payment and refund) and year-end adjustments. By promoting the simplification of tax returns, the NTA aimed to create a system where tax returns can be completed with just a few clicks, automatically incorporating necessary data (such as salary, pension, and medical expenses) into the tax return database.

Another notable development was the introduction of automated tax consultations through a chatbot, which enhanced the consultation's content and user convenience. The NTA is actively promoting various measures to expand the use of e-Tax, with the online usage rate steadily increasing. Additionally, the NTA aimed to further boost the rates of online filing, setting ambitious targets for corporate income tax (92% target) and personal income tax (71% target) by the end of fiscal year 2023.

Mr. Ota reiterated that the NTA's mission was to “help taxpayers properly and smoothly fulfill their tax duties.” To enhance taxpayer convenience, various payment methods had been introduced, including cashless payment options like online payment using transfer tax payment, direct payment, internet banking, credit card payment, and payment at convenient stores using Quick Response (QR) codes. These options provided alternatives to paying taxes in

cash at financial institutions and tax offices. The NTA's goal is to raise the cashless payment ratio to around 40% by fiscal year 2025.

Questions and Answers

Mr. Tocchi stated that he was wondering about the chatbot that Mr. Ota was referencing and how to keep it up to date. Mr. Tocchi further mentioned that personal income tax was an area, at least in his experience, that was evolving constantly. The government was regularly making amendments and changes. Mr. Tocchi asked: Do you keep your chatbot service up to date with answers to client questions? Mr. Ota responded that the NTA updated relevant answers every year. Before the answers were updated and publicized, the tax officers in consultation centers gave comments and feedback to ensure the functionality of the chatbot.

5. Session 3: New technology considered for assisting the collection/administration of VAT/GST

Dr. Richard Stern, Senior Consultant, ADB, served as the moderator of the third session. Dr. Stern introduced the two speakers. The first speaker was Ms. Saowakon Meesang of Thailand's Revenue Department, MOF and the second speaker was Ms. Ling-Chia Chang of the NTBCA, MOF (Chinese Taipei). Dr. Stern mentioned that the rapid advancement of information and communications along with the widespread mobile use of devices posed challenges to tax administration and fiscal situations of all APEC economies. In this session, speakers and participants would discuss current strategies and obstacles in the VAT or GST collection and administration, and further explore the integration of new technologies to enhance these processes.

Ms. Saowakon Meesang, Director of Tax Policy and Planning Division, Revenue Department, MOF of Thailand
"Application of New Technology on VAT Administration in Thailand"

Ms. Saowakon Meesang, Director of Tax Policy and Planning Division, the Revenue Department, Thailand's MOF, made a presentation titled "Application of New Technology on VAT Administration in Thailand." She mentioned that the topic was an example of applying new technology, specifically AI, in their VAT administration. Each tax authority faced its unique challenges, and the goals of

utilizing new technology to address specific challenges may vary. Ms. Meesang illustrated how Thailand utilized new technologies to the issues they encountered.

e-VAT Journey

Ms. Meesang provided the overview of the e-VAT journey in Thailand. Digital transformation or trying to be digitalized had always been the agenda for every tax authority. Thailand had also promoted digital transformation for a long period of time and that was why all the electronics services covered every part of the journey for the taxpayer. In the VAT administration starting from the registration, taxpayers can complete each required procedure and file VAT returns online without the need to visit the tax offices.

When taxpayers conduct their business online, they can issue and submit e-tax invoices. This meant that tax matters, including those with the Revenue Department, can also be conducted online. This was the principle behind introducing the e-tax invoice. In addition, Ms. Meesang added that payments can be made through various channels, such as credit cards and mobile banking. Refunds were also processed and paid online through a digital channel known as PromptPay, which was part of the ordinary VAT scheme.

Furthermore, the e-VAT journey in Thailand included conducting data analytics, which consisting of four elements of forecasting, risk-based analysis, network analysis, and policy simulation, among which the network analysis was held to fight fraud.

