Annual Report

Thailand Digital Outlook 2021

Office of the National Digital Economy and Society Commission (ONDE)

Annual Report

Thailand Digital Outlook 2021

Title Annual Report
Thailand Digital Outlook 2021

Edition 1st December 2021

Amount 50 volumes

Submitted By Office of the National Digital Economy and Society Commission
120 Moo 3, 9 floor The Government Complex Commemorating His Majesty, Chaeng Watthana Road, Thung Song Hong, Laksi, Bangkok 10210
Tel: 02-142-1202 Fax: 02-143-7962
Website: www.onde.go.th
Email: pr.onde@onde.go.th

Place of publication Hispeed Laserprint Co. Ltd. (Head Office)
21/13 Ngamwongwan Road, Lad Yao Subdistrict,
Chatuchak District, Bangkok 10900
Tel: 02-579-6718 Fax: 02-940-6153
Email: hispeedlaserprint2014@gmail.com

List of Content

List of Tables

List of Figure

Chapter 1 : Introduction

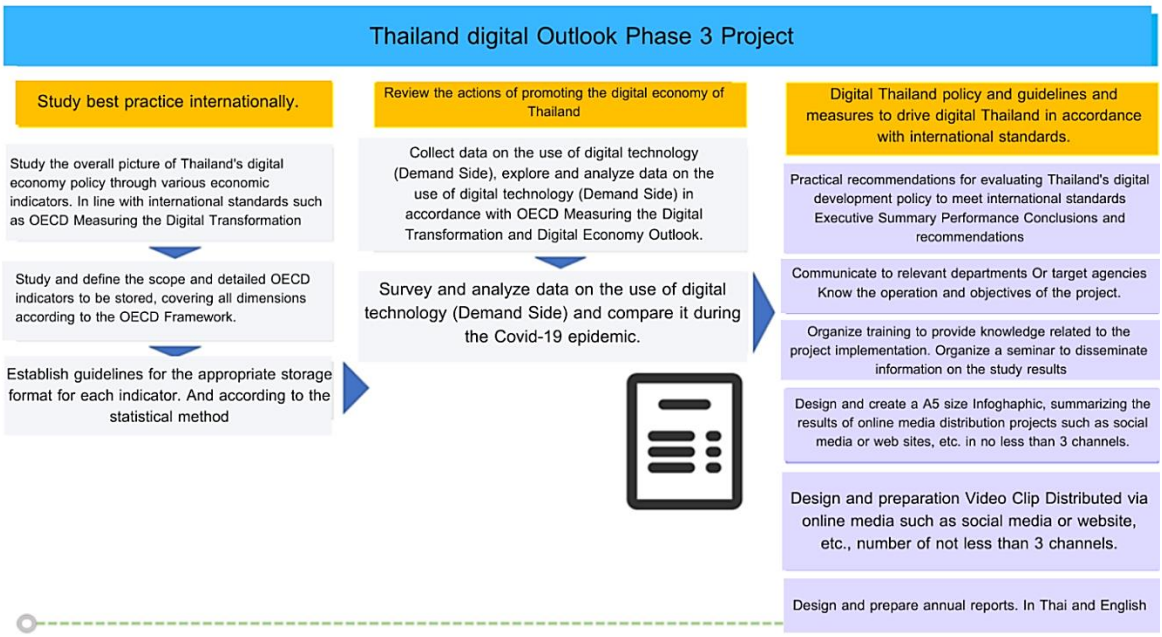
1. Principles and Reasons

The Thai government has announced the country development strategy "Thailand 4.0" to reform the economic structure of Thailand. An approach is the adoption of digital technology and the enhancement of the quality of digital infrastructures. The Ministry of Digital Economy and Society has implemented a project to upgrade the country's telecommunication infrastructure or the public Internet to urge Thai people accessing to the Internet equally. It is to reduce inequality in society as well as to increase the potential of people in remote areas in having the opportunity to access applications and services similar to those whome are served in large cities. This will also result in driving the country to be able to do simultaneously across the country.

Office of the National Digital Economy and Society Commission (ONDE) has initiated the Thailand Digital Outlook Phase 1 in the fiscal year 2018 by using a guideline for collecting indicators and measuring the Digital Transformation according to the Organisation for Economic Co-operation and Development (OECD). The Thai government has a framework for cooperation with the OECD through the Country Programme Project to analyze the overall of policy development in the digital economy and innovation of the country in order to apply the results of the assessment to be used in determining the policy of the digital economy in developing the country effectively. This project has begun testing data collection by using the big data analysis in 3 pilot provinces, namely Ratchaburi, Suphanburi and Kanchanaburi, and the Office of the National Digital Economy and Society Commission (ONDE) has continued its work in the Thailand Digital Outlook Phase 2 to further its operations and expand coverage. It also deems appropriately to implement in the Thailand Digital Outlook Phase 3 in order to expand the survey data to cover more areas in the country and increase the scope of indicators according to the OECD's Digital Economy Outlook framework. The study area has been expanded from the pirot 3 provinces, and the study has been increased to 77 provinces in the following year. For the year 2021, the study of 77 provinces with a larger sample size is intended to achieve completeness in all dimensions of the study of this Thailand Digital Outlook Phase 3.

2. Project Operation

To achieve the above objectives of the research project, the Office of the National Digital Economy and Society Commission (ONDE) has designed a conceptual framework and divided the project implementation plan into 3 phases and the results are as follows:



3. Indicator Framework for the Digital Development of the Country According to the OECD Guidelines and the Indicators

In the implementation of the Thailand Digital Outlook Phase 3, the OECD Going Digital Toolkit was adopted the framework of indicators in digital development for the economy and society, designed by the Organisation for Economic Co-operation and Development (OECD) under the OECD Measuring the Digital Transformation concept of the OECD Going Digital which consists of 7 policies and a theme with a total of 8 indicators as following:

1. Access
2. Use
3. Innovation
4. Jobs
5. Trust
6. Society
7. Market openness
8. Growth and well-being

According to the above OECD - Going Digital Toolkit indicator framework, the ONDE has analyzed and considered suitability and feasibility of the survey, data collection for the Thai context of each 54 indicators, including other related factors; for example, the consistency and correlation in the implementation of the Thailand Digital Outlook Phase 3, reviewing the significant points from the implementation of Phase 2 by considering recommendations of the OECD and suggestion from the workshops, etc. to determine the scope of indicators to be studied under the Thailand Digital Outlook Phase 3. There are 47 indicators out of 54 indicators in summary that can be implemented.

In this regard, the scope determination of the indicators in the Thailand Digital Outlook Phase 3, there are 47 implemented indicators out of 54 indicators. In addition to the OECD indicator framework, ONDE has studied the other international standard indicators and has presented 10 additional indicators from the Thailand Digital Outlook Phase 2 and considered the additional indicators in the implementation of the Thailand Digital Outlook Phase 3 in order to reflect the digital development of Thailand (Thailand Digital Outlook) to be more complete. There are 57 indicators in total.

Figure 1 Summary of indicators implemented in Thailand Digital Outlook Phase 3

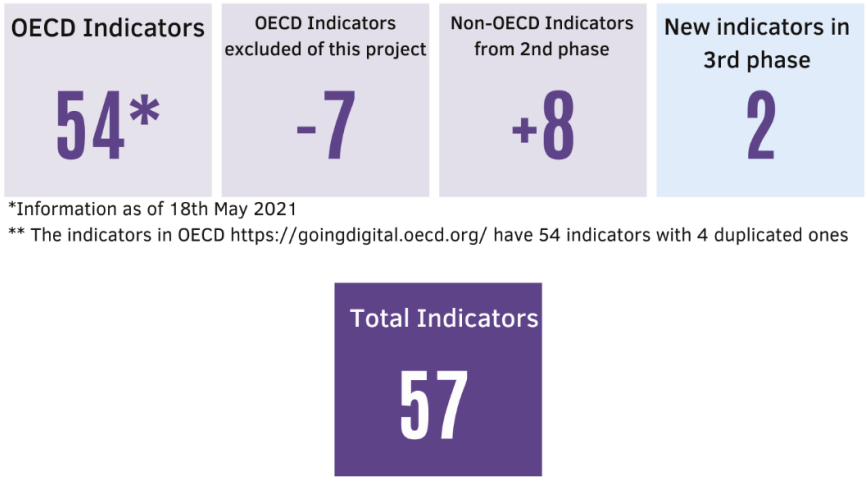


Table 1 Summary of all indicators implemented in Thailand Digital Outlook Phase 3

No	Code	Indicators	Details of assessment and calculation of indicators	Note
Access with 10 indicators				
1	A1	A1 : Fixed broadband subscription per 100 inhabitants	It is a measure of the proportion of fixed broadband Internet access based on fixed broadband Internet user per 100 inhabitants. The OECD defines fixed broadband Internet users as the download speeds of 256 kbps or greater. This is to measure the accessibility of the fixed broadband Internet in Thailand. The service providing of fixed broadband Internet can be the proportion of its Internet network by many types of cables such as Hybrid Fiber Coaxial or Coaxial Cable, FTTx as well as other types of broadband Internet such as satellite Internet, fixed wireless broadband Internet and etc.	Indicators in the OECD Going Digital Toolkit
2	A2	A2 : M2M (Machine to-Machine) SIM cards per 100 inhabitants	Machine-to-Machine (M2M) access rate was calculated from a number of registered SIM cards of Machine-to-Machine (M2M) per 100 population in order to determine the amount of IoT technology components of device-to-device connectivity which is an important foundation in the development and the use of technology. This indicator is relevant to SIM card registrations used in machines and devices such as automobiles, consumer electronics, smart meters, personal navigation devices and other applications that do not include Dongle devices and tablets.	Indicators in the OECD Going Digital Toolkit

No	Code	Indicators	Details of assessment and calculation of indicators	Note
3	A3	A3 : Mobile broadband subscription per 100 inhabitants	The proportion of mobile broadband Internet accessibility was calculated from 100 Internet users who registered the mobile broadband. The OECD indicates that these users must consume the mobile broadband Internet service with a download speed of at least 256 kbps; for example in HSPA networks, LTE networks, etc., but excluding the users of specific networks in the GPRS EDGE or CDMA segment and the network from 1xRTT to measure the population's mobile broadband Internet usage in each country.	Indicators in the OECD Going Digital Toolkit
4	A4	A4 : Share of households with broadband connections	The proportion of households with Internet access was calculated from the households that use both fixed broadband internet and mobile broadband comparing to a number of households across the country. This indicator reflects the accessibility to broadband Internet services of people in the country. It also reflects the level of development of the country's digital infrastructure. The types of broadband Internet have been divided to: 1) Fixed broadband services that are the copper wire Internet or xDSL such as ADSL, SDSL, VDSL, etc., the cable wire, the fiber optic cable (FTTx), the other cable types such as leased line Internet, etc., and the wireless types such as broadband Internet via satellite, fixed wireless Internet (Fixed Wireless Access: FWA), etc. 2) Mobile broadband services such as mobile Internet (3G,	Indicators in the OECD Going Digital Toolkit

No	Code	Indicators	Details of assessment and calculation of indicators	Note
			4G, 5G technology, etc.) and other broadband services such as narrowband Internet. The OECD will consider only the Internet accessible area where the download speed is not lower than 256 kbps.	
5	A5	A5 : Share of business with broadband contracted speed of 30 Mbps or more	The proportion of businesses with Internet speeds of 30 Mbps or more was calculated from a number of businesses that have installed Internet speeds of 30 Mbps. per total number of businesses. This indicator reflects the broadband accessibility of the businesses in diferrent sizes and various industrial sectors within the country. It can also reflect the level of development of the country's digital infrastructure. The OECD will consider domestic business accessibility to broadband Internet services only in the part of fixed Internet service with a download speed of 30 Mbpsor more and will consider for the businesses that employ 10 or more employees.	Indicators in the OECD Going Digital Toolkit
6	A6	A6 : Share of the population covered by at least a 4G mobile network	The proportion of population in a 4G or faster area was calculated from the population in a 4G or faster area comparing to the total population of the country. This indicator shows the coverage of 4G or faster connections which is another measure of telecommunication infrastructure and accessibility, but it does not present its traffic. There are other factors that are another stimulus such as price, etc.	Indicators in the OECD Going Digital Toolkit

No	Code	Indicators	Details of assessment and calculation of indicators	Note
7	A7	A7 : Disparity in broadband uptake between urban and rural households	A measure of disparity in access to broadband Internet usage between urban areas and rural areas. This is a comparison of the proportion of households using the Internet both in the form of fixed broadband or mobile broadband Internet at the speed above 256 kbps in the households between urban and rural areas where most consumers in remote areas face barriers to Internet access due to the price factors, distance and population distribution.	Indicators in the OECD Going Digital Toolkit
8	AX1	AX1 : Fixed Broadband Price to GNI per Capita	It is a measure of the proportion of fixed broadband Internet prices on national income per person to pay an effort to use fixed broadband Internet service of the population in each country on national income per person by using the price of fixed broadband Internet per month, which is the basic price that makes it possible to use Internet service and it is compared with the value of national production per person. This indicator is also one of the indicators of the country's digital infrastructure development strategy of the Ministry of Digital Economy and Society as well.	In addition to the indicators From the OECD Going Digital Toolkit framework.
9	AX2	AX2 : Proportion of fiber optic high speed internet connections	This indicator is an analysis of the proportion of high-speed Internet connections of the fiber optic cable type, calculated from the use of the service (subscription) of the Internet fixed broadband type of fiber optic cable per total number of fixed broadband Internet services. This indicator reflects the	In addition to the indicators From the OECD Going Digital

No	Code	Indicators	Details of assessment and calculation of indicators	Note
			efficiency of fixed broadband infrastructure by using the technology of a network cable (Fiber Optic) which makes it highly efficient. In order to provide the highest Internet speed available today, a fiber optic network enables the use of a high speed Internet network for more than 1 gigabit per second and it is an indicator that is included in the ICT Development Index framework of the ITU.	Toolkit framework.
10	AX3	AX3 : Proportion of internet access of primary care units	Referring to the design of indicators for the 4-year government action plan 2019-2022 of the Ministry of Digital Economy and Society Strategy 1: To develop the country's digital infrastructure, the indicator of Internet access was determined by using the percentage indicator of the sub-district health promoting hospitals and Local Administrative Organisation and community digital center with Internet access.	In addition to the indicators from the OECD Going Digital Toolkit framework.
Use with 10 indicators				
11	U1	U1 : Internet users as a share of individuals	The proportion of individuals who use the Internet was calculated from the general Internet usage comparing to the total country population. This indicator reflects the broadband Internet usage of the population in the country, which in general means to the daily use. It is able to look in deep details at the issues such as Internet user characteristics (eg gender, age range, education level, income level, etc.) or Internet user behavior (eg frequency of use, place, Internet using	Indicators in the OECD Going Digital Toolkit

No	Code	Indicators	Details of assessment and calculation of indicators	Note
			period, etc.) The OECD will analyze data from Internet users aged 16-74 years.	
12	U2	U2 : Share of individuals using the internet to interact with public authorities	The proportion of individuals who use government online services via Internet. It was calculated from a number of government online services via Internet among the users of the age 16-74 years comparing to the total population of the ages between 16-74 years. This indicator reflects people's digital activities in related to government online services from receiving general services such as surfing on government offices' websites including getting provided online services such as forms downloading, forms submitting, etc. The OECD will analyze data from Internet users aged 16-74 years who use digital government services.	Indicators in the OECD Going Digital Toolkit
13	U3	U3 : Share of internet users who have purchased online in the last 12 months	The proportion of Internet users who purchased goods/services via online channels during the past 12 months was calculated from a number of Internet users aged between 16-74 yesrs who bought products or services via online channels comparing to the total number of all Internet users aged 16-74 years over the past 12 months. This indicator reflects the digital activitivies of people involving in online purchases of goods/services. It can also reflect the level of digital development in other relevant areas, such as the development of payment infrastructure and electronic transactions including the trust and confidence of	Indicators in the OECD Going Digital Toolkit

No	Code	Indicators	Details of assessment and calculation of indicators	Note
			people to use Internet and online financial transactions, etc.	
14	U4	U4 : Share of small businesses making e-commerce sales in the last 12 months	The proportion of small entrepreneurs who have distributed online products or services in the past 12 months. It was calculated from small entrepreneurs who distribute products or services through online channels during the past 12 months comparing to the total number of entrepreneurs with more than 10 employees in total. OECD defines the small entrepreneurs that they should have 10-49 employees. This indicator reflects the digital activities of business section. It's about e-commerce trade which is an important strategy to expand business opportunities. It can also reflect the level of digital development in other relevant areas, such as the development of payment infrastructure and e-transactions including the trust and confidence toward Internet usage and online financial transactions of people.	Indicators in the OECD Going Digital Toolkit
15	U5	U5 : Share of businesses with a web presence	The proportion number of entrepreneurs with online presence was calculated from a number of entrepreneurs who have their own websites or use the websites for public relations. It is a channel for online selling products comparing to the total number of all entrepreneurs. This indicator reflects the proportion of businesses that are ready to transact and operate online activities which is a key factor in today's business models in many industries.	Indicators in the OECD Going Digital Toolkit

No	Code	Indicators	Details of assessment and calculation of indicators	Note
16	U6	U6 : Share of businesses purchasing cloud services	The proportion of entrepreneurs who purchase Cloud services was calculated from a number of entrepreneurs who have bought Cloud services comparing to all entrepreneurs with 10 or more employees consuming the Cloud services that provide the technology services over the Internet to access data or database storage systems and various application software systems. This indicator reflects the digitalization of business activities in digital adoption and adaptation. The OECD considers the use of Cloud services of businesses among the OECD state members and other countries where data is stored by considering the size of the business sector and the purpose of using Cloud services, such as for storing corporate email, for company software, to process or run programs/ applications, etc.	Indicators in the OECD Going Digital Toolkit
17	U7	U7 : Average monthly mobile data usage per mobile broadband subscription, GB	The average monthly data usage of mobile broadband Internet users indicates the ability of mobile broadband Internet users to use online services and access to contents via online channels. The network efficiency is critical to meet the growing demand for mobile broadband data services.	Indicators in the OECD Going Digital Toolkit
18	UX1	UX1 : Value of digital payment transactions per person	This indicator shows the value of digital payment transactions per person. “Digital channels” refers to the services provided by Internet Banking and Mobile Banking, the other digital channels are additionally permitted by the Bank of Thailand. This	Out of the indicator framework of OECD Going

No	Code	Indicators	Details of assessment and calculation of indicators	Note
			indicator reflects the digital transactions of people and their adoption.	Digital Toolkit
19	UX2	UX2 : Proportion of cloud usage by government agencies to total cloud demand	This proportion was calculated from a number of government Cloud traffic that an agency has in use versus the total number of agencies that needs all Cloud usage in the implementation of the Thailand Digital Outlook Phase 3, the scope of data collection from public Cloud service providers has also been increased to provide additional services to government agencies.	Out of the indicator framework of OECD Going Digital Toolkit
20	UX3	UX3 : Average daily time spent on the internet	It is an additional indicator in the Thailand Digital Outlook Phase 3 to determine as an indicator of the people's Internet usage behavior based on the indicator design from OECD Social Indicators OECD (2019), Society at a Glance 2019: OECD Social Indicators, OECD Publishing, Paris, https://ourworldindata.org/grapher/daily-time-spent-on-the-Internet-by-young-people	Out of the indicator framework of OECD Going Digital Toolkit
Innovation with 6 indicators				
21	I1	I1 : ICT investment as a percentage of GDP	The percentage of investment in Information and Communications Technology to GDP is a measure used to indicate the distribution of Information and Communications Technology (ICT Diffusion) in the economic sector. The investments in the Information and Communication Technology sector are calculated from Gross Fixed Capital Formation in the field of Information Technology Equipment, computer software and databases according to the	Indicators in the OECD Going Digital Toolkit

No	Code	Indicators	Details of assessment and calculation of indicators	Note
			System of National Accounts 2008 (SNA 2008) standards per Gross Domestic Product.	
22	I2	I2 : Business R&D expenditure in information industries as a percentage of GDP	The percentage of investment expenditure on Research and Development of business groups in the information industries to GDP, it is all account types of funding sources in the information industry and will be consistent with all 7 industries based on the 2009 TSIC industry standard. 1) Subsection 26 The Manufactures of Computer, Electronic and Optical Products 2) Subsection 58 Publishing Activities 3) Subsection 59 Motion Picture, Video and Television Program Production, Sound Recording and Music Publishing Activities 4) Subsection 60 Television Programming and Broadcasting Activities 5) Subsection 61 Telecommunications 6) Subsection 62 Computer Programming, Consultancy and Related Activities 7) Subsection 63 Information Service Activities This is to indicate the amount of Research and Development investment in the information industry by type of industry and may be compared with digital-related industries.	Indicators in the OECD Going Digital Toolkit
23	I3	I3 : Venture Capital investment in the ICT sector as a percentage of GDP	The percentage of Venture Capital investment in ICT sectors to GDP was calculated from the investment value of Venture Capital businesses in the	Indicators in the OECD Going

No	Code	Indicators	Details of assessment and calculation of indicators	Note
			Information and Communications Technology sector per GDP (Gross Domestic Product), compared during the same period. It is an indicator to measure the amount of Venture Capital investment in innovative companies with high growth potential. It represents a way to develop and stimulate investment of entrepreneurs in businesses that are expected to have high potential in each country.	Digital Toolkit
24	I4	I4 : Share of start-up firms (up to 2 years old) in the business population	The proportion of the new entrepreneurs (business age not over 2 years) per total number of all entrepreneurs was calculated from a number of new entrepreneurs (business age is not more than 2 years) comparing to the total number of entrepreneurs who are still running business. This indicator is a measure of business dynamics, which is a mechanism that leads to more efficient allocation of resources through the movement of resources from underperforming businesses to higher performing businesses. Indicator I4 is a calculation of the proportion of new entrepreneurs in all 3 indicators as follows: 1) The proportion of new entrepreneurs aged not over 2 years that are still in operation 2) The proportion of new entrepreneurs aged less than 1 year that are still in operation	Indicators in the OECD Going Digital Toolkit

No	Code	Indicators	Details of assessment and calculation of indicators	Note
			3) Registration ratio of new entrepreneurs at the time of analysis, however it does not count in cases where the company has restructured its operations, such as a merger, separation of the company or restructuring within the group of companies comparing to the total number of companies that are still in operation.	
25	IX1	IX1 : The number of patent applications in the Information Technology or related fields in Thailand	The indicator shows a number of patent applications in Thailand in the related fieds to Information Technology each year, based on the International Patent Classification (IPC) 2015-2017 from the Department of Intellectual Property; therefore, it can reflect the innovation dimension of the country in another indicator.	Out of the indicator framework of OECD Going Digital Toolkit
26	IX2	IX2 : A number of robots being used in Thailand's manufacturing sector per 10,000 manufacturing workers	This indicator was calculated based on a number of active robots used in the manufacturing sector of Thailand towards 10,000 people in the manufacturing industry. This indicator has showed the referenced and statistical data from the organisation. The International Federation of Robotics, which conducts the Thailand Digital Outlook Phase 3 study project, The consumption of robots in the service sector in addition to the manufacturing industry including collecting in-depth information of objectives in adopting robotic technology that is robotic or physical, and factors used in decision-making and benefits or impacts both	Out of the indicator framework of OECD Going Digital Toolkit

No	Code	Indicators	Details of assessment and calculation of indicators	Note
			directly and indirectly from the adoption of robotic technology.	
Jobs with 7 indicators				
27	J1	J1 : ICT task-intensive jobs as a percentage of total employment	The percentage of IT staff to total workforce was calculated from a number of IT staff to the total number of IT workers. The OECD has defined the Information Technology jobs as 21 positions of ICT Specialist and 36 positions of other ICT-Intensive jobs which are classified by occupations according to international standards (ISCO-08).	Indicators in the OECD Going Digital Toolkit
28	J2	J2 : Digital-intensive sectors' share in total employment	The proportion of people employed in the digital sectorc to the total number of employed people was calculated from a number of people who are employed in the digital business sector to the total number of employed workers in the country. The OECD defines the digital business sector as a business group that uses digital technology on 4 levels. 1) High Digital-intensive Sectors 2) Medium-high Digital-intensive Sectors 3) Medium-low Digital-intensive Sectors 4) Low Digital-intensive Sectors This indicator calculates a number of workforces in High Digital-intensive Sectors and Medium-high Digital-intensive Sectors. The OECD has surveyed and assessed the level of digital technology use among all business segments by ISIC (International Standard Industrial Classification of All Economic Activities Revision) 4: ISIC Rev.4).	Indicators in the OECD Going Digital Toolkit

No	Code	Indicators	Details of assessment and calculation of indicators	Note
			ISIC is a standard for categorizing economic activities in terms of production of goods and services. In addition, all economic activities are organized into different industry categories to make it easier to present statistical data.	
29	J3	J3 : Workers receiving employment-based training, as a percentage of total employment	The percentage of employees who gain the work-related skills training per number of all labors was calculated from a number of employed workers who have been trained in work related skills provided by employers or business operators. However, professional development/training includes formal training and on-the-job training.	Indicators in the OECD Going Digital Toolkit
30	J4	J4 : New tertiary graduates in science, technology, engineering and mathematics, as a percentage of new graduates	For the indicator J4, as defined by the OECD, only graduates of higher education covering grades 5-8 are selected according to the International Standards Classification of Education (ISCED 2011). However in Thailand, the International Standards Classification of Education (ISCED 2013) has been compiled with slightly different classification details, but the overall category data is the same. This can be possibly compared with the OECD state members and the other countries where OECD data is stored by classifying education according to International Standards Classification of Education 2013 (ISCED 2013), only for graduates of higher education, covering 4 levels as follows: • Level 5: Diploma/Higher Vocational Certificate (High Vocational Certificate)/Technical	Indicators in the OECD Going Digital Toolkit

No	Code	Indicators	Details of assessment and calculation of indicators	Note
			Vocational Certificate (High Vocational Certificate) • Level 6: Bachelor's degree or equivalent to Diploma of Advanced Technical Teacher (Thailand) and Bachelor's Degree Continuing • Level 7: Master's degree or equivalent • Level 8: PhD or equivalent, dividing the fields of graduates according to international standards At each graduate level, the OECD selects major field/branch of graduates according to the International Standards Classification of Education (ISCED 2013) by disciplines related to Science, Technology, Engineering and Mathematics, including fields/branches related to Information Technology according to the definition of the OECD, there are 3 areas of field studies: • Branch 05 Natural Science Mathematics and Statistics • Branch 06 Information and Communication Technology • Branch 07 Engineering production and construction	
31	J5	J5 : Public spending on active labour market policies, as a percentage of GDP	The percentage of government expenditure on labor market policy implementation to GDP (Gross Domestic Product) was calculated by taking the sum of government expenditure budgets	Indicators in the OECD Going

No	Code	Indicators	Details of assessment and calculation of indicators	Note
			related to labor market policy implementation. The OECD has set the framework for considering budgeting of related expenditures into 5 groups: 1) Expenditure budget to support the target labor group to create their own business (Start-up incentives) 2) Direct job creation expenditure budget 3) Expenditure budget to support the target workers to have employment incentives 4) Expenditure budget for spending on recruitment/placement and related services 5) Expenditure budget for spending on the professional development	Digital Toolkit
32	JX1	JX1 : Average wage of ICT specialists	This average was calculated by taking the income of workers who are grouped as Information Technology workers and divided by a number of all workers in this group by the survey. This indicator is one of the main indicators to measure the competitiveness of the countries in many institutions such as the World Economic Forum (WEF: World Economic Forum) in Thailand. The National Statistical Office (NSO) has recognized the importance and has conducted a survey on Information Technology workers in Thailand and also presented statistics on the average income of this group of workers as well.	Out of the indicator framework of OECD Going Digital Toolkit

No	Code	Indicators	Details of assessment and calculation of indicators	Note
33	JX2	JX2 : Labor Productivity in Digital-intensive industries	It was calculated by dividing the current year's output by the base year's productivity, and by dividing a number of working hours at the current year, by dividing that data at the base year, then dividing the output with the base year, dividing the quotient of a number of working hours or a number of workers comparing to the base year. It will get the result as an index labor productivity per working hour. This indicator is widely used in different countries including the OECD members as it is important in economic and social assessment for Thailand. The Bank of Thailand has also calculated this indicator.	Out of the indicator framework of OECD Going Digital Toolkit
Society with 8 indicators				
34	S1	S1 : Percentage of individuals aged 55-74 using the internet	The percentage of individuals aged 55-74 years using the Internet was calculated from a number of Internet users aged 55-74 years per total number of all population. This indicator reflects the broadband Internet use among the elderly population in the country. It also reflects the gaps in digital development and implementation of promotional measures related to social dimensions. The OECD will compare the Internet usage data of each OECD member country and other countries where data is collected which will be classified according to the educational level of the elderly, which is the level of	Indicators in the OECD Going Digital Toolkit

No	Code	Indicators	Details of assessment and calculation of indicators	Note
			higher education, moderate level of education and low or uneducated level.	
35	S2	S2 : Percentage of individuals who live in households with income in the lowest quartile using the internet	The percentage of individuals in households with the household income levels at the lowest 25% range (1st quartile) using the Internet was calculated as a number of individuals in households with the lowest 25% household income level (1st quartile) using the Internet per total number of all population. This indicator reflects the usage of broadband Internet among the low-income population in the country. It also reflects the level of the country's digital divide as a result of household income inequality.	Indicators in the OECD Going Digital Toolkit
36	S3	S3 : Women as a share of all 16-24 year-olds who can program	The proportion of women aged 16-24 years who can program was calculated from a number of women aged 16-24 years who can program per total number of female population. This indicator reflects the level of gender inequality prevailing of digital dimension in the country. It is evaluated by programming skills which are one of the essential skills in the digital era onwards.	Indicators in the OECD Going Digital Toolkit
37	S4	S4 : Disparity in Internet use between men and women	The proportion of the difference in Internet use between males and females was calculated by the difference in the proportion of Internet use between males and females analyzed between the ages of 16-74 years. This indicator reflects gender differences in Internet use, which can be taken to increase female use and access to the Internet.	Indicators in the OECD Going Digital Toolkit

No	Code	Indicators	Details of assessment and calculation of indicators	Note
38	S5	S5 : Percentage of individuals who use digital equipment at work that telework from home once a week or more	The percentage of individuals who use digital tools for telework from home once or more per week was calculated based on a number of people who use digital tools for telework from home once or more per week comparing to the total number of population. The OECD has determined the use of digital tools referring to the use of computers and digital devices to work remotely from home. This indicators can reflect the pattern and organisation of government offices and/or the private companies in the country to become digital sections which can reflect the work and life balance quality of workers in the country as well.	Indicators in the OECD Going Digital Toolkit
39	S6	S6 : Top-performing 15-16 year old students in science, mathematics and reading	The percentage of students aged 15-16 years who achieved the quotient scores of PISA reading in Mathematics and Science at advanced Level (Level 5 and above) (per total number of students taking PISA assessments) was calculated from the students aged 15-16 years who completed the OECD's Programme for International Student Assessment (OECD's Programme) and achieved the high level of assessment (Level 5 and Level 6) comparing to the total number of students taking the PISA assessment. This indicator is used to measure the level of required basic individual competence to adapt in the digital era in Thailand. There is the Institute for the Promotion of Teaching Science and Technology	Indicators in the OECD Going Digital Toolkit

