



**Asia-Pacific  
Economic Cooperation**

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Agenda Item: 2

## **APEC Seminar Summary Report: Advancing Big Data Applications in Trade**

Purpose: Information  
Submitted by: Chinese Taipei



**Concluding Senior Officials' Meeting  
Lima, Peru  
14-15 November 2016**

## **EXECUTIVE SUMMARY**

The Big Data process is being used more and more, and in many different areas. For SMEs, it is very new and could be costly. There is no doubt, however, that SMEs would benefit greatly from being able to share information and experiences in international trade through the application of the Big Data process. Chinese Taipei has developed the tools and created a platform on which Big Data analytics can be made available to the public.

The 2016 Seminar took place in Taipei on 6 and 7 October, with discussion on the first day and a field trip on the second. The Seminar was held concurrently with the 2016 E-Commerce Expo Asia, in Taipei, which showed new trends and the application of Big Data in international trade.

The APEC seminar of “Advancing Big Data Applications in Trade” in 2016 has improved members’ communication and understanding of how to take advantage of big data in trade, which will benefit and in turn boost regional and global economic development. The participants recognize the knowledge-sharing activities, and suggest to continue and extend the initiation.

### **Required Action/Decision Points**

It is recommended that Senior Officials: To note progress of the APEC project called “Advancing Big Data Applications in Trade.”

**APEC Seminar Summary Report**  
**“Advancing Big Data Applications in Trade”**  
**Taipei, Chinese Taipei**  
**October 6-7, 2016**

**1. Introduction**

In the era of the data-driven economy, there exists the need to improve our knowledge and insights into international trade and the decision-making process, through the use of multi-source data sets and the so-called "Big Data" technologies. The combination of Big Data (consisting of large sets of data from a number of different sources, including open source data), together with the latest technology (including modern statistics) and the insights of experts in their respective fields, can significantly enhance the decision-making process of APEC member economies in trade-related areas.

The Big Data process is being used more and more, and in many different areas. For SMEs, it is very new and could be costly. There is no doubt, however, that SMEs would benefit greatly from being able to share information and experiences in international trade through the application of the Big Data process. Chinese Taipei has developed the tools and created a platform on which Big Data analytics can be made available to the public. Now, any private sector business can view large quantities of data and carry out complex analyses immediately, allowing them to quickly gain a greater understanding of trends and prospects in their particular field of interest.

Big Data will also help businesses to access the information they need in order to successfully market their products internationally, for example, with regard to selecting target markets and judging future sales prospects. These innovative methods can be adopted by both the public and the private sector to respond to the challenges of the ever-changing global trade environment, and to create an ecosystem (or intelligence system) that will greatly enhance the performance of SMEs internationally.

Through this collaborative, knowledge-sharing project on Big Data applications, APEC will have the ability to kick-start progress on the issues outlined above. The 2016 Seminar took place in Taipei on 6 and 7 October, with discussion on the first day and a field trip on the second. The Seminar was held concurrently with the 2016 E-Commerce Expo Asia, in Taipei, which showed new trends and the application of Big Data in international trade. At the same time, the Seminar provided a valuable opportunity for participants to interact with Big Data companies.

**2. Opening Remarks**

**Mr. Chern-Chyi Chen, Deputy Director-General, Bureau of Foreign Trade, Ministry of Economic Affairs**, welcomed delegates to Taipei for this meeting on a very innovative topic. As WTO reported that global trade growth for 2015 was 1.7%, lower than the average GDP growth, good data and information were needed to create a good environment for international trade for companies to find demands and growth possibilities. Good data may lead to insights and is key to business success, making Big Data the topic of the time.

Mr. Chen also stated that the Seminar focused on trends and practices of Big Data applications in trade by gathering representatives from governments, industries and scholars and experts in the field to share knowledge and expertise. APEC can help SMEs go international by understanding and realizing the potential of technology.

**Mr. Peter Huang, President & CEO, TAITRA**, welcomed delegates to this event and expressed thanks to delegates from APEC economies for their support. He highlighted that TAITRA's role is to assist SMEs in improving their international competitiveness with services like trade shows and seminars and online trade portal. TAITRA also uses Big Data to formulate marketing strategies that

help SMEs gain market insights and maximize business potential and provides key data of major world trade shows to guide SMEs in investing and finding new customers.