Ms. Meesang further related that Thailand had implemented e-invoicing systems since 2012. The objectives are to improve VAT collection and to align with the expanding digital economy. The initial purpose of introducing the e-Tax invoice is to provide a channel for taxpayers who were already conducting business online. It was a form of tax invoice that had changed from traditional paper-based invoice to an electronic format which incorporated digital certificates and signatures for verification. These additional security measures ensured the integrity and authenticity of an e-Tax invoice. Data collection was not the primary goal at that time.

E-Tax Invoice System

In the beginning, the adoption of the e-Tax invoice system was slow because it was not mandatory. However, from 2017 onwards, Thailand began to find ways to attract more taxpayers to use the e-Tax invoice system. Thus numerous changes were made to the system, so as to be more user-friendly and to encourage more taxpayers to utilize this system. She added that Thailand also introduced service providers to assist small businesses in entering the ecosystem more easily. Previously, service providers had a single responsibility, which was to deliver e-Tax invoices to the Revenue Department on behalf of businesses. Service providers can now prepare, deliver, and retain tax invoices for businesses. As a result, the number of users has been growing.

Moreover, she mentioned that the e-Tax invoice system had gained a wealth of data which brought advantages. One benefit was the availability of comprehensive transaction records. The system was able to capture detailed transaction data, including the dates, parties involved, invoice amounts, and tax amounts. The existence of comprehensive record-keeping enhanced transparency and accountability. Another benefit was the opportunity to leverage machine learning to capture unstructured data of Business-to-Business (B2B) transactions from e-Tax invoices for the purpose of identifying non-filers and under-reporting cases. There were still constraints. Even though e-Tax invoices provided abundant data, the picture remained incomplete due to its non-mandatory nature. Additionally, since the issuance of these invoices was not controlled by the authorities and was often a private matter, it posed further limitations.

Now, with all this data at their disposal, Thailand must consider how to leverage it, especially given the growing trend of online shopping. In the post-COVID period, the Revenue Department was increasingly providing services online, and businesses conducted online transactions more frequently. Thailand boasted one of the highest worldwide rankings for online purchases at 68.3%. She added that Thailand faced an important issue of whether all businesses operating in the e-commerce sector were truly independent entities and in compliance with the relevant VAT obligations. Thus Thailand was exploring how the e-Tax invoice data can aid in identifying businesses that may not yet be in the tax system.

Leveraging AI for e-Tax Invoice Analytics

Ms. Meesang presented the thinking process of using machine learning to capture the data. Regarding a large number of tax invoices, it was challenging for tax officers to read each invoice and categorize transaction to identify the potential taxpayers. Therefore, the Revenue Department of Thailand applied new technology (such as ChatGPT) and trained AI to read each tax invoice for tax officers. They had to incorporate the business domain, which meant keywords can help AI identified B2B tax invoices, such as collection fees and commission fees.

In terms of supervised learning for business entity identification, the primary challenge was the unlabeled nature of the descriptions in e-Tax Invoices, making it unclear whether they pertained to a business entity or not. The way to address the challenge was to undertake a data augmentation project. Ms. Meesang elaborated three key considerations of data augmentation for enhanced model training: “Expert-Driven Sentence Creation,” “Data Familiarity,” and “Dual-Knowledge Officers.”

First, for effective data augmentation, knowledge of specific domain-related keywords that can identify a business entity was crucial. It was also vital to understand how these keywords had been distributed in real-world data, so a unique blend of domain expertise and data science insights were needed. Second, since not all AI experts were familiar with the entirety of data in its natural form, it was important to have a broad view of the data, so as to ensure comprehensive understanding and effective augmentation. Third, officers should be equipped with domain expertise and data science skills, so that they will be able to revise and diversify invoice descriptions as well as to adjust details to cater to varied data inputs. In addition, officers can enhance the diversity of examples, so as to refine the model’s understanding and overall performance.