No	Code	Indicators	Details of assessment and calculation of indicators	Note
			(NSTDA), together with the OECD Organisation, to create an International Standards Student Competency Assessment Program (PISA) every 3 years, with the last year being assessed in 2018.	
40	S7	S7 : OECD Digital Government Index	It is an indicator used to evaluate and compare the effectiveness of digital government action by assessing policies, strategies and projects involved in all dimensions. The dimensions of the assessment are based on the OECD Digital Government Policy Framework, which consists of 6 areas: 1) Digital by design 2) Being a data-driven General public 3) Government as a platform 4) Openness (Open by default) 5) User driven consideration 6) Proactiveness It is a data and opinion survey from the government and related offices. All scores are calculated on a Composite Index from 0 (least) to 1 (highest).	Indicators in the OECD Going Digital Toolkit
41	S8	S8 : E-waste generated, kilograms per inhabitant	The amount of electronic waste generated in the country each year can be calculated by using an assessment from the Global E-waste monitor. The OECD defines the definition of “E-waste” as unused electrical and electronic products, therefore it is considered not to be recycled. It is necessary to calculate the amount of electronic waste in 2 categories: the amount of generated electronic waste and the amount of	Indicators in the OECD Going Digital Toolkit

No	Code	Indicators	Details of assessment and calculation of indicators	Note
			electronic waste that can be recycled. All products will be classified into 54 categories according to the UNU-Keys standard. It indicates and reflects to the environmental impact of the production and consumption sectors of the ICT industry.	
Trust with 5 indicators				
42	T1	T1 : Percentage of internet users experiencing abuse of personal information or privacy violations	The percentage of people experiencing the breach to their personal data was calculated based on a number of Internet users aged 16-74 years who experienced the breach of their personal data within the past 12 months comparing to the total number of Internet users. The OECD defines that the personal data breaches includes the breach of personal data that is transmitted and received on the Internet and/or being uploaded or disseminated personal information, photos and videos on various online medias. This indicator reflects the insecurity of resulting information that is an important factor affecting the trust of most Internet users in the country.	Indicators in the OECD Going Digital Toolkit
43	T2	T2 : Percentage of individuals not buying online due to payment security concerns	The percentage of individuals who do not choose products/services through online channels due to the concerns of secure payment system was calculated from a number of Internet users aged 16-74 years who do not choose online shopping due to the concerns of secure payment systems in the past 12 months per the total number	Indicators in the OECD Going Digital Toolkit

No	Code	Indicators	Details of assessment and calculation of indicators	Note
			of all Internet users. This indicator reflects the level of the trust in electronic transactions security of people in the country related to e-commerce trade.	
44	T3	T3 : Percentage of individuals not buying online due to concerns about returning products	The percentage of individuals who do not buy/choose products/services through online channels due to concern in product returning was calculated from a number of Internet users aged 16-74 years who do not choose online shopping due to the concerns of product returning in the past 12 months per the total number of Internet users. This indicator reflects the level of the trust in electronic transactions security of people in the country related to e-commerce trade.	Indicators in the OECD Going Digital Toolkit
45	T4	T4 : Percentage of businesses in which ICT security and data protection tasks are mainly performed by own employees	The percentage of companies operating in the company's Information Technology security or data protection operated by personnel/employees within the company was calculated from a number of companies operating in the Information Technology security or data protection operated by personnel/employees within the company per the total number of all companies with more than 10 employees. This indicator shows the importance of implementing IT security as part of business operations. It also shows the readiness of business sectors to adapt themselves to the digital age.	Indicators in the OECD Going Digital Toolkit
46	T5	T5 : Health data sharing intensity	The proportion of people's health data sets (Data sets) that can be exchanged between agencies was calculated from a number of public health data sets (Data	Indicators in the OECD Going

No	Code	Indicators	Details of assessment and calculation of indicators	Note
			sets) that can be exchanged between agencies comparing to the total number of public health datasets as a percentage. The OECD defines exchangeable entities for consideration as follows: 1) Government bodies 2) Universities and/or non-profit research centers 3) Health care providers 4) Business departments 5) Foreign government agencies or university or non-profit research organisations	Digital Toolkit
Market openness with 4 indicators				
47	M1	M1 : Share of businesses making e-commerce sales that sell across borders	The proportion of companies that distribute products/services through online channels in the international markets (cross-border e-commerce trade) was calculated from a number of companies that distribute goods/services through online channels in the international market (cross-border e-commerce trade) per total number of companies whose products/services are distributed through online channels except for companies in the financial and banking industry. This indicator reflects the potential of online business and the competitiveness in international markets, which are key factors in the growth of the business sector.	Indicators in the OECD Going Digital Toolkit
48	M2	M2 : Digitally-deliverable services as a share of	The proportion of business providing digital services to all service trade was calculated from the value of digital	Indicators in the OECD

No	Code	Indicators	Details of assessment and calculation of indicators	Note
		commercial services trade	service trade, taking into account both the imports and exports per the total value of all trade I services. The OECD classifies businesses in accordance with EBOPS 2010 (Extended Balance of Payments Classification) by selecting 5 businesses that provide digital services as a priority, as follows: 1) Insurance and provident fund services 2) Financial services 3) Intellectual Property Services that are not classified in other categories 4) Telecommunications, computer and information services 5) Audio-visual service and related services	Going Digital Toolkit
49	M3	M3 : ICT goods and services as a share of international trade	The proportion of ICT goods and services trading comparing to the value of international trade was calculated from the value of trade in ICT goods and services comparing to the value of international trade, taking into account both the value of imports and exports. The OECD defines ICT goods and services as: 1) Consumer electronic equipment 2) Electronic components 3) Computers and peripheral equipment 4) Telecommunication equipment 5) Other ICT products and services	Indicators in the OECD Going Digital Toolkit
50	M4	M4 : Digital-intensive services value added embodied in manufacturing exports, as a percentage of	The percentage of added value of goods exports resulting from the utilization of digital services or digital technology to the value of exports of the entire manufacturing industry was calculated	Indicators in the OECD Going

No	Code	Indicators	Details of assessment and calculation of indicators	Note
		manufacturing export value	from the value of trade in the form of value-added (Trade in Value-added: TiVA) in the service business using digital technology to the export value of the entire manufacturing industry. The OECD considers that businesses with moderate to high level of use of digital technology only can reflect the digital business sector. These business groups are all 5 major categories according to the ISIC Rev. 4 standard, namely: 1) Wholesale and retail of the motor vehicles and motorcycles repairing 2) Information and Communication 3) Financial and insurance activities 4) Professional, scientific and academic activities 5) Other categories related to digital services	Digital Toolkit
Growth and well-being with 3 indicators				
51	G1	G1 : Digital-intensive sectors' contribution to value added growth	The average annual growth rate of added value generated in the digital sector which its added value can be measured by the average increase in Gross Domestic Products (GDP) was calculated from the growth rate of real GDP on a chain only in the digital business sector comparing with the average annual growth rate of the real GNP in the chain. The OECD defines the digital business sector as High Digital-intensive Sectors and Medium-high Digital-intensive Sectors. This is to meet the participation of the digital	Indicators in the OECD Going Digital Toolkit

No	Code	Indicators	Details of assessment and calculation of indicators	Note
			business sector in economic development.	
52	G2-S5	G2-S5 : Percentage of individuals who use digital equipment at work that telework from home once a week or more	The percentage of individuals who use digital tools for telework from home once or more per week was calculated from a number of people using digital tools for working remotely from home, once a week or more comparing to the total population. The OECD has determined the use of digital tools which means to use a computer and various digital devices to work remotely from home. This indicator can reflect the pattern and organisation of government agencies and/or the private sector in the country to become digital use and can reflect the balance of work and quality of life of labor in the country as well.	Indicators in the OECD Going Digital Toolkit
53	G3	G3 : Workers experiencing job stress associated with frequent computer use at work	The proportion of employees who experience the stress during work from using computers more than half of the total working period calculated from employed workers who use computers for more than half of the total working time, and sometimes feeling stress, feeling stress most of the time and to be always stress per total number of all employed workers.	Indicators in the OECD Going Digital Toolkit
54	G4-S2	G4-S2 : Percentage of individuals who live in households with income in the lowest quartile using the internet	The percentage of individuals in households with household income levels at the lowest 25% range (1st quartile) of the Internet using was calculated from a number of people living in a household with a household income level at the lowest 25% range (1st quartile) of the	Indicators in the OECD Going Digital Toolkit

No	Code	Indicators	Details of assessment and calculation of indicators	Note
			Internet using per total number of all population. This indicator reflects the broadband Internet usage among the low-income people and also reflects the level of digital divide as a result of household income inequality in the country.	
55	G5	G5 : Students aged 15-16 who feel bad if no internet connection is available	The proportion of students aged 15-16 years who feel anxious when they are unable to use or connect to the Internet was calculated from the questionnaires of the students aged 15-16 years who answered “Strongly agree” and “Agree” per the total number of all students aged 15-16 years.	Indicators in the OECD Going Digital Toolkit
56	G6-T1	G6–T1 : Percentage of internet users experiencing abuse of personal information or privacy violations	The percentage of people experiencing personal data breach was calculated based on a number of Internet users aged 16-74 years who experienced personal data breaches within the past 12 months comparing to the total number of Internet users. The OECD defines personal data breaches to include personal data breach that are transmitted on the Internet and/or being uploaded or disseminated personal information, images and videos on various online medias. This indicator reflects the resulting information insecurity. This is an important factor that affects the trust of Internet users in the country.	Indicators in the OECD Going Digital Toolkit
57	G7-S8	G7–S8 : E-waste generated, kilograms per inhabitant	The amount of electronic waste generated in the country each year is assessed from the Global E-waste monitor. The OECD defines the definition of “E-waste” as unused electrical and	Indicators in the OECD Going

No	Code	Indicators	Details of assessment and calculation of indicators	Note
			electronic products. Therefore, it is considered not to be recycled. It is necessary to calculate the amount of electronic waste in 2 categories: the amount of electronic waste and the amount of electronic waste that can be recycled. All products will be classified into 54 categories according to the UNU-Keys 9 standard. This indicator reflects the environmental impact from the IT manufacturing and consumption industry sectors.	Digital Toolkit

4. Survey and Data Collection

In considering the appropriate data collection methods, ONDE has reviewed the guidelines and methods of data collection implemented in the Thailand Digital Outlook Phase 2 to study the occurred problems and appropriateness of data collection methods for using in the implementation of the Thailand Digital Outlook Phase 3 by considering 2 main approaches that can be carried out in collecting data to analyze indicators and other dimensions as follows:

Data collection with the surveys as the primary data is the method of collecting for analyzing indicators or other dimensions in the absence of secondary data for reference or for instoring more information that is more up-to-date than secondary data in the analysis in order to be more accurate by analyzing demographic dimensions under the OECD Going Digital Toolkit framework, which has 3 main target groups: 1) the public and general sectors, 2) the private business and entrepreneur sectors, and 3) the primary care units

Collecting data from secondary sources is a study of the availability of the published secondary information or it has already been collected from the responsible agencies both domestically and internationally that can be refered for calculation and analysis. In this way, the ONDE has also scheduled a meeting with the data subject agency to understand details for correct reference and/or request additional information with courtesy to be used for a more comprehensive analysis.

4.1 Collecting indicator data with surveys

The survey and indicator data collecting will be conducted with 3 sample groups as follows:

- Determining the sample of the general public sector will conduct a survey of at least 500 samples per province, 77 provinces across the country, by calculating the samples based on the application of Stratified Sampling that are not less than 38,500 samples in total
- Determining the sample groups of private business sectors will conduct the comprehensive survey in 1) Bangkok, 2) Central region (excluding Bangkok but counting the provinces in the perimeter, 3) the eastern region, 4) the northeast region, 5) the northern region, 6) the western region, and 7) the southern region, and determine the total number of samples to be surveyed at least 3,000 samples
- Determining the sample groups of primary care units to survey the sample of the primary care unit by using the method of asking for cooperation from the subordinate population groups, Ministry of Education such as OBEC, Border Patrol Police, etc., and Ministry of Public Health such as Sub-district Health Promoting Hospitals, Community Health Centers, etc. In the process, a sample group from the surveyed population is: the number of educational institutions in Thailand which are 41,258 schools from the central data system of the Ministry of Education and the number of Sub-district Health Promoting Hospitals and Community Health Centers which are 10,158 units. There are all 51,456 agencies in total. They were determined as the survey population size and calculated according to the Taro Yamane principle, which was calculated as the sample size of at least 397 agencies and calculated the percentage by area of surveyed population in all primary care sectors. It is the target of the sample number of primary care agencies.

In this Thailand Digital Outlook Phase 3, ONDE has defined two survey formats which are Online Survey and Offline Survey. The details and survey methods are as follows

Online Surveys herein means the online surveys which are prepared in the form of survey platform and will be the main guideline for the data survey of private business samples and primary care units.

Offline Survey refers to the surveys based on other methods including phone interviews, field trips/survey casts/submissions survey by mail, etc., which will be the main

guideline for conducting surveys in this Thailand Digital Outlook Phase 3 of the general public sample groups and private business sample groups because ONDE needs to survey the sample groups that require the accuracy of the data and covering all provinces across the country according to the action plan.

The ONDE started the survey since June 22, 2021, both online and offline, and the survey ended on July 31, 2021.

4.2 Collecting and storing indicator data from secondary sources

In conducting studies and collecting data from the secondary sources to analyze indicators and dimensions of digital economy and society, ONDE studied the reference data conducted by the OECD to collect data for OECD countries in the Going Digital Toolkit framework and reviewed the data collection guidelines of the Thailand Digital Outlook Phase 2 to study the data collected by various agencies both public and private sectors which are published in the relevant reports in the Thai context format. It is to analyze the data in detail to assess the readiness and feasibility of using references from secondary sources with data groups and reports related to the indicators in the implementation of the Thailand Digital Outlook Phase 3 from many agencies and organisations which are:

1. Office of the National Broadcasting and Telecommunications Commission (NBTC)
2. National Statistical Office Thailand (NSO)
3. Office of the National Economic and Social Development Council
4. Bank of Thailand
5. Digital Economy Promotion Agency (DEPA)
6. Electronic Transactions Development Agency (ETDA)
7. Office of National Higher Education, Science, Research and Innovation Policy Council (NXPO)
8. Department of Business Development, Ministry of Commerce
9. Department of Intellectual Property, Ministry of Commerce
10. Office of the Chief Administrator of the Ministry of Higher Education, Science, Research and Innovation
11. Parliamentary Budget Office
12. Office of the Chief Administrator of Ministry of Public Health
13. Office of Small and Medium Enterprises Promotion (OSMEP)

14. The Institute for the Promotion of Teaching Science and Technology (IPST)
15. The Office of the National Digital Economy and Society Commission (ONDE)
16. Total Access Communication Public Company Limited
17. True Corporation Public Company Limited
18. Advance Info Service Public Company Limited
19. Techsauce Media Company Limited
20. International Telecommunications Union (ITU)
21. United Nations (UN)
22. International Federation of Robotics
23. The Organisation for Economic Cooperation and Development (OECD)
24. Global E-waste Statistics Partnership (GESP)

Chapter 2 : Digital Development of Thailand in the Dimension of Access

The efficient digital infrastructure that everyone can access and utilize to support the Thailand digital transformation is to enhance the country's economy and society with digital technology. The critical digital infrastructure consists of the quality telecommunication Information Technology infrastructure. It covers all areas and can provide continuous service to support communication, connection, information exchange, trade and commerce, public and private services, as well as the use of various forms which is beneficial to the creation of economic wealth and social security of the country including to support being a digital hub in the future. The results of digital development in Access according to the framework of indicators of the OECD organisation are as follows:

Indicator A1 : Fixed broadband subscription per 100 inhabitants

It is a measure of the proportion of fixed broadband Internet access based on fixed broadband Internet user per 100 inhabitants. The OECD defines fixed broadband Internet users as the download speeds of 256 kbps or greater. This is to measure the accessibility of the fixed broadband Internet in Thailand. The service providing of fixed broadband Internet can be the proportion of its Internet network by many types of cables such as Hybrid Fiber Coaxial or Coaxial Cable, FTTx as well as other types of broadband Internet such as satellite Internet, fixed wireless broadband Internet and etc.

According to the information in the Thailand Telecommunications Index 2019-2020 report from the Office of The National Broadcasting and Telecommunications Commission (NBTC), the proportion of fixed broadband internet users per 100 population is 16.87 people per 100 population, up from 14.52 in 2019.

Table 2 Percentage of fixed internet users per 100 population in 2017-2020

Proportion of fixed internet users	2017	2018	2019	2020
Percentage of fixed internet users per 100 population	11.86	13.24	14.52	16.87

Reference: Office of The National Broadcasting and Telecommunications Commission (NBTC) and the report from ICT Country Data, ITU

Indicator A2 : M2M (Machine to-Machine) SIM cards per 100 inhabitants

The proportion of registered Machine-to-Machine (M2M) SIM cards per 100 inhabitants was calculated from a number of registered SIM cards of machine-to-machine (M2M) per 100 population in order to determine the amount of IoT technology components of device-to-device connectivity which is an important foundation in the development and the use of technology. This indicator is relevant to SIM card registrations used in machines and devices such as automobiles, consumer electronics, smart meters, personal navigation devices and other applications that do not include Dongle devices and tablets.

According to the annual report of the telecommunications providers and the relevant candid data of the number of registered SIM cards of Machine-to-Machine (M2M) per 100 population are 1.9 numbers.

Indicator A3 : Mobile broadband subscription per 100 inhabitants

The proportion of mobile broadband Internet accessibility was calculated from 100 Internet users who registered the mobile broadband. The OECD indicates that these users must consume the mobile broadband Internet service with a download speed of at least 256 kbps; for example in HSPA networks, LTE networks, etc., but excluding the users of specific networks in the GPRS EDGE or CDMA segment and the network from 1xRTT to measure the population's mobile broadband Internet usage in each country.

According to the information in the Thailand Telecommunications Index 2019-2020 report from the Office of The National Broadcasting and Telecommunications Commission (NBTC), the proportion of the mobile broadband subscription per 100 inhabitants is 92.56 people, up from 86.68 people in 2019.

Table 3 Percentage of mobile internet users per 100 population in 2017-2020

Proportion of the mobile broadband Internet users	2017	2018	2019	2020
Proportion of the mobile broadband Internet users per 100 inhabitants	79.73	83.62	86.68	92.56

Reference: The report from telecommunication market, Office of The National Broadcasting and Telecommunications Commission (NBTC) and the report from ICT Country Data, ITU

Indicator A4 : Share of households with broadband connections

The proportion of households with Internet access was calculated from the households that use both fix broadband interne internet and mobile broadband comparing to a number of households across the country. This indicator reflects the accessibility to broadband Internet services of people in the country. It also reflects the level of development of the country's digital infrastructure. The types of broadband Internet have been divided to:

Fixed broadband services that are the copper wire Internet or xDSL such as ADSL, SDSL, VDSL, etc., the cable wire, the fiber optic cable (FTTx), the other cable types such as leased line Internet, etc., and the wireless types such as broadband Internet via satellite, fixed wireless Internet (Fixed Wireless Access: FWA), etc.

Mobile broadband services such as mobile Internet (3G, 4G, 5G technology, etc.) and other broadband services such as narrowband Internet. The OECD will consider only the Internet accessible area where the download speed is not lower than 256 kbps.

According to the survey report of using telecommunication in the household of the year 2020 report from the Office of The National Broadcasting and Telecommunications Commission (NBTC), it is calculated at 85.2% which is up from 74.6% in the year 2019. The proportion of households with broadband connections is decreasing every year.

Table 4 Percentage of the households with broadband connections in 2017-2020

Proportion of the households with broadband connections	2017	2018	2019	2020
Proportion of the household with broadband connections	64.4	71.3	74.6	85.2

Referrence: The survey report of using telecommunication in the household of the year 2020 report from the Office of The National Broadcasting and Telecommunications Commission (NBTC)

Indicator A5 : Share of business with broadband contracted speed of 30 Mbps or more

The proportion of businesses with Internet speeds of 30 Mbps or more was calculated from a number of businesses that have installed Internet speeds of 30 Mbps. per total number of businesses. This indicator reflects the broadband accessibility of the businesses in diferrent sizes and various industrial sectors within the country. It can

also reflect the level of development of the country's digital infrastructure. The OECD will consider domestic business accessibility to broadband Internet services only in the part of fixed Internet service with a download speed of 30 Mbps or more and will consider for the businesses that employ 10 or more employees.

According to the survey data of Thailand Digital Development Indicators Index 2021 (private business sector) under the Thailand Digital Outlook Phase 3, it was found that business entities with regular internet service with a download speed of 30 Mbps or more was 89.8% for the businesses that employ 10 or more employees.

Indicator A6 : Share of the population covered by at least a 4G mobile network

The proportion of population in a 4G or faster area was calculated from the population in a 4G or faster area comparing to the total population of the country. This indicator shows the coverage of 4G or faster connections which is another measure of telecommunication infrastructure and accessibility, but it does not present its traffic. There are other factors that are another stimulus such as price, etc.

The data from Indicator 9.c.1 proportion of population covered by at least 4G mobile network (%) 2019, the UN's Global SDG Indicators Database, which is based on the data from NBTC presents the 4G service area or faster in Thailand at 98% in 2019. Regarding to that source, Thailand has had 98% of the population in 4G or faster service areas since 2016.

Indicator A7 : Disparity in broadband uptake between urban and rural households

An indicator of disparity in access to broadband Internet usage between urban areas and rural areas is a comparison of the proportion of households using the Internet both in the form of fixed broadband and mobile broadband Internet at the speed above 256 kbps between urban and rural areas where most consumers in remote areas face barriers to Internet access due to the price factors, distance and population distribution.

The National Statistical Office (NSO) has conducted a survey to collect data using Information Technology and household communication in 2020 and found that a total of 63.8 million people are the in age of 6 years old and over which is 77.8% of whom are internet users, at 83.6% is in the municipalities, while outside municipalities is at 73.2% of Internet users. Regarding the household level data, there are a number of households in municipalities with Internet connectivity at 89.4% and the number of non-municipal households with Internet connectivity accounted for 81.5%. In calculating disparity of the

households' Internet using in the form of broadband internet or 256 kbps connections or more between the municipal and non-municipal areas were 7.9% which is reduced from 11.9% in 2019.

Table 5 Percentage of the survey on the use of information and communication technology in the household in 2020

Year	Municipal Area	Non-municipal Area	Proportion of Disparity
2020	89.4	81.5	7.9
2019	80.9	69.0	11.9

Referrence: National Statistical Office, Proportion of people who can access to the Internet in comparison within municipal and non-municipal areas

It is because the OECD does not have a clear definition of urban and remote areas but depending on the discretion of each country. The ONDE has considered the appropriateness of reference to divide the urban and remote areas according to the criterion by the district at the National Statistical Office used as a criterion.

Indicator AX1 : Fixed Broadband Price to GNI per Capita

This indicator is a measure of the proportion of fixed broadband Internet prices on a national income per person in order to assess the affordability (Affordability) to use fixed broadband Internet service of the population in each country on a national income per person by using fixed broadband Internet price per month which is the basic price that allows you to use Internet service and compared with the value of national production per person. This indicator is in addition to the OECD framework, but is a reference indicator in the framework of the international standard assessment of international digital standards. It is also one of the indicators of the country's digital infrastructure development strategy of the Ministry of Digital Economy and Society as well.

According to the report data of telecommunication market from NBTC in Q3 of the year 2020, the average monthly fixed broadband internet price is 523 baht, based on the average monthly income per number of service providers. Regarding the economic report in the year 2020 from the Office of the National Economic and Social Development Council, it presents that the annual income per capita is 225,914 baht which is 2.78% and is reduced from 2.9% based on the same indicator data in the Thailand Digital Outlook Phase 2.

Indicator AX2 : Proportion of fiber optic high speed internet connections

This indicator is an analysis of the proportion of high-speed Internet connections of fiber optic cable (Fiber Optic) calculated from the subscription of fixed broadband internet (Fiber Optic) per total number of fixed broadband internet services. This indicator reflects the efficiency of building a fixed broadband infrastructure by using high efficiency of Fiber Optic cabling technology to provide the highest internet speed. At present, it is a fiber optic network. This makes it possible to use high-speed internet networks at more than 1 Gbps. It is also an indicator that is included in the ICT Development Index framework of ITU.

According to the data in the Telecommunications Industry Index report 2019–2020, the proportion of fiber-optic broadband internet connections was at 47% which was increased from 44.73% in 2019.

Table 6 Percentage of the high speed internet connections with the Fiber Optic cable category in 2016-2020

Proportion of the high speed internet connections with the Fiber Optic cable	2016	2017	2018	2019
Proportion of the high speed internet connections with the Fiber Optic cable	27.83	36.13	42.10	44.73

Referrence: From the report in the Thailand Telecommunications Index

Indicator AX3 : Proportion of Internet access of primary care units

It is a measure of the proportion of Internet access of primary care units such as sub-district health promotion hospitals, local administrative organisations and community digital centers. It is an indicator in the 4-year government action plan 2019-2022 of the Ministry of Digital Economy and Society Strategy 1: Develop the country's digital infrastructure.

Regarding the survey in the implementation of the Thailand Digital Outlook Phase 3 of primary care units, the proportion of Internet access of primary care units was accounted for 76.4%.

Chapter 3 : Digital Development of Thailand in the Dimension of Use

The benefits and results of using digital technology and Information Technology in the public sector, the private sector and government agencies depend on the effective use of technology and public relations to achieve both direct and indirect use and resulting in many sectors including investment in ICT technology, both tangible and intangible assets, which is an important mechanism for the skill development and knowledge enhancement for users. The operation of the agencies involving in both the development of skills and knowledge is also an important factor. An environment that facilitates and encourages the use of digital technology and spreads it across all sectors will be able to create sustainable systemic change to develop society and the better quality of people's lives. It also creates economic opportunities and expands the competitiveness both at the business level and at the national level in a concrete manner. The results of the digital development in Use according to the framework of indicators of the OECD organisation are as follows:

Indicator U1 : Internet users as a share of individuals

The proportion of individuals who use the Internet by calculating from the general people who are internet users comparing to the total population, this indicator reflects the broadband internet usage of the population in the country which in the overview means general use in everyday life. It can also take a deeper look at issues such as Internet user characteristics (e.g. gender, age range, education level, income level, etc.) or Internet user behavior (e.g., frequency of use, place, usage duration, etc.). The OECD will analyze data from the internet users aged 16-74 years.

The results of the survey on the use of Information and Communication Technology in the household in 2020, the National Statistical Office Thailand (NSO) found that there are approximately 63.8 million people at the age of 6 years old and over calculated to 77.8% are using the internet.

Table 7 Percentage of individuals who use internet in the year 2017-2020

Proportion of individuals who use internet	2016	2017	2018	2019
Proportion of individuals who use Internet (Between the ages of 16-74 years, according to the OECD difiniton)	52.9	60.8	66.7	77.8

Referrence: data from National Statistical Office Thailand (NSO)

The results of the survey in the implementation of Thailand Digital Outlook Phase 3 by the survey study of the digital development indicators of Thailand in 2021 (public sector) showed the proportion of population in the age range of 16-74 years old who use the internet at 84.3%.

Indicator U2 : Share of individuals using the internet to interact with public authorities

The proportion of individuals who use government online services via Internet, it was calculated from a number of government online services via internet among the users of the age 16-74 years comparing to the total population of the ages between 16-74 years.

This indicator reflects people's digital activities in related to government online services from receiving general services such as surfing on government offices' websites including getting provided online services such as forms downloading, forms submitting, etc. The OECD will analyze data from internet users aged 16-74 years who use digital government services.

According to the survey data of public sector in Thailand Digital Outlook Phase 3, it was found that the proportion of people between the ages of 16-74 years old who used government services via the Internet was 64.2% comparing to all population at the age of 16-74 years old in Thailand.

Indicator U3 : Share of internet users who have purchased online in the last 12 months

The proportion of Internet users who purchased goods/services via online channels during the past 12 months was calculated from a number of internet users aged 16-74 years who bought products or services via online channels comparing to the total number of all internet users aged 16-74 years over the past 12 months. This indicator reflects the digital activitivies of people involving in online purchases of goods/services. It can also reflect the level of digital development in other relevant areas, such as the development of payment infrastructure and electronic transactions including the trust and confidence of people to use Internet and online financial transactions, etc.

According to the survey results on the use of Information and Communication Technology in the household in 2020, the National Statistical Office Thailand (NSO) found that the 49.7 million people was the internet user. Most of them (56.5%) have never

purchased goods or services via the internet, 43.5% of those who have purchased goods or services via the Internet which can calculate to 58.4% of women and 41.6% of men.

The survey results in the implementation of Thailand Digital Outlook Phase 3 by the survey study of the digital development indicators of Thailand in 2021 (Public sector) showed that the proportion of internet users who have purchased goods/services through online channels during the past 12 months was accounted for 78.5%.

Indicator U4 : Share of small businesses making e-commerce sales in the last 12 months

The proportion of small entrepreneurs who have distributed online products or services in the past 12 months. It was calculated from small entrepreneurs who distribute products or services through online channels during the past 12 months comparing to the total number of entrepreneurs with more than 10 employees in total. OECD defines the small entrepreneurs that they should have 10-49 employees. This indicator reflects the digital activities of business section. It's about e-commerce trade which is an important strategy to expand business opportunities. It can also reflect the level of digital development in other relevant areas, such as the development of payment infrastructure and e-transactions including the trust and confidence toward Internet usage and online financial transactions of people.

According to the report on the use of Information and Communication Technology in the workplace in 2019, the National Statistical Office Thailand (NSO), in the data set of the number and percentage of establishments classified by the use of Information and Communication Technology, economic activities and the size of the establishment (number of workers) throughout the Kingdom in 2019, there were a total of 2,520,695 entrepreneurs, including 110,086 entrepreneurs with more than 10 employees. The small entrepreneurs according to the definition of the OECD are 90,556 and there are 16,804 small entrepreneurs, of these number, who sell products or services via the Internet. The small scale that has sold online products or services in the past 12 months will account for 15.26%.

The survey results in the implementation of Thailand Digital Outlook Phase 3 by a survey of Thailand Digital Development Indicators Index 2021 (Private Business Entities) found that the proportion of small entrepreneurs distributing products or services through

online channels during the past 12 months were 788 companies out of 2,158 companies with more than 10 employees or 36.5%.

Indicator U5 : Share of businesses with a web presence

The proportion number of entrepreneurs with online presence was calculated from a number of entrepreneurs who have their own websites or use the websites for public relations. It is a channel for online selling products comparing to the total number of all entrepreneurs. This indicator reflects the proportion of businesses that are ready to transact and operate online activities which is a key factor in today's business models in many industries.

