DATA REVOLUTION CREATING OPPORTUNITIES FOR BOOSTING THE THAI ECONOMY AND REFORMING GOVERNMENT SERVICES

INTRODUCTION[1]

The ongoing data revolution, together with the revolution in information and communications technology (ICT), is bringing about the emergence of "big data" and the data management revolution, including the opening of government data to new users. The data revolution furnishes various opportunities for driving Thailand forward. It can stimulate economic growth by increasing the productivity of the agricultural, manufacturing, and service sectors. The data revolution also creates an opportunity to reduce economic inequality by increasing transparency, reducing corruption, and redistributing income more effectively in targeting the poor. With an appropriate policy framework, the data revolution can help improve the people's quality of life. Moreover, the data revolution affords an opportunity to formulate better policies based on evidence rather than assumptions.

Nevertheless, all these opportunities will not happen automatically without the readiness of governmental agencies, businesses, farmers, labor, civil society, and the general public. Appropriate data policies are also needed to strike the right balance between disclosing individual-level data and maintaining privacy, and between opening up public data for general use and maintaining national security.

The theme of the recent annual academic conference organized by the Thailand Development Research Institute (TDRI) was on using the data revolution to boost the Thai economy and reform government services. It was held on March 13, 2017, at the Bangkok Convention Center, located in the Central World Complex. The presentations included concepts, examples and policy recommendations covering five topics. The following sections are summaries of each session of that conference.

DATA REVOLUTION AND OPPORTUNITIES FOR THAILAND[2]

By Dr. Somkiat Tangkitvanich

Humanity used to believe that the Earth was the center of the universe until early scientists collected data on the orbits of stars, which proved that belief wrong. Not until health pioneers generated mortality data, which helped identity the cause of disease and bring about changes in the field of public health, did it become possible to convince people that cholera could not be transmitted through the air. In the same way, mankind used to think that most soldiers were killed in combat until casualty records demonstrated that most military deaths occurred in hospitals, a finding which led to the evolution of hospital sanitation.

[1] *The session was translated by Ms. Mana Vitayakorn and Ms. Pimchanok Guarod.*

[2] *Summarized by Ms. Mana Vitayakorn and Mr. Kittiphat Buaubol.*

Not so long ago, Google's Computer Go beat a dominant professional player. A computer also defeated human experts on a game show, and computers are enabling cars to be driven without human drivers. Such capabilities are supported by four underlying technologies: sensors, big data, deep learning, and cloud computing.

Sensors are used to store real data in the corpus which amounts to big data, and these are then analyzed through deep learning; the knowledge is stored by cloud computing for later use.

Everything mankind encounters in this world comprises data. The opening of data to general users will bring about various economic benefits, such as Global Positioning System (GPS) data that in 2013 generated business and services worth more than US$ 56 billion.[3] Data have brought about social benefits, such as those used in tracking people, providing welfare, and monitoring government spending. Also, data are used to increase competitiveness, such as when selecting game players based on their aptitude.

Humanity is stepping into an information economy. If technologies are combined with existing data, new economic systems can be created.

- Manufacturing technology together with sensor data will create "Industry 4.0"
- Agricultural technology together with sensor data will create precision farming
- Financial technology together with transaction information will create "FinTech"
- Energy management technology together with electricity consumption data will create a smart energy management system

It is true that Thailand has collected weather data and satellite images, yet dissemination of such data remains in old-fashioned paper-based formats. Although some data are disseminated on line, they are subject to a time delay and are out of date. What is more, for some data there are discrepancies with reality. For example, a land title deed may be inconsistent with the Geographic Information System (GIS) map concerned, thus causing overlapping territorial claims. Such evidence suggests that Thailand still lags behind in data development.

Most data currently stored are merely virtual data. However, what is to come in the future would deal with real data and big data use, which are priceless. This introduces the notion of "Data 4.0," where Data 1.0 refers to data in the form of reports, which lack reliability and are largely undisclosed in Thailand. Data 2.0 includes data from surveys, which are rather scarce and costly in Thailand. Data 3.0 refers to a large volume of virtual data which Thai private sectors have begun to collect, but for which no clear mechanism yet exists for providing support from the government. Lastly, Data 4.0 is so-called big data, which refers to extremely large volumes of data that have not been adequately captured in Thailand.