Questions and Answers

Dr. Stern observed that data augmentation with generative AI has produced results both B2B and Business-to-Consumer (B2C) transactions, but the presentation concentrated on the B2B side of it. Can Ms. Meesang provide any further insights into the mechanisms or strategies in place to prevent B2C tax evasion? Ms. Meesang answered that through e-Tax data set, it was difficult to tell whether a transaction was customized B2B transaction or B2C transaction

because a taxpayer was not required to provide such information. Thailand did not require the taxpayer to inform whether this transaction was for businesses or consumers. Therefore, the whole point was trying to categorize transactions by reading the tax invoices through this technique, including identifying hidden business entities in transactions.

Another question from the audience was asked: Whether or not the e-Invoicing is compulsory for SMEs? Ms. Meesang related that, for the Revenue Department, e-invoicing was not compulsory for SMEs. The primary aim of introducing e-Invoicing system was to encourage businesses doing online transactions to do tax matters online, and that was why Thailand did not design a system to be mandatory to collect all the information. This was also the reason for why the data that came in was not a complete picture.

Ms. Ling-Chia Chang, Revenue Officer, NTBCA, MOF (Chinese Taipei)
"Adopting AI in Case Examination Selection System for VAT: Analysis of Transaction Network among Business Entities"

Ms. Ling-Chia Chang, Revenue Officer, NTBCA, MOF (Chinese Taipei), made a presentation titled "Adopting AI in Case Examination Selection System for VAT: Analysis of Transaction Network among Business Entities." She first introduced Chinese Taipei's VAT system and the challenges being faced. Then, she related about how to detect cycle transactions traditionally, and how to adopt AI algorithms to improve it. Following that, she explained the practice and result of Chinese Taipei's AI taxation model, and finally, how beneficial this AI model can be.

VAT System Introduction

Ms. Chang introduced the overview of Chinese Taipei's VAT system. She emphasized that the "uniform invoice" had played an essential role. When selling goods or services, the business entity shall issue a uniform invoice to the purchaser as a transaction evidence document. Each uniform invoice was printed with a unique uniform invoice number consisting of two letters and an eight-digit number. Such uniform invoices were the complete evidence, not only for the purpose of recognizing and organizing the transaction but also for tax audit. Business entities were obligated to report detailed information to the tax authority bimonthly, including the issuing dates and the printed numbers of the uniform invoices issued, along with sales amount, tax amount, and TINs of the

sellers and purchasers on each uniform invoice. It indicated the existence of an enormous transaction database that dealt with over 10 billion uniform invoices every year. Chinese Taipei leveraged the uniqueness of each uniform invoice number to compare transaction details between the seller and purchaser, and examined such transactions if something suspicious drew the tax authority's attention.

The Challenges of Cycle Transaction Detection

The cycle transaction issue related to VAT system enabled companies to reduce their tax payable amount through input tax credits. In practice, there were some cases like companies issuing false invoices to other companies without actually purchasing goods or services to inflate sales revenue to window-dress the financial statement, increase the earnings per share (EPS), and manipulate stock prices for multiple purposes, such as over borrowing from banks. Thus tax evasion occurred when companies obtained false uniform invoices from other companies without an actual transaction, trying to deduct the tax payable amount by the forged input taxes.

Moreover, tax evasion groups may also establish a group of fictitious entities across different areas to set up firewalls, bringing the cycle transaction up to multiple layers, making it more difficult to detect the false transactions. False cycle transaction was a major tax evasion crime. Tax authorities and judicial agencies have been trying to tackle the problem.

Ms. Chang showed how to detect cycle transactions traditionally. She pointed out that identifying cycle transactions was not an easy task. After the forged invoice had been issued and declared, the tax authority would audit it by comparing it to the counterparty's record. Further verification would be triggered when an abnormal notice showed up during an audit of invoices declared by the companies involved.

Traditionally, the invoice fraud investigation usually focused on individual abnormal entities and relied on the experience of senior auditors to review the transaction records both from the upstream and downstream entities of the supply chain to analyze any abnormal patterns to reveal the criminal cycle transaction network.