Mr. Huang indicated that this was the first time for TAITRA to host an event on Big Data and warmly invited delegates to visit the e-commerce exhibition in the same premises and the Taitronic Show, focusing on IOT.

### 3. Session 1: The Big Data Landscape in International Trade

#### Moderator:

**Mr. Klaus Felsche, Principal, C21 Directions, Australia**, introduced concept and definition of Big Data and trends. He pointed out three basic features of Big Data to be the volume, velocity and variety of data that cannot be coped with traditional systems, citing an example that all words ever spoken by human beings” could be stored in approximately 5 exabytes of data, but 165 exabytes of data were created in 2015 alone.

He highlighted the importance of analytics as only 0.55% of data collected is being analyzed. The challenge then is how to make Big Data available for analysis, which means the scientific application of mathematical, statistical and machine- intelligence techniques to extract knowledge from data to assist with sense making and decision making. It's about getting meaning out of data to enable governments and businesses to provide better services. Common types of analytics include those who are descriptive – what happened; diagnostics – why did it happened; predictive – what will happen; and prescriptive – what should I do?

Open data is another important topic. Data collected by the government belong to the public and should be made accessible to them accordingly, which is what Australia is doing. Open Source refers to computer software with its source code made available with a license in which the copyright holder provides the rights to change, and distribute the software for any purpose. Today open source accounts for 40-60% of market share.

What do all these trends mean for international trade? In Australia, retailers are demanding goods and services taxes be charged for online purchases. Issues like this pose new challenges. Finally, we need to be aware of the limitations of the accuracy of predictive and prescriptive diagnostics so they are not misused. The good news is that we do know what the margin of errors of such systems are.

#### Panelists:

**Ms. Dulce A. Regala, Assistant National Statistician, Head of Economic Sector Statistic Service, Philippines**, indicated that the monitoring of Philippine foreign trade data, imports and exports in particular, started in 1880, but compiled data are available only after 1963. The Philippine Statistics Authority (PSA) has been recording the movement of commodities by port of origin and by air and water port of destination since 1968.

The PSA, established in September 2013, is tasked to plan, develop, prescribe, disseminate and enforce policies, rules and regulations and coordinate government-wide programs governing the production of official statistics, general-purpose statistics, and civil registration services. PSA is responsible for all national censuses and surveys, sectoral statistics, consolidation of selected administrative recording systems and compilation of national accounts.

PSA products and services include statistical policies, programs and standards, statistical frameworks and indicators systems, censuses and surveys, generation of administrative-based statistics, civil registration services, statistical dissemination and advocacy.

Major data sources for trade statistics include IMTS (imports and exports tables) and Domstat (quantity and value of domestic trade). Data like trade statistics between Chinese Taipei and the Philippines are available under the systems. Data are disseminated through Monthly Press Releases, available on the

website 40 calendar days after the reference month ([www.psa.gov.ph](http://www.psa.gov.ph)), Special Releases, Publications, and Yearbook.

**Mr. Thomas Howells, Chief of Division of Industry Analysis Division, Bureau of Economic Analysis, USA**, noted that nowadays many products are being made in the world, and there is increased need to assess the impact of globalization/global value chains (GVCs) on an economy. One approach to measurement is Trade in Value Added (TiVA) Statistics, which requires global network of Supply-Use tables Economy-level tables linked together through bilateral international trade flows.

GVCs bring new challenges to traditional trade statistics, which is mostly based on bi-lateral trade. With TiVA, we can dig deeper into statistics to identify indirect input sources in the Global Supply Chains and attribute value added to different economies along the supply chain.

Such new Supply-use Tables were released in September, 2015 in BEA's *Survey of Current Business* and updated in November, 2015, and historical make-use tables were released in February, 2016.

BEA is also developing a Census-BEA microdata linking project that identifies firm-level heterogeneity within industries in the supply-use framework, one reason being to reduce potential bias in published Trade in Value Added (TiVA) statistics.

Potentials challenges of Big Data include representativeness of the data, matching of the concepts and those needed to measure output, prices, and employment; consistency of time series and classifications; gaps in coverage; timelines; cost effectiveness; and confidentiality issues. Potential benefits of Big Data are lower cost, more timely and detailed data, lower respondent burden, and higher response rates.