There are many challenges that Thailand is currently facing, namely insufficient data utilization, lack of understanding of the use of data, undisclosed data, outdated data policies and laws, and shortage of manpower for dealing with data. By overcoming such challenges, the data revolution would create opportunities for Thailand to increase economic growth, reduce inequality, improve the people's quality of life, and formulate good policies.

DATA REVOLUTION FOR AN INFORMATION ECONOMY

By Dr. Somkiat Tangkitvanich and Dr. Saowaruj Rattanakhamfu (TDRI), with guest speakers Mr. Pawoot Pongvitayapanu (CEO and Founder, TARAD.com) and Mr. Teeraboon Ariyasuthiwong (Managing Director, Longkong Studio Co., Ltd.)

[3] *http://gpsworld.com/the-economic-benefits-of-gps/*

Data comprise a crucial factor of production in the information economy. In addition, data can increase the productivity of other factors of production, such as land, labor, capital, and knowledge. As a result, data are becoming an indispensable element in wealth creation. For example, of 183 "unicorns" (start-up companies with a valuation exceeding US$ 1 billion) around the world, almost all are involved in data-intensive or data-management businesses, such as Uber, Airbnb, Snapchat, and Dropbox.

Data can help in creating new businesses in various ways, such as by making possible innovative pricing strategies (as in the case of setting car insurance premiums based on driving behaviors) or by helping to create new business models (as in the case of "FinTech" services). However, we argue that the quickest and biggest wins for Thailand in the use of data would not come from such innovative business models but from an increase in productivity across all sectors.

An example of such a quick win is the SCG Logistics Management Company's use of data to reduce energy costs. The company has utilized temperature data to decrease the use of energy consumption in its cold-chain storage by appropriately adjusting the air-cooling system in accordance with outside temperatures. Without making additional capital investment, the company's monthly energy cost has been reduced by 200,000 baht, which represents about 17 percent of the total energy cost of its cold-chain storage.

The agricultural sector in Thailand has also started to use data to increase its productivity. For example, Mitr Phol Group, a global leader in sugar production, has utilized data to increase productivity at its sugarcane plantation in Phu Khieo District, Chaiyaphum Province. Pieces of land are consolidated into large plots to accommodate the use of machinery, such as sugarcane harvesters. The distance between individual sugarcane plants is adjusted so that they are 1.85 meters apart from each other. Large agricultural machinery and other related equipment are controlled by a GPS system to decrease crop damage, prevent soil compaction, and reduce unnecessary tillage, which leads to an increase in sugarcane output and the ability to plant and harvest sugarcane in time for refining. The use of data also improves logistics management by reducing transportation time, which in turn helps increase the sugar content of the harvested sugarcane.

Mitr Phol Group also uses data from various sources to forecast sugarcane production by utilizing satellite imagery and GIS maps to measure sugarcane cultivation areas. Workers in sugarcane plantations use their tablets or smart phones equipped with GPS to locate their cultivated areas and collect necessary data, such as the types of sugarcane planted and periods for planting and fertilizing. Data on sugarcane crop growth monitored by drones and weather information in each area are also collected. All these data are estimated by a model to forecast sugarcane yield more accurately, enabling the company to enter into futures contracts for sugar with confidence.

The manufacturing sector in Thailand has also started using data to increase productivity. For example, in the printing business, Siri Wattana Interprint Company uses operational data to solve many management problems, such as the mismatches between printing presses and types of printed work, and high inventory costs. The company has also developed an information system to manage printing orders and monitor the working status of printing machines, and it set up a "war room" to monitor and manage all its production processes.

Among all economic sectors, the service sector uses data most intensively. For instance, All Thai Taxi utilizes data to solve problems of taxi drivers and passengers by reducing non-revenue-

generating time, saving fuel cost, decreasing accident rates, and increasing service quality. In particular, the company makes use of taxi location data to match nearby taxi cabs in order to speed up the shift-changing process. The company also provides data on routes and locations with high concentrations of potential passengers to reduce taxi drivers' idle time. To improve the quality of its service, the company applies a GPS tracking system to monitor the driving behavior of taxi drivers. As a result, passengers feel more secure because taxi drivers can neither overcharge them nor refuse to provide service.