It was obvious that the traditional way was time-consuming. Especially, when the crime was committed as a group, it will be difficult to investigate due to the complicated modus operandi and detailed job allocations. It meant the system resources will be overloaded because of the need to do data surfing among overwhelming numbers of records. This led to possible misjudgments during tax examinations and prolonged audit processes.

Adopting AI Algorithm

Ms. Chang illustrated how to use AI to fix the problem. First, she introduced the AI team she belonged to. Under the supervision of the Director-general, the team was built up, consisting of tax officers and IT programmers to discuss with external expertise periodically about the possibility of adopting AI algorithms to tax administration. After the cost-performance assessment, when the AI team was confident of the feasibility, it arranged for team members to undergo training in AI algorithms and implementation practices. By doing so, the team members deepened the exchange and cooperation among each other to bring everyone on the same page and constructed an AI taxation model step by step.

Ms. Chang elaborated that the AI team applied AI algorithms to reconstruct transaction networks. For building the AI taxation model, the utilization of the network algorithm was a mature technique to manage the big data of transaction records. With the help of the AI algorithm, they can build a transaction network among all the domestic business entities. There existed now a comprehensive overview of transactions. It helped to eliminate the blind spot of a traditional single-layer audit system. Using multiple layers of the network audit system, the AI team can promptly identify suspicious targets within cycle transaction groups and avoid not seeing the forest for the trees.

There were four types of data inventory needed to adopt an AI Algorithm in this case: “Registration Information,” “Sales Revenue Information,” “Transaction Information,” and “High-Risk Character.” As for the data features and model restrictions, there was a database consisting of comprehensive and real-time transaction information. The AI team pre-processed the raw data by eliminating the outliers of tiny transaction amounts and businesses of considerable scale to improve the accuracy of predictions. On the other hand, the AI model still had its limits. It did not provide information on cash flows or physical logistics which can truly distinguish a false cycle transaction from a real one.

Ms. Chang further demonstrated the AI model. First, the AI team started with 79 million raw transaction data points. After pre-processing, such data points were narrowed down to 4.8 million transaction entries and 0.7 million nodes of business entities. In addition, the AI team tossed such data into the algorithm, which provided a long list of 867 high-risk cycle transaction groups. After incorporating expertise and experience from senior tax officers, together with the high-risk character to optimize the AI model, the AI team was able to get a short list of 26 suspicious groups.

Ms. Chang introduced the project benefits. The AI model was launched for all the tax authorities across different areas in October 2022, resulting in four identified benefits. First, the new AI technology helped to pass on experiences because it provided junior officers with expertise from senior officers. Second, it can lower the tax administration and collection cost by optimizing the single-layer audit system to multiple layers of transaction network analysis. Third, it helped to detect suspicious cycle transaction groups in time with good accuracy. Fourth, it can enhance auditing efficiency.

Questions and Answers

A question was raised by the audience: The AI model is based on Chinese Taipei's uniform invoice system; can you share a little more about the system? And how would you persuade businesses to use it? Ms. Chang pointed out that the invoice system was launched in the 1950s. There were two types of uniform invoice systems: B2B and B2C. For business entities, the sellers were required to issue uniform invoices, while the purchasers were also obligated to obtain them, which can also serve as deductible input tax evidence for the purchasers. For individual consumers, Chinese Taipei provided uniform invoice lottery but mostly as an incentive. By both the stick and carrot, the uniform invoice system had been quite effective for the VAT system.

Furthermore, a whole new electronic uniform invoice system had been developed since 2010. The new electronic invoices can be issued via Internet and stored in the cloud storage. This eliminated the need to use the traditional paper copies. The system can not only lower the tax compliance cost for business entities, but also lower the tax administration cost for the tax authorities. It had been a win-win solution. In addition, Dr. Wen-Hsi Chang, Director General of the FIA, MOF (Chinese Taipei), further indicated that Chinese Taipei set up a uniform invoice lottery to encourage customers to

request invoices. Every two months, the government drew out lucky numbers. A jackpot winner can win NTD10 million. If customers asked an invoice in electronic forms, they would increase the chance for winning the prize. Extra prizes had also been added for e-invoice only. Over 85% of uniform invoices had been in e-invoice form.