According to the report on the use of Information and Communication Technology in the workplace in 2019, the National Statistical Office Thailand (NSO), in the data set of the number and percentage of establishments classified by the use of Information and Communication Technology, economic activities and the size of the establishment (number of workers) throughout the kingdom in 2019, there were 2,520,695 entrepreneurs in total. There were 265,723 entrepreneurs in calculatin at 10.5% appearing the online presence which increased from the proportion in 2018 at 10.1%.

Considering by economic activities, it was found that the business related to private hospitals had the websites at 83.5%, followed by information and communication activities at 32.4%, trade and service business at 11.5%, construction at 10.1%, land transportation and storage facility at 7.7%, and the production at 5.9%.

Regarding the survey results in the implementation of Thailand Digital Outlook Phase 3 by a survey of Thailand Digital Development Indicators Index 2021 (Private Business Entities) found that the proportion of entrepreneurs having an online presence was accounted for 73.9%.

Indicator U6 : Share of businesses purchasing cloud services

The proportion of entrepreneurs who purchase Cloud services was calculated from a number of entrepreneurs who have bought Cloud services comparing to all entrepreneurs with 10 or more employees consuming the Cloud services that provide the technology services over the Internet to access data or database storage systems and various application software systems. This indicator reflects the digitalization of business activities in digital adoption and adaptation. The OECD considers the use of Cloud services of businesses among the OECD state members and other countries where data is

stored by considering the size of the business sector and the purpose of using Cloud services, such as for storing corporate emails, for company software, to process or run programs/ applications, etc.

Regarding the survey results in the implementation of Thailand Digital Outlook Phase 3 by a survey of Thailand Digital Development Indicators Index 2021 (Private Business Entities) found that the proportion of entrepreneurs who have purchased Cloud services was accounted for 51.3%.

Indicator U7: Average monthly mobile data usage per mobile broadband subscription, GB

The average monthly data usage of mobile broadband Internet users indicates the ability of mobile broadband Internet users to use online services and access to contents via online channels. The network efficiency is critical to meet the growing demand for mobile broadband data services.

Regarding the information in the Telecommunications Industry Index report for the year 2019–2020 from the Office of National Broadcasting and Telecommunications Commission (NBTC), the average monthly data usage of mobile broadband internet users was 18 gigabytes/month/subscriber which was increasing from the average monthly data usage in Q3 of the year 2020 at 17.11 gigabytes/month/user. The average monthly data usage for prepaid numbers was 16.1 gigabytes/month/subscriber and the average monthly data usage of the postpaid number was 19.8 GB/month/subscriber. The number of prepaid mobile phone subscribers were 86,493,411 numbers and the postpaid mobile phone subscribers were 32,676,348 numbers.

Indicator UX1 : Value of digital payment transactions per person

It is an additional indicatior out of the OECD framework that shows the value of digital payments transactions per person per year, where “digital channels” means the service channels which are Internet Banking, Mobile Banking and other digital channels permitted by the Bank of Thailand. This indicator reflects the transaction volume in the digital form of the people and the adoption of digital by the Bank of Thailand Statistics. The value of payment transactions are stored through Mobile Banking and Internet Banking services.

From the table of payment transactions via Mobile Banking and Internet Banking services of the Bank of Thailand, the value of payment transactions via Mobile Banking in

the year 2020 is at 34,233 billion baht, the value of payment transactions via Internet Banking in 2020 is at 28,373 billion baht, and the number of residents all over the kingdom according to evidence of civil registration as of December 31, 2020 from the Central Registration Office, Department of Provincial Administration, Ministry of Interior. There are a total of 65,228,120 Thai nationals, divided into 31,874,308 males, 33,353,812 females, representing the value of payment transactions via Mobile Banking per person per year at 524,820 baht and the value of payment transactions via Internet Banking. per person is at 434,981 baht per person per year, which is an increase from 2019 when the value of payment transactions via Mobile Banking and Internet Banking services per 100 population was 366,713 baht and 394,808 baht per person per year, respectively.

Table 8 Percentage of the payment transactions via digital channels in 2017–2020

Value of payment transactions via digital channels	2016	2017	2018	2019
The value of payment transactions via Mobile Banking in billions of baht	9,550	17,602	24,861	34,233
Transaction value of payments via Internet Banking in billions of baht	20,339	23,530	26,278	28,378

Referrence: Table of payment transactions via Mobile Banking and Internet Banking services of the Bank of Thailand

Indicator UX2 : Proportion of cloud usage by government agencies to total cloud demand

This indicator was calculated from the number of Cloud using in the government offices comparing to the total number of all agencies that needed the Cloud usage.

According to data collected by the ONDE from agencies that request government Cloud applications, it was found that the number of allocated virtual computers are 29,023 and the number of Cloud virtual computers on the demand are 54,522 machines, representing 53.2% of the total of 311 departments and 1,033 offices.

Indicator UX3 : Average daily time spent on the internet

It is an indicator that assesses the average number of hours in using internet per day of the people according to the survey data of people behaviour in the Internet usage of the Electronic Transactions Development Agency (ETDA) in 2020, it was found that Thai people have used the Internet on the average at 11 hours and 25 minutes per day which was 1 hour and 3 minutes increasing from 2019. The first year of the survey was in 2013

and it showed that Thai people used the Internet on the average at only 4 hours and 36 minutes per day, representing a growth rate for 3 times.

Chapter 4 : Digital Development of Thailand in the Dimension of Innovation

The investments on Research and Development (R&D) enable modern technologies and innovations that enhance the efficiency and effectiveness of manufacturing, providing services or conducting various economic and social activities. The Research and Development model covers the development and enhancement of efficiency machine, equipment or software/applications, creating innovation and adding value on products and services including the creation and inventing of intellectual property. The results of digital development in Innovation according to the framework of indicators of the OECD organisation are as follows:

Indicator I1 : ICT investment as a percentage of GDP

The percentage of investment in Information and Communications Technology to GDP is a measure used to indicate the distribution of Information and Communications Technology (ICT Diffusion) in the economic sector. The investments in the Information and Communication Technology sector are calculated from Gross Fixed Capital Formation in the field of Information Technology equipment, computer software and databases according to the System of National Accounts 2008 (SNA 2008) standards per Gross Domestic Product.

Data from the National Accounting Statistics of Thailand 2020, Office of the National Economic and Social Development Council, investment value in Information Technology includes computer equipment, parts and accessories software package TV converter television video and digital cameras including equipment, telephone sets, based on the value survey of the digital industry in Thailand Digital Economy Promotion Agency (DEPA), value of investment in Information Technology and digital in Thailand was 316.5 billion baht and gross national income for the year 2019 was 15,703,021 million baht. Percentage of investment in the technology industry sector, information and communication to Gross National Income (GDP) was at 2.02%.

Table 9 Percentage of the expenditure on the Information Technology and digital investment in the year 2020

IT and Digital Investment Expenditure	Value in Billion Baht
Computer and computer parts and accessories	284.9
Television and radio converters, televisions, video and digital cameras including telephone set	
Packaged Software	31.6

Referrence: Data from the National Accounting Statistics of Thailand 2020, Office of the National Economic and Social Development Council

Indicator I2 : Business R&D expenditure in information industries as a percentage of GDP

The percentage of investment expenditure on Research and Development of business groups in the information industries to GDP, it is all account types of funding sources in the information industry. The OECD defines business segments in the new industries that correspond to all 7 industries according to the 2009 TSIC industry standard as follows:

1) Subsection 26 The Manufactures of Computer, Electronic and Optical Products
2) Subsection 58 Publishing Activities
3) Subsection 59 Motion Picture, Video and Television Program Production, Sound Recording and Music Publishing Activities
4) Subsection 60 Television Programming and Broadcasting Activities
5) Subsection 61 Telecommunications
6) Subsection 62 Computer Programming, Consultancy and Related Activities
7) Subsection 63 Information Service Activities

This indicator is intended to indicate the volume of research investment and develop in the information industry by type of industry which may be compared to the related digital industries.

Regarding the data from the survey results report of the research and development and innovation activities in the industrial sector of Thailand for the year 2019 by the Office of the National Higher Education, Science Research and Innovation Policy Council (NXPO), the investment expenditure on Research and Development in the information industry sector was 11,761 million baht in total and the gross product

national income for the year 2018 with a value of 16,365,600 million baht. The percentage of Research and Development investment expenditures of the information industries per Gross Domestic Product (GDP) was 0.072%

Table 10 Expenditures and investment value on the information industry sector development in the year 2019

Expenditures and investment value on information industry sector development	Expenditures on investing in Research and Development (Million Baht)
Computer product manufacturing, electronics and optical equipment	4,113
Computer and software industry	3,664
Postal and Telecommunication industry	3,441
Radio and television industry	483

Referrence: Data from the survey results of the research and development and innovation activities in the industrial sector of Thailand for the year 2019 by the Office of the National Higher Education, Science Research and Innovation Policy Council (NXPO)

Indicator I3: Venture Capital investment in the ICT sector as a percentage of GDP

The percentage of Venture Capital investment in ICT sectors to GDP was calculated from the investment value of Venture Capital businesses in the Information and Communications Technology sector per GDP (Gross Domestic Product), compared during the same period. It is an indicator to measure the amount of Venture Capital investment in innovative companies with high growth potential. It represents a way to develop and stimulate investment of entrepreneurs in businesses that are expected to have high potential in each country.

According to a study report of Thailand Tech Startup Ecosystem Year in Review 2020, conducted by Techsauce Thailand, reported investment from Venture Capital investors in technology and digital startups with a value of US$364.05 million or approximately 11,300.11 million baht, compared to the value of gross national income in the year 2020 (2020) at 11,570,300 million baht from the Bank of Thailand data. As a result, the percentage of investment in venture capital businesses in the Information and Communications Technology sector is 0.098, a leap forward from the previous year. In 2019, the investment value from Venture Capital investors was only 61.25 million US dollars, or approximately 1,901.2 million baht, which is up to almost 6 times of the investment value.

Table 11 Percentage of the investment from Venture Capital investors in 2017–2020

Investment value from investors	2016	2017	2018	2019
Investment value from Venture Capital investors (Million USD)	78.02	105.55	61.25	364.05

Referrence: It is based on a study report of Thailand Tech Startup Ecosystem Year in Review 2020 conducted by Techsauce Thailand Co.Ltd.

Indicator I4 : Share of start-up firms (up to 2 years old) in the business population

The proportion of the new entrepreneurs (business age not over than 2 years) to the total number of all entrepreneurs was calculated from a number of new entrepreneurs (business age is not more than 2 years) comparing to the total number of entrepreneurs who are still running business. This indicator is a measure of business dynamics, which is a mechanism that leads to more efficient allocation of resources through the movement of resources from underperforming businesses to higher performing businesses by using 3 data groups as follows:

1) A number of new entrepreneurs aged not over 2 years that are still in operation
2) A number of new entrepreneurs aged less than 1 year that are still in operation
3) A number of registered entrepreneurs at the time of analysis

However, it does not count in cases where the company has restructured its operations, such as a merger, separation of the company or restructuring within the group of companies by the Department of Business.

According to the statistics of the Department of Business Development, the yearly registration was classified by status and type of juristic person and Department of Business Development. There were 834,8210 new juristic persons that were newly established and operated (as of June 20, 2021) and the number of newly established juristic persons with a business age not more than 2 years from the year 2020 were 91,198 persons in total. The proportion of the new entrepreneurs (business age not over 2 years) per total number of entrepreneurs was 10.9%.

Table 12 The statistical data on the number of new established entrepreneurs and the business age not more than 2 years

Statistical data on the number of juristic persons	Number of juristic persons (Persons)
Number of new juristic persons established in 2021 (Jan-May 2021)	34,929
Number of juristic persons aged 1 year	22,910
Number of juristic persons aged 2 years	33,359

Referrence: The statistics data of yearly registration from the Department of Business Development

Indicator IX1 : The number of patent applications in the Information Technology or related fields in Thailand

This indicator shows a number of patent applications in the relavant fields of the Information Technology each year in Thailand which is based on International Patent Classification (IPC) 2015-2017 from the Department of Intellectual Property. This can reflect another indicator of the country's innovation dimension.

This indicator covers each type of patent application by selecting specific items relating to the Information Technology group in all 3 items are:

1) Audio-visual technology

It is a product that has applied technology in relevant to general consumer electronics. The IPC code section in this category includes certain technologies and related products, such as loudspeakers and audio systems.

2) Information Technology

This categoru is classified technically and it consists of many relevant technologies such as data processing for various purposes, image and data processing, data analysis and data recognition etc.

3) Telecommunications

The latest official data as the referrence from the Department of Intellectual Property was in 2018. It was also the reference for the implementation of Thailand Digital Outlook Phase 2. This indicator has not changed and is at 93%.

Table 13 Percentage of patent applications for technology

Data on applying for the invention patent	Number of patents on application
Audio-visual technology	41
Information Technology	9
Telecommunications	43

Referrence: Data on applying for a Thai invention patent in accordance with the International Patent Classification IPC from the Department of Intellectual Property

Indicator IX2 : A number of robots being used in Thailand's manufacturing sector per 10,000 manufacturing workers

This indicator was calculated from the number of robots being used in the manufacturing industry in Thailand per 10,000 industrial workers. It is based on the statistical data from the International Federation of Robotics. In the implementation of the Thailand Digital Outlook Phase 3, the survey of the robots using in the service business sector has been operated besides the manufacturing industry including collecting in-depth information, discussing the purpose of adopting robotic technology which are robotic or physical robots, and the factors in decision-making and benefits or impacts both directly and indirectly from the adoption of robotic technology.

The statistical data from the International Federation of Robotics Thailand has the highest number of robots using in the manufacturing industry in the ASEAN country. There are approximately 3,000 robots in use which is accounting for about 1% of the total industrial 373,000 robots worldwide. Calculating in the proportion of robots in production industry per 10,000 workers, Thailand will account for 45 robots which is the second highest proportion after Singapore.

Chapter 5 : Digital Development of Thailand in the Dimension of Jobs

To drive the digital development for the economy and society, the Information and Communication Technology personnels are key contributors to the transformation and growth of the digital industry. This will affect the expansion of the country's digital economy and society. The factors that reflect the current status of the country's digital human resources include the assessment of the proportion of such personnel in the country's labor market, emphasizing on developing and enhancing skills or enhancing the capacity and capability of personnel in this group as well as to produce and create a new generation of digital people to enter the labor market with the results of the development in Jobs according to the framework of the OECD indicators as follows:

Indicator J1 : ICT task-intensive jobs as a percentage of total employment

The percentage of IT staff to total workforce was calculated from a number of IT staff to the total number of IT workers. The OECD has defined the Information Technology jobs as 21 positions of ICT Specialiss and 36 positions of other ICT-Intensive jobs which are classified by occupations according to international standards (ISCO-08).

Regarding the survey data of people working in Information and Communication Technology in the year 2019 by the National Statistical Office, the total number of employed people in Information and Communication Technology were 434,382 people, and the total number of employed people in the country were about 38.76 million which the percentage of Information Communication Technology employees was 1.15% out of the total number of all workers.

Indicator J2 : Digital-intensive sectors' share in total employment

The proportion of employees in the digital-intensive sector to the total employment was calculated from a number of people who are employed in the digital business sector to the total employment in the country. The OECD defines the digital business sector as a business group that uses digital technology on 4 levels.

1) High Digital-intensive Sectors
2) Medium-high Digital-intensive Sectors
3) Medium-low Digital-intensive Sectors

4) Low Digital-intensive Sectors

This indicator calculates a number of workforces in High Digital-intensive Sectors and Medium-high Digital-intensive Sectors. The OECD has surveyed and assessed the level of digital technology use among all business segments by ISIC (International Standard Industrial Classification of All Economic Activities Revision) 4: ISIC Rev.4). ISIC is a standard for categorizing economic activities in terms of production of goods and services. In addition, all economic activities are organized into different industry categories to make it easier to present statistical data.

The statistic of working conditions of population classified by business type which is prepared by the Bank of Thailand in 2020 showed that there were 37,680.2 billion employees in total and the employees in the business sectors who used digital technology in the moderate to high level were 10,235.5 billion people, accounting for 27.2% of the total number of employment.

Table 14 The number of business workers using digital technology in the moderate to high level

Business groups that use digital technology in moderate to high level	Number of workers (Thousands)
1) Wholesale and retail, motor vehicles repairing and motorcycles	6,276.98
2) Information and communication	222.1
3) Financial and insurance activities	524.89
4) Professional, scientific and academic activities	385.98
5) Other categories related to digital services	887.95
6) Transportation and storage	1,402.4
7) Financial and Insurance Activities	535.2

Referrence: Data on working conditions of the population classified by business type (ISIC Rev 4) according to the OECD definition from the Bank of Thailand

Indicator J3 : Workers receiving employment-based training, as a percentage of total employment

The percentage of employees who gain the work-related skills training per number of all labors was calculated from a number of employed workers who have been trained in work related skills provided by employers or business operators. However, professional development/training includes formal training and on-the-job training.

The survey results of the study of the Digital Development Indicators Index of Thailand Year 2021 (private business sector), the National Statistical Office, the percentage of employees who received training in relevant to the work per the total employment was accounted for 44.2%.

Indicator J4 : New tertiary graduates in science, technology, engineering and mathematics, as a percentage of new graduates

As defining by the OECD, only graduates of higher education covering grades 5-8 are selected according to the International Standards Classification of Education (ISCED 2011). However in Thailand, the International Standards Classification of Education (ISCED 2013) has been compiled with slightly different classification details, but the overall category data is the same. This can be possibly compared with the OECD state members and the other countries where OECD data is stored by classifying education according to International Standards Classification of Education 2013 (ISCED 2013), only for graduates of higher education, covering 4 levels as follows:

- Level 5: Diploma/Higher Vocational Certificate (High Vocational Certificate)/Technical Vocational Certificate (High Vocational Certificate)
- Level 6: Bachelor's degree or equivalent to Diploma of Advanced Technical Teacher (Thailand) and Bachelor's Degree Continuing
- Level 7: Master's degree or equivalent
- Level 8: PhD or equivalent dividing the fields of graduates according to international standards

At each graduate level, the OECD selects major field/branch of graduates according to the International Standards Classification of Education (ISCED 2013) by disciplines related to Science, Technology, Engineering and Mathematics, including fields/branches related to Information Technology according to the definition of the OECD, there are 3 areas of field studies:

- Branch 05 Natural Science Mathematics and Statistics
- Branch 06 Information and Communication Technology
- Branch 07 Engineering production and construction

The statistical table of the graduates for the year 2020 (graduates for the year 2019) classified by 10 discipline groups (10 GROUP ISCED), name of institution, level of education, gender by the Ministry of Higher Education, Science, Research and Innovation

showed that there were 17,080 graduates from the Diploma or above in the field of 05 Natural Sciences, Mathematics and Statistics, 17,504 graduates from branch 06 Information and Communication Technology, and 44,113 graduates from branch 07 Engineering, production and construction, so there were 78,697 graduates in total in these 3 disciplines, with a total number of 351,450 graduates in 2020. The percentage of graduates in Science, Technology, Engineering and Mathematics per total number of graduates was at 22.39% which was higher than the previous year at 21.6%.

Table 15 A number of graduates from Information Technology and digital department

Field of study	Number of graduates from diploma level up
Branch 05 Natural Science Mathematics and Statistics	17,080
Branch 06 Information and Communication Technology	17,504
Branch 07 Engineering, Production and Construction	44,113
Total number of graduates in the year 2020	351,450

Referrence: Data from the Office of the Chief Administrator of the Ministry of Higher Education, Science, Research and Innovation

Indicator J5 : Public spending on active labour market policies, as a percentage of GDP

The percentage of government expenditure on labor market policy implementation to GDP (Gross Domestic Product) was calculated by taking the sum of government expenditure budgets related to labor market policy implementation. The OECD has set the framework for considering budgeting of related expenditures into 5 groups:

1) Expenditure budget to support the target labor group to create their own business (Start-up incentives)
2) Direct job creation expenditure budget
3) Expenditure budget to support the target workers to have employment incentives
4) Expenditure budget for spending on recruitment/placement and related services
5) Expenditure budget for spending on the professional development

The Comptroller General's Department is an office that collects information and manages all disbursement budgets of all government expenditures in Thailand. The

budget that is involved in the labor market consists of 6 agencies under the Ministry of Labor which has the following roles:

1. Office of the Permanent Secretary, Ministry of Labor is responsible for the study, research, analysis and preparation of data for the use in setting goals and implementing policies including operations and resource management to reach the achievements of the ministry. It is also responsible for the development of Information Technology systems, the administration and service of the departments under the Ministry of Labor, research and evelopment including the determination of official inspections and complaints under the authority of the ministry.

2. Department of Employment is responsible for promoting the employment of the population, to protect the job seekers including to study and analyze the current labor market conditions. In addition, this department takes an important role of intermediary in developing and promoting the management system for the people, who obtain the skills and knowledge, are given the recruitment opportunity and receive benefits where appropriate.

3. Department of Skill Development is responsible for developing workers to have knowledge and enhance theirs skills in working and supporting entrepreneurs both in terms of skill development and skill testing systems to create the standards that can compete with other in the international level. It is also an intermediary inaccordingly between the public and private sectors to formulate national skills to labor on a demand plan and develop a network of labor potential development including implementation of laws related to the development of labor skills.

4. Department of Labor Protection and Welfare is responsible for the establishment of labor standards in accordance with international standards. It also protects and takes care of workers in many aspects as legal benefits, safety at work, welfare including any labor conflicts relieve by addressing knowledge of labor standards, labor protection and labor welfare, the development of management systems, information systems and laws related to labor welfare and protection.

5. Social Security Office is responsible for overseeing the administration of social security and compensation funds, taking care of the benefits of the self-insured (taking turn) and employees as required by law. It also develops a system for social security and compensation and related laws to ensure stable living.

6. Institute for the Promotion of Occupational Safety, Health and Work Environment (Public Organisation) is responsible for promoting and solving problems related to safety and a hygienic working environment through various measures, such as establishing standards of operation with various agencies, conducting research studies, as well as creating a body of knowledge to promote awareness, safe and working environment sanitary.

It is because Thailand has a classification of government expenditures based on the standard of expenditure classified by the nature of government jobs (Classification of the Functions of Government) that is standardized by the United Nations. The study of expenditure standard categories found that Section 70412 on Labor is relevant to the implementation of labor market policies. However, Thailand has recorded only 4 digits of government expenditure classification in detail, so it is impossible to clarify expenditure of a resolution up to 5 digits, such as Section 70412 on labor. Therefore, ONDE uses a method of collecting government expenditures that support all 5 types of labor markets, which will be charged according to the duties of the agencies that implement labor market policies including projects of other agencies with characteristics that meet various expenses. According to the OECD, it is found that there are a total of 4 agencies under the Ministry of Labor whose duties are consistent with the types of government expenditures to support the labor market, such as the Office of the Permanent Secretary, Ministry of Labor Department of Employment, Department of Skill Development and Department of Labor Protection and Welfare. All 3 expense types have definitions that are consistent with the Employee Welfare Fund and a fund for employees affected by privatization because the Employee Welfare Fund is paid to workers in the event of termination of employment and the employer does not pay or compensate. In addition, Type 1 expenditures are detailed in accordance with the integrated work plan for promoting small and medium enterprises gathered by the Office of Small and Medium Enterprises Promotion (OSMEP).

From the government expenditure budget data for the year 2020, referring to the Parliamentary Budget Office, it showed the information of the disbursement budget of 4 agencies under the Ministry of Labor, namely the Office of the Permanent Secretary, Ministry of Labor Department of Employment, Department of Skill Development, Department of Labor Protection and Welfare Year 2020 and Annual Budget Expenditure. The Office of Small and Medium Enterprises Promotion (OSMEP) analyzed and calculated

according to 5 related cost estimation groups, resulting in a percentage of government expenditure budget for implementing labor market policies per GDP at 0.061%

Table 16 The budget data of the government labour

Budget group of the year 2020	Value (Million Baht)
1. The expenditure budget for supporting the target labor group to create their own business (Start-up incentives)	756.77
2. The expenditure dudget for direct job creation	1,228.12
3. The expenditure budget for supporting the target group of workers to have employment incentives	139.79
4. The expenditure budget in relevant with the recruitment and related services (placement and related services)	2,379.17
5. The expenditure budget for skill development	1,911.09

Indicator JX1 : Average wage of ICT specialists

The indicator was calculated by taking all income of workers classified as Information Technology workers and dividing by the total number of workers in this survey group. This indicator is one of the main indicators which is used to measure the competitiveness among many countries in various institutions, such as the World Economic Forum (WEF: World Economic Forum) in Thailand. The National Statistical Office (NSO) has noticed the importance and has conducted a survey on labor in the Information Technology in Thailand and presented average income statistics of this worker group.

The summarizing report of Information and Communication Technology employees in 2019 by the National Statistical Office, the average income for Information Technology employee was 26,568 baht per month in the private business sector and 28,362 baht per month for the government employees.

Indicator JX2 : Labor productivity in digital-intensive industries

This indicator was calculated by dividing the current year yield by the base year output and taking a number of working hours of labor as of the current year, divided by the data at the base year, then divided by the quotient of productivity comparing to the base year, divided by the quotient of a number of working hours or a number of workers compared to the base year. The result is a labor productivity index per hours work or labor productivity index which the Bank of Thailand produces every quarter. This indicator

is widely calculated in various countries including the OECD members because this indicator is important in assessing the economy and society for Thailand. The Bank of Thailand (BOT) has also calculated this indicator.

According to the data in the labor productivity index table per hour work classified by business type (ISIC Rev.4), Bank of Thailand and selected industries related to digital technology according to the OECD definition, namely 1) those with high digital technology and 2) those with moderately high digital technology, it was found that the labor productivity index per hour work-and the average labor productivity index was 142.5 in Q4 2020, which is lower than the average hourly labor productivity index of 145.6 when calculated as the productivity of workers in industries related to digital technology which was 19,306,920 baht per person.

Chapter 6 : Digital Development of Thailand in the Dimension of Society

The Internet access and use in all areas of the country with equality for all genders, all ages, or Digital Inclusion, is the ultimate goal of developing a digital society that government and related agencies in each country need. To assess the level of Internet access and use will consider on various points such as the digital skills and competencies of people of different ages, gender equality and social inequality, etc., with the results of Society according to the framework of indicators of the OECD as follows:

Indicator S1 : Percentage of individuals aged 55-74 using the internet

The percentage of individuals aged 55-74 years using the Internet was calculated from a number of Internet users aged 55-74 years per total number of all population. This indicator reflects the broadband Internet use among the elderly population in the country. It also reflects the gaps in digital development and implementation of promotional measures related to social dimensions. The OECD will compare the Internet usage data of each OECD member country and other countries where data is collected which will be classified according to the educational level of the elderly, which is the level of higher education, moderate level of education and low or uneducated level.

According to a survey data on the public sector in Thailand Digital Outlook Phase 3, it was found that the percentage of general people aged 55-74 years using the Internet at 48.8%.

Indicator S2 : Percentage of individuals who live in households with income in the lowest quartile using the internet

The percentage of individuals in households with the household income levels at the lowest 25% range (1st quartile) using the Internet was calculated as a number of individuals in households with the lowest 25% household income level (1st quartile) using the Internet per total number of all population. This indicator reflects the usage of broadband Internet among the low-income population in the country. It also reflects the level of the country's digital divide as a result of household income inequality.

According to a survey data on the public sector in Thailand Digital Outlook Phase 3, it was found that the household incomes in the lowest 25% range were families with

the income levels of 6,000 baht or less which was the lowest 25% (1 quartile) of the Internet using at 83.2%.

Indicator S3 : Women as a share of all 16-24 year-olds who can program

The proportion of women aged 16-24 years who can program was calculated from a number of women aged 16-24 years who can program per total number of all female population to see the level of gender inequality occurring in the country. The digital dimension as assessed by programming skills is one of the key skills in the digital age from now on.

According to a survey data on the public sector in Thailand Digital Outlook Phase 3, it was found that the proportion of women aged 16-24 years who could write programs was 12.1%.

Indicator S4 : Disparity in Internet use between men and women

The proportion of the difference in Internet use between males and females was calculated by the difference in the proportion of Internet use between males and females analyzed between the ages of 16-74 years. This indicator reflects gender differences in Internet use, which can be taken to increase and be implemented to increase female use and access to the Internet.

According to a survey data on the public sector in Thailand Digital Outlook Phase 3, it was found that 84.1% of males was using the Internet while there was 84.5% of females using the Internet. The difference in the Internet usage between males and females was -0.4.

Indicator S5 : Percentage of individuals who use digital equipment at work that telework from home once a week or more

The percentage of individuals who use digital tools for telework from home once a week or more was calculated based on a number of people who use digital tools for telework from home once or more per week comparing to the total number of population. The OECD has determined the use of digital tools referring to the use of computers and digital devices to work remotely from home.

This indicator can reflect the pattern and the organisation change of government agencies and/or the private sector in the country to become digital society and can also reflect the balance of work and quality of labors' lives in the country.

According to a survey data on the public sector in Thailand Digital Outlook Phase 3, it was found the percentage of individuals who use digital tools for telework once a week or more was 36.7%.

Indicator S6 : Top-performing 15-16 year old students in science, mathematics and reading

The percentage of students aged 15-16 years who achieved the quotient scores of PISA in reading, Mathematics and Science at advanced Level (Level 5 and above) (per total number of students taking PISA assessments) was calculated from the students aged 15-16 years who completed the OECD's Programme for International Student Assessment (OECD's Programme) and achieved the high level of assessment (Level 5 and Level 6) comparing to the total number of students taking the PISA assessment. This indicator is used to measure the level of required basic individual competence to adapt in the digital era in Thailand. There is the Institute for the Promotion of Teaching Science and Technology (NSTDA), together with the OECD Organisation, to create an International Standards Student Competency Assessment Program (PISA) every 3 years, with the last year being assessed in 2018.

The next PISA assessment will be in 2021, this metric is based on the latest data in 2018. Therefore, the percentage of students aged 15-16 years who achieved the PISA score in reading, Math and Science at an advanced level (level 5 and above) (per total number of students taking PISA assessments) was at 2.7%.

Indicator S7 : OECD Digital Government Index

It is an indicator used to evaluate and compare the effectiveness of digital government action by assessing policies, strategies and projects involved in all dimensions. The dimensions of the assessment are based on the OECD Digital Government Policy Framework, which consists of 6 areas:

1) Digital by design
2) Being a data-driven General public
3) Government as a platform
4) Open by default
5) User driven
6) Proactiveness

It is a data and opinion surveys from the government and related offices. All scores are calculated on a Composite Index from 0 (least) to 1 (highest).

In evaluating the OECD Digital Government Index, ONDE has considered a comparative approach to the OECD Digital Government Development Index and the United Nations E-Participation Index, which are used in the assessment and already defined as indicators at the policy and national level, such as national policies and plans on digital development for the economy and society, setting development goals for the year 2018-2037, the 4-year government action plan 2019-2022 of the Ministry of Digital Economy and Society. It is a master plan under the National Strategy on Public Service and Government Efficiency in Phase 1, one strategy of the Digital Government Development Agency (Public Organisation), in order to be consistent with the development context of the digital government of Thailand.