In the construction business, the Builk software package helps increase the productivity of contractors by providing them with a free construction accounting program. By adopting this software, contractors can shorten their construction period and calculate their project costs more quickly. Accordingly, they can reduce direct and overhead costs and thus increase their profit.

The above-mentioned case studies show that data can increase productivity in the agricultural, manufacturing and service sectors. An improvement in total factor productivity (TFP) is a result of increased output and revenue, while inputs increase at lower rates or even decrease in some cases.

- The Mitr Phol Group has increased its total factor productivity by 34 percent, with a 43 percent increase in output, 7 percent decrease in labor cost, 12 percent increase in capital cost, and 10 percent increase in raw materials cost
- Sirivatana Interprint has increased its total factor productivity by 6 percent, with an 82 percent increase in output, 60 percent increase in labor cost, 75 percent increase in capital cost, and 81 percent increase in raw material cost
- All Thai Taxi has increased its total factor productivity by 18 percent, with a 24 percent increase in output, 15 percent decrease in raw material cost, and 23 percent decrease in capital cost
- Construction companies using Builk's software have increased their total factor productivity by 26 percent, with a 23 percent increase in output, 2 percent decrease in labor cost, and 3 percent decrease in capital cost

To estimate the economic impact of data use, it is assumed that data usage in the agricultural, manufacturing, and service sectors across the board has resulted in a modest increase in total factor productivity of 20 percent in each sector in terms of the above case studies. In particular, the TFP for each of the agricultural, manufacturing and service sectors was assumed to increase 6.8 percent, 1.2 percent, and 4.8 percent, respectively. The estimation based on the computable general equilibrium model shows that Thailand's gross domestic product would increase by 0.82 percent, or 81 billion baht, just by making good use of data.

A workforce sufficiently qualified in the data area is key to creating an information economy. A 2016 survey by the National Statistical Office (NSO) found that there are about 81,000 workers employed in data-related jobs, consisting of 11,000 specializing in mathematics/statistics, 47,000 in software development, and 23,000 in related IT jobs. In the past five years, on average, the pool of these data-related employees increased by about 7,300 per year, while as many as 23,000 students per year graduated from universities where they took subjects in the related fields. As such, the number of persons in the data-related workforce in Thailand grows at only one-third of the annual number of new graduates, which implies either a mismatch between the skills of the graduates and market demand, or graduates of poor quality.

To summarize, a quick win in boosting the Thai economy is through applying data to increase

productivity. In most of the above-mentioned case studies, the data used to increase productivity already existed in the related companies. Wisely utilized, existing data can help increase the productivity of companies. Large companies are generally in a good position to make use of their data. They should do so and should also help small and medium-sized enterprises (SMEs) in their supply chains to utilize data, as exemplified in the case of the Mitr Phol Group, which helps its sugarcane farmers to apply data for productivity improvement.

The public sector can play many crucial roles in promoting data utilization, such as raising awareness of the benefit of using data among the private sector, subsidizing SMEs and small-scale farmers in developing their own data systems, and collecting and publishing up-to-date and accurate data. The government should not try to seek revenue from selling the data gathered with taxpayers' money. Instead, it should disclose important data sets, such as business registration data, weather information, transportation timetables, land-ownership data, and agricultural prices, in forms that are machine readable and free of charges.

Finally, Thailand should accelerate its development of a data-related workforce. In particular, universities should revise their curricula to meet market demand and provide "dual education" by working closely with the business sector so that students can learn from real-world problems. The government should also support the private sector in producing a workforce in data fields through the mechanism of joint scholarships. To meet shortages in the short run, foreign workers with expertise in the data fields should be allowed to work in Thailand.

IMPROVING QUALITY OF LIFE THROUGH THE DATA REVOLUTION[4]

By Dr. Worawan Chandoevwit, Dr. Wichsinee Wibulpolprasert, and Mr. Nuthasid Rukkiatwong (TDRI), with guest speaker Assoc. Prof. Dr. Agachai Sumalee (Smart City Research Center, King Mongkut's Institute of Technology Ladkrabang)

Public services play a critical role in every stage of human life. Even though public services are provided to all people, their quality is still a major concern. In the era of information technology, data are key to improving the quality of public services and upgrading the quality of life for the Thai people.