6. Closing Remarks

Ms. Pi-Lien Ding, Director General, Department of International Fiscal Affairs, MOF (Chinese Taipei) made the closing remarks. She took this opportunity to thank the APEC Secretariat, the moderators, the speakers, and all the participants, as their participation and contribution were significant and made the virtual workshop successful. In addition, she believed that after the virtual workshop, all the participants better understood the trends and benefits of applying new technologies to tax administration. Nevertheless, each economy has its unique situation and would face many different challenges in terms of making and implementing relevant policies. Furthermore, Ms. Ding hoped that with the assistance of international organizations and the close collaboration with each other, for instance, by holding a virtual workshop like the one, APEC economies may maintain their fiscal revenues, enhance domestic resource mobilization, and promote inclusive and sustainable growth. Meanwhile, she also hoped that APEC economies will continue to promote equal gender participation in this field.

Result of the Ex-Post Survey

After the conclusion of the workshop, a survey was given to participants for the purpose of seeking their views and feedback. There were 49 respondents. In Part I General Evaluation, there were three items on the general perception section. For the first item “The objectives of the virtual workshop were clearly defined,” 61% of respondents gave a score of five while 35% indicated a score of four. Regarding the second item “The virtual workshop achieved its intended objectives,” 57% awarded a score of five and 19% conferred a score of four. In terms of the third item “The agenda items and topics covered were overall relevant,” 59% granted a score of five and 39% accorded a score of four. It can be inferred that most of the respondents gave a high mark for general perception.

The second section of Part I was on performing and organizing and included three items. For the first item “The contents/ presentations were well organized and easy to follow,” 55% of respondents gave a score of five while 33% indicated a score of four. As for the second item “The speakers and moderators were well prepared and knowledgeable about the topics,” 61% accorded a score of five whereas 31% bestowed a score of four. With respect to the third item “The time allotted for the virtual workshop was appropriate.” 47% assigned a score of five and 33% awarded a score of four.

In PART II Effect Evaluation, there were six questions. The first question was: “After this virtual workshop, to what extent do you agree with the importance of cooperation among tax revenue officers, IT programmers, and policy makers in order for successful leveraging a new technology for tax administration?” 85.7% of respondents gave a score of five while 12.2% offered a score of four.

The second question was: “After this virtual workshop, to what extent do you agree that you gained knowledge from the experience or practice shared during the virtual workshop?” 65.3% of respondents indicated a score of five and 30.6% of respondents provided a score of 4. In addition, for the third question “After this virtual workshop, to what extent do you agree that it is necessary to consider the problems and characteristics of a specific category of tax when adopting a new technology for administration to the said tax?” 83.7% granted a score of five and 16.3% accorded a score of 4.

The fourth question was: “After this virtual workshop, to what extent do you agree that it is necessary to consider the required database and the application, the goal, the risk, and the effectiveness that may be brought about when adopting a technology for facilitating tax administration?” 83.7% assigned a score of five while 16.3% conferred a score of 4. Moreover, as to the fifth question “After this virtual workshop, to what extent you would be interested in contacting those experienced experts if you are considering leveraging similar technologies in your tax administration?” 71.4% of respondents awarded a score of five and 20.4% allotted a score of four. Lastly, the sixth question was: “To what extent would you consider expanding the knowledge, methodology, or approaches in terms of adopting a new technology learned from this virtual workshop beyond the field of tax administration in the future?” 71.4% of respondents conferred a score of five and 24.5% granted a score of four. It can be inferred that the virtual workshop had positively affected the respondents, so that they would be willing to advance new technologies for tax administration and even extend to other field.