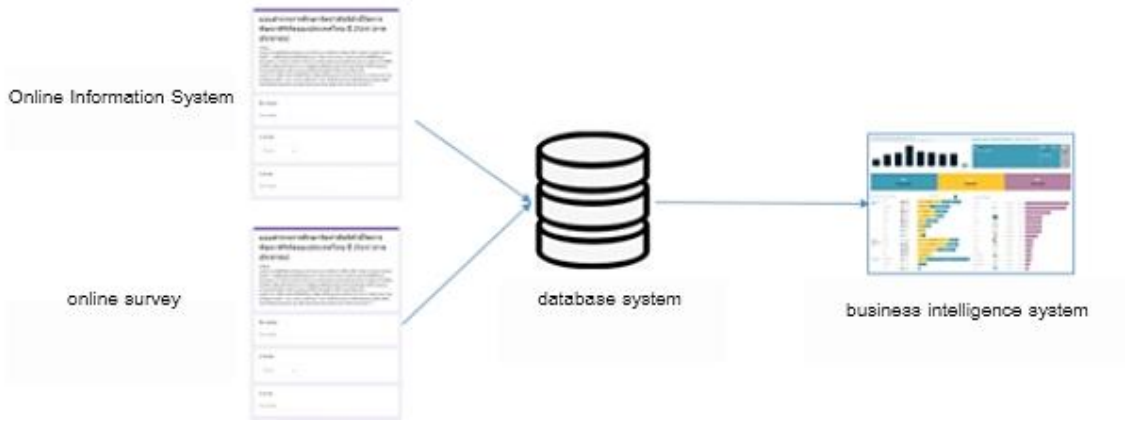
The Electronic Government Index (E-Government Development Index: EGDI) consists of an assessment of telecommunication fundamentals (Telecommunication Infrastructure Index), Online Service Index, Human Capital Index, and Electronic Participation Index .

The E-Participation Index (EPI) is a quality and informative assessment of engagement in providing services to the public. The level of public electronic participation, which, when considering the content and assessment dimensions, can be seen that in the OECD Digital Government Policy Framework, which comprises 6 areas, is highly consistent with the OECD Digital Government Policy Framework, Electronic government index, Online Service Index, which assessed in 4 main areas: providing government information to the public in the form of online services, the efficiency of providing information through government websites, it is a simple 1 way or 2 way communication between the government and the people which is a 2 way communication model in receiving and giving information to the people and the assessment of the decentralization of the government's authority to the people by the nature of government services that focus on meeting the needs of people in various sectors and participated index. This is an assessment of the approach to use digital tools to promote participation from the General public in determining the direction of the government's work.

ONDE has studied and analyzed the relation of indicators by comparing the relation of coefficients of government digital index, e-government index and the

electronic participating index of the sample countries. It found that a high level of consistency of index results was a coefficient of 0.5334.

Figure 2 Graph of the relation in coefficients between the OECD Digital Government Index and EGDI



In 2020, Thailand had an electronic government index score of 0.7565 when calculating the coefficient, the OECD Digital Government Index was 0.40 (E-Government Development Index: EGDI). Thailand had a significantly higher ranking in 2020 comparing to the survey results of the year 2018. In 2021, Thailand moved up from the 73th place to the 57th place among 193 countries. It was an upgrade from the developing country in a high-level digital government into a highly developed group with 56 other countries. It is also regarded as ASEAN's 3rd place, after Singapore, which is the 11th place in the world while Malaysia is the 47th place and Brunei is the 60th place in the latest survey results. Considering to the scores in each aspect, it was found that the areas with higher scores from the previous year were Online Service Index (OSI) and Telecommunication Infrastructure (Telecommunication Infrastructure Index: TII). Human Capital Index (HII) had a slight downward score. It showed that the change was due to the development of government digital services which were more responsive to the sustainable development goals and the development of information technology infrastructures that supported the access to information and government services through the online channels of people.

Electronic Participation Index (E-Participation Index: EPI) is an assessment of guidelines using digital tools to promote participation from the public sector. In determining the direction of the government's work, it was found that the Thai government has opened

more electronic channels to listen to opinions from the public sector in complaints, formulating policies, drafting laws and monitoring expenditure budget and procurement. As a result, Thailand had a much higher ranking. It rose from the 82nd place in 2018 to the 51st place in 2020. Thailand still ranks the 3rd place among ASEAN countries after Singapore which is the 6th place in the world while Malaysia is in the 29th place.

Indicator S8 : E-waste generated, kilograms per inhabitant

The amount of electronic waste is generated in the country each year by using an assessment from the Global E-waste monitor. The OECD defines the definition of "E-waste" as unused electrical and electronic products. Therefore, it is considered not to be recycled. It is necessary to calculate the amount of electronic waste in 2 categories: the amount of generated electronic waste and the amount of electronic waste that can be recycled. All products will be classified into 54 categories according to the standard of UNU-Keys 9 including equipment and parts from electronic products, mobile phones, computers, electrical products, refrigeration equipment, monitors, televisions, light bulbs, household electrical equipment such as refrigerators, washing machines, vacuum cleaner, microwave, electronic toys that have been discarded or not recycled. This indicator is a measure that reflects the environmental impact of the production and consumption sectors of the Information and Communication Technology industry.

The Global E-waste monitor report is not produced every year. The latest year is the 2020 report in which Thailand has approximately 621 kilotons of e-waste, or 9.2 kg of e-waste per person.

Chapter 7 : Digital Development of Thailand in the Dimension of Trust

Information security, maintaining personal information and cyber threats become the important issue occurring from the development of the digital economy and society. To build the trust to the Internet users in both public sector and business sector is another way to help the growth of using Internet and technology including the various activities in electronic and online formats. The results of Trust according to the OECD framework indicators are as follows:

Indicator T1 : Percentage of internet users experiencing abuse of personal information or privacy violations

The percentage of people experiencing the breach to their personal data was calculated based on a number of Internet users aged 16-74 years who experienced the breach of their personal data within the past 12 months comparing to the total number of Internet users. The OECD defines that the personal data breaches include the breach of personal data that is transmitted and received on the Internet and/or being uploaded or disseminated personal information, photos and videos on various online medias. This indicator reflects the insecurity of resulting information that is an important factor affecting the trust of most Internet users in the country.

According to a survey data on the public sector in Thailand Digital Outlook Phase 3, it was found that the percentage of people experiencing personal data violation is 6.3%.

Indicator T2 : Percentage of individuals not buying online due to payment security concerns

The percentage of individuals who do not choose products/services through online channels due to the concerns of secure payment system was calculated from a number of Internet users aged 16-74 years who do not choose online shopping due to the concerns of secure payment systems in the past 12 months per the total number of all Internet users. This indicator reflects the level of the trust in electronic transactions security of people in the country.

According to a survey data on the public sector in Thailand Digital Outlook Phase 3, it was found that the percentage of people who do not purchase products/services through online channels due to payment security concerns was at 5.4%

Indicator T3 : Percentage of individuals not buying online due to concerns about returning products

The percentage of individuals who do not buy/choose products/services through online channels due to the concern on product returning was calculated from a number of Internet users aged 16-74 years who do not choose online shopping due to the concern on product returning in the past 12 months per the total number of Internet users in the age range of 16-74 years old.

According to the survey results of the public sector in Thailand Digital Outlook Phase 3, it was found that the percentage of people who did not purchase goods/services through online channels due to the concern on product returning was at 13.6%.

Indicator T4 : Percentage of businesses in which ICT security and data protection tasks are mainly performed by own employees

The percentage of companies operating in the company's Information Technology security or data protection operated by personnel/employees within the company was calculated from a number of companies operating in the Information Technology security or data protection operated by personnel/employees within the company.

According to a survey result of private business data collection in Thailand Digital Outlook Phase 3, it was found that the percentage of companies operating in ICT security or data protection performed by internal employees was at 28.6%.

Indicator T5 : Health data sharing intensity

The proportion of people's health data sets (Data sets) that can be shared between agencies was calculated from the number of public health data sets that can be exchanged to agencies comparing to the total number of all public health datasets as a percentage. The OECD determines the agencies that are exchangeable with the data for consideration are:

1) Government bodies
2) Universities and/or non-profit research organisations

3) Health care providers

4) Business departments

5) Foreign government agencies or university or non-profit research organisations

At present, the public health data set (Data set) is defined as 43 files storing in Health Data Center (HDC), which is a data set on public health that has been collected by hospitals under the Ministry of Public Health for the use in management. The information has been sent from the originating hospital to collect in the central data storage.

This health data set is mainly exchanged between health departments within the Ministry of Health under the supervision policy. If assessing according to the OECD definition of information exchange, it is found that it is consistent with the assessment criteria, which is exchanged among group of agencies, only government agencies. The OECD does not determine the definition of data set exchanging or clear guidelines and methods. Regarding the meeting between ONDE and the Information and Communication Technology Center, Office of the Chief Administrator of Ministry of Public Health had concluded and agreed to consider the use of 43 health data files of the Ministry of Public Health as a public health data set that can be exchanged between agencies by using the main group criteria set by the OECD. Thailand considers that there has been a systematic exchange of information on people's health within government agencies.

In conclusion, the indicator of the proportion of people's health data sets that can be exchanged between agencies is accounted for 20% of the assessment by the number of agencies that share the health information. Thailand has exchanged health data among the government agencies which is only 1 from the 5 OECD groups.

Chapter 8 : Digital Development of Thailand in the Dimension of Market Openness

Digital technologies and innovations do not only empower business sector but also create opportunities for entrepreneurs to reach online markets and buyers/consumers. The e-commerce trading or E-Commerce has become one of the new forms of trading and distribution that has been popular and growing rapidly in recent times because it can facilitate the purchaser/consumer to be able to buy products or services easily, quickly and have options for decision making, while also facilitating and increasing opportunities for sellers/distributors to be able to sell products/services to buyers without face to face meeting. It may be cross-border trade (cross-border e-commerce) because all activities and transactions are conducted via online.

Indicator M1 : Share of businesses making e-commerce sales that sell across borders

The proportion of companies that distribute products/services through online channels in the international market (Cross-border e-commerce) was calculated from a number of companies that distribute goods/services through online channels in the international markets (cross-border e-commerce) per the total number of all companies whose goods/services are distributed on the online channels. With the exception of companies in the banking and finance industries, this indicator reflects the potential of online business operations and competition in the international market, which is an important factor in the growth of the business sector.

A report on the value of electronic commerce in Thailand in 2019, the Electronic Transactions Development Agency (PDA) found that entrepreneurs who distributed products and services through online channels were at 91.29% of Thailand's which was focusing on the online domestic sales of goods and services, and only 8.71% was from selling goods and services to consumers in international markets.

According to the survey results of the public sector in Thailand Digital Outlook Phase 3, it was found that the proportion of companies that distribute products/services through online channels in international markets (cross-border e-commerce trade) was at 3.2%.

Indicator M2 : Digitally-deliverable services as a share of commercial services trade

The proportion of business providing digital services to all service trade was calculated from the value of digital service trade, taking into account both the imports and exports per the total value of all trade in services. The OECD classifies businesses in accordance with EBOPS 2010 (Extended Balance of Payments Classification) by selecting 5 businesses that provide digital services as a priority, as follows:

1) Insurance and provident fund services
2) Financial services
3) Intellectual Property Services that are not classified in other categories
4) Telecommunications, computer and information services
5) Audio-visual service and related services

According to the data in the 2020 balance of payments table prepared by the Bank of Thailand, the proportion of services trade in businesses providing digital services to total services trade and the survey results of digital content market value in Thailand in 2019 by the Digital Economy Promotion Agency calculated from the value of services trade in Thailand's digital services sector was at 14.1%.

Table 17 Value of service trade in businesses provinding digital services

Type of Services	Value (Million Baht)
Receiving service	987,488.17
Insurance and pension fund services	4,589.25
Financial service fee	24,417.09
Intellectual property service fee that are not classified in other categories	7,039.39
Telecommunication, computer and information service fee	15,077.09
Payment service	1,463,003.57
Insurance and pension fund services	76,039.38
Financial service fee	33,795.56
Intellectual property service fee that are not classified in other categories	140,858.32
Telecommunication, computer and information service fee	28,222.18
Production and export of animation, character and games	14,571.00

Reference: The balance of payments data for the year 2020 compiled by the Bank of Thailand

Indicator M3 : ICT goods and services as a share of international trade

The proportion of ICT goods and services comparing to the value of international trade was calculated from the value of trade in ICT goods and services and is compared to the value of international trade, taking into account both the value of imports and exports. The OECD defines ICT goods and services as:

1) Consumer electronic equipment
2) Electronic components
3) Computers and peripheral equipment
4) Telecommunication equipment
5) Other ICT products and services

Regarding the report, the value and quantity of goods classified by production activities, complied by Bank of Thailand, the value of trade in ICT goods and services was at 2,827,107.62 million baht. From the report on the value of imported and exported goods classified by economic sector and production activities according to Thailand customs statistics, the total value of imported and exported goods was 13,680,900.64 million baht or equivalent to the value of trade in ICT goods and services comparing to the value of international trade, it was at 20.66% in 2020.

Table 18 The value and quantity of launched goods classified by the production activities, Bank of Thailand

ICT goods and services	Value (Million Baht)
Consumer electronic equipment	422,193.00
Electronic components Computers and peripheral equipment Communication equipment	1,093,609.94
Electronic components and electrical parts	945,027.15
Home appliances	39,415.35
Computer	71,226.42
Telecommunication equipment	255,635.76

Reference: Report on the value and quantity of launched goods classified by production activities, Bank of Thailand

Indicator M4 : Digital-intensive services value added embodied in manufacturing exports, as a percentage of manufacturing export value

The percentage of added value of goods exports resulting from the utilization of digital services or digital technology to the value of exports of the entire manufacturing industry was calculated from the value of trade in the form of value-added (Trade in Value-added: TiVA) in the service business using digital technology to the export value of the entire manufacturing industry.

The OECD considers businesses with a moderate to high level of use of digital technology only, which reflects the digital business sector. These business groups are all 5 major categories according to the ISIC Rev. 4 standard, namely:

1) Wholesale and retail, themotor vehicles and motorcycles repairing
2) Information and Communication
3) Financial and insurance activities
4) Professional, scientific and academic activities
5) Other categories related to digital services

However, the values of Trade in Value-added (TiVA) calculated by the OECD were only published until 2015. In the calculations, the OECD worked with the Office of the National Economic and Social Development Council to compile the table of input factors and outputs which were collected every 5 years to calculate the TiVA value. The OECD added the data after the Office of the National Economic and Social Development Council completed the 2020 table of input factors and outputs and submitted them to the OECD for calculation and dissemination of TiVA values until 2020. The data used for analysis and reports in the implementation of Thailand Digital Outlook Phase 2, 2015, has no further update from the OECD resulting from the utilization of digital services or digital technology to the value of goods exports of the entire manufacturing industry remained the same at 23.1%.

Chapter 9 : Digital Development of Thailand in Dimension of Growth & Well Being

Digital technology can create the growth for the country's economy by helping various production processes with more efficient and effective, create the added value for the goods (products/services) whilie the work process is more efficient. The growth of the industrial sector would lead to job vacancies and income earning for all sectors of society. The adoption of digital technology can also affect the living conditions of people; for example, causing the stress on long-term users or causing e-waste and air pollution.

Indicator G1 : Digital-intensive sectors' contribution to value added growth

The average annual growth of added value generated in the digital sector, its added value can be measured by the average increase in Gross Domestic Products (GDP) which was calculated from the growth rate of real Gross Domestic Products: GDP on a chain only in the digital business sector comparing to the average annual growth of the real GDP in the chain. The OECD defines the digital business sector as High Digital-intensive Sectors and Medium-high Digital-intensive Sectors. This is to meet the participation of the digital business sector in economic development. Digital business in economic development by the OECD has classified these business groups into 5 main categories according to the ISIC Rev. 4 standard:

1) Wholesale and retail, motor vehicles and motorcycles repairing
2) Information and Communication
3) Financial and Insurance Activities
4) Professional, scientific and academic activities
5) Other categories related to digital services

From the National Income Report of Thailand in 2019 in the chain volume form National Economic and Social Development Council, the growth rate of real GDP on a chain only in the digital business sector during the year 2016–2019 was 279,037 million baht. The average increase of the gross national income product during the year 2016 – 2019 was 769,250 million baht. It showed that the average annual growth of the added value in the digital business sector was at 36.27%.

Indicator G2-S5 : Percentage of individuals who use digital equipment at work that telework from home once a week or more

The percentage of individuals who use digital tools for telework once a week or more was calculated on a number of people who have used digital tools for telework once a week or more comparing to the total number of population. According to the OECD defining of using digital tools, it refers to the use of computers and digital devices to work remotely from home.

This indicator can reflect the pattern and organisation change of the government agencies and/or the private sector in the country to become digital society and can also reflect the balance of work and quality of life of the labor in the country.

According to the results of the public sector survey in Thailand Digital Outlook Phase 3, the percentage of individuals who use digital tools for telework once a week or more was 36.7%.

Indicator G3 : Workers experiencing job stress associated with frequent computer use at work

The proportion of employees who experience the stress during work from using computers more than half of the total working periods, calculated from employed workers who use computers for more than half of the total working time, and sometimes feeling stress, feeling stress most of the time and to be always stress per total number of all employed workers.

According to the results of the public sector survey in Thailand Digital Outlook Phase 3, the proportion of employees experiencing job stress associated with using computer for more than half of all working periods was 61.3%.

Indicator G4-S2 : Percentage of individuals who live in households with income in the lowest quartile using the internet

The percentage of individuals in households with household income levels in the lowest 25% range (1st quartile) of the Internet using was calculated from a number of people living in a household with a household income level are in the lowest 25% range (1st quartile) of the Internet using per total number of all population. This indicator reflects the broadband Internet usage among the low-income people and also reflects the level of digital divide as a result of household income inequality in the country.

According to the results of the public sector survey in Thailand Digital Outlook Phase 3, it was found that the household income at the lowest level of 25% (1st quartile) was the family that earned approximately 6,000 baht or less. In analyzing, the percentage of individuals with the household income at the lowest level of 25% (1st quartile) using the Internet was at 83.2%.

Indicator G5 : Students aged 15-16 who feel bad if no internet connection is available

The proportion of students aged 15-16 who feel anxious when they are unable to use or connect to the Internet was calculated from the number of students aged 15-16 years who feel anxious when Internet connection is unavailable from the answers in the questioneirs, "Agree – too much anxious" and "Agree – moderate anxious" per all students aged 15-16 years.

According to the results of the public sector survey in Thailand Digital Outlook Phase 3, the proportion of students aged 15-16 years who feel anxious when Internet connection is unavailable was 71.2%.

Indicator G6-T1 : Percentage of internet users experiencing abuse of personal information or privacy violations

The percentage of people experiencing to personal data breach was calculated based on a number of Internet users aged 16-74 years who experienced personal data breaches within the past 12 months comparing to the total number of Internet users aged 16-74 years. The OECD defines personal data breaches. This includes personal data breaches that are transmitted on the Internet and or being uploaded or disseminated personal information, images and videos on various online medias. This indicator reflects the resulting information insecurity. This is an important factor that affects the trust of Internet users in the country.

According to the results of the public sector survey in Thailand Digital Outlook Phase 3, the percentage of people experiencing to personal data violations was at 6.3%

Indicator G7-S8 : E-waste generated, kilograms per inhabitant

The amount of electronic waste generated in the country each year is assessed from the Global E-waste monitor. The OECD defines the definition of "E-waste" as unused electrical and electronic products. Therefore, it is considered not to be recycled. It is necessary to calculate the amount of electronic waste in 2 categories: the

amount of electronic waste and the amount of electronic waste that can be recycled. All products will be classified into 54 categories according to the UNU-Keys9 standard, including the equipment and parts from electronic products, mobile phones, computers, refrigeration equipment, monitors, televisions, light bulbs, household electrical equipment such as refrigerators, washing machines, vacuum cleaner, microwave, electronic toys that have been discarded or not recycled. This indicator reflects the environmental impact from the IT manufacturing and consumption industry sectors.

The Global E-wase monitor report is not produced regularly every year. The latest one is the 2020 report, in which Thailand accounts for approximately 621 kilotons of electronic waste, or 9.2 kg of e-waste per person.

Chapter 10 : Summary of the Results and Analyzing the Digital Development of Thailand with Surveys

In conducting the survey under the Thailand Digital Outlook Phase 3, the survey methods were applied to the sample groups of both general users and company groups including the study of secondary data collecting from relevant agencies both in and out the country to collect and process according to the framework of OECD indicators and indicators implemented in this Thailand Digital Outlook Phase 3. This chapter will present the progress of survey data collection from the roadmap and the scope of operation.

1. Survey results and data storage from 77 provinces, not less than 500 samples of each province, focusing on collecting and analyzing the utilization of digital technology (Demand Side) such as data from the utilization of the Pracharat Internet or information on the internet usage of the private sector, both fixed broadband and mobile broadband, to support life and economic development in the area

2. The survey results and analysis of data on the use of digital technology (Demand Side) comparing between the period of COVID-19 outbreak and the present in the group of 77 provinces, not less than 500 samples of each province

3. The summary of the survey and collecting indicator data using under Thailand Digital Outlook Phase 3 are as follows:

10.1 Survey results from the sample of individual users

To conduct a data survey in this Research Project Phase 3, a survey was initiated with a sample groups of general users and a sample group of companies as of June 22, 2021. The responses were received from a total of 39,145 individual user samples and from a total of 38,500 survey targets (accounting for 101.7% of the targets).

10.1.1 Statistics of survey responsdants

The sample survey of general users was conducted both online and offline in 77 provinces covering all regions of the country including both municipal and non-municipal areas. The basic information from the survey respondents are as follows:

The total number of survey respondents were 39,145 divided into 22,169 females (representing 56.6%) and 16,976 males (representing 43.4%) with the age range 0-19 years

accounting for 23.1%, the age range 20-29 years accounting for 14.6%, the age range of 30-39 years accounting for 14.8%, the age range 40-49 years old accounting for 15.7%, the age 50- 59 years old accounted for 14.8% and those aged 60 years and over accounted for 17.0%.

Classifying by the educational level, it was found that the majority of respondents in the first 3 groups were 8,931 graduated with a bachelor's degree representing 22.8%, graduated from high school/vocational vocational level were 8,269 representing 21.1% ,and upper primary school were 6,338 representing 16.2% respectively. The educational group of the least survey respondents were graduates with master's degrees, doctorate degrees, and others at 1.7%, 0.2% and 0.0% respectively. The others are international standard education levels.

Classifying by occupation, it was found that the majority of respondents in the first 3 groups were 9,064 students/university students representing 23.2%, occupying a private business/trade of 6,028 people representing 15.4% and 5,968 farmers representing 15.2% respectively.

Classifying by the average monthly household income, it is calculated in proportion to the number of survey respondants with the 4 steps of quartile 1. The income level is divided into 1 to 4 quartiles by using the income distribution from the respondents. The household income range can be divided as follows:

- The first quartile is low-income households averaging 0 - 6,000 baht per month.
- The second quartile is the average low-income households between 6,001 – 13,000 baht per month.
- The 3rd quartile is the average low-income households between 13,001 – 23,000 baht per month.
- The 4th quartile is households with average low incomes of more than 23,001 - 120,000 baht per month.

It was found that the number of survey respondents 1) The income range 0-6,000 baht per month (the 1st quartile) amounted to 10,154 people representing 25.9%, 2) The income range 6,001-13,000 baht per month are 10,967 cases representing 28.0%, 3) The income range is lower than 13,001–23,000 baht per month amounted to 8,490 cases representing 21.7%, and 4) The lower income ranges 23,001–120,000 baht per month are totaling 9,534 cases accounting for 24.4%.

There were 19,432 survey respondents or 49.6% in municipalities and 19,713 in non-municipal areas or 50.4%.

Table 19 Percentage of respondents by gender

Gender	Number (cases)	Percentage
Male	16,976	43.4
Female	22,169	56.6

Table 20 Percentage of respondents by age range

Age Range (years old)	Number (cases)	Percentage
0-19	7,892	23.1
20-29	6,664	14.6
30-39	6,491	14.8
40-49	6,443	15.7
50-59	6,029	14.8
60+	5,626	17.0

Table 21 Percentage of respondents by education level

Education level	Number (cases)	Percentage
Lower than Elementary school	2,564	6.6
Elementary school	3,087	7.9
Junior primary school	6,338	16.2
junior high school	5,376	13.7
High school/vocational	8,269	21.1
Diploma/High Vocational/Vocational Diploma	3,837	9.8
Bachelor's degree	8,931	22.8
Master's degree	651	1.7
Doctorate	87	0.2
Others	5	0.0

Table 22 Percentage of respondents by occupation

Occupation	Number (cases)	Percentage
Civil servant/employee/government employee	3,237	8.3
Employees/employees of state enterprises	2,047	5.2
Private employees/employees	4,304	11.1
Student	9,064	23.2

Occupation	Number (cases)	Percentage
Private business/Trade	6,028	15.4
Farmer	5,968	15.2
Freelance /daily work	4,301	11.0
Butler/housekeeper	2,132	5.4
Do not work	2,049	5.2
Others	15	0.0

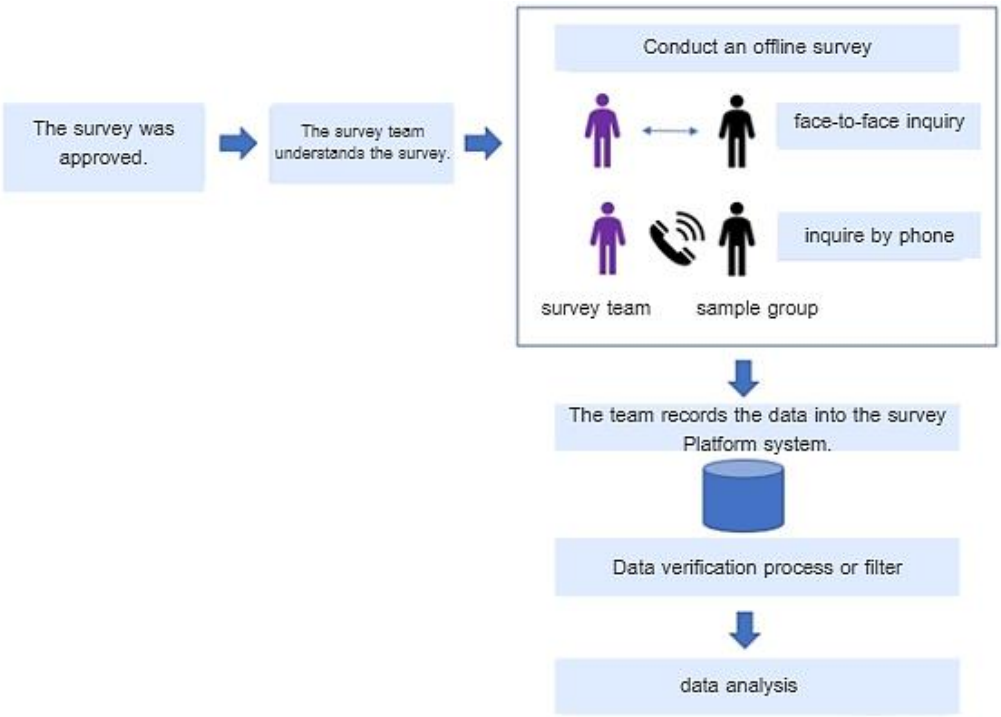
Table 23 Percentage of the average household income of respondants according to 4 quartile periods

Average Household Income per Month (Baht)	Number (cases)	Percentage
0–6,000	10,154	25.9
6,001–13,000	10,967	28.0
13,001–23,000	8,490	21.7
23,001–120,000	9,534	24.4

Table 24 Percentage of respondents by area

Areas	Number (cases)	Percentage
Municipality	19,432	49.6
Outside the municipality	19,713	50.4

Figure 3 The chart shows the statistics of the survey respondents



10.1.2 Results of the sample distribution and statistical values

The survey results of a sample of 39,145 general users by area and the age range as follows

Table 25 The sample distribution results

Provinces	Number of survey respondents	Number of survey respondents by age range (years old)						Total number of survey respondents by gender	
		0-19	20-29	30-39	40-49	50-59	60	Male	Female
Bangkok	526	111	73	76	82	86	98	276	250
Central Region									
Chai Nat	501	100	65	66	75	82	113	164	337
Nakhon Pathom	508	112	77	74	82	76	87	239	269
Nonthaburi	501	101	66	76	85	80	93	156	345
Pathum Thani	508	117	74	77	90	78	72	242	266
Ayutthaya	502	110	68	74	81	77	92	173	329
Lop Buri	507	107	80	70	76	79	95	235	272
Samut Prakan	501	113	70	79	86	76	77	150	351
Samut Sakhon	528	120	82	80	85	77	84	260	268
Saraburi	502	115	75	71	79	77	85	282	220
Sing Buri	501	98	64	68	72	82	117	322	179
Ang Thong	501	103	66	68	74	81	109	158	343
Eastern Region									
Chanthaburi	502	114	71	72	78	77	90	174	328
Chachoengsao	502	118	71	75	79	73	86	178	324
Chonburi	502	126	73	82	85	68	68	165	337
Trat	503	115	70	73	80	74	91	182	321
Nakhon Nayok	501	111	72	69	74	77	98	243	258
Prachin Buri	501	118	76	74	79	71	83	190	311
Rayong	503	128	72	83	87	67	66	181	322
Sa Kaeo	507	125	75	81	80	71	75	227	280
Southern Region									
Krabi	505	148	75	85	76	61	60	231	274
Chumphon	505	117	73	73	79	75	88	153	352
Trang	503	126	75	76	77	70	79	242	261
Nakhon Sri Thammarat	502	122	74	75	77	68	86	198	304
Narathiwat	505	167	84	76	63	58	57	227	278

Provinces	Number of survey respondents	Number of survey respondents by age range (years old)						Total number of survey respondents by gender	
		0-19	20-29	30-39	40-49	50-59	60	Male	Female
Pattani	505	173	88	71	59	54	60	203	302
Phangnga	503	126	71	73	76	72	85	176	327
Phatthalung	501	117	71	72	79	70	92	212	289
Phuket	501	141	73	83	84	63	57	210	291
Yala	502	171	85	72	60	54	60	181	321
Ranong	552	131	89	83	78	85	86	261	291
Songkhla	503	133	77	75	75	65	78	215	288
Satun	502	152	76	78	72	60	64	200	302
Surat Thani	502	129	72	77	80	69	75	205	297
Northeast Region									
Kalasin	501	110	70	75	87	78	81	203	298
Khon Kaen	501	108	74	72	82	77	88	226	275
Chaiyaphum	502	112	70	70	81	78	91	259	243
Nakhon Phanom	504	122	76	75	87	70	74	218	286
Nakhon Ratchasima	548	113	90	83	91	84	87	254	294
Bueng Kan	520	129	76	84	93	69	69	217	303
Buriram	505	123	75	75	83	69	80	264	241
Maha Sarakham	504	108	77	71	85	77	86	178	326
Mukdahan	504	120	75	78	86	72	73	200	304
Yasothon	505	108	72	72	90	77	86	222	283
Roi Et	514	106	76	76	88	81	87	219	295
at all	501	115	68	72	80	78	88	203	298
Si Sa Ket	505	118	75	74	83	75	80	202	303
Sakon Nakhon	503	122	73	76	88	72	72	205	298
Surin	510	121	77	74	82	74	82	195	315
Nong Khai	514	116	83	73	87	76	79	236	278
Nong Bua Lamphu	510	118	74	78	88	76	76	244	266
Amnat Charoen	509	114	83	74	83	75	80	251	258
Udon Thani	523	117	84	85	88	74	75	232	291
Ubon Ratchathani	518	123	83	77	88	70	77	233	285
Northern Region									
Kamphaeng Phet	502	115	70	71	80	77	89	176	326
Chiang Rai	502	110	72	71	71	81	97	237	265
Chiang Mai	515	106	71	74	80	81	103	216	299

Provinces	Number of survey respondents	Number of survey respondents by age range (years old)						Total number of survey respondents by gender	
		0-19	20-29	30-39	40-49	50-59	60	Male	Female
Tak	510	153	79	69	70	68	71	217	293
Nakhon Sawan	504	106	69	69	78	81	101	317	187
Nan	502	101	70	72	73	87	99	276	226
Phayao	520	91	80	78	74	90	107	268	252
Phichit	502	105	68	68	78	80	103	283	219
Phitsanulok	501	108	72	70	78	79	94	337	164
Phetchabun	502	112	70	72	81	76	91	189	313
Prae	617	100	88	121	85	108	115	301	316
Mae Hong Son	508	149	83	77	70	59	70	208	300
Lampang	502	84	69	68	73	91	117	168	334
Lamphun	512	90	65	74	79	87	117	274	238
Sukhothai	505	102	66	70	82	84	101	298	207
Uttaradit	510	99	71	69	81	83	107	263	247
Uthai Thani	505	112	68	69	80	76	100	199	306
Western Region									
Kanchanaburi	502	121	77	75	78	70	81	200	302
Prachuap Khiri Khan	508	119	76	80	78	72	83	183	325
Phetchaburi	504	109	70	75	79	76	95	122	382
Ratchaburi	508	110	72	77	78	75	96	150	358
Samut Songkhram	504	97	64	73	78	79	113	282	222
Suphan Buri	501	107	68	72	76	77	101	240	261

10.1.3 Survey results on internet usage

Internet Usage Behavior

According to the survey data on the Internet usage behavior, it was found that the proportion of people who have used the Internet in the past 12 months accounted for 85.1% whereas 14.9% never used it. Most of the reasons found in the top 3 were 1) lack of access to signal devices such as mobile phones, computers (70.1%), 2) not being able to use it at 40.5%, and 3) expensive Internet service charges accounted for 36.7%.