During childhood, data and technology can be used to improve the quality of schools. Thailand's concern about good-quality education has been heightened due to the fact that a large proportion of Thai students scored below the international baseline of the PISA[5] science test. One of the reasons is that Thai parents have limited

[4] *Summarized by Ms. Wannapha Kunakornvong and Mr. Phasith Phatchana.*

[5] *PISA (Programme for International Student Assessment) is a global study conducted by the Organisation for Economic Co-operation and Development (OECD), in which 15-year-old students' scholastic performance in mathematics, science, and reading is assessed.*

information on school quality and thus make decision when selecting schools for their children based on the physical and environmental conditions of schools, such as the number and appearance of school buildings. Under the circumstances, open data on school quality can help parents make better decisions while increasing competition among schools in order to improve their quality. Linking data from various sources is also useful to overcome administrative and management problems. Through mobilization and utilization of shared resources among small schools in nearby areas, the "Kang Chan Model" (K-C model) has successfully addressed teacher shortages, resulting in significant improvement in student learning. Currently, the K-C model has been conceptually adapted by the Ministry of Education for replication in other areas.

For the working-age population, using good-quality data can help not only in improving the education system in Thailand but also in responding to labor market demands. Labor market studies in Thailand face a number of methodological and administrative challenges, as revealed by NSO. According to NSO, the labor demand survey has been constraint by high survey costs and hence fixed sample frame/size and data quality. To improve the survey's quality, data from online job announcements are used to analyze target markets and skills. For example, in a study conducted by TDRI on skills needed in the labor market, of 100,000 job announcements collected by the National Electronics and Computer Technology Center (NECTEC) 10,000 were randomly selected to construct a skills demand database. These online data were then used to produce deeper insights about the skills needed in different occupations while reflecting on the reality of labor market situations. Further, online job announcement data can support educational institutions in designing and enhancing curricula to meet labor market demands.

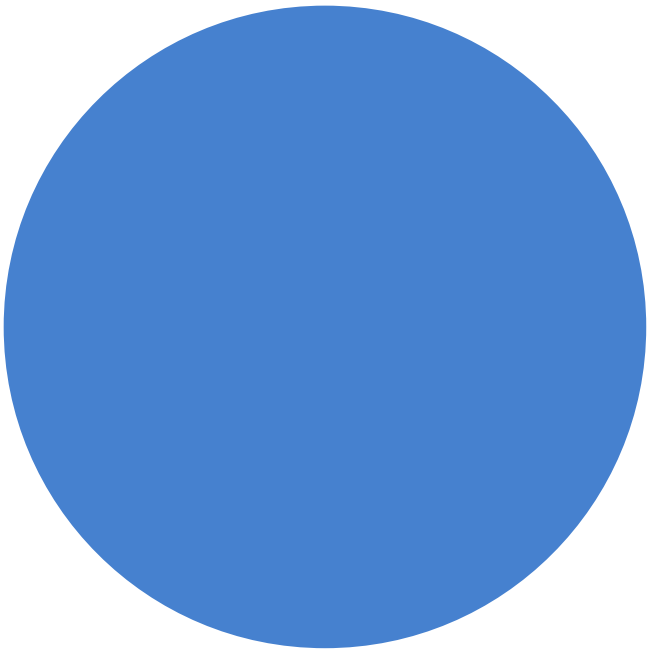
For all age groups, big data are potentially useful for improving people's quality of life by reducing health risks and the risk of early death. Synchronization of data from various sources can reflect real situations. For example, by synchronizing health data and civil registration data, it was found that Thailand's maternal mortality ratio (MMR) is much higher than had been previously perceived, and still far from achieving one of the targets of the Millennium Development Goals. The MMR also reveals health inequalities among population groups based on geographical and age differences. For example, the MMR in the southern region of Thailand is four times higher than that in Bangkok and its vicinity, which is similar to the ratios measured in Egypt and Tunisia. Thus, data management and analysis processes, including data collection, synchronization, open data, and data analytics, are contributing significantly to the effective planning and management of health resources.