With regard to PART III Gender Perception Evaluation, there were two questions in which respondents had to answer yes or no. The first question was: “Do you agree that this virtual workshop has offered equitable opportunities for both women and men to enhance their capacities?” 100% of respondents stated yes. In addition, the second question was: “Do you agree that this virtual workshop is in line with the measures taken to fulfill the objective of APEC to advance gender equality by conducting science, technology, engineering, and mathematics (STEM) related trainings?” 100% of respondents reported yes to the question. Since 100% of respondents answered yes to both questions, it can be said that respondents considered the virtual workshop had promoted gender equality.

The final part of the survey was titled PART IV Opinions and Comments. There were two items, and it was optional for respondents to answer. The first item was: “Would you suggest any topic or program linked to the virtual workshop’s outcomes to be subsequently arranged collectively by the APEC fora (FMP) or individually by economies?” Examples of suggested topics were as follows: 1) Cybersecurity or AI for tax administration; 2) Tax audits; and 3) Electronic invoicing system. It underscores the need for continuous capacity building in leveraging new technologies for tax administration. Furthermore, the second item was: “Please provide comments on how to improve this virtual workshop,

if relevant.” Examples of comments were: 1) Provide presentations before the conference; 2) Offer longer time for questions; and 3) Impress with the use of data for research on Chinese Taipei's VAT and show examples from other economies in the future.

Conclusion and Recommendations

In conclusion, it can be seen that the project has achieved the objective of enhancing understanding of the importance of utilizing new technologies for tax administration. There exists the need to gain knowledge on this issue because the COVID-19 pandemic has accelerated digitalization of business operations, which may present challenges to tax administration and thereby worsen the fiscal situation of APEC economies. In most economies, taxes are the main source of fiscal revenues. Thus the sustainment of fiscal revenues to support inclusive and sustainable recovery necessitates the leveraging of new technologies for tax administration, so as to enhance the efficiency of compliance risk analysis and investigation of tax evasion cases. This project has been created to strengthen the APEC economies' capacity to utilize new technologies for tax administration.

Furthermore, this project has supported the implementation of the economic drivers "Innovation and Digitalization" and "Strong, Balanced, Secure, Sustainable and Inclusive Growth" under APEC Putrajaya Vision 2040. This project has also contributed to the "digitalization for digital economy" under the 2022 priorities of the FMP. Moreover, this project has equipped APEC economies with effective strategies, practices, and benefits for leveraging new technologies in tax administration. These approaches outperform traditional audit techniques, enhancing tax administration capabilities and increasing compliance. This helps combat illicit financial flows and supports an inclusive, sustainable recovery.

As an important part of the project, a virtual workshop had been held to examine the new technologies for tax administration. From the virtual workshop, several significant recommendations are generated for APEC economies as follows:

- Continue to advance new technologies for tax administration, such as digital identity, digital tax payment, big data analysis, RPA, AI, blockchain technology, etc., so as to enhance the efficiency of compliance risk analysis and investigation of tax evasion cases.

- Promote the adoption of new technologies through implementing the following actions: 1) Establish active atmosphere and culture within an organization; 2) Encourage prospective planning in government policy; and 3) Provide adequate confidentiality and data safeguards.

- Ensure the existence of necessary conditions before officially adopting a certain new technology: 1) Clear understanding the new technology to be applied; 2) Cognizant of the problems to be solved; and 3) Availability of the digital environment for applying such new technology.

- Increase the gender participation rate in applying new technologies for tax administration in APEC through the following actions: 1) Provide sufficient and equitable training opportunities; and 2) Ensure equal opportunities for women to develop and to be promoted in STEM career fields.

- Address shadow economy challenges through the following actions: 1) Adopt mandatory TINs; 2) Employ blockchain-based APIs for data sharing; 3) Promote e-invoicing; 4) Utilize tools like chatbots; 5) Employ AI for dynamic profiling and behavioral; and 6) Introduce turnover-based taxes for micro-businesses and SMEs.