**Dr. Soontaree Songserm, Office of the Electronic Transactions Commission, Ministry of Information and Communication Technology, Thailand**, indicated that the mission of the ministry is to transform Thailand to digital Thailand, with a 20-year Thailand digital landscape in three phases of digital foundation; inclusion – including Big Data applications; and full transformation.

She stressed that when analyzing Big Data, correlation should go before causation to draws analytics from data-driven patterns, which means first finding out what is happening, not why.

Big Data drives business value for e-commerce, esp. cross-border. Successful Big Data applications can be found in areas like personalization (transaction, social media, video and voice data), dynamic pricing (e.g. Amazon), customer service (e.g. social listening using Big Data provides proactive maintenance for your brand), supply chain visibility, and predictive analytic (improving customer engagement, launching targeted promotions, and optimizing pricing).

Big Data strategy for SMEs should address questions like: what do I need to know and what business problems do I need to solve? Know the customers better. What data do I need to answer my questions?

Some common Big Data mistakes that should to be avoided included: collecting data on everything; collecting but not analyzing; going straight to external unstructured data; getting overwhelmed by the volume of existing data; not matching Big Data to your strategic questions.

**Dr. Makoto Yokozawa, Visiting Professor, Kyoto University**, said Big Data has changed quickly over the past 5 years, as e-commerce usage has expanded from numerical to text to voice data and beyond.

His presentation focused on issues of Big Data as a Global Natural Resource. Big Data will strengthen regional economies, but how? APEC economies are exchanging data among themselves, and we need to think in terms of Global Big Data.

Nowadays, Big Data has an important role for businesses like Uber to help them predict and optimize their services, while online game Pokemon Go is also heavily supported by Dig Bata. Data driven innovation like 3-D printing is bound to change Asia Pacific markets.

In Japan, remote supervision of construction machinery has become a reality: machines are equipped and connected with an IOT device to enable remote sensing, remote control, and remote maintenance. Another example is that strawberry farms in India can have their conditions remotely controlled from Japan, thanks to Big Data. Entertainment platform is another example.

While new market growth with the use of Big Data can be expected, we need to address issues like multilayered structure in digital trades and policy/regulation to ensure a healthy data-flow environment.

**Dr. Karl Ng Kah Hou, Director, Innovation Capital, Multimedia Development Corporation, Malaysia**, reported that digital economy accounts for 17% of Malaysia's economy and Big Data is an official initiative of adopting new technologies, with the pilot project starting 3 years ago to identify the need for developing a good ecosystem.

Under the official BDA framework, Malaysia focuses on different elements like creating and fulfilling the demand and has identified the need for developing talents in the field, with a target of 2000 by 2020. A two-track system has been implemented to create data scientists - formal university initiatives and professional development.

To develop a complete BDA ecosystem, Malaysia now has over 100 BDA companies that are thriving as well as local companies who have strong partnership with international players. Some global analytics centers have been established in Malaysia.

In order to galvanize the mindset, the government created a platform to engage the private sector, two examples being the Big Data Week Asia 2016 and Big App Challenge 3.0.

Malaysia has also created an ASEAN Analytics Exchange (ADAX) for Professionals, featuring 3 components - innovation labs, talent development, and start-up accelerator. Potential economic impacts and job benefits of creating such a Big Data ecosystem is estimated to be US\$ 5.2 billion.

#### **4. Session 2: Practices and Experiences in Trade Promotion**

##### **Moderator:**

**Mr. Thomas Howells, Chief of Industry Analysis Division, Bureau of Economic Analysis, USA**, opened the session with a question: What should be the relationship between providers and users of data? Providers are often guided by the principles of accuracy and timeliness but also credibility. One approach adopted by BEA to maintain credibility is that we leave the data interpretation and analysis work to others. On the other hand, what daily users eventually want is for the data to be actionable. So we need some intermediaries to provide services that bridge the gap.

##### **Panelists:**

**Mr. Chrisitan Delachenal, Senior Trade Analyst, International Trade Center**, introduced that ITC is Swiss-based UN agency dedicated to developing applications that help end-users select their markets and products/services in trade.

One such example is Trade Map, which is a reference website on trade statistics containing time series, trade indicators, companies details and more than half a million of users registered. It provides a constant update of monthly and quarterly detailed data from both developed and developing economies. Trade Map aims to help enterprises in their international business development and serves as a user friendly tool to visualize data on tables, graphs, and maps.