To reduce the risk of traffic accidents, the private sector — for example, All Thai Taxi — has virtually integrated three important devices, namely engine, speed and GPS, to determine risk factors. A recent study revealed that key risk factors associated with traffic accidents are unsafe driving behaviors, car performance, and road conditions.[6] Similarly, the Department of Land Transport has collected data on driver behavior through personalized identification cards and GPS sensors. To detect and measure related risk factors for car accidents, GPS has been installed in public transport vehicles, and their drivers are observed through personal data collected automatically. Synchronization between public and private data will enable the agencies concerned to effectively assess areas at risk and facilitate further study on specific issues of policy interest.

In summary, data collection, synchronization,

[6] *http://bhs.doh.go.th/statistic/cause*

FOR ALL AGE GROUPS, BIG DATA ARE POTENTIALLY USEFUL FOR IMPROVING PEOPLE'S QUALITY OF LIFE BY REDUCING HEALTH RISKS AND THE RISK OF EARLY DEATH. SYNCHRONIZATION OF DATA FROM VARIOUS SOURCES CAN REFLECT REAL SITUATIONS.



open data, and data analytics are key data-related processes for improving public services and increasing the quality of life for all people. Such challenges as different data formats, lack of data scientists, and privacy issues require appropriate strategies and actions by the government.

DATA FOR CREATING A FAIR SOCIETY[7]

By Mr. Chanon Techasunthornwat (Faculty of Economics, Thammasat University) and Mr. Tippatrai Saelawong (TDRI), with guest speaker Asst. Prof. Dr. Thanee Chaiwat (Faculty of Economics, Chulalongkorn University)

The afternoon sessions started with a presentation on social injustice. Generally, social injustice comes in various guises, including forms of social inequality and corruption. In the session entitled Data for Creating a Fair Society, the speakers discussed and illustrated how big data and open data as well as machine learning technology could help in addressing social injustice issues.

Big data can promote social justice through the provision of more accurate data for policy-making. An example is the application of high-resolution satellite imagery data to improve the process of targeting poverty. By locating some proxies, such as types of household roof and road conditions, using satellite images, one can identify poor areas or households living in poverty. Such data can also help reduce inclusion error from poverty targeting by comparing proxies for areas that are not poor with locations of welfare-for-the-poor recipients. If there is a concentration of welfare recipients in non-poor areas, it could be possible that the poverty alleviation program has misidentified non-poor households as poor.

Apart from satellite imagery data, cell phone data are potentially helpful for targeting poverty. Cell phones record such data as the duration of calls, calling costs, and locations. These data provide additional information for tracking poverty. In comparison with data obtained via satellite, cellular data, with frequent updates, have higher potential for accurately locating areas where help is needed most following disasters.

Beyond poverty issues, the availability of big data and open data can also help Thailand in detecting corruption risks and incidents in the public sector. Researchers at TDRI focused on identifying and detecting fraud in government procurement by using competitiveness as a proxy to determine corruption in the system across governmental agencies. Open data also revealed the fact that the government's new e-bidding system can increase price competition and reduce costs to the government.

Whereas big data and open data are necessary for Thailand to move toward a fair

[7] *Summarized by Mr. Chayathorn Termariyabuit, Mr. Kantaphon Amornrat, and Mr. Chakorn Loetnithat.*

and just society, one key element also needed for building a just society is an active citizenry. Dr. Thanee's research using mobile visual novel style games has led to the conclusion that incentives in the current system, rather than attitudes or moral grounds, play a major role in shaping susceptibility to corruption. Apart from building solid databases of big data and open data, it is therefore necessary for the Thai government to create a system in which active citizens are encouraged to engage, cooperate, and take part in helping Thailand become a fair and just country.

GOOD POLICIES THROUGH GOOD DATA AND GOOD DATA THROUGH GOOD POLICIES[8]

By Dr. Deunden Nikomborirak and Mr. Chatra Kamsaeng (TDRI), with guest speaker Mr. Worapoj Wongkitrungruang (Executive Editor of Openworlds Publishing House)

Big data, which have immense potential to improve society, are made up of a massive amount of versatile data that are constantly changing and being updated. Big data can be used, among other vital applications, to elevate a country's economy, improve living standards, alleviate poverty, and combat corruption. As a major data producer, user, and facilitator, the government must push through more data management reforms to adequately support a data-driven society in order to secure the greatest benefits from big data.