- Develop mobile tax functionalities, such as offering a contactless service option, eliminating the need for physical visits to service counters during the pandemic. Mobile services ensured that tax information remained accessible irrespective of one's location. In addition, intelligent chatbots had also been integrated into the system, serving the dual purpose of providing technical support and delivering customer services to taxpayers.

- Strengthen cybersecurity and personal information protection, so as to ensure that all new technologies adhered to the principles of safeguarding all the personal information when implementing data cleansing, data analytics, and application development to mitigate potential risks.

- Consider the implementation of a digital strategy that consists of the following actions: 1) Achieve digital maturity through investing in the right technologies and platforms; 2) Provide an optimized user experience, emphasizing upgrades not only for clients but also for tools, applications, and systems used by officers; and 3) Establish connected and trusted ecosystems with partners, especially in areas like identity verification and fraud prevention; and 4) Focus on four key enablers: data and analytics, technology, law and policy, as well as cybersecurity.

- Enhance taxpayer convenience through the offering of various payment methods, including cashless payment options like online payment using transfer tax payment, direct payment, internet banking, credit card payment, and payment at convenient stores using QR codes. These options provide alternatives to paying taxes in cash at financial institutions and tax offices.

Annex: Workshop Agenda

APEC Virtual Workshop

Leveraging New Technology for Tax Administration in the Post-COVID Era

28 September 2023 (Thursday), 09:00am ~ 12:00pm (GMT+8)

Platform: Cisco Webex

Time (GMT+8)	Activity/Topic	Speaker/Presenter
09:00 ~ 09:10	Preparation and housekeeping	**Ms. Chiao-Ming CHENG (Emcee)** Revenue Officer, NTBT, MOF (Chinese Taipei)
	Welcoming and opening remarks	**Ms. Pi-Lien DING** Director General, Department of International Fiscal Affairs, MOF (Chinese Taipei)
	Introduction of the ex-ante survey result	**Ms. Yi-Chun CHEN** Revenue Officer, NTBT, MOF (Chinese Taipei)
Session 1: Overview - New technology for tax administration **Moderator: Dr. Esther A.P. KOISIN,** Chair of SGATAR Taskforce (15-minute presentation and 5-minute Q&A session for each speaker)		
09:10 ~ 09:50	Tax Administration of the Future: What is here, what to expect	**Dr. Richard STERN** Senior Consultant, ADB
	Blueprint of leveraging new technology for tax administration	**Dr. Wen-Hsi CHANG** Director General, FIA, MOF (Chinese Taipei)
09:50 ~ 10:00	Coffee break	
Session 2: New technology considered for assisting the collection/administration of income tax **Moderator: Mr. Silvano TOCCHI,** Assistant Commissioner and Digital Transformation Officer, CRA (20-minute presentation and 5-minute Q&A session for each speaker)		
10:00 ~ 10:50	Australian Taxation Office Digitalization of Taxation Processes	**Mrs. Elissa WALKER** Chief Digital Officer and Deputy Commissioner for Digital Delivery, ATO
	Digital Transformation of Tax Administration in Japan– Future Vision of Tax administration	**Mr. Hidetaka OTA** Deputy Director of International Operations Division, Commissioner's Secretariat, NTA, Japan
10:50 ~ 11:00	Coffee break	
Session 3: New technology considered for assisting the collection/administration of VAT/GST **Moderator: Dr. Richard STERN**, Senior Consultant, ADB (20-minute presentation and 5-minute Q&A session for each speaker)		
11:00 ~ 11:50	Application of New Technology on VAT Administration in Thailand	**Ms. Saowakon MEESANG** Director of Tax Policy and Planning Division, The Revenue Department, MOF, Thailand
	Adopting AI in Case Examination Selection System for VAT: Analysis of Transaction Network among Business Entities	**Ms. Ling-Chia CHANG** Revenue Officer, NTBCA, MOF (Chinese Taipei)
11:50 ~ 12:00	Conclusion and Closing Remarks	**Ms. Pi-Lien DING** Director General, Department of International Fiscal Affairs, MOF (Chinese Taipei)