Trade map provides embedded information for finding answers to an array of questions. For instance, it is embedded in the National Statistical Office of Malawi as Trade Map Malawi to enable users to search and find useful market information, using a combination of keywords or criteria like import/export, product, partner economy, and tariff, etc. Data can be shown in table or graphic mode to indicate trends in bilateral trade with a specific economy for a specific product in a specific currency.

Trade Map also provides information of main competitor economies in a foreign market, complete with detailed information like main importer/exporter for specific products. Also available are relevant laws and regulators on public tender in an economy.

In conclusion, Trade Map provides easy access to all economy group trade data available in Trade Map as well as access to trade database and web pages hosted on ITC servers. Any institution can benefit from this up to date and transparent trade information, and a customized version of the reference web site – update in the Trade Map database is automatically reflected on the web pages published on the NSO web site.

**Ms. Bin Lin, Vice President, China Council for the Promotion of International Trade Beijing Sub-council (CCPIT Beijing), China**, stated that China's Big Data has a 63.01% growth from 2014 to 2015. World leaders at the G20 Hangzhou Summit have recently adopted a joint communiqué emphasizing the importance of digital economy and treating it as an important link in innovation-driven development.

CCPIT Beijing worked with Guiyang Municipal Government to organize a Big Data Expo to promote industrial development in the Guizhou. The 2015 expo attracted 389 major global players, including Dell, Qualcomm, and Tencent, in the industries as well as 13,000 participants in the forums and 40,000 visitors to the expo, and attendance was more than doubled at the 2016 expo.

Big Data industry of Guiyang has rooted in the province with significant economic contributions in areas like data security, processing and standardization. However, Big Data applications remain a challenge and various bottle necks need to be addressed. Government declaration, yearbook and white paper on Big Data standardization have helped pave the way forward.

A Global Big Data Exchange was established in Guiyang to promote over 30 types of data exchange. Guiyang has been rated by UK's Economic Intelligence Unit as China's number one of its top ten fastest rising cities. In 2015, Guizhou officially became China's first comprehensive big data experimental zone.

From 2013 when Guizhou started its Big Data industry, the focus on SMEs and Start-ups has been a guiding concept. As a result, platforms like Truck Alliance and DiDi and Uber were showcased at expo to help boost such a development.

**Mr. Simon Wang, Executive Vice President, TAITRA**, gave an introduction to TAITRA. TAITRA was founded in 1980 with 1300 staff, 4 local offices and 60 worldwide offices and is the foremost trade promotion organization in Chinese Taipei, organizing 293 overseas trade promotion events and training 7000 trade graduates each year. TAITRA is a member of World Trade Center Association, certified as best practice in 2013.

One exemplary TAITRA service is the Exhibition Selection Scheme. As SMEs are limited in resources and need referral scheme for selecting trade shows, TAITRA collects and compiles information from a wide variety of sources into an easy-to-search Trade Show Selection Platform. Besides search function, the platform features an analytics function with multiple trade show indicators and allows users to pinpoint most suitable trade shows. It also has an opinion survey element.

Another service is the Market Exploration Scheme, which works at both the supply and demand sides to meet SME needs. The supply side services include collecting the information of firms, analyzing the firms' features, and clustering the firms by features, while the demand side operations involve collecting the information of foreign market; analyzing the market demand; classifying the market demand.

The data science requires an inter-disciplinary collaboration, with the core connecting factor being the domain knowledge.

**Mr. Iliia Dimitrov, Executive Director, Association of Electronic Trading Platforms, Russia**, gave

a presentation entitled, "Big Data technologies for cross-border trade promotion." Use of Big Data is growing in Russia, with applications in areas like logistics, transactions, customs, etc. Data are not always well-structured, so it is important to have processing technologies to derive value from volume of data collected and to have relevant tools, either home-grown or imported, to analyze data. Then there is also the need to overcome linguistic barrier to understand better the economy in Russia.

The platform Seldon.Basis has been developed to make Russian market more understandable and accessible, with a comprehensive database of over 22 million Russian companies in 12 languages. It also features data-mining map along other new technologies. Big Data analytics can lead to new products, new solutions, to promote sustainable and inclusive growth. It's hard to predict what the future integration looks like, but it's certainly convenient for businesses to have information they need available.