The Government as Data Producer

The Thai government constantly produces and possesses a large amount of data, such as citizen information, economic information, geographical information, environmental information, government procurement information, and legal information. Such a large bulk of data has both commercial and social value, but remains underutilized and difficult to access.

Of 92 countries in the Open Data Barometer's implementation rankings, Thailand currently ranks 56. While some government data are publicly available, much of the data are not in a computer-friendly format. In cases where more data should be and can be made available, the main obstacles to information disclosure include unwillingness of state agencies to be held more accountable, the poor quality of existing data, and possible legal repercussions associated with data disclosure.

The experiences of other countries suggest that open data initiatives often start from the top level. A prominent example is the United States Open Government Initiative, the brainchild of former President Barack Obama, who set out from his first day in office to create an "open and transparent government." His subsequent Open Government Directive was issued to instruct government agencies to adopt the "presumption of openness" principle, which means that all government data must be publicly available unless they fall within certain exemptions.

Thailand should consider learning from the experience of others and adopt a national open government initiative. Such an initiative could include the adoption of the "presumption of openness" by all government agencies in addition to data standardization and storage practices. Stakeholders, such as academics and journalists, should be involved in order to increase transparency and participation, and to promote efficiency and effectiveness in government.

The Government as Data User

Government functions and policy-making decisions require updated and comprehensive

[8] *Summarized by Mr. Sasipong Suma, Mr. Natchapol Praditpetchara, and Mr. Jirawat Suriyashotichyangkul.*

THE GOVERNMENT SHOULD CREATE A PARTICIPATORY AND INCLUSIVE ENVIRONMENT FOR PUBLIC INVOLVEMENT IN POLICY-MAKING, PARTICULARLY THROUGH COMMUNICATION TECHNOLOGY. FOR INSTANCE, THE UNITED KINGDOM HAS A WEBSITE WHERE THE GOVERNMENT CAN DIRECTLY COMMUNICATE WITH THE PUBLIC AND VICE VERSA.

information in order to enhance their efficiency. As previously mentioned, the Thai government possesses a large amount of data, but much of those data remain underused. One of the main reasons is that data often are not streamlined across government agencies. For instance, due to disintegration of data and information, land reform policies often overlap with those concerning protected areas, thus contributing to ineffective policy implementation. Therefore, it is imperative that the Thai government should establish or designate an independent body to streamline information across government agencies in order to efficiently minimize overlapping policies and functions.

Furthermore, the government should create a participatory and inclusive environment for public involvement in policy-making, particularly through communication technology. For instance, the United Kingdom has a website where the government can directly communicate with the public and vice versa. The website also provides a platform for the public to petition the government directly.

The people of Thailand have recognized the importance of participation and are interested in engaging in the policy-making process, although no official communication channel is available. In 2016, for example, a large number of people protested against the Computer Crime Act via a Change.org petition which attracted more than 300,000 signatures. With considerable public interest, the government should consider reviewing the "Rule of the Office of the Prime Minister on Public Consultation, B.E. 2548 (2005)" in order to facilitate an authentic participatory process.

The Government as Facilitator of Data Use

Whereas data disclosure benefits both the public and private sectors, protection of personal privacy must be taken into consideration. Currently, regulations governing personal information are ambiguous, resulting in misconduct, non-compliance, and discrepancy in implementation between the private and public sectors. Specifically, government agencies must abide by the Official Information Act, B.E. 2540 (1997), which states that disclosure of personal information is prohibited. However, the lack of clear definition of personal information discourages government officials from releasing even non-personal information because of speculative or abstract fears, whereas such reluctance does not prevent the private sector from information disclosure.

Currently, many countries are amending their domestic legislation to facilitate greater utilization of data while still honoring individual privacy. For instance, Japan classifies personal information into three risk-based categories: anonymized personal data; general personal data; and sensitive personal data. While anonymized data can be fully utilized, personal information in the latter two categories may be used only with the consent of the owner and only for certain purposes. To facilitate the productive and appropriate utilization of information, the Thai government should clearly define personal information and regulate its usage based on information sensitivity. Such an approach will establish a standardized system for improving the effectiveness of information disclosure.