The most popular places to use the Internet in the past 3 months were found in the top 3 of: 1) housing at 69.1%, 2) workplaces at 22.2%, and 3) public places provided by the government at 5%.

The top 3 of places with the most Internet usage during the past year were 1) residence (66.7%), 2) workplace (25.3%), and 3) government office (2.2%).

The most popular places to use the Internet in the pre-Covid period or during September-November 2020, ranked in the top 1-3 rankings: 1) housing 55.6% 2) workplace 38.0% and 3) 1.4% of public places provided by the government.

The most popular places to use the Internet during Covid or December 2020–July 2021, ranked in the top 1-3 rankings: 1) housing at 70.2%, 2) workplace at 22.2%, and 3) hospitals at 2.1%.

In the comparison of the data of popular places in Internet using at different times both before and during COVID-19, it can be seen that there has not been much change. The most popular place is residence and work place which shows the behavior of Internet users that has adapted according to the situation during the period since during the epidemic of COVID Since the beginning of the year 2020 and make homes and workplaces the places with the highest Internet usage.

In terms of Internet usage patterns, the top 3 of most used are 1) 4G mobile broadband Internet (89.3%), 2) fixed broadband Internet (33.4%), and 3) 3G mobile broadband Internet (13.5%). The most commonly used fixed broadband Internet types are fiber optic type, 55.5% FTTx, and Internet speed. The 3 most commonly used fixed broadbands were 1) 34.0% 101-300 Mbps 2) 18.4% 301-500 Mbps and 3) 16.8% 501-1,000 Mbps. (Subscription) Internet with 4G or faster found that the majority of respondents had 1 contract, 70.9%, and more than 1, 26.6%.

The top 3 average monthly Internet expenses per household are 1) 200-400 baht 35.2% 2) 401-600 baht 21.0% and 3) 15.9% lower than 200 baht.

Most of the survey respondents using the Internet had a primary purpose for using the Internet. The top 3 rankings were 1) to support work such as online meetings, connect/connect to workgroups via social media for work, etc. 75.2%2) for receiving online services in education such as online learning, searching for information, etc., 71.1% and 3) for transactions Online purchase and sale of goods and services such as online shopping, online delivery, etc. 67.4%

The top 3 of devices with the highest The proportion of Internet usage are 1) Mobile Phone/Smart Phone (97.9%), 2) Mobile Computer (39.6%), and 3) Tablet at 37.9%.

The frequency and average time of Internet using, it is found that during the period before COVID or September-November 2020, the most Internet usage was Internet usage almost every day (5-6 days a week) with an average time of 3-6 hours/day, and during the COVID-19 period or December 2020 – July 2021, the most active Internet usage using an average of 3-6 hours/day whereas in the past 3 months The most active use of the Internet spent an average of 6-10 hours/day, with the highest percentage of respondents using the Internet 30-39 hours per week at 45.4%.

Comparing Internet usage behaviors in the pre-Covid period and during the COVID period, it was found that the majority of respondents were using the Internet more frequently than almost every day in the pre-COVID period. It's everyday use during COVID. A number of Internet users is increasing every day accounted for 49.4%. The proportion of respondents who spent 6-10 hours on the Internet per day on average increased by 11.5% and comparing to the past 3 months, it was found that the respondents use the Internet daily maximum accounted for 77.2%, up from 2.9% during the coronavirus period, and spent an average of 6-10 hours a day the most at 39.4%, up from 8.2% during the coronavirus period.

Internet usage activities were found during the pre-COVID period or during September-November 2020, the top 3 of most popular activities that people do were 1) studying online at 81.5%, 2) for work purposes such as online meetings or working from home at 79.6%, and 3) conversation/chatting through applications such as Line, Facebook messenger at 70.7%.

Internet use activities during the COVID-19 period or December 2020 - July 2021, the top 3 of most popular activities for people were; 1) for work purposes such as online meetings or work from home, 83.1%, 2) studying online, 83.1%. 82.5 and 3) chatting/ chating via applications such as Line, Facebook messenger, 73.8%.

Increasing Internet usage activity comparison before and during COVIDs: 1) File your taxes online increased by 40.3%, 2) monitoring the situation of COVID increased by 35.2%, and 3) using online health services such as online queue bookings or online telemedicine consultation (Telemedicine) increased by 24.3%.

The decrease of Internet activity comparing between before and during the COVID-19 pandemic were 1) the use of online transportation services decreased by 15.4%, 2) decreased search queries from other academic sources by 3.0%, and 3) created a website or personal homepage, down 1.6%.

However, when considering the activities of using the Internet before and during the COVID The more popular activities that people do besides using the Internet to file their taxes online, which is a specific activity for a particular period of time. Overall, the survey respondents were more interested in monitoring the COVID situation because during the survey, it was a severe outbreak in Thailand. A number of deaths has been reported including service news and measures related to COVID that the public must closely monitor to know how to prevent, exercise of vaccination rights and remedial measures and online health service activities such as online queue booking or online telemedicine consultation. The increase in telemedicine and the increase in online health care services because almost all medical and public health agencies have been developed online channels and campaigned for people to use online channels as their main channel for obtaining services in particular, registering for the vaccination against COVID-19 and for convenience during the measures and travel restrictions to help reduce the risk of spreading the virus as well.

In the activities with the highest percentage of usage decline is the use of online transportation services. This is mainly due to the spread of the coronavirus, causing many transportation service points to close or reduce their business hours. In addition, people will use transportation services only as needed. To reduce the risk of the chance of contracting COVID from bringing items to the transport service point or have employees come to pick up

In the comments section on the benefits of using the Internet, most of the respondents agreed on the point: 1) Finding a job is easier, 76.8%, 2) Finding a new, better job resulting in higher income by 68.6%, 3) Being able to purchase goods and services and the price was reduced by 74.7%, 4) Being able to sell products that were rarely sold in the past or not selling at all 68.0%, 5) Being able to book tickets such as planes, trains, buses, including hotels 70.6% cheaper, 6) Being able to contact with family, relatives and friends more conveniently 84.9%, 7) Family, relatives and friends at 84.8% more easily contacted, 8) Found new friends online who became your friends online with 77.2%, 9) 69.1% found a partner through online dating, 10) Easy to find government information increased 73.6%, 11) Do you know or have received welfare and benefits? at 73.3 % of government agencies you should get online, 12) Better health because of online medical information 60.7 %, 13) Being able to find a hospital 66.3% of which are appropriate for the disease through online searches, 14) Being able to choose subjects that interest you

and help you progress in the future 67.7%, 15) Being able to choose from a hundred subjects that cannot be studied offline 67.8%.

In terms of the impact of the coronavirus pandemic on Internet use, the 28.5% of respondents had a significant increase in Internet use, and the 25.8% had a slight increase, with only 2. % having a significant increase in Internet use. Internet use declined slightly and 1.0% with a significant decrease in Internet use. Online services that were increasingly needed during the COVID-19 pandemic include: 1) 85.4% online teleconferencing, 2) online learning at 80.2%, and 3) following up on news such as the COVID situation at 67.5%.

From the survey data on Internet usage behavior, it clearly shows the behavior of using the Internet in a new normal way in addition to using the Internet in order to access social media, which is still the main activity of most people in using the Internet for Internet activity to support living during the COVID epidemic that restricts travel. The service providers use online channels as their main service channels resulting in online telework activities online learning and online payment. Online obtaining of medical and public health services is a growing proportion of the main activities. It is because during the survey period, the epidemic of COVID is more severe than last time. Therefore, there is a campaign for health care to prevent infection with COVID and receive vaccination services. This may encourage the online use. Health and medical services have also increased.

Table 26 Percentage of population with internet usage

The proportion of the population with Internet usage	Percentage
Yes	85.1
No	14.9
The reason that never use the Internet	**Percentage**
Unable to use internest	40.5
Seeing that there is no need, is not interested, feels a waste of time	14.5
Internet service is expensive.	36.7
The reason that never use the Internet	**Percentage**
There are no devices to access the signal, such as mobile phones, computers.	70.1
No Internet access because it is an area with a signal no network	12.5
Concern on the personal data breach	5.5
Others	0.0

Note: Percentage of calculation results in the table from questions with more than 1 answer. The survey data from "Other" responses did not contain statistically significant details.

Table 27 Percentage of popular places with internet usage

Popular places to use the Internet	Percentage			
	During the period 3 months ago	During a past year	Before COVID (Sep–Nov 20)	During COVID (Dec 20-Jul 21)
Accommodation	69.1	66.7	55.6	70.2
Other people's residence	0.0	0.1	0.0	0.0
Workplace	22.2	25.3	38.0	22.2
Aademy	1.2	0.6	1.1	1.3
Government office	0.0	2.2	0.7	0.1
Public transport/ private vehicles	0.0	0.0	0.0	0.1
Hospital	2.1	0.0	0.0	2.1
Park	0.0	0.0	0.0	0.1
Privately public places (e.g. restaurants, cafes, hotels, airports)	1.8	1.2	0.9	1.0
Hotel	0.2	1.0	0.0	0.3
Public places provided by the government	5.0	1.6	1.4	1.5
Internet cafe/game shop	0.0	1.3	1.0	1.1
Others	0.0	0.0	0.0	1.3

Note: Percentage of calculation results in the table from questions with more than 1 answer. The survey data from "Other" responses did not contain statistically significant details.

Table 28 Percentage of internet type usage

Internet usage patterns	Percentage
Install fixed broadband Internet	33.4
• Copper cable type xDSL such as ADSL, SDSL, VDSL, etc.	30.2
• Cable type such as Hybrid Fiber Coaxial and Coaxial etc.	11.1
• FTTx fiber optic cable type	55.5
• Other types of lines, such as leased line Internet circuits	3.5

Internet usage patterns	Percentage
• Wireless type, such as Fixed Wireless Access (for example, SIM-inserted Internet router).	5.8
• Satellite Internet (for example, IPSTAR), etc.	8.9
Unknown	34.3
Use 3G mobile broadband Internet.	13.5
Use 4G mobile broadband Internet	89.3
Use 5G mobile broadband Internet	5.4
Use Narrowband Internet Service	1.1
Type of telephone line connection (Analogue Modem, Dial-up VIA Standard Phone Line)	0.0
Mobile Internet that is lower than 3G technology such as 2G technology, GPRS technology, etc.	0.2
Don't know/not sure	1.5

Note: Percentage of calculation results in the table from questions with more than 1 answer

Table 29 Percentage of sedentary internet speed

Static Internet speed	Percentage
Less than 30 Mbps	3.7
30-100 Mbps	14.4
101-300 Mbps	34.0
301-500 Mbps	18.4
501-1000 Mbps	16.8
More than 1000 Mbps	2.2
Don't know	10.5

Table 30 Percentage of 4G internet subscription or faster

A Number of Service Contracts (Subscription) internet 4G or Faster	Percentage
A contract	70.9
More than 1 contract	26.6
No 4G or faster Internet contracts.	2.5

Table 31 Percentage of average monthly internet expenses per household

Average monthly internet cost per household	Percentage
Never use Internet service	14.9
Free of charge	0.8

Average monthly internet cost per household	Percentage
Less than 200 baht	15.9
200–400 baht	35.2
401–600 baht	21.0
601–800 baht	7.8
801–1,000 baht	3.0
1,001–1,500 baht	1.3
1,500 baht or more	0.2

Table 32 Percentage of the main purpose of internet using

The main purpose of using the internet	Percentage
To follow general news such as reading or downloading newspapers online or online magazines, etc.	39.1
For communication, conversation, such as sending and receiving e-mails, telephone calls via the internet or video call (VDO Call), etc.	65.1
To support work such as online meetings, connect/contact with working groups via social media for work, etc.	75.2
For receiving online services in education such as studying online, searching for information, etc.	71.1
For receiving online services in public health such as tracking news/searching for health information, etc.	48.6
For the transaction Online shopping for goods and services such as online shopping, online delivery, etc.	67.4
To make a transaction Online travel, such as booking/buying tickets for various activities, etc.	2.2
For online financial transactions such as online payment, tax filing, etc.	54.7
For recreational activities such as listening to online radio/television, watching content/content via Youtube, etc.	53.1
For content creation or content such as creating a website or personal homepage	28.2
To participate in government actions such as registering and applying for participation in projects, using government applications, etc.	49.6
For other uses such as sending and receiving electronic files on the Cloud, Google Drive, Dropbox, OneDrive, etc.	35.6
Others	0.1

Note: Percentage of calculation results in the table from questions with more than 1 answer. The survey data from "Other" responses did not contain statistically significant details.

Table 33 Percentage of internet devices

Internet device	Percentage
Mobile Phone/Smart Phone	97.9
Portable computer (Notebook)	39.6
Desktop computer	29.3
Tablet	37.9
Smart TV	16.8
Music player MP3/Video Player/Game	16.8
Electronic book device (e-Book Reader)	16.8
Others	1.3

Note: Percentage of calculation results in the table from questions with more than 1 answer. The survey data from "Other" responses did not contain statistically significant details.

Table 34 Percentage of frequency in the use of internet

Details	Percentage		
	Before COVID (Sep–Nov 20)	During COVID (Dec 20-Jul 21)	During 3 months ago
Every day	24.9	74.3	77.2
Almost every day (5-6 days a week)	42.8	11.5	22.5
3-4 days a week	4.1	11.7	0.1
1-3 days a week	28.2	2.5	0.2
Inactivation	0.1	0.0	0.0

Note: Percentage of calculation results in the table from questions with more than 1 answer

Table 35 Percentage of the average hours of internet usage per day

Details	Percentage		
	Before COVID (Sep–Nov 20)	During COVID (Dec 20-Jul 21)	During 3 months ago
Less than 3 hours a day	23.1	14.0	5.8
3-6 hours a day	53.6	49.1	35.9
6-10 hours a day	19.7	31.2	39.4
More than 10 hours a day	3.6	5.7	18.9

Note: Percentage of calculation results in the table from questions with more than 1 answer

Table 36 Percentage of internet using per week in the past 3 months

Length of Time for the Internet use per week in the past 3 months	Percentage
Less than 5 hours	0.0
5-9 hours	0.0
10–19 hours	0.1
20-29 hours	12.9
30-39 hours	45.4
40–49 hours	28.5
50–59 hours	6.7
60–69 hours	5.3
70 hours or more	1.0

Table 37 Percentage of internet activities

Internet Usage Activity	Percentage	
	Before COVID (Sep–Nov 20)	During COVID (Dec 20-Jul 21)
General news tracking		
Follow the COVID situation	34.2	69.4
Use social media such as Facebook, Instagram	70.1	70.7
Search for information about a product or service from a search engine such as Google	60.3	60.1
Read or download newspapers online. or online magazine	10.6	11.1
Communication, chats		
Send and receive e-mails	64.2	65.6
Chat/chat via applications such as Line, Facebook messenger	70.7	73.8
Enter online forums on websites, blogs, discussion groups, or forums.	0.1	0.3
Internet phone or video call (VDO Call)	40.1	47.7
For work supporting		
For work such as online meetings or work from home	79.6	83.1
Find job information/register online	33.3	53.2
Download programs, software, applications (other than games).	15.0	15.2
Connect/connect with work groups through social media for work such as LinkedIn.	35.5	39.5

Internet Usage Activity	Percentage	
	Before COVID (Sep–Nov 20)	During COVID (Dec 20-Jul 21)
Upgrade programs, software, applications	11.4	12.6
For receiving online services in education		
Online learning	81.5	82.5
Take an online training course	10.5	10.5
Contact/receive educational advice from educational experts	8.2	9.2
Search Wikipedia resources.	5.3	4.3
Search for information in other academic sources.	5.5	2.5
For receiving online services in public health		
Book an appointment for medical services online	11.1	33.3
Use online health services such as online queue bookings. or online telemedicine consultation (Telemedicine)	12.5	36.8
Contact/get health advice from a medical professional.	29.4	33.3
Follow news/search for health information	33.6	38.2
For the transaction of online shopping for products and services		
Order online food	50.2	55.3
Online shopping	44.1	66.7
Sell products online	38.8	50.7
Use online delivery services	44.5	29.1
For the transaction online travel		
Book/buy tickets for activities such as planes, accommodation/hotels	3.5	2.2
Use online travel-related services such as travel planning. attraction booking	2.7	1.9
For online financial transactions		
Online Payment/Online Money Transfer/Online Top Up/Internet Banking	58.1	64.3
online tax filing	23.1	63.4
Buy/sell investment assets online such as stocks, mutual funds.	11.5	33.1
For recreational activities		
listen to radio online or online television	12.9	13.1

Internet Usage Activity	Percentage	
	Before COVID (Sep–Nov 20)	During COVID (Dec 20-Jul 21)
Download programs, software, game applications.	15.5	15.7
Play or download or streaming online pictures/movies/series/music	18.1	19.0
Watch content/content via YouTube, Netflix or similar websites.	65.2	68.8
Playing online games with others	30.9	43.2
Upload content or content to publish on websites such as YouTube, TikTok, etc.	12.4	12.4
Online gamble	2.5	1.1
Write or update content on the blog (Blog)	2.1	1.3
For content creation or various content		
Build a website or personal homepage	10.2	8.6
To participate in government action		
Participate in discussions or voting over the Internet to determine social or political issues.	2.1	2.4
To register and use the right to participate in government projects, such as 33, we won half.	50.2	66.6
Use government applications such as Pao Tang, Doctor Chana, Doctor Prom.	41.2	44.1
For other uses		
Send and receive Deposit electronic files on Cloud systems such as Google Drive, Dropbox, OneDrive, etc.	35.7	36.7
Others	1.1	1.1

Note: Percentage of calculation results in the table from questions with more than 1 answer. The survey data from "Other" responses did not contain statistically significant details.

Table 38 Percentage of benefits from internet using

Benefits of using the internet	Agree	Disagree	Unsure
You can find a job more conveniently and easily.	76.8	11.3	11.9
You can find a new better job and make higher income.	68.6	12.9	18.5
You can buy products and services and get the lower price.	74.7	12.0	13.3

Benefits of using the internet	Agree	Disagree	Unsure
You can sell items that were rarely sold in the past or not at all.	68.0	13.5	18.5
You can book tickets such as airplanes, trains, buses, as well as hotels and accomodations. It's more convenient and cheaper.	70.6	10.9	18.5
You can contact your family, relatives and friends more conveniently.	84.9	8.1	6.9
Family, relatives and friends can contact you more easily.	84.8	7.7	7.6
You meet new online friends who also become your online friends.	77.2	11.5	11.2
You meet your soul mate through online dating.	69.1	13.5	17.4
You can find government information more easily.	73.6	10.3	16.1
You know or receive the welfare and benefits of the government that you should have via online access.	73.3	11.2	15.0
Your health has improved because of online medical information.	60.7	15.7	23.6
It is able to find suitable hospitals for the disease through online search.	66.3	12.5	21.2
You can choose subjects that are intering and help your progress in the future.	67.7	10.6	21.7
You can choose to study subjects that cannot be studied offline.	67.8	10.9	21.3

Note: Percentage of calculation results in the table from questions with more than 1 answer

Table 39 Percentage of COVID epidemic impact on internet usage

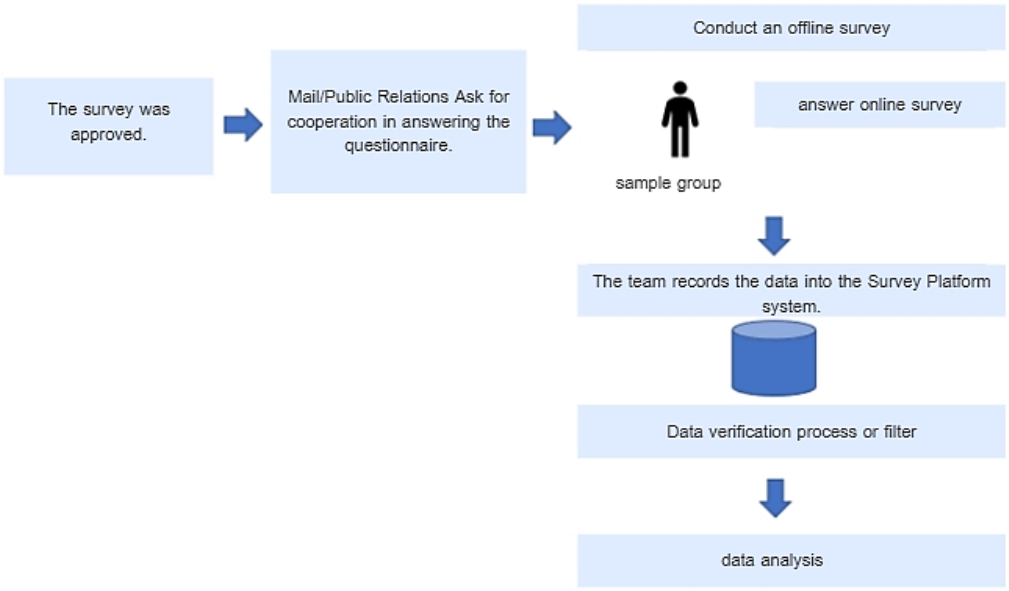
COVID epidemic impact on internet usage	Percentage
Greatly increased	28.5
Slightly increase	25.8
Same	27.3
Slightly reduced	2.5
Greatly reduced	1.0
No Internet service	14.9

Table 40 Percentage of online services in more need during COVID-19

An increasingly necessary online service model	Percentage
Online conferencing	85.4
Online learning	80.2
Online payment, e.g. in e-commerce	46.9
Cashless payments such as Promptpay, QR code payments	50.5
Follow up on news such as the COVID situation	67.5
Social access like Facebook, Instagram, Youtube	33.5
Food and goods ordering through online channels	64.2
Communication such as Line, Messenger	44.7
No Internet service	14.9
Others	2.3

Note: Percentage of calculation results in the table from questions with more than 1 answer. The survey data from "Other" responses did not contain statistically significant details.

Figure 4 Diagram illustrating internet usage behavior



10.1.4 Survey results of the government online services

The behavior of using/receiving the government online service

The behavior of using services/receiving government online services from the survey data is at 60.7% of respondents who used/received government online services and the 39.3% of all survey respondents never used/received government online services. Most of them used online government serviecs during the last 3 months, 48.6% used services within the past 6 months, 30.2% used services longer than a year ago, 12.8% used at least

once a week (1-4 days a week), at most 50.6%, use it less than once a week, 48.4% used it every day or almost every day (5-7 days per week) at 1.0%.

The most commonly used government online services were 1) searching or requesting information at 48.8%, 2) downloading forms/documents by 26.4%, and 3) submitting forms/documents via online channels accounted for 24.7%.

The most used government online services period before COVID or September - November 2020, ranked in the top 3 of: 1) paying electricity/water/telephone/utilities bills by 77.4%, 2) registering/receiving rights/checking social security benefits by 52.7%, and 3) following government news, such as the COVID-19 report by 51.2% of all survey respondents to the characteristics of online government services. The most used during the Covid period or from December 2020 - July 2021, respectively, in the top 3 are 1) paying for electricity/water/telephone/utility bills by 86.7%, 2) Online income tax return 68.9%, and 3) registering /receiving rights/social security eligibility 64.2%.

The top 3 characteristics of government online services with the highest percentage change are 1) online income tax returns with an increase of 42.7%, 2) Job search/registration online increased by 28.9% and 3) registering/receiving rights/validation of various government projects such as the Thai Chana Project, Rao Chana Project and Haf and Half Project which was up by 15.5%.

This is the reason why online tax income filing services has increased. It comes from the due period for the payment of personal income tax From January to June 2021, the increase in the use of online job search/registration services. This was mainly due to the economic slowdown that was affected by the spread of the coronavirus and it encouraged people to use government services searching for jobs that are being hired in the event of a job termination, the government has issued various measures to help those who affected by the Covid outbreak by using online channels as the main registration/entitlement/authentication. This is the reason why the use of government services in this matter has increased.

In the government service satisfaction survey, the majority of respondents were 37% satisfied, 31.2% very satisfied, and 20.8% most satisfied, demonstrating an improvement in service efficiency. It can be seen that the government online serviecs have been accepted by most of the general public.

However, according to the survey respondents who did not opt for online government services, most of the reasons for not choosing in the top 3 government

online services are 1) No need to submit forms/documents. through online channels 62.2% 2) lack of competence and knowledge including the complexity of website usage (58.9%), and 3) more than 47.7% of respondents were confident in submitting paper documents directly to agencies, based on a number of respondents who did not opt for online government services. Pointing out ways to increase the efficiency of online government serviecs, such as increasing the type of online services to cover all government services, designing the online system to be easy and convenient for users especially through the use of mobile phones, smart phones, and building confidence and reliability among people in using secure online data services.

Table 41 Percentage of using/receiving government online services

Using/receiving online government services	Percentage
Ever	60.7
Never	39.3

Table 42 Percentage of using government online services at the recent times

Recent times using online government services	Percentage
Within the past 3 months	48.6
Within the past 6 months	30.2
Within a period of 1 year	8.3
More than 1 year ago	12.8
Others	0.0

Note: The survey data from the “Other” responses are not statistically significant.

Table 43 Percentage of the frequency in recently using government online services

Frequency of using government online services in the past	Percentage
It is used every day or almost every day (5-7 days a week).	1.0
It is active at least once a week (1-4 days a week).	50.6
Less than once a week	48.4

Table 44 Percentage of online government services

Types of online government services	Percentage
Search or obtain information	48.8
Download form/document	26.4

Types of online government services	Percentage
Submit forms/documents through online channels	24.7
Others	0.1

Note: Percentage of calculation results in the table from questions with more than 1 answer. The survey data from "Other" responses did not contain statistically significant details.

Table 45 Percentage of the appearance of the available government online services

Characteristics of online government services	Percentage	
	Before COVID (Sep–Nov 20)	During COVID (Dec 20-Jul 21)
Submitting the online tax income form	26.2	68.9
Follow government news, such as the COVID-19 report.	51.2	63.2
Register/Get Rights/Check Social Security Rights	52.7	64.2
Register/get rights/check rights for various government projects such as Thai Chana Project project we win half-person project	44.3	59.8
Submitting a reservation/request for documents online such as requesting a passport, asking for an ID card Apply for a driver's license, birth certificate, etc.	30.5	33.3
Online library service	1.8	2.5
Applying to a school or university	26.9	31.2
Online notification of the address change	6.1	10.1
Booking an appointment for online medical services	47.7	54.1
Paying electricity/water/phone/utilities bills	77.4	86.7
Job search/ online registration	12.1	41.0
Paying tax/renewing car-motorcycle online registration	14.5	13.2
Complaint/grievance to online agencies	5.5	4.3
Never used the service	40.9	31.8
Others	2.1	3.4

Note: Percentage of calculation results in the table from questions with more than 1 answer. The survey data from "Other" responses did not contain statistically significant details.