Big Data accumulation creates super-competitive advantages for cross-industry development, and Big Data analytics technologies help promote inclusive growth in the era of electronic economy.

### **5. Session 3: Business Deployment of Big Data**

#### **Moderator:**

**Mr. Jai-won Choi, Director, Daumsoft, Korea**, mentioned his company Daumsoft is a pioneer in Social Big Data analytics. Nowadays, user experience has expanded to cover commodity, goods, service, and experience. We usually compute data and information but the real value is knowledge derived from the process.

#### **Panelists:**

**Mr. JD Chiu, Director, UWin**, presented his company, which was founded in 2014 to provide enterprises with the latest worldwide government procurement opportunities, market analysis and partner matchmaking through advanced technologies in big data and cross-language information reference.

With the support from the international affairs experts, UWin Consulting aims to build a zero-distance international procurement partner network. UWin provides customized information to subscribers by keywords. With collection of information of over 1 million tenders, UWin began to analyze information and provide match-making services for local companies to reach out to overseas markets.

Government procurement is a big market, so far UWin has covered over 40 economies, including EU, which has a centralized website for such information, and China, where each province has its own website. Based on the keywords entered by users, the website provides information, including metadata from each tender.

The company also provides market analysis. For instance, it helps identify which economies are having the largest tender for city-bike rental system or LED lights. Standardization of metadata is needed to make information more readily available and accessible.

Government procurement data are often open to the public by default and we work to collect them and make them easy to use. UWIN also partners with companies, like KPMG, with global connections to make the process smooth for local businesses.

**Mr. Jason Loh, Global Technology Practice, SAS, Singapore**, presented the UN Global Pulse Initiative, which utilizes Big Data for development and humanitarian actions, especially in lower, weaker economies. It processes data through social media to look for indicators by monitoring what people talk online.

What does the future hold? The speaker identified several trends like Convergence of high tech, with big companies like Samsung, Lenovo, LG, SONY, Huawei all looking into big data market; messaging is growing fast as not everyone is using Facebook - WeChat in China has much integrated with banking and taxi services as well as gift delivery; Sponsored free Wi-Fi is also growing, as the information of



users provides valuable information for businesses; Android TV - people are watching less TV channels but more online Channels; Mobile/online/social is becoming mainstream, with services from Facebook, Uber, etc; transaction fingerprint analytics; deep learning uses neural networks to analyze Big Data and gain insights. Looking forward, the best outcome is a combination of man and machine.

**Mr. Klaus Felsche, Principal, C21 Directions, Australia**, pointed out that the problem with government is that many people don't know what they want when it comes to Big Data. How do you fix it? By changing the way you operate.

To start up a big Data analytics capability, you need to have a team comprising data scientist, data wranglers/engineers, business experts, leader, data journalist, and programmers. Once a team has been in place, then it's crucial to ensure data is available; provide platforms; provide clear vision of priorities/objectives; create a culture of innovation; and enable links between analytic and frontline system.

Maintaining an analytics capability entails both routine business analytics and new data-driven solutions; recruit, retain, and train your teams; and focus should be on meeting business needs and identify business opportunities. The right process that works involves Lab, Test, Proto-type, and Production/deployment.

He concluded with some important tips: get smart people; allow people time and opportunity to think; provide opportunities to test ideas; provide mechanisms to take ideas further; accept failure as a positive; seize unexpected opportunities; deliver incrementally towards strategic goals; educate the organization to accept new things in the process; treat innovation as a culture, not a project; people first (not platform, process, or tool).

## **6. Session 4: Suggestions for APEC**

**Moderator: Dr. Gloria Pasadilla, Senior Analysts, Policy Support Unit, APEC**, focused her presentation on the Internet value chain, which comprises key segments of content rights, online service, enabling technology and services, connectivity, and user interface.

Global technology players are operating across several segments through M&A. Big Data are mainly generated in the online services and enabling technology and services segments, and Big Data is useful for many online services, esp. when advertising is involved.

Issues and challenges of Big Data include protecting data privacy and security with the least trade distortion. We need to understand the trade-offs involved, the economic value of data, and the impact of data regulations.

APEC has a Cross Broder Privacy Rules (CBPR) System, which is a voluntary accountability-based system endorsed by APEC Leaders in 2011, with the aim to reduce barriers to information flows, enhance consumer privacy, and promote interoperability across regional data privacy regimes.