THAILAND'S NATIONAL AGENDA ON DATA: WHO NEEDS TO DO WHAT?[9]

At its 2017 annual conference, TDRI convened a panel discussion on "Thailand's National Agenda on Data: Who Needs to Do What?" The panelists were Mr. Chen Namchaisiri, President of the Federation of Thai Industries; Mr. Teeranun Srihong, President and Chairman of

[9] *Summarized by Mr. Supanutt Sasiwuttiwat, Mr. Sunthorn Tunmuntong, and Ms. Urairat Jantarasiri.*

Kasikorn Business-Technology Group; Mr. Siriwat Vongjarukorn, President and Chief Executive Officer of MFEC Public Company Limited; and Dr. Prawit Leestapornwonsa, M.D., Commissioner of the National Broadcasting and Telecommunications Commission (NBTC). The discussion was moderated by Dr. Nattha Komolvadhin, News Editor and Anchor of the Thai Public Broadcasting Service (ThaiPBS).

Data as the Petroleum of the Future

The panelists agreed that the modern economy is being transformed and driven by big data and data technologies. In order to maintain and improve Thailand's economic competitiveness, Thai businesses and other sectors urgently need to catch up with new developments in this field. One of the most transformed sectors is manufacturing. Mr. Chen gave as an example the case of big data in the garment industry. Instead of mass-producing clothes in standard sizes (S, M, L, XL), a Thai manufacturer hires tailor shops to measure customers' body size and shape. The data are then sent to automated factories where production machines read the data and produce clothes to fit each customer's body and shape.

With big data on customer behavior, businesses can also set new pricing strategies. This was illustrated by Mr. Teeranun's work experience at Kasikorn Bank (K-Bank), which is now a leader in the credit market for SMEs. During the 1997 financial crisis, K-Bank collected large amounts of data for calculating companies' credit risk scores. Strikingly, it was found that many high-risk companies received low-interest loans while high-interest loans were offered to low-risk businesses. With those data, K-Bank redesigned its loan packages, using interest rates that properly matched companies' risk levels.

Mr. Teeranun emphasized: "Data is the future petroleum – the future economy will no longer be shaped by crude oil (petroleum), but data and knowledge generated from these data."

Utilizing Big Data is the Only Solution for Disrupted Businesses

Mr. Siriwat shared his experience in helping companies in industries disrupted by new technologies to recover. LOVEiS, a music company, lost its main revenue stream because consumers turned to free music available on YouTube. Fortunately, the company has many famous artists who are followed by about 5 million fans on social media. By analyzing the fans' music preferences, the company could arrange events that serve the fans' moods, while also encouraging them to subscribe to additional services, such as mobile banking. The company is now earning a new revenue stream from its contribution to the growth of other companies' customer base.

Matichon Group is currently the top Thai newspaper on social media, with more than 60 million views per month or 2 million views per day on Facebook Live. With its expanding follower

base and views on social media, the company recovered its revenues and has high potential to earn a lot more from advertisements on Facebook.

Dr. Prawit added that telecom companies are also looking at "Big Data Monetization," i.e. how to generate revenue from their large amount of data in order to compensate for the declining growth of mobile phone users.

Big Data Improve Public Services

Big data and data technologies can improve the quality of life, which the Thai state and society should learn to do. As Dr. Prawit said, many countries improve their public services by utilizing mobile data use. For example, South Korea could prevent the spread of epidemics into the country by examining whether data exist on people arriving in the country concerning their previous visits or residence in countries with epidemic risks. By tracking patients' mobile phone use, African countries predicted the direction in which ebola and malaria would likely spread, and thus they were able to effectively prepare prevention plans. In addition, countries in Africa could identify poor areas by considering the density of 2G package users and provide free buses in such areas.

Dr. Prawit suggested that Thailand could do the same, by using data on mobile top-ups of 10 baht or less per time to identify poor areas.

Challenges of the Data Revolution in Thailand

Compared with several other countries, Thailand is not utilizing data to their full potential; it cannot catch up with the advancement of information technology and the vast amount of data being stored. Mr. Teeranun gave the example of Kasikorn Bank, which uses only 15 datasets to predict credit risks, compared with the Chinese financial firm "WeLab," which uses a thousand-parameter data set and shorter time for credit approval. Such underutilized data as in the case of the financial sector can also be seen in the Thai manufacturing sector. Most entrepreneurs in the country have yet to fully utilize data both inside and outside their factories – customer behavior, export and import price comparison, and shelf value, for instance – to improve their competitiveness.