Table 46 Percentage of satisfaction on the government online services, e.g. Half and Half Project, Thai Chana and Rao Chana

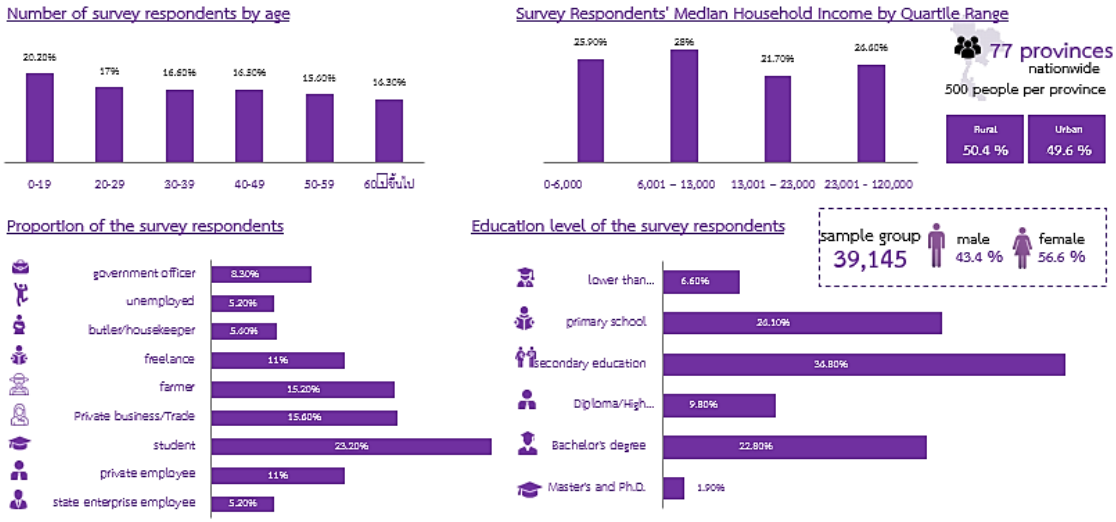
Satisfaction of online government serviecs	Percentage
Most satisfied	20.8
Very satisfied	31.2
Satisfied	37.0
Indifferent	10.4
Unsatisfied	0.7

Table 47 Percentage of reasons for not using government online serviecs

Reasons for not using government online serviecs	Percentage
There is no need to submit forms/documents through online channels.	62.2
There is no website to provide the service that you want to use.	39.2
Would like to contact the service with more government officials	43.1
Late reply or no response from service provider	22.5
Confidence in sending documents in paper to the agency more directly	47.7
Lack of talent and knowledge Including the complicated use of website	58.9
There are concerns about the security of personal data.	27.2
Service that requires transactions and need to see the government officials service in person	25.5
Use an electronic signature/electronic identity verification	12.1
Having a third party to transact, such as consultants, tax advisors	36.8
There is no problem using the service.	8.8
Others	0.3

Note: Percentage of calculation results in the table from questions with more than 1answer. The survey data from “Other” responses did not contain statistically significant details.

Figure 5 Diagram illustrating behavior in using/receiving government online services



10.1.5 Survey results on the use of online transactions

The behavior of goods/services purchasing through online channels

From the survey results of purchasing products/services through online channels, the proportion of survey respondents who purchase goods/services through online channels in the past 12 months accounted for 76.6% and responded to surveys that have not purchased goods/services online in the past 12 months. accounted for 23.4%. The top 3 of reasons for not buying online services are 1) 45.9% are not interested in using the service, 2) prefer to shop at stores more than 42.1%, and 3) are concerned about the store's credibility, such as product return warranty, 33.6%

When considering the frequency of purchasing goods and services online, it was found that in the pre-COVID period or September-November 2020, most respondents consumed the online services less than 1 day per week (51.1%), chose online services at least once a week but not every day (1-4 days a week) by 33.3% and every day or almost every day (5-7 days a week) by 15.6% and the frequency of online purchases of goods and services during COVID or December 2020 - July 2021 found that online services were purchased for at least a week. Once, but not every day (1-4 days a week) by 44.4% shop online less than 1 day a week by 39% shop online every day or almost every day (5-7 days a week) by 16.6% when comparing the frequency of purchasing goods and services online before and during the COVIDs, there was an increase of the proportion of people who purchased online services at least once a week but not every day (1-4 days a week), and increase of online service purchases every day or almost every day (5-7 days a week)

by 1%, indicating a more frequent online shopping behavior during the COVID-19 pandemic.

The top 3 types of online services that people buy in the pre-Covid period or September-November 2020, including 1) food/beverage ordering service from restaurants (including ordering through applications) such as Grab, LINE Man, Food Panda, etc. at 78.5%, 2) Cosmetics at 68.2%, 3) Consumer goods at 48.7%.

The top 3 types of online service products that people buy during the COVID-19 period or December 2020 – July 2021 are 1) food/drink ordering services from restaurants. (including ordering through applications) such as Grab, LINE Man, Food Panda, etc. 89.2% 2) consumer products 67.2% and 3) medicines 63.4%.

Comparing to the pre-Covid period and during the COVID period, the top 3 of changes in service and products were 1) medicines, increased by 22.2%, 2) financial products such as stocks, insurance, etc., increased by 20.5%, and 3) consumer products by 18.5% increase

The type of service that showed the biggest decrease was 1) cosmetics, a 48.8% decrease, 2) clothing, shoes, sports equipment and accessories, a 17.0% decrease, and 3) (purchase/reserve) movie tickets, concert tickets, tickets for various entertainment activities went down by 15.9%.

This reflects the behavior of using internet to support basic livelihoods during the COVID epidemic. That is to order medicines and consumer products because people avoid traveling and going out in public areas and vendors provide goods and services through online ordering mainly from both government and consumers who want the convenience and reduce the risk of contracting COVID-19. These are the main reasons for the increase of products purchasing for this group of services. Due to the concerns on risks that may arise in both financial, income, and security of people's lives and health, financial products such as stocks, insurance, are also a higher proportion of online purchasesl.

In the category of cosmetics, clothing, shoes, sports equipment and accessories, it reflects the behavior of consumers who see less need for non-essential products and it may be the luxury items that most citizens need to save money on including the reduction of movie tickets, concert tickets, tickets of various entertainment activities. This is because Thai government and regulators have implemented travel restrictions including

announcing a lockdown that prohibits entertainment venues from the country opening or events organizing.

Payment via online channels

According to the online payment survey data, the top 3 of of online payment formats with the largest percentage of users in the pre-COVID period were found in September-November 2020 are 1) payment via website (Internet Banking) or bank application (Mobile Banking) 50.1% 2) cash on delivery (COD) 45.6% and 3) payment via 27.5% credit card. The top 3 of forms of online payment with the largest the proportion of users during COVID or December 2020 - July 2021 1) Pay via website (Internet Banking) or application of mobile banking by 61.3 %, 2) 36.9 % paid via credit card, and 3) 25.2% used the reward points to redeem goods/services.

The top 3 most used online payment modes when compared before and during the COVID-19 are: 1) Reward points using to redeem goods/services; An increase of 13.5%, 2) Payment via the website (Internet Banking) or a banking application (Mobile Banking) increased by 11.2 %, and 3) Payment via credit card up to 9.4 %.

The top 3 declines in online payment formats when in comparison between before and during COVID were: 1) Cash on Delivery (COD), a 20.5% decrease; 2) Wire transfer, counter services, such as at the banks or convenience stores, fell to 15.2 %, and online payment services such as PayPal, Google Pay declined at 4.6 %, demonstrating the adoption of a form of payment that can be used online easily especially the use of credit cards, paying through the website (Internet Banking) or the banking application (Mobile Banking) that clearly increased the usage and the use of reward points to redeem products/services. This is due to the fact that sellers of goods and services stimulate sales and marketing to allow consumers to accumulate and use points to pay for goods and services as if paying with money.

Online payment methods that require a staff to assist in the payment transaction include Cash on Delivery (COD) or money transfers via counter services such as at banks or convenience stores. There is a smaller proportion. This is because people avoid forms of contact with banknotes or meeting with the authorities to assist in the transaction and reduce the risk of contracting COVID causing people to choose a standardized form of payment for banks and financial institutions directly accepting payments rather than using

the services provided by other companies or organisations. This makes online payment services such as PayPal and Google Pay in decrease.

Online sales/services platform

In terms of online goods/services trading platforms, it was found that the top 3 most used were 1) buying products from online stores on E-Marketplace, such as Lazada, Shopee (82.3%), 2) buying products through social media channels (78.6%), and 3) buying products directly from the online store of the product owner 35.7% through social media channels, through Facebook/ Facebook Page. Most of them were 97.3%, LINE/LINE Official account for 92.1% and Instagram by 85.6% of the total number of survey respondents who bought online goods and services.

Other online activities in addition to trading goods /services to earn the income

Regarding the surveys in other online areas in addition to trading goods/services to earn the income, most of the respondents are content creators on social networks such as YouTube, Instagram, Tiktok, 91.2%, online training 36.2%, product and service reviews 88.9%, and other online areas such as employment. It is the nature of the work such as document translation, product design or creating professional knowledge exchange groups, etc. by 12.1%.

Table 48 Percentage of goods/services purchasing through online channels

Buying products/services through online channels	Percentage
Purchased goods	76.6
Did not purchase service/products	23.4

Table 49 Percentage of reasons for not purchasing online goods and services

Reasons for not buying online services	Percentage
Nnot interested in using the service	45.9
Prefers to go shopping at the store.	42.1
Concerned on product/service quality	16.1
There are the concerns on the security of payment systems, such as providing credit/debit card information.	13.4
The concerns on the security of personal data, such as personal information is being stolen or misused	10.2
There are concerns on the store's reliability, such as product warranties, returning	33.6

Reasons for not buying online services	Percentage
Lack of confidence/lack of knowledge and understanding in purchasing products/services through online channels	16.0
There is a concern on the product that cannot be returned if there is a mistake.	31.2
Unable and don't have the knowledge to buy products/services online?	13.2
Lack of confidence in purchasing products/services via online channels, such as fear of being scammed, fear of receiving wrong products as ordered, not receiving products/services	16
Others	0.8

Note: Percentage of calculation results in the table from questions with more than 1 answer. The survey data from "Other" responses did not contain statistically significant details.

Table 50 Percentage of the frequency in online purchase of goods and services

The frequency of purchasing online goods and services	Percentage	
	Before COVID (Sep–Nov 20)	During COVID (Dec 20-Jul 21)
It is used every day or almost every day (5-7 days a week).	15.6	16.6
It is active at least 1 day a week, but not every day (1-4 days a week).	33.3	44.4
Less than once a week	51.1	39.0

Table 51 Percentage of online products and services

Products	Percentage	
	Before COVID (Sep–Nov 20)	During COVID (Dec 20-Jul 21)
Magazine, book or newspaper	0.9	0.9
Clothing, shoes, sports equipment and accessories	36.7	19.7
Computer equipment or parts	14.4	24.4
Game computer or a video game console (Video Game)	13.2	24.4
Program, software, or application of the computer	4.0	2.1
Cosmetics	68.2	19.4
Financial products such as stocks, insurance, etc.	11.6	32.1
Dry food	24.8	26.3
Fresh food (excluding food/drink orders from restaurants) via food delivery service)	22.5	22.1

Products	Percentage	
	Before COVID (Sep–Nov 20)	During COVID (Dec 20-Jul 21)
Consumer goods	48.7	67.2
Cigarettes and liquor	0.5	2.4
Information and Communication Technology (ICT Service) services do not include software purchases.	11.8	22.3
Medicines	41.2	63.4
Movies, short films, series, pictures (including streaming services)	1.9	4.8
Music (including music streaming services)	1.6	2.4
Cameras, lenses and photographic/video equipment	3.4	4.3
Mobile phone and communication equipment	13.3	14.2
(Purchase/Reserve) Movie Tickets, Concert Tickets, Tickets for various entertainment activities	19.2	3.3
(Buy/reserve) a ticket such as a plane ticket Train tickets include rental cars and vehicles.	18.7	4.6
Accomodation	4.8	2.1
Food/beverage ordering service from restaurants (including ordering through applications) such as Grab, LINE Man, Food panda, etc.	78.5	89.2
Pick-up and delivery services for parcels, documents and items	32.4	23.2
Calling a bus service through the application	16.7	9.5
Others	1.1	0.9

Note: Percentage of calculation results in the table from questions with more than 1 answer. The survey data from “Other” responses did not contain statistically significant details.

Table 52 Percentage of online payment forms

Online payment format	Percentage	
	Before COVID (Sep–Nov 20)	During COVID (Dec 20-Jul 21)
pay via credit card	27.5	36.9
Pay via debit card	12.4	13.3
Pay through the website (Internet Banking) or the banking application (Mobile Banking).	50.1	61.3
Use online payment services such as PayPal, Google Pay.	13.9	9.3

Online payment format	Percentage	
	Before COVID (Sep–Nov 20)	During COVID (Dec 20-Jul 21)
Pay by electronic wallet (e-Wallet)	12.5	14.2
Prepaid card or online gift card	5.7	4.4
Use your accumulated points to redeem products/services.	11.7	25.2
Transfer money through counter service such as at the bank or convenience stores	26.6	11.4
Cash on Delivery (Cash on Delivery: COD)	45.6	25.1
Others	3.1	3.4

Note: Percentage of calculation results in a table from questions with more than 1 answer. The survey data from the "Other" responses were similar in the same direction.

Table 53 Percentage of platforms for online goods/services trading

Online trading platform for goods/services	Percentage
Buying and selling products from an online store on the system. e-Marketplace such as Lazada, Shopee, Kaidee, Lnwshop, etc.	82.3
Buying and selling products online in retail stores such as Central online, Tesco Online, etc.	25.3
Buying and selling products directly from the owner's online store.	35.7
Buying and selling products through social media channels	78.6
• Facebook/Facebook Page	97.3
• LINE/ LINE Official Account	92.1
• Instagram	85.6
Buying and selling products through other online channels	8.2
Your own Website /Webpage /Application	11.6
Others	2.5

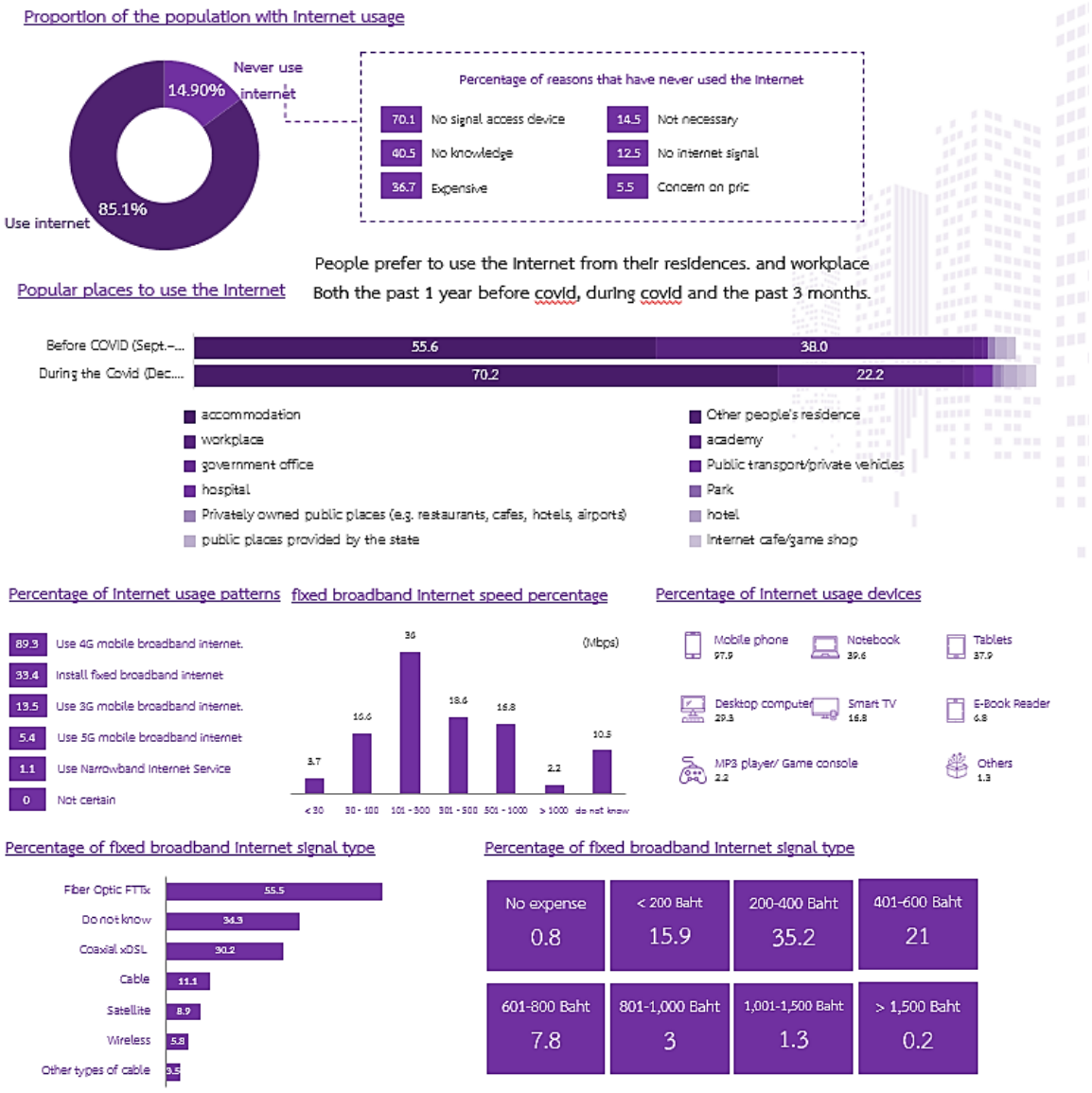
Note: Percentage of calculation results in the table from questions with more than 1 answer. The survey data from "Other" responses did not contain statistically significant details.

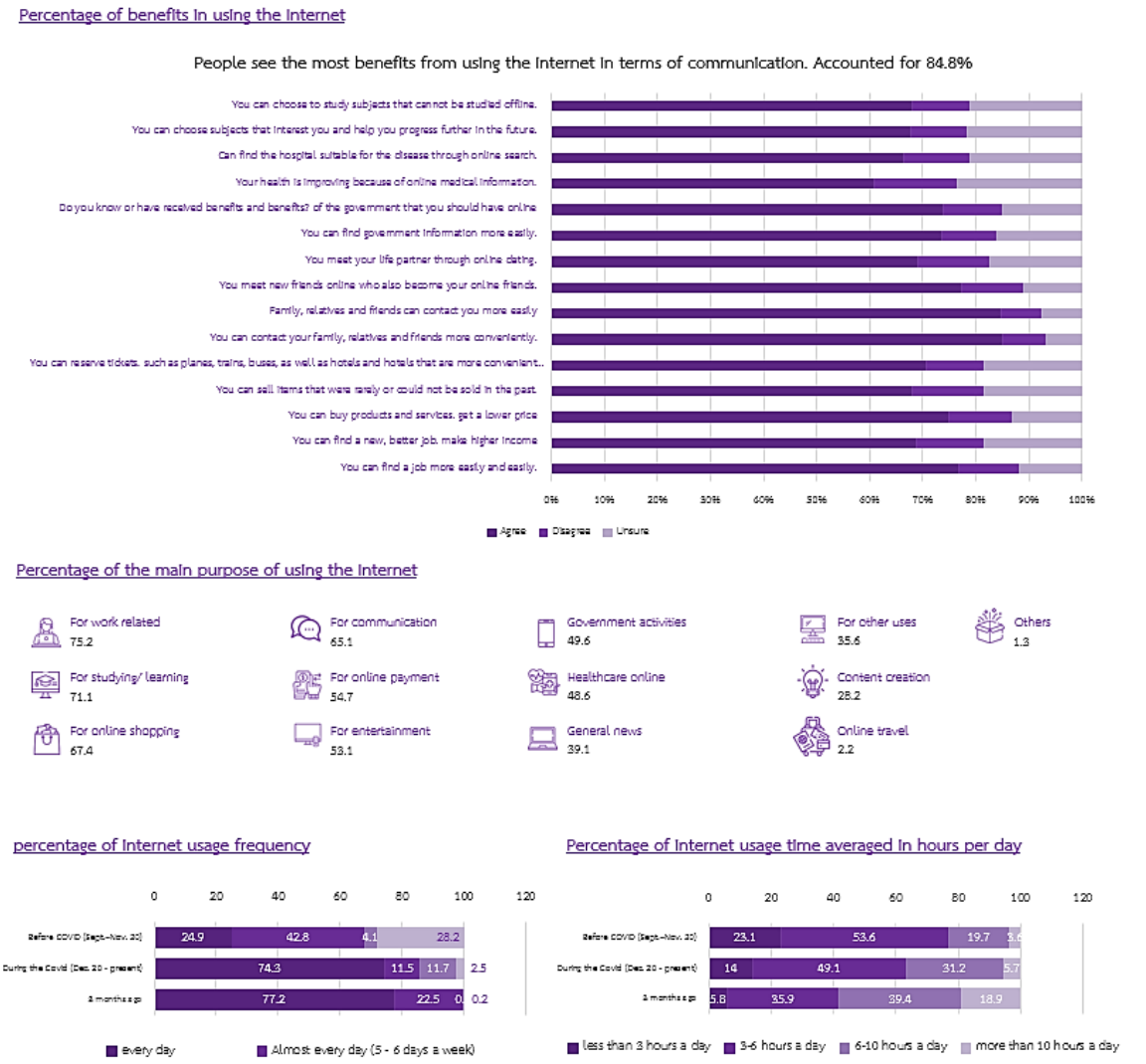
Table 54 Percentage of online presence in other areas in addition to trading goods/ services for the income earning

Other aspects of being online in addition to trading goods/ services to generate income	Percentage
Content creator on Social Network such as YouTube, Instagram, Tiktok.	91.2
Product and service reviews	88.9
Organizing online training	36.2
Others	12.1

Note: Percentage of calculation results in the table from questions with more than 1 answer. The survey data from the "Other" responses were similar in the same way.

Figure 6 Diagram illusting of online transactions





10.1.6 Survey results on digital work/study skills

In the digital work/study skills survey section, there were the 29.5% of respondents who worked remotely, the 34% studied online via online learning, and the 36.5% did not work/study online.

Table 55 Percentage of online working/studying people

The proportion of people working/studying online	Percentage
Working remotely (Telework) with an online system	29.5
Distance learning online (Online Learning)	34.0
Not working/studying	36.5

Telework behavior

Considering telework behavior, it was found that the proportion of respondents with telework characteristics who were able to work remotely with all online systems accounted for 36.9% of those who work remotely who are able to work remotely online in some jobs accounted for the the 62.9% and the work that can not work remotely at 0.2%.

Considering the frequency of working remotely in the pre-COVID period or September-November 2020, it was found that the 55.2% of respondents worked remotely more than once a week, the 44.8% of the respondents worked remotely once a week, and none of those who did not work remotely. During the COVID-19 period, or December 2020- July 2021, the 99.2% of people who worked remotely more than once a week and 0.8% worked remotely once a week, and none of those who did not work remotely.

When comparing the frequency of working remotely, it was found that the proportion of people who worked remotely more than once a week increase of 44%, an increase from those who used to work remotely once a week to work remotely more than once a week. This shows the proportion of working remotely more frequently and clearly reflects the New Normal working behavior by using the online system more clearly because many organisations. There is a policy for employees to work from home more.

In terms of activities related to telework, it was found that the top 3 of highest activities were in the pre-COVID period or September-November 2020, namely 1) video conference (86.6%) 2) e-mail traffic of agencies/companies at 80.8% 3) access to documents of agencies/companies at 48.2%.

Telework-related activities was highest during COVID-19 or December 2020 - July 2021, with the top 3 of being 1) VDO conference (93.2%) 2) Use for email traffic of agencies/companies 82.2% 3) access to documents of agencies/companies at 53.2%

Comparing the proportion of change in telework-related activities, it was found that the top 3 were 1) using the agency/company's website, such as recording time in - out. Approval for leave of absence, etc., increased by 11.1%, 2) VDO conference, increased by 6.6%, and 3) access to information documents of agencies/companies. This was up 5.0%, reflecting more activities related to telework and more fully online in addition to teleconference (VDO Conference), which is the main event before and during the Covid

As for the systems used for working remotely, the 3 most used are 1) systems used for meetings such as Microsoft Team, Zoom, Google Meet, 77.6%, 2) Document systems such as Microsoft Office 365, Google Workspace by 63.4%, and 3) systems used for planning events such as Google Calendar, ZenDay, Trello by 21.2 %.

The top 3 of systems used for teleconferencing were 1) Zoom (78.2%), 2) Google Meet (55.5%), and 3) Microsoft Team (48.2%).

In the survey of telework opinions, the vast majority of remote workers agreed and strongly agreed that can work remotely (Telework) effectively accounted for 58.1% and 27.5%, respectively, and 10.7% disagreed and 3.7% strongly disagreed. The top 3 of barriers to using online systems for working remotely were: 51.2% inappropriate home or accommodation, 2) Lack of efficient computer equipment 36.5%, and 3) Lack of high-speed Internet 31.3%, with 45.8% agreeing that working remotely can replace traditional work and working remotely is not a replacement for the 54.2 % of normal working.

Table 56 Percentage of telework behavior

Telework characteristics	Percentage
Able to work remotely with all online systems	36.9
Able to work remotely with some online systems	62.9
Can't work remotely at all	0.2

Table 57 Percentage of the frequency of telework

The frequency of working remotely	Percentage	
	Before COVID (Sep–Nov 20)	During COVID (Dec 20-Jul 21)
Once a week	44.8	0.8
More than 1 time per week	55.2	99.2
Not working remotely	0.0	0.0

Table 58 Percentage of telework-related activities

Telework related activities	Percentage	
	Before COVID (Sep–Nov 20)	During COVID (Dec 20-Jul 21)
Used for sending emails of agencies/companies.	80.8	82.2
Access to information sheets of agencies/companies	48.2	53.2
Use the application system of the agency/company	36.6	37.8

Telework related activities	Percentage	
	Before COVID (Sep–Nov 20)	During COVID (Dec 20-Jul 21)
Use the website of the agency/company such as recording time in-out, requesting approval, time off, etc.	22.8	33.9
Working remotely with in-house personnel (Work from Home /Teleworking)	36.3	39.1
Teleconference (VDO Conference)	86.6	93.2
For submitting work online	33.2	31.9
Others	3.1	1.2

Note: Percentage of calculation results in the table from questions with more than 1 answer. The survey data from "Other" responses did not contain statistically significant details.

Table 59 Percentage of systems used in telework

Systems used for remote work	Percentage
Conferencing systems such as Microsoft Team, Zoom, Google Meet	77.6
System used for planning events such as Google Calendar, ZenDay, Trello.	21.2
Data collection and management systems such as Microsoft Outlook, Google Drive	20.1
Document systems such as Microsoft Office 365, Google Workspace	63.4
External connection systems such as Remote Desktop, VPN systems	7.2
The develop system of the organisation	15.2
Others	2.1

Note: Percentage of calculation results in the table from questions with more than 1 answer. The survey data from "Other" responses did not contain statistically significant details.

Table 60 Percentage of systems used for teleconferencing

System used for teleconferencing	Percentage
Microsoft Team Program	48.2
Zoom program (Zoom)	78.2
Google Meet program	55.5
Quidlab FoQus	2.5
One Conference program	0.7
CISCO WebEx program	29.6
The develop system of the organisation	1.9

System used for teleconferencing	Percentage
Others	0.3

Note: Percentage of calculation results in the table from questions with more than 1 answer. The survey data from "Other" responses did not contain statistically significant details.

Table 61 Percentage of the ability to work remotely (Telework) effectively

being able to work remotely (Telework) effectively	Percentage
Strongly agree	27.5
Agree	58.1
Disagree	10.7
Strongly disagree	3.7

Table 62 Percentage of obstacles while using online systems for telework

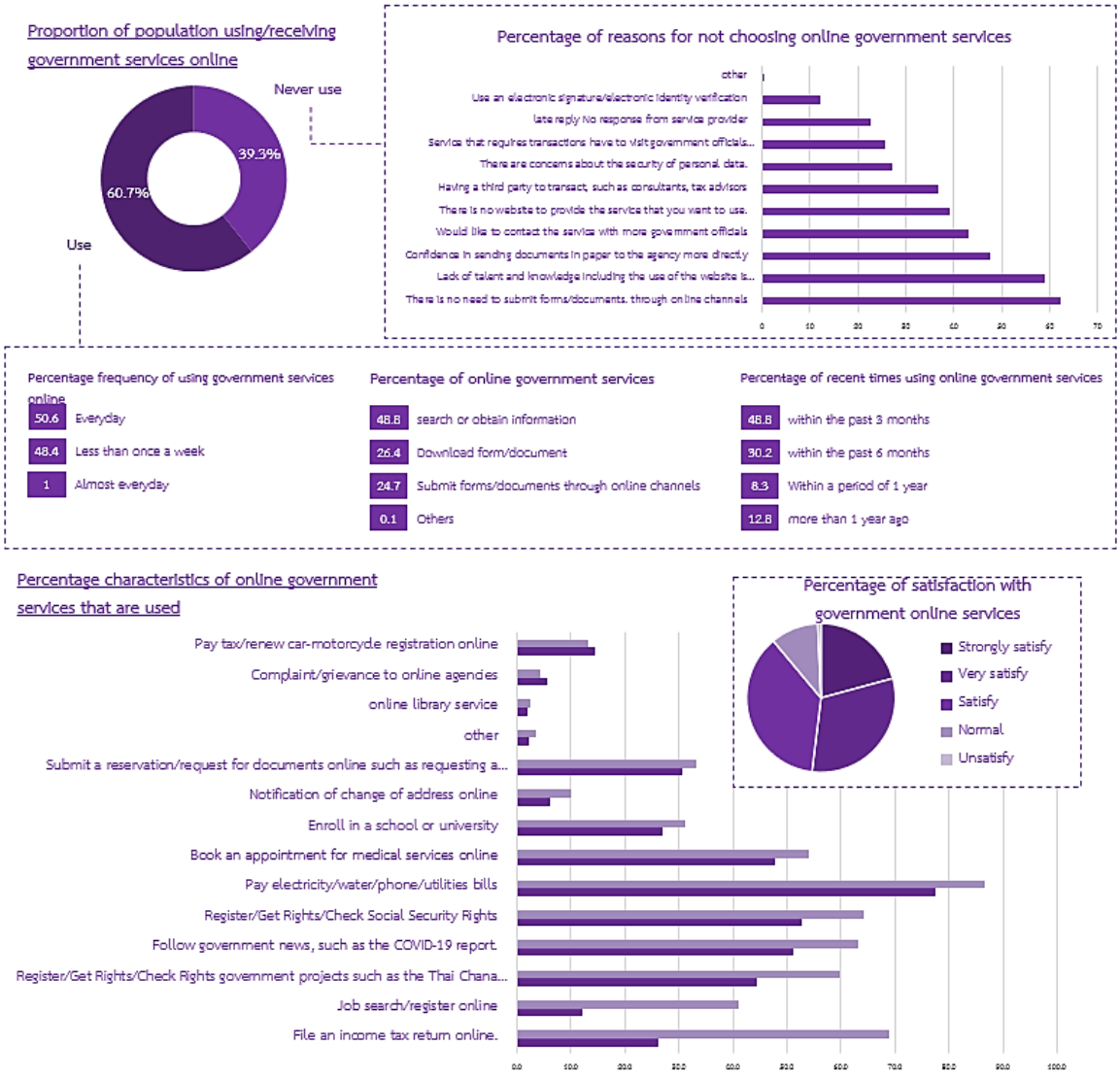
Obstacles while using online systems for working remotely	Percentage
Lack of computer equipment powerful	36.5
Lack of accessories such as headphones, video cameras	15.3
Lack of high speed Internet	31.3
The environment at home or accommodation is inappropriate.	51.2
Lack of knowledge in using the program	18.4
Others	2.1

Note: Percentage of calculation results in the table from questions with more than 1 answer. The survey data from "Other" responses did not contain statistically significant details.