Potential areas for capacity building are regulatory environment, infrastructure, and human resource development. One example is the APEC DIGITAL OPPORTUNITY CENTER (ADOC) Project proposed by Chinese Taipei at the Economic Leaders' Meeting in APEC 2003.

Digital trade is expected to continue to grow but its pace will depend on how the regulatory environment everywhere facilitates digital trade transactions. It also depends on how swiftly the digital divide is bridged to enable cheap access to more people in the internet. We need to ensure that investments flow into modernization of telecommunications and related infrastructures to meet growth in digital demand.

There has been anecdotal evidence on benefits of the internet abound, but challenges exist from the emerging policy environment, economic disruptions brought about by internet technologies, future skills requirement, and anti-competitive behavior. Continuing policy dialogue is important with the participation of major stakeholders.

## **7. Responses from APEC Delegates:**

**Singapore:** Most in the trade community do not know the link between data and trade. Big Data can help supply chain management by improving efficiency.

**Philippines:** Big Data needs to serve people and businesses. Governments need to be more selective in providing data, so as to gain trust in providing the government with good data. The question is if data should be open source or not.

**Moderator:** APEC provides best practices and it is individual economies who make final decision on this issue.

**Chile:** We value e-commerce and how it can help SMEs. This seminar has highlighted how Big Data can help SMEs grow in e-commerce.

**Peru:** Big Data can facilitate international trade, especially for SMEs. We are working on collaging and analyzing trade data. Perhaps we can bring e-commerce trade closer to the traditional trade mode.

**China:** Presentations at this seminar have been informative and enlightening. China values Big Data development at the national level with concrete measures, including Guiyang BD Expo Center. China is happy to work with member economies on delivering the benefits of Big Data to SMEs. The seminar is a good example of the importance for APEC members to meet and discuss issues of common concern like Big Data.

**USA:** Privacy is an ongoing issue, especially in the formulation of regulations that define the right boundaries. Private sector is trying to see what customers want and protect their interests.

**Australia:** Business model is mainly built around trust. If customers do not trust a process or a tool, they will go and find something else. Open and transparency from the government is essential to gain trust in the government. In Australia, we need to enhance independent assessment. Quality assurance policy needs to be in place.

**Philippines:** One challenge is access to data owned by big companies. One step the government has done was to get them together to discuss how they can share data with government agencies. The government is playing both advocacy and capacity-building roles.

**Japan:** This region is highly dependent on SMEs, so we need to begin to think about the risks and costs for businesses. We need to think of APEC's unique position compared to other regions. APEC used to be the world's manufacturing hub, and how can we migrate to a more service-oriented mode is a key issue. Also important is how different economies can differentiate each other in terms of their unique strengths. Several APEC working groups have touched on issues related to Big Data. Using the Star Trek analogy, Mr. Data in the 2<sup>nd</sup> generation Star Trek series could be a good reference to look into.

**Chinese Taipei:** We can continue working on sharing knowledge and information of Big Data applications by collecting case studies, success stories and best practices; facilitate sharing experiences and insights to enhance Big Data success in trade promotion/facilitation and global value chain; and utilize Big Data technologies to create new services or reach new customers and add value to customers. Various APEC working groups can collaborate and Chinese Taipei is interested to play a part.

**Malaysia:** Any strategy needs to cascade into actions. The suggestions are: 1). Creating a calendar of Big Data events across the region; 2). Capacity building, by means of collaboration and licensing, to expedite the development process; and 3). Cases of solving problems experienced in the region.

## **8. The way forward**

The APEC seminar of “Advancing Big Data Applications in Trade” in 2016 has improved members’ communication and understanding of how to take advantage of big data in trade, which will benefit and in turn boost regional and global economic development. The participants recognize the knowledge-sharing activities, and suggest to continue and extend the initiation. Through the collaborate mechanism, members can discover new opportunities, develop new partnerships, and establish more links socially and economically between APEC members and in turn facilitate economic growth and prosperity in the Asia Pacific region.

In the future, Chinese Taipei will continue to hold relevant seminars. APEC members can extend collaboration in sharing knowledge and experiences through this platform and gain benefit by fostering MSMEs capabilities to extract more values from data, to establish an inclusive environment to boost regional and global economic development in the data-driven era.