Regulations concerning data openness also have effects on competition in the market. Mr. Teeranun said that data are now the key to competition. "As long as the data remain protected, big companies that possess the data will continue gaining the upper hand." Currently Thailand still lacks a central database that is trustworthy and accessible with established regulation. This impedes SMEs from improving their competitiveness.

Moreover, data professionals are still greatly needed in Thailand. Mr. Siriwat added that "the key input of the data industry is human," as the number of data scientists in the market is very few. This situation is partly due to the limited opportunity to use data in the country, compared with Silicon Valley, where many skillful Thai data professionals have gone to work because working there enables

them to maximize their capabilities. In addition, machine builders and system integrators are also in demand in the manufacturing sector, said Mr. Chen.

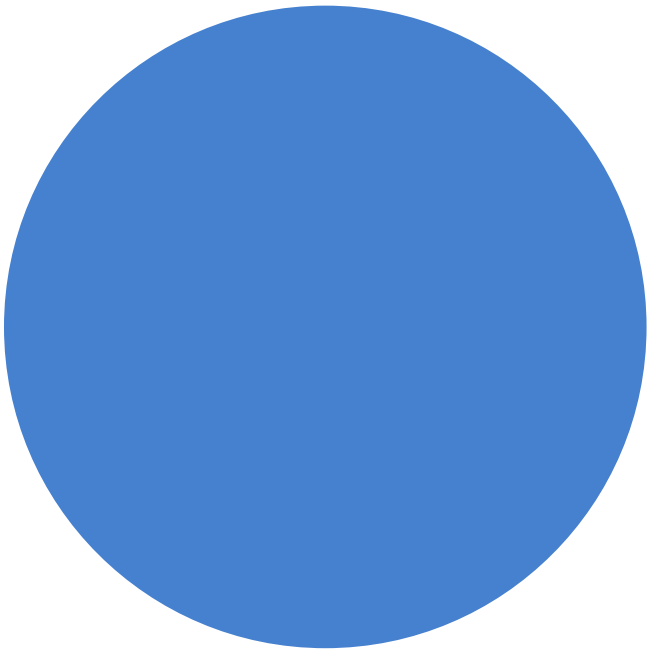
Another side of data openness, however, is the privacy of data owners. Since data and information have become a new asset, privacy and data ownership have become a "gray" area. Dr. Prawit said there have been cases of cybercrime and personal data abuse in many countries, including Thailand. This situation highlights the risks of having vast amounts of data collected and stored.

Thus, there have been attempts by nations, led by European countries, to effectively control the use of databases. For example, database accessibility in Europe is designed on the privacy-by-default principle, requiring the consent of data owners before use can be made of the data. In addition, accessible data must be anonymous and unidentifiable. Dr. Prawit added that NBTC's current regulation governing the use of personal information also stipulates that the data owner's permission is required before the data can be processed by others.

Key Recommendations for the Government and Businesses

The panel discussion concluded with four recommendations that would help the public and private sectors to prepare for the data revolution.

First, the national database should be established by a government agency which would also collect, store, clean, and manage data accessibility. It does not matter whether the agency is a statutory body or independent committees, as long as it is trustworthy and transparent, and able to preserve integrity and confidentiality. Examples of data stored in such a database would be financial data, mobile device data, and e-commerce data. The benefits and costs should be set for data users and contributors in order to properly maintain the system.



Second, data-related regulations should be revised and further developed. The government needs to create a good balance between data disclosure and privacy protection. This would include drafting a personal data law in order to cope with the growth of personal data related to people's daily life. Experimenting in a "sandbox" could be used as a trial for learning and development, instead of introducing comprehensive legislation which covers all issues but cannot be enforced effectively.

Third, a workforce with suitable data skills should be developed, especially data scientists, machine builders, and system integrators in the manufacturing sector.

Finally, the private sector should collect data both on production lines by investing in machines with IT capabilities, and other information, for instance, that on shelf value and customer behaviors. Offering incentives is a strategy to obtain data from customers. Moreover, businesses should use data to come up with a new business model that could save them from disruption of their normal functioning.