Table 63 Percentage of telework that can replace the normal working

Can working remotely (Telework) replace the normal working style?	Percentage
Yes	45.8
No	54.2

Figure 7 Dagram illustrating teleworking behavior



Online learning behavior

From a survey of the frequency of online learning, it was found that in the pre-COVID period, or September - November 2020, the proportion of those who studied online more than once a week was 66.2%, online learning once a week was at 33.8% and none who did not study online during COVID or December 2020 – July 2021. The proportion of those who study online more than once a week was 71.0%, and those who studied online once a week were 29.0%

When comparing the change in the frequency of online learning, it was found that the proportion of those who studied online more than once a week was 4.8% increase, an increase from those who took online classes once a week, demonstrating a higher

frequency of online learning from school closures for the protection outbreak of coronaviruss.

Highest online learning-related activities in the pre-Covid period or September - November 2020, it was found that the top 3 rankings were 1) attending classes with 88.9% of online classroom teaching, 2) 63.6% of VDO conference, and 3%.) 29.5% access to educational material materials and online learning-related activities highest during COVID or December 2020 - July 2021, thetop 3 of were 1) Study-based attendance Live teaching via online system (Online classroom) 92.2%, 2) VDO conference (69.2%), and 3) access to educational documents 31.1%.

Comparing to the changes in online learning-related activities, the top 3 of activities with the highest proportion were the same both before and during the coronavirus. The top 3 of activities with the largest proportion of growth were 1) online self-study. increased by 6.4% 2) submitting work via online system an increase of 6%, 3) VDO conference, an increase of 5.6%, showing the use of other activities involved in online learning that is increasing beyond the main activities of online attendance alone.

As for the systems used in online learning, the 3 most used are 1) Zoom program (92.1%), 2) Google Classroom (85.6%) and 3) Google. Lmeets (Google Meet) 34.9%.

In the survey about being able to study online effectively, it was found that the majority of online learners agreed with 57.3%, strongly agreed with 26.5%, disagreed with 12.0% and strongly disagreed with 4.2%. The top 3 of utilization of online systems in distance learning are 1) Lack of learning equipment such as computers, laptops, tablets, and mobile phones 44.2% 2) the home or accommodation environment. 39.4% inappropriate and 3) lack of efficient computer equipment at 22.3%, and there are opinions that Online learning was a 57.8% replacement for traditional learning, and 42.2% of online learning was considered a substitute for traditional learning.

Table 64 Percentage of frequency in online learning

The frequency of online learning	Percentage	
	Before COVID (Sep–Nov 20)	During COVID (Dec 20-Jul 21)
Once a week	33.8	29.0
More than once a week	66.2	71.0
No distance learning	0.0	0.0

Table 65 Percentage of distance online learning-related activities

Activities related to distance online learning	Percentage	
	Before COVID (Sep–Nov 20)	During COVID (Dec 20-Jul 21)
To send and receive e-mails of educational institutions	15.2	18.2
Access to educational institutes' information sheets	29.5	31.1
Use the educational institute's application system	17.9	18.0
Teleconference (VDO Conference)	63.6	69.2
Attending classes with live teaching via online system (Online classroom)	88.9	92.2
Online self-study	18.2	24.6
Submitting online work	13.5	19.5
No distance learning	0.0	0.0
Others	3.2	2.1

Note: Percentage of calculation results in the table from questions with more than 1 answer. The survey data from "Other" responses did not contain statistically significant details.

Table 66 Percentage of system used in online learning

System used in online learning	Percentage
Microsoft Team Program	11.6
Zoom program (Zoom)	92.1
Google Meet program	34.9
Google Classroom program	85.6
Quidlab FoQus	2.2
One Conference program	2.0
A system of educational institutions developed especially	9.1
Others	0.3

Note: Percentage of calculation results in the table from questions with more than 1 answer. The survey data from "Other" responses did not contain statistically significant details.

Table 67 Percentage of the ability in online learning effectively

Can study online effectively	Percentage
Strongly agree	26.5
Agree	57.3
Disagree	12.0

Can study online effectively	Percentage
Strongly disagree	4.2

Table 68 Percentage of obstacles to use online systems in the distance learning

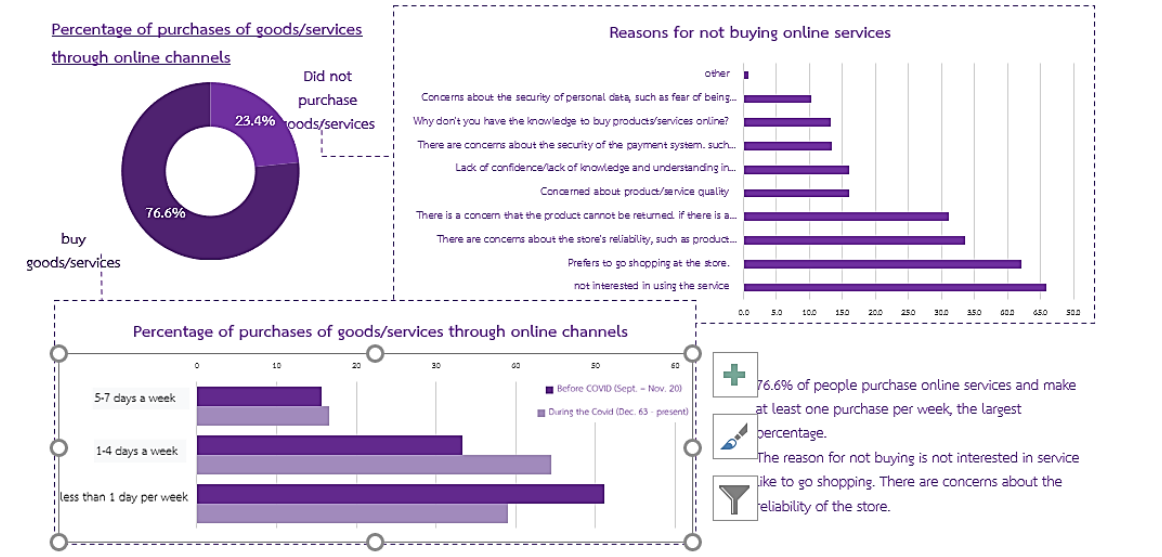
Obstacles to use online systems in the distance learning	Percentage
Lack of learning equipment such as computers, notebooks, tablets, mobile phones	44.2
Lack of computer equipment powerful	22.3
Lack of accessories such as headphones, video cameras	3.9
Lack of high speed Internet	14.5
Home environment or inappropriate accommodation	39.4
Parents are not comfortable with in the case of young children	13.8
Lack of knowledge in using the program	5.2
Others	3.1

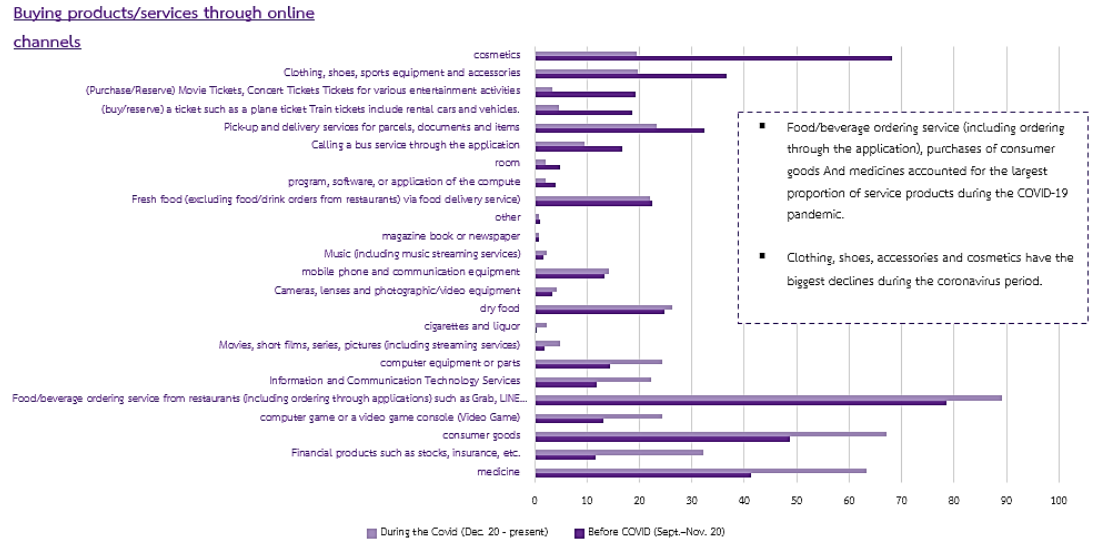
Note: Percentage of calculation results in the table from questions with more than 1 answer. The survey data from "Other" responses did not contain statistically significant details.

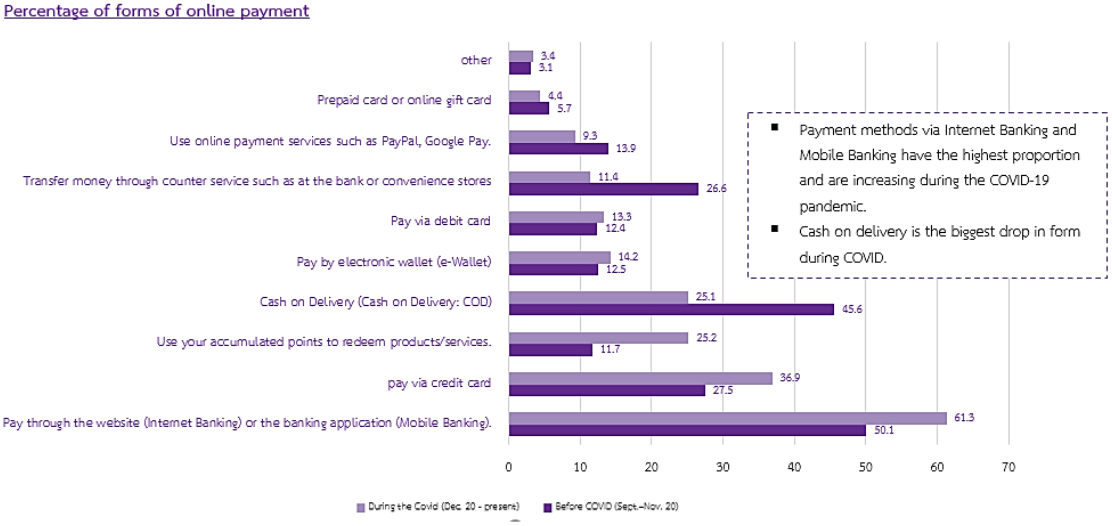
Table 69 Percentage of online learning that can be substituted for normal learning

Can online learning be a substitute for regular learning?	Percentage
Yes	57.8
No	42.2

Figure 8 Diagram illustrating online learning behavior







Digital skills

To explore digital skills, most of the survey respondents could not write a computer program accounted for at 88.3% and able to write computer programs at 11.7% with the ability to use programs/applications with the highest proportion found that the top 3 of were 1) taking still pictures 85.4% 2) shooting video at 81.2% and 3) copy-paste, move-text on devices or the Cloud, computers, tablets, phones, smartphones, at 77.3% of smart TVs, and the ability to use programs/applications. The lowest The percentages were 1) altering web browser security at 9.8%, 2) installing or uninstalling an operating system such as Microsoft Windows 10.2%, and 3) modifying and checking software applications 12.2%

Table 70 Percentage of programming proficiency

Be able to write the computer programs	Percentage
Yes	11.7
No	88.3

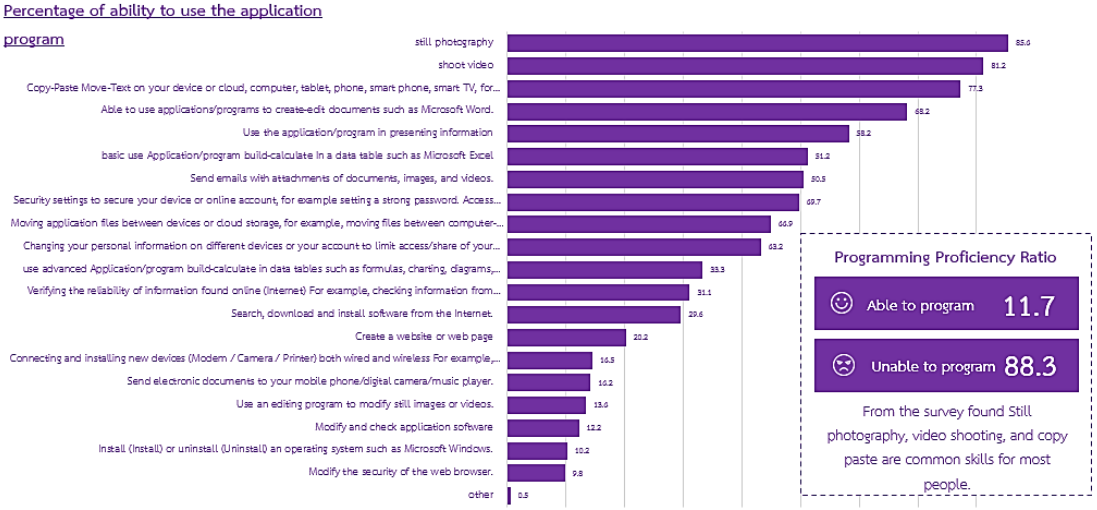
Table 71 Percentage of ability to use the program/application

Program/application ablility	Percentage
Create a website or web page	20.2
Copy-Paste Move-Text on device or Cloud, computer, tablet, phone, smart phone, smart TV, for example copy-paste-move, Text/Content On Document/Copy-Paste-Move Text/content on the phone such as text on Line, copy the url to open on the browser, etc.	77.3
Connecting and installing new devices (Modem/Camera/Printer) both wired and wireless, for example, connecting and installing devices. (Modem/Camera/ Printer) on the computer both Wired/Wireless - Connecting Camera/Printer to Smart Phone both wired/wireless	14.5
Moving application files between devices or on Cloud storage, for example, moving files between computer-computer, computer-tablet, computer-mobile, computer-Cloud storage, moving files/Back up files (photos/videos/applications) between your smart phone and computer or Cloud	44.9
Security settings to secure your device or online account, for example setting a strong password to access your computer/tablet/mobile phone, online account access security settings, abnormal login alerts	49.7
Changing your personal information on different devices or your account to restrict access to the proportion your personal information such as your name/data/contact/picture etc., for example; to change your privacy information on Facebook/LINE to be able to display only the name not showing photos to friends or not showing email/phone numbers for friends to see, not showing publicly, etc.	43.2
Verifying the reliability of information found online (Internet); for example, reviewing information from multiple sources, verifying information with trusted agencies/persons/government agencies.	31.1
Able to use applications/programs to create-edit documents such as Microsoft Word	68.2

Program/application ablility	Percentage
Use basic applications/computing programs In a data table such as Microsoft Excel	51.2
Use advanced applications/computing builders. in data tables, such as formulas, charting, diagrams, and graphs	33.3
Running applications/programs in presenting information	58.2
Send emails with attachments of documents, images, and videos.	50.5
Send electronic documents to your mobile phone/digital camera/music player	14.2
Search, download and install software from the Internet.	29.6
Modify and check application software	12.2
Modify web browser security	9.8
Install (Install) or uninstall (Uninstall) an operating system such as Microsoft Windows	10.2
Portrait photography	85.4
Shooting video	81.2
Use an editing program to modify still images or videos.	13.4
No program/application capability	9.8
Others	0.5

Note: Percentage of calculation results in the table from questions with more than 1 answer. The survey data from “Other” responses did not contain statistically significant details.

Figure 9 Diagram illustrating digital skills



The stress on the computer use

In the survey of the stress on the use of computers at work compared to working without a computer, at 41.1% of respondents reported unrelated stress, at 31.0% viewed it as unrelated at 17.7% more stressed, and at 10.3% less stressed. The opinion about the occurrence of stress from computer work for more than half of the working hours found that the 44.2% of respondents were stressed at some time, the 10.9% experienced stress most of the time, and stress on a regular basis (Always) at 6.6% with survey respondents, the 38.3% of the opinion that it does not stress (Never)

Discomfort when accessing the Internet

According to the survey, the 75.0% of respondents agreed that they felt uncomfortable when they didn't have access to the Internet, and at 25.0% disagreed, at 9.9% very unsatisfied, at 30.0% moderately unsatisfied and at 35.1% less uneasy.

Content Creation or Content on social media

According to the survey, the majority of respondents at 73.4% created the content for entertainment and leisure, 23.1% earned extra income, such as selling products/services, product/service reviews, etc., 3.2% provided knowledge, understanding or dissemination of various content to the audience, and other 0.2% such as for keeping as a memory, for experimentation.

Table 72 Percentage of stress levels at work compared to non-computerized work

Work stress compared to working without a computer	Percentage
More stressful	17.7
No difference	41.1
Less stressful	10.3
Not relate to	31.0

Table 73 Percentage of various content creation on social media

Content creation or content on social media	Percentage
For entertainment and recreation	73.4
To earn extra income such as selling products/services Product/service reviews, etc.	23.1
To provide knowledge, understanding or disseminate various content to the audience	3.2

Content creation or content on social media	Percentage
Others	0.2

Note: Percentage of calculation results in the table from questions with more than 1 answer. The survey data from the "Other" responses were similar in nature to the responses.

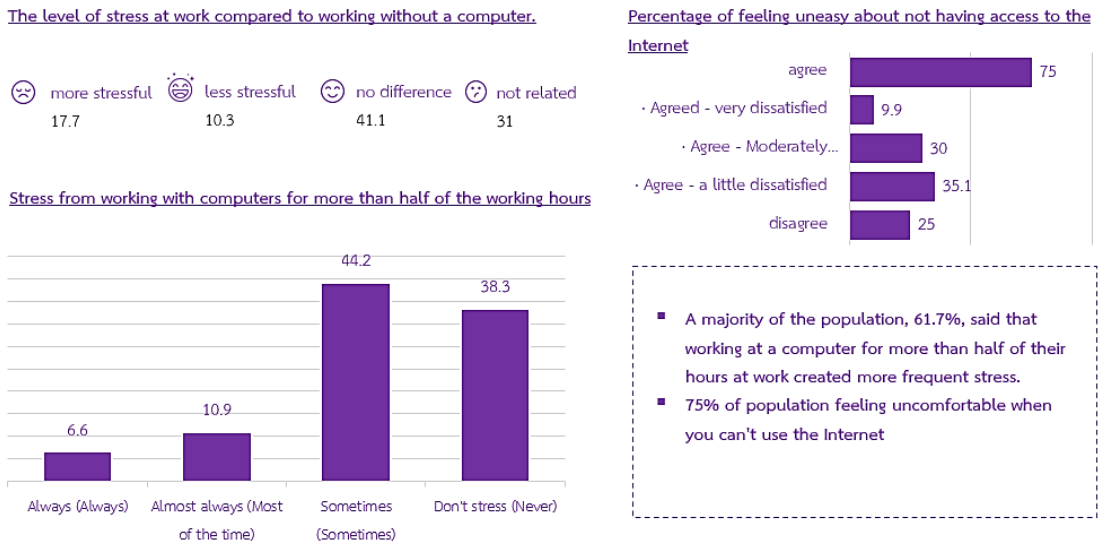
Table 74 Percentage of the stress from working with computer for more than half of working hours

Stress from working with computers for more than half of the working hours	Percentage
Always (Always)	6.6
Almost always (Most of the time)	10.9
Sometimes (Sometimes)	44.2
Don't stress (Never)	38.3

Table 75 Percentage of dissatisfaction with inability to access the internet

You will feel "uncomfortable" when you cannot access to the Internet	Percentage
Agree	75.0
• Agree - very unhappy	9.9
• Agree - moderately uneasy	30.0
• Agree - less dissatisfaction	35.1
Disagree	25.0

Figure 10 Diagram illustrating stress from working with computers, and uneasiness when unable to access the Internet



10.1.7 Survey results on the trust and digital security

Trust and digital security

According to a general survey of trust and digital security on the issue of knowledge of safety in the use of the Internet, the survey respondents were knowledgeable about the disclosure of personal information in the online world. The 71.2% of respondents were aware of digital risks, at 51.1% were knowledgeable about the risks of using public Wifi, and at 48.2% had knowledge of the most secure passwords. The resopondants knowed the Personal Data Protection Act (PDPA), at 43.6% do not know the Personal Data Protection Act (PDPA) by 56.4%.

Table 76 Percentage of internet safety knowledge

Internet safety knowledge	Percentage
Exposing your personal information online is a risk of digital jeopardy.	71.2
The Risks of Using Public Wifi	51.1
Setting a password (Password) is the most secure.	48.2

Note: Percentage of calculation results in the table from questions with more than 1 answer

Table 77 Percentage of Personal Data Protection Act (PDPA) Perceptions

Acknowledgment of the Personal Data Protection Act (PDPA)	Percentage
Know	43.6
Don't know	56.4

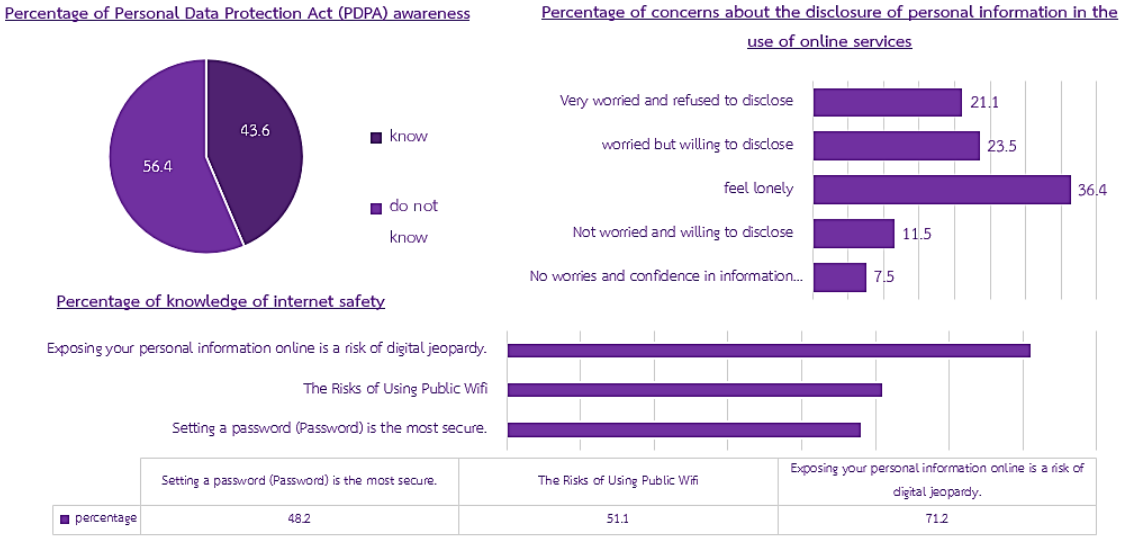
Concerns on the disclosure of personal information

The survey results concerning personal information disclosure ranked according to the proportion, it was found that at 36.4% of respondents felt indifferent, at 23.5% were worried but agreed to disclosure, at 21.1% were very worried and refused to disclose, at 11.5% were not worried and agreed to the disclosure, and at 11.5% were not worried and believed, confidence in the treatment system was at 7.5% of information security. Considering to the overall picture, it can be seen that the majority of the total 78.9% agree to the disclosure of personal information.

Table 78 Percentage of the concerns on disclosure of personal information in online services

Concerns on the disclosure of personal information in the use of online services	Percentage
Very worried and refused to disclose	21.1
Worried but willing to disclose	23.5
Feel lonely	36.4
Not worried and willing to disclose	11.5
No worries and confidence in information security.	7.5

Figure 11 Diagram illustrating the concerns on disclosing personal data when using online services



Problems and prevention of security incidents in Information Technology (Security Incident)

According to the survey data, the majority of respondents have never experienced an IT security problem accounted for 56.9%, with 43.1% of those who experienced Information Technology security problems. The top 3 of most common problems were: 1) infected devices (Virus) / Trojan (Trojan) / Malware (Malware) until damage to the device or various data, at 69.4% of devices internally, 2) the 25.6% of privacy and security were compromised, and 3) lost money from phishing messages and traps from fraudulent websites (Pharming) at 14.2%. The top 3 of most commonly practiced cyber attack prevention methods are 1) 45.3% change passwords regularly, 2) set a passcode lock on

the device and lock it every time when it isn't in use by 42.1%, and 3) Not sharing your personal password at 39.9%.

The top 3 of methods of solving the problem of Information Technology attacks are as follows: 1) reporting the attack to government agencies such as police stations, data breach prevention agencies at 35.2% of individuals, 2) Installing and using software services to prevent IT attacks 33.4%, 3) reporting attacks to ISPs/changes of ISPs at 20.1%

It shows that the majority of people are aware of the ways to correct and prevent Information Technology attacks. There are some people who have been hit and the attacked as well but did not take any actions to solve the problem accounted for 19.2%. Therefore, the government should educate about the prevention and solution of this Information Technology attack as well as to encourage people who are experiencing problems but have not yet awakened and aware of the impact that will occur to themselves as well.

Table 79 Percentage of the occurred problems in Information Technology security

Information Technology Security Issues	Percentage
Infected device (Virus) / Trojan (Trojan) / malware (Malware) until damage to the device or various data inside the device	69.4
Infringement of personal data or privacy (Privacy and Security)	25.6
Lose money from phishing messages/emails and get trapped by phishing attacks.	14.2
Lost money from credit/debit card hack including financial applications	11.1
Affected by the problem of Information Technology security problems by system operators	2.3
Never faced such problem	56.9

Note: Percentage of calculation results in the table from questions with more than 1 answer

Table 80 Percentage of problem prevention on Information Technology security

Prevention of Information Technology security problems	Percentage
Change your password regularly	45.3
Set a device lock code and lock it every time in case it is not in use	42.1
No confidential information is stored on personal devices such as computers or mobile phones	11.1
Log out including deleting personal data every time you use public devices	13.2
Has the ability to recognize and circumvent untrusted websites and emails.	5.5
Never tell anyone your personal password	39.9

Prevention of Information Technology security problems	Percentage
Do not publish personal information such as age, date of birth, as well as photographic documents and location information on the social media channels	10.9
Do not use other people's devices for financial transactions.	22.8

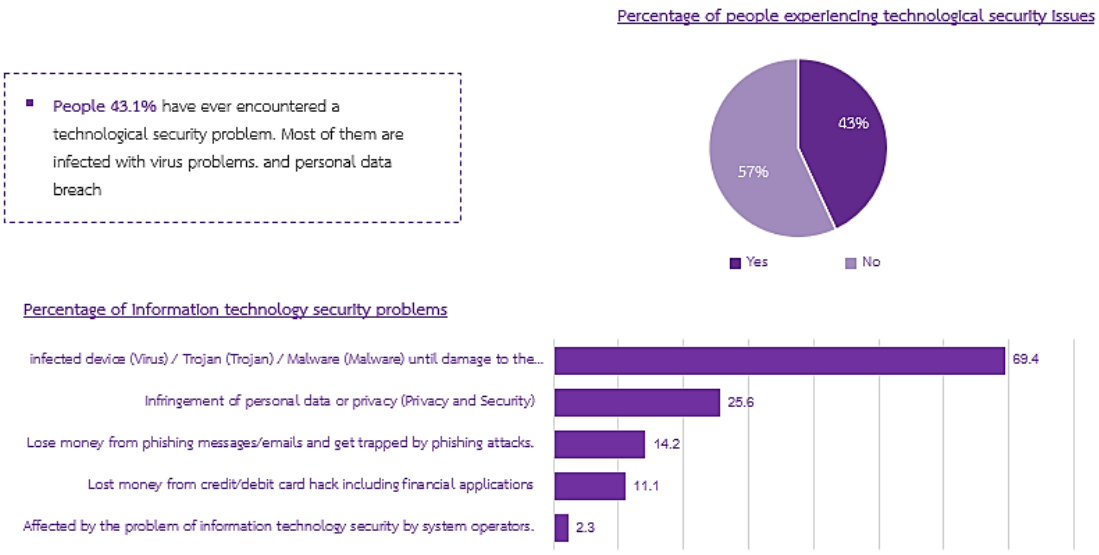
Note: Percentage of calculation results in the table from questions with more than 1 answer

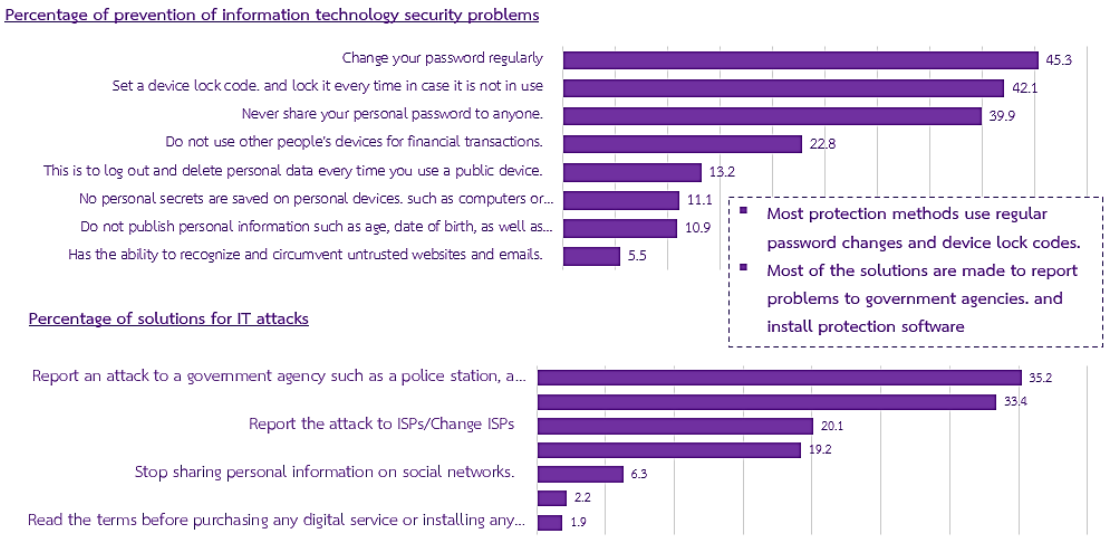
Table 81 Percentage of solutions for IT attacks

How to solve the problem of Information Technology attacks	Percentage
Report an attack to a government agency such as a police station, a personal data breach prevention agency.	35.2
Report the attack to ISPs/Change ISPs	20.1
Installing and using software services to protect against IT attacks	33.4
Read the terms before purchasing any digital service or installing any program/software	1.9
Stop sharing personal information on social networks.	6.3
Not doing anything	19.2
Others	2.2

Note: Percentage of calculation results in the table from questions with more than 1answer. The survey data from "Other" responses did not contain statistically significant details.

Figure 12 Diagram illustrating problems encountering and protecting against IT security incidents





10.1.8 Survey results on the implementation of government digital policies and related measures

Service usage statistics

From the survey respondents who use government projects as follows:

Areas and service points of the Pracharat Internet Project, there were 36.8% of respondents with local service points, 25.7% of them not, 37.5% of USO Net Internet centers. 31.9% of service points in the area, no service points 27.2%, 40.9% unsure, digital community centers 30.6% of respondents with local service points, 24.6% without service points, 44.8% unsure.

As for the statistics of using the services of the Pracharat Internet Project and considered according to the period used to use the service, divided into 4 periods: 1) within the past 3 months 9.2%, 2) within the past 6 months 7% 3) within the period 14.2% in the past year 4) 19.8% longer than the previous year and 49.8% never used the service at USO Net Internet center 1) within the past 3 months 3.2% 2) within the past 6 months 5.2% 3) 11.6% within the past year 4) 24.4% longer than the previous year and 55.6% never used the service.

Community digital centers: 1) 0.9% within the past 3 months, 2) 11.7% within the past 6 months, 3) 16.1% within the past 1 year) 14.8% more than a year ago and 56.5% never used the service when considering the frequency of use only during the past 3 months of the Pracharat Internet Project. There was daily or almost daily use (5-7 days a week), 0.1% were used at least once a week (1-4 days a week), 5.5% were active less than 1% times a week, 3.6%.

The USO Internet Center is active every day or almost every day (5-7 days a week) by 0.0%, active at least once a week (1-4 days a week) by 0.0%, active less than once a week by 3.2%.

Community Digital Center was active every day or almost daily (5-7 days a week) by 0.0%, used at least once a week (1-4 days a week) by 0.0%, and used it less than once a week by 0.9%.

Considering the frequency of use of the service in the post period Pracharat Internet Project at 0.2% of people who use it daily or almost every day (5-7 days a week), 28.7% used it at least once a week (1-4 days a week), and use it less than 1 time per week at 71.1%. USO Net Internet Centers of users who were active daily or almost every day (5-7 days a week) at 0.1%, use at least once a week (1-4 days a week) at 7.2% and 92.7% is less than once a week. Digital community centers of those who used it daily or most days (5-7 days a week) at 0.1%, used it at least once a week (1-4 days a week) at 11.7%, and used it less than once a week at 88.2%.

When analyzing statistically, the use of services and the frequency of use of government digital projects in the period before and during the COVID-19 period, including the past 3 months, showed a significant reduction in a number of users both the public Internet project USO Net Internet Center and Community Digital Center especially in the past 3 months from the date of the survey, partly due to the spread of the coronavirus, causing service areas in many government projects It is necessary to reduce service time or close the service according to government measures. Including the concern that people were concerned about using the service because it is a common area and may have a chance to spread the disease easily. As for the objectives of use, it was found that the Pracharat Net Project had 3 main objectives for use as follows: 1) for learning; 48.4% searching for information, 2) accessing online services of the public and private sectors (13.6%) and 3) shopping online 9.7%.

The USO Internet Center has 3 main objectives: 1) for learning; 42.8% search for information 2) to access online services of the public and private sectors (14.8%) and 3) to use public relations at 9.9%.

The community digital center has 3 main objectives: 1) for learning, 43.0% for information searching, 2) for 16.9% of public and private online services, and 3) 9.9% for online shopping.

From the survey, it was found that there were other objectives and a variety of services in government projects, such as meeting to exchange knowledge with the local community, doing recreational activities on the Internet such as playing online games or watching content on social media channels, Youtube and using the internet because there is no device or internet access at home.

Table 82 Percentage of service points in the area

Hosting service	Percentage		
	Pracharat Internet Project	Internet Center USO Net	Digital Center community
There is a service point.	36.8	31.9	30.6
No service point	25.7	27.2	24.6
Unsure	37.5	40.9	44.8

Note: Percentage of calculation results in the table from questions with more than 1 answer

Table 83 Percentage of using service lately

Lately used	Percentage		
	Pracharat Internet Project	Internet Center USO Net	Digital Center community
Within the past 3 months. Please specify the frequency	9.2	3.2	0.9
• It is active every day or almost every day (5-7 days a week).	0.1	0.0	0.0
• Active at least once a week (1-4 days a week).	5.5	0.0	0.0
• Less than once a week.	3.6	3.2	0.9
Within the past 6 months	7.0	5.2	11.7
Within a period of 1 year	14.2	11.6	16.1
More than 1 year ago	19.8	24.4	14.8
Never	49.8	55.6	56.5

Note: Percentage of calculation results in the table from questions with more than 1 answer

Table 84 Percentage of service use frequency

Service frequency	Percentage		
	Pracharat Internet Project	Internet Center USO Net	Digital Center community
It is used every day or almost every day (5-7 days a week).	0.2	0.1	0.1
It is active at least once a week (1-4 days a week).	28.7	7.2	11.7
Less than once a week	71.1	92.7	88.2

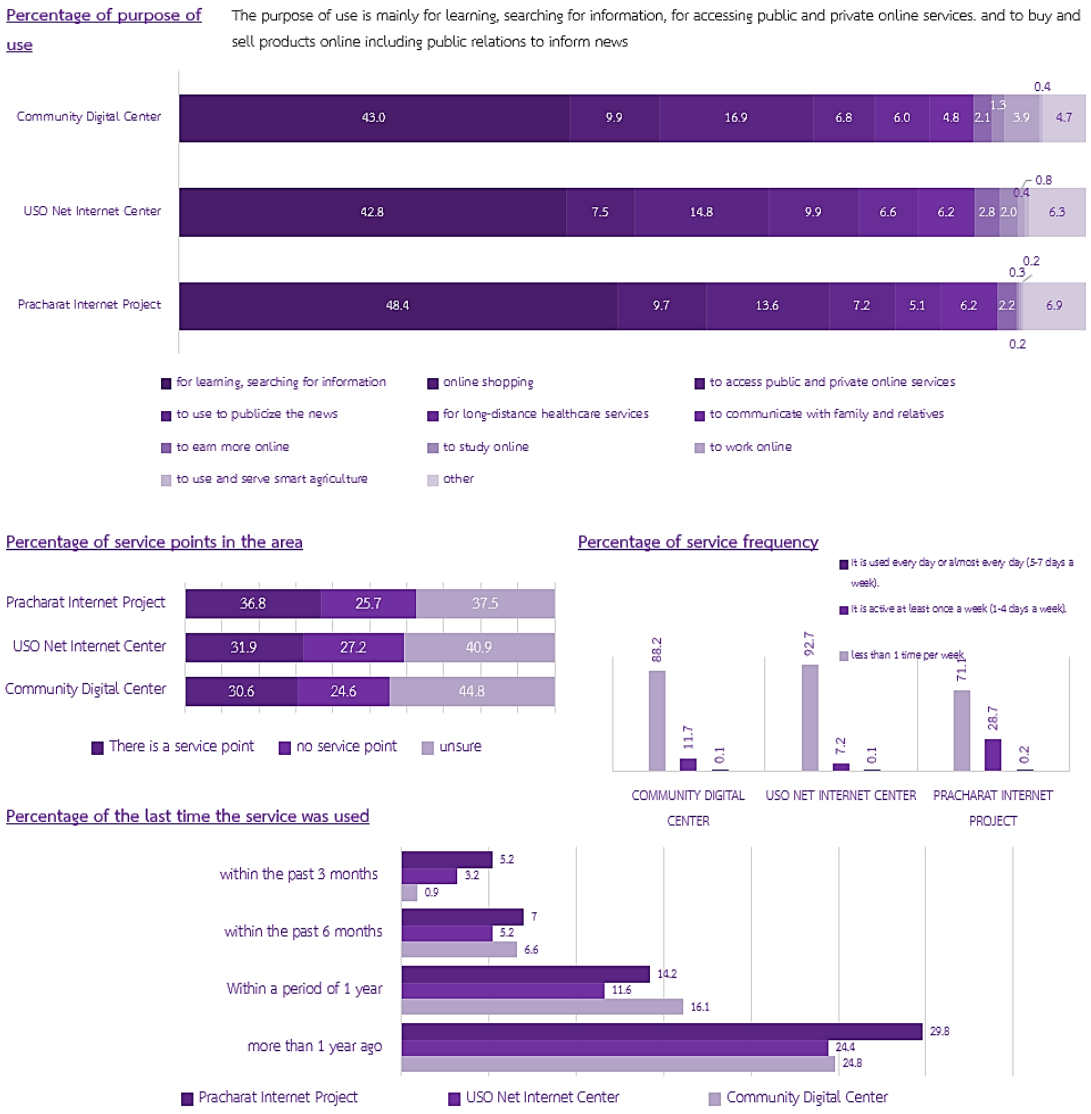
Note: Percentage of calculation results in the table from questions with more than 1 answer

Table 85 Percentage of using purpose

The purpose of use	Percentage		
	Pracharat Internet Project	Internet Center USO Net	Digital Center community
For learning, searching for information	48.4	42.8	43.0
Online shopping	9.7	7.5	9.9
To access public and private online services	13.6	14.8	16.9
To use to publicize the news	7.2	9.9	6.8
For long-distance healthcare services	5.1	6.6	6.0
To communicate with family and relatives	6.2	6.2	4.8
To earn more online	2.2	2.8	2.1
Onlien learning	0.2	2.0	1.3
Online working	0.3	0.8	3.9
To use and serve smart agriculture	0.2	0.4	0.4
Others	6.9	6.3	4.7

Note: Percentage of calculation results in the table from questions with more than 1 answer

Figure 13 Diagram illustrating statistical information in using government digital services



Satisfaction with the implementation of government digital policies and measures

From the survey of opinions and satisfaction with the implementation of government digital policies and measures, it was found that digital policies and measures to promote digital development for the government's economy and society, the opinion is beneficial/convenient, 10.1% No good effect/inconvenient/difficult to use 7.3%, unknown at 82.5% and not used at 0.1%

Pracharat Internet Project, at 14.5% of the opinions, were good/convenient, at 8.7% had no effect/inconvenient/difficult to use, at 27% didn't know, and at 49.8% didn't use it.

USO Net Internet Center, there were 12.8% of favorable/convenient, 7.2% not good/inconvenient/difficult to use, at 24.4% unknown, and at 55.6% unused.

Community Digital Center, there was an opinion that was good/convenient for the 12.8%, no effect/inconvenient/difficult to use at 2.9%, 28.7% unknown, and 56.5% did not use it.

Thai Chana application through the opinion was good/convenience at 86.4%, no good effect/inconvenient/difficult to use at 6.6%, unknown at 5.8%, and did not use at 1.2% for wallet application, at 67.1% of the opinions were good / convenient, at 6.6% had no effect/ inconvenient/difficult to use, at 2.2% didn't know, and at 24.1% didn't use it.

Anti fake news center was 61.6% favorable/convenient, at 7.6% not good/inconvenient/ difficult to use, at 23.7% unknown, and at 7% unused.

For the satisfaction assessment, the scores were 1-5, with a score of 1 being the least satisfied and score of 5 being the most satisfied. The digital policies and measures to promote digital development for the government's economy and society received an average score of 3.19% satisfaction, of which the Pracharat Net Project received an average score on satisfaction at 3.21%, USO Internet Center scored an average of 3.19% and Digital Community Center had an average score of 3.14%. Anti fake news received an average score on satisfaction at 3.09%.

USO Internet Center, found the problem of people's lack of knowledge at 13.4%, the problem of insufficient number of devices for a number of users 9.4%, the problem of the Internet system is slow/somewhat ineffective at 8.5%, and other problems of 13.0% such as have been using computers for a long time because there is not enough equipment to use. The course of introduce to the use of computers and the Internet was asked for traing.

Community Digital Center was at 11.2% of the population found the problem of lack of knowledge, 9.8% of a number of devices being insufficient, 7.0% of the Internet system being slow/not working, and 15.4% of other problems, such as having a service user. Many at certain times, the air conditioner is not cold, would like to have continuous training, and need help in online marketing.

Thai Chana application was found that there was a problem of unacknowledged people at 14.3%, no devices such as phones or computers at 13.1%, at 6.8% of problems with no Internet, and 64.2% of other problems, such as application stability, the need of

serious use of force, applications should be designed to be more capable and many applications are confusing.

Paotang application was found that there was a problem of unacknowledged people at 34.2% of people have problems with lack of knowledge, problems with lack of equipment such as telephones, 13.8% of computers, 8.6% of problems with no Internet, and 19.3% of other problems such as application stability, difficulty to use, unable to register and the registration process is complicated.

The Anti fake news center found that 84.0% of the people had a problem with lack of knowledge, a problem of lack of equipment such as a phone, a computer at 0.2%, a problem with no Internet at 5.5% and other problems by 3.3%. Most of the problems were caused by people who did not understand the forms or channels of service of Anti Fake News Center or clear benefit.

Table 86 Percentage of participation in government projects/use of government applications effect on their lives

Projects	The results obtained from using government services (percent)			
	Don't know	Don't use	Good/ convenient	Not good/ Inconvenient/ Difficult to use
Digital policies and measures to promote digital development for the government's economy and society	82.5	0.1	10.1	7.3
Pracharat Internet Project	27.0	49.8	14.5	8.7
USO Net Internet Center	24.4	55.6	12.8	7.2
Community Digital Center	28.7	56.5	12.8	2.9
Thai Chana application	5.8	1.2	86.4	6.6
wallet application	2.2	24.1	67.1	6.6
Anti fake news center	23.7	7.0	61.6	7.6

Note: Percentage of calculation results in the table from questions with more than 1 answer

Table 87 Percentage of satisfaction scores

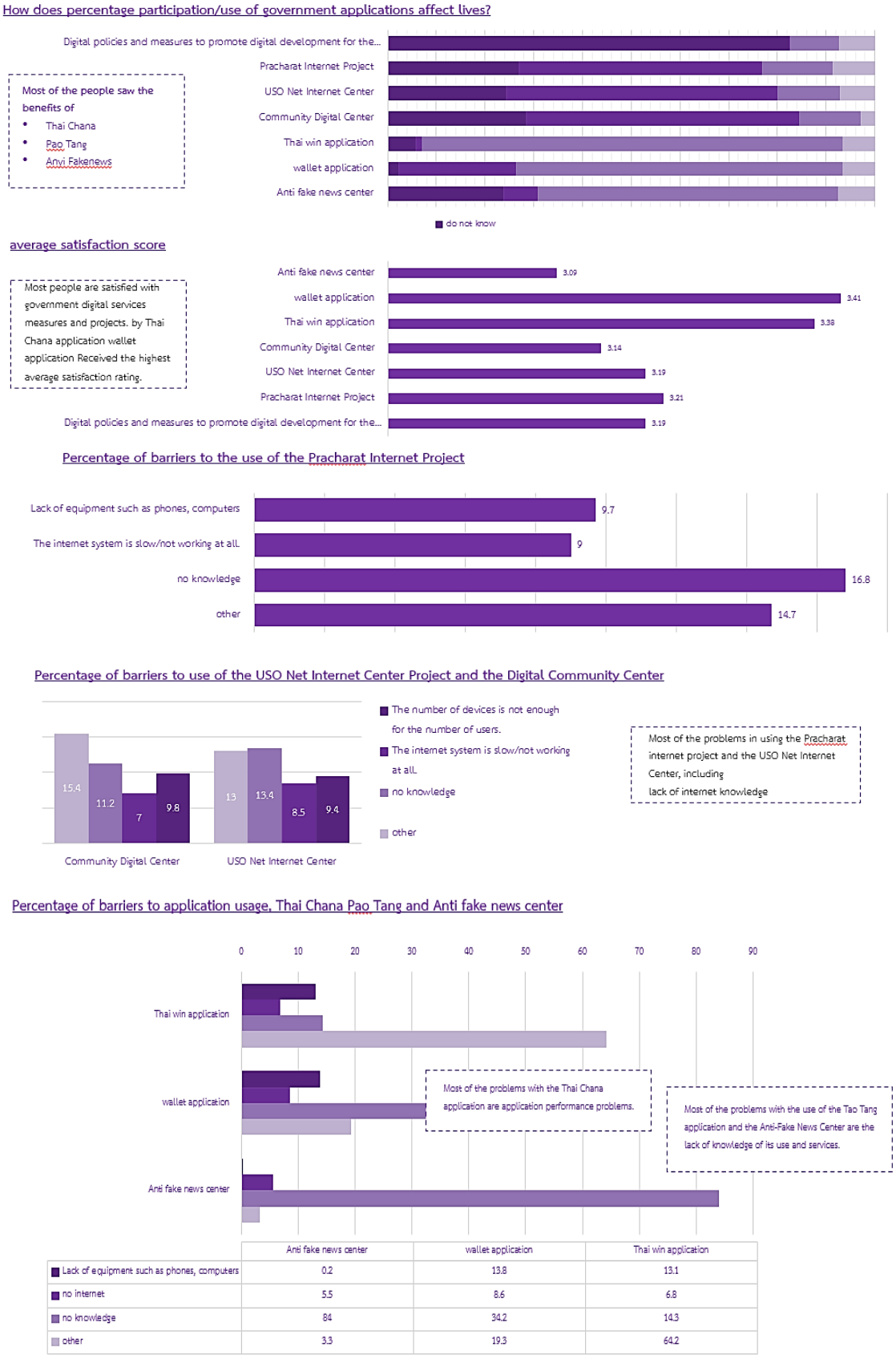
Projects	The Average Satisfaction Score
Digital policies and measures to promote digital development for the government's economy and society	3.19
Pracharat Internet Project	3.21
USO Net Internet Center	3.19
Community Digital Center	3.14
Thai Chana application	3.38
Pao Tung application	3.41
Anti fake news center	3.09

Table 88 Percentage of problems and obstacles

Projects	Obstacles (Percentage)			
	Lack of equipment such as phones, computers	The Internet system is slow/not working at all.	No knowledge	Others
Pracharat Internet Project	9.7	9.0	16.8	16.8
USO Net Internet Center	9.4	8.5	13.4	13.4
Community Digital Center	9.8	7.0	11.2	11.2
Thai Chana application	13.1	6.8	14.3	64.2
Pao Tung application	13.8	8.6	34.2	19.3
Anti fake news center	0.2	5.5	84.0	3.3

Note: Percentage of calculation results in the table from questions with more than 1 answer. The survey data from the “Other” responses were similar in nature to the responses.

Figure 14 Diagram illustrating the satisfaction level of the government digital policies and related measures



	Anti fake news center	wallet application	Thai win application
Lack of equipment such as phones, computers	0.2	13.8	13.1
no internet	5.5	8.6	6.8
no knowledge	84	34.2	14.3
other	3.3	19.3	64.2

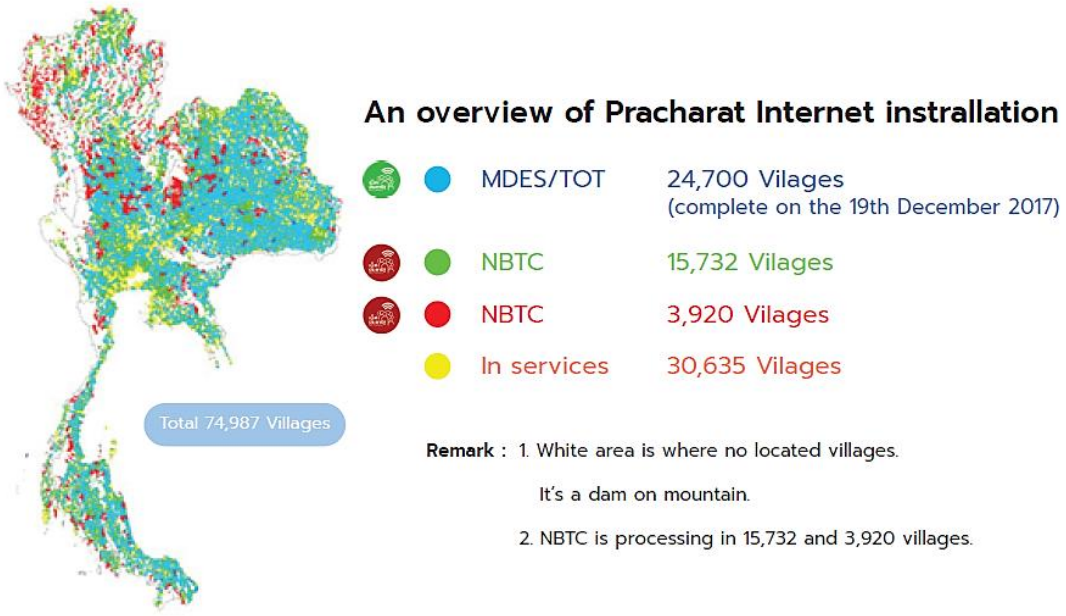
Suggestions or additional comments on the implementation of policies and measures in the digital aspect to promote digital development for the government's economy and society

Additional suggestions or opinions on the implementation of digital policies and measures to promote digital development for the economy and society of the government sector, most want the government to provide free or cheap Internet service for all groups of people especially the low income group to provide opportunities for access to comprehensive government services and welfare including providing or supporting computer equipment to use the Internet and to meet the needs of each service center or service area, and there are opinions from the survey about the lack of public relations, in particular, to contact or to coordinate for more information or to ask when problem arises including providing teachers and advice on the use of the internet.

10.1.9 Utilizing the Pracharat Internet platform

Pracharat Internet Project is a project to enhance the telecommunication infrastructure to drive the country's economy. The goal is to expand the high-speed Internet network to cover all villages in Thailand which has designated the villages in the remote areas (Zone C) and the target area of 40,432 villages and has expanded the high-speed Internet network to cover 24,700 villages, and the NBTC has joined the operation in more 15,732 villages and border areas (Zone C+) of 3,920 villages.

Figure 15 Overview of the Pracharat Internet installation



In its implementation, the Ministry of Digital Economy and Society has established an Optical Distribution Network (ODN) to the target villages that are non-commercially viable and have no service, high speed Internet for 24,700 target villages as well as providing a public wireless Internet service point in each village, 1 point per village, free of charge to users at a speed of not less than 100/50 Mbps (Download/Upload). The Internet has allowed villagers to consider appropriateness, easy access and convenient transportation, such as the village community hall or the headman's office (without the construction of a building/Internet service center). In the design and installation of fiber optic cable network, it must be physically like an open access network that can support the connection of users in other service provider conveniently.

Regarding the meeting with the NESDB to ask for more information in terms of information utilization of the Pracharat Internet, it was found that the benefits from the Pracharat Internet can be divided into 2 main dimensions: 1) social benefits 2) economic benefits. The important issues are as follows:

Utilization of the Pracharat Internet for Soceity

The Pracharath Internet is the most utilized for entertainment purposes; watching movies, dramas, listening to music and comedy channels, is popular among children and teenagers including playing online games in groups, which can be seen in this manner in every region of Thailand. For personal or private communication with voice calls, text messages, pictures and video, including Video Call, using Line and Facebook Messenger were the second stage of most using which makes traveling to find each other a waste of time. The cost of travel is clearly reduced in both traveling to meet each other in the same village, different districts and other provinces by communication if they are the same families, for example, calling parents, calling children, relatives, including friends, and contacting government agencies or related work groups. In addition, there are benefits used for learning and education. Most of the use of the public Internet is used by students in schools, mainly teaching in the classroom or a computer room. It will be a computer course of the computational science. In addition, there will be art classes, English and Thai are designed to use for words searching, translation of words, spelling and audio. Science is used for studying science experiments and for research, homework or assignments to teachers including online learning using the Internet of the village

project. During the survey, during the corona virus or COVID epidemic, they will use online learning and send documents via Line.

The use of Internet services is also used to access general news information, daily news, especially news about the COVID epidemic. It is the news that people in all sectors, both adults and children, will follow the report of a number of infected people, risk areas including how to protect yourself from the Covid situation, but the most popular among adult men are news about country news, accidents, theft news, and natural disasters and agricultural knowledge documentary. Teenage boys like to fix and customize motorcycles. As for the adult and female group, they loves to see how cooking programme, vegetables planting in the home garden, health care, medicinal, and herbs. The elderly women will also like to listen to the drama series. It is also used for the benefit of receiving official information or contacting the government. The main group will be the village headman, assistant to the village headman. Village Public Health Volunteers (VHVs) are used to contact and receive information, including sending work to the district, sub-district administrative organisation, provincial sub-district, health promotion hospital (Hospital Education Policy Scholarships) including submitting work to the school district office which will use the public Internet from the installation point within the school.

Another part of the utilization, which is quite important according to the objective of this project is to create a source of income, to contact customers to develop knowledge in order to increase the professional potential especially the general trading profession that is used as a public relations channel to find customers. Most of them are recommending their own shops via personal Facebook or through the village Line group to introduce products in the shop including the new products to the people in the community. Most of these trading groups have stores near the Pracharat Internet installation point. According to the model of utilizing the Pracharat Internet for income generation, it has a wide variety of applications; for example, to trade products and services in different areas, to apply for the use in promoting community tourism, to use publicizing community activities, to use as a channel to trade agricultural products including creating career opportunities through online public relations by the Pracharat Internet network

Figure 16 Example of using the Pracharat Internet for the trading purposes of the villagers

Figure 17 Example of using the Pracharat Internet for the promotion of local tourism purposes

Figure 18 Example of using the Pracharat Internet for the communal activites

Figure 19 Example of using the Pracharat Internet for creating occupational opportunities

Figure 20 Example of using the Pracharat Internet for trading of their products

In addition, the use of the Pracharat Internet to provide services in conjunction with government projects, part of which will be community stores, such as, the half-half co-payment scheme with the application "Paotang", the state welfare card that gives money to buy consumer goods. Originally, some areas were villages that were far from the highway, therefore having to use the Internet via a mobile phone may not be as stable as using the Pracharat Internet. This effects to the inconvenient or impossible money transactions which the entry of the public Internet has played an important role in accessing government services to a certain extent.

The utilization of the Pracharat Net for farming and agricuturing, it is not used as a direct source of the income, but rather to use the gained knowledge from the Internet to increase products or save costs. The main issue of farmers is the use of fertilizers and pesticides, which oth are important costs in farming, so farmers try to cut down on fertilizer costs by making their own organic fertilizer or bio-compost by using in combination with chemical fertilizers to reduce the use of expensive chemical fertilizers. Another part will be the plant grain that will be used to compare the price of the variety from outside and in their own district, such as rice grain.

From the survey, it was found that the Internet of the project was used as a channel to sell their own agricultural products to people in the same village or people who know each other through Line, a personal Facebook group, such as planting tamarind and selling to friends in the same group. Banana products from the orchard are sold to people in the community. Most civil servant teachers will use the Internet at the

installation point within the school to teach students in various subjects that almost all schools will use Internet services from USO, along with the Internet of schools that are mostly supported by the Office of the Basic Education Commission (OBEC) through the school district office. The use of Internet will be allocated by building, some schools will use USO Internet only in computer rooms, some schools are using the Internet from the entire project, which can be seen in the USO marginal program. The survey found that schools using the Internet from the USO are small primary schools or a medium-sized school at the middle school level which is a group of schools expanding opportunities with a small number of students in each class, causing the school to have insufficient number of teachers (caused by determining the ratio of a number of students to a number of teachers) forcing teachers to teach in non-major subjects. Therefore, the use of satellite distance education (DLTV) can solve the problem. Currently, teachers will open content in various subjects, with a list of these subjects for teachers to choose to teach via the website (DLTV) in accordance with the content being taught at that time.

The purchases of goods and services through Online Shopping have also been found to be useful for this purpose. This will include buying products via personal Facebook, sometimes a Facebook shop in the district to order raw materials to produce for resale, such as a beverage shop, but the popular ordering for people using the public Internet service is to buy clothes and other items through LAZADA, which will have cheaper prices than buying in the district or province and have more variety to choose from. This reduces the cost of traveling to the district or province used to compensate for the delivery cost of the parcel and will prefer to pay more on destination. In the male group, motorcycle parts are purchased for use in car modifications or car repairs including computer equipment and peripherals to repair or increase the efficiency of the computer as well.

For publishing self-generated digital content In the form of text, images, video, live, live blogging, reviews find quite a bit of use and most of these releases are not monetized.

The group of teachers have used it to disseminate teaching materials in various subjects, school activities via Facebook or the school website. For the children, they used to cast their own games. There are many children who dream of growing up to be a game caster, which is different from the past that they wanted to be a teacher, nurses and soldiers. Other purposes in the use of the public Internet is to use for downloading or

updating games or various applications on mobile phones because downloading or updating via WiFi takes less time or sometimes unable to download or update if via mobile phone directly.

In another dimension of benefits from the Pracharat Internet, people in villages can use the Internet in emergency situations, such as not topping up their mobile phones or having no money to pay for the Internet. People still feel that the Pracharat Internet Project is like a basic service that the state should provide to the people, especially in times of emergency.

Overall, the benefits of the Pracharat Internet are reducing inequality and increasing the quality of lifestyle, enabling equal access to information, helping to decrease gaps or inequalities (between oneself and others) to access the computer communication equipment. The Internet of the people (Digital Divide) becomes to be the search engine for the knowledge at any time. Thus, searching for knowledge is not restricted, even in rural areas, people can receive information or knowledge from the interests themselves as much as the people in urban areas and empowering people to increase their potential to create jobs, generate income, education, public health, agriculture and online commerce.

When people in the remote areas have access to information and make them aware of various situations which cause adjustment in society Including having a way of life and values that have changed in a better way; for example, helping to be closer to friends or family, relatives, meet more online, giving a different perspective on the world that make life in better society and helping people in the whole community. There is a way of life and values for the better changes.

However, there may be some negative impacts from Internet service provided by this project. It is because most of the people who use the Pracharath Internet are children and young groups. Using Internet sometimes without parents' supervise may result in access to inappropriate digital content, mimicking inappropriate behavior or young people often gather together to play games at night. It's a random source of all youths. There may also be teenagers from neighboring villages entering the area and this may cause quarrels or drug trafficking over the Internet.

Utilizating of the Pracharat Internet in the economy

Based on the information received from the Office of the Permanent Secretary for Digital Economy and Society, the benefit that various economic sectors will receive only the digital economy sector and telecommunication infrastructure combining the benefit in the amount of 102.4 billion baht, which is a 2.60 times in return on the investment which shows the investment in the Pracharat Internet project. If the network is connected to the private sector's use in the digital economy, it will certainly make the investment in worthwhile. It's not only investing in the Pracharat Internet Project, but also helping economic development in the term of inclusive growth, meaning households at all levels benefit from income distribution and pro-poor growth because the lowest income households at 40% benefit is the most. The amount is up to 49,490 million baht, which represents a rate of the return at 1.26 times the investment.

The Pracharat Internet project also contributes to drive the overall national income at a rate of 1.81% of GDP when calculated from national monetary income (Nominal GDP) and 0.14% when calculated from real national income (Real GDP), which is deducted from inflation.

In terms of tax collection, that will be increased from the expansion of various economic sectors and people's consumption. It is estimated that the government will receive an additional tax of 45,610 million baht, representing a yield of 1.16 times in the investment which means that the government invested in the Pracharat Internet project for the amount to 39,378 million baht. This amount will be able to generate income in various economic sectors that are taxable to the government until the tax money received will eventually exceed the investment. This means that the investment is very worthwhile, that is, as if the government will receive net income from this investment in the form of tax equal to 6,232 million baht. It is direct tax which is collected from household income and corporate profits amounted to 29,500 million baht, followed by indirect taxes. which collects together with the sale of goods amounting to 14,840 million baht and customs duties of 1,270 million baht, households and corporate profits amounted to 29,500 million baht, followed by indirect taxes which collects together with the sale of goods amounting to 14,840 million baht and customs duties of 1,270 million baht.

In summary, the investment in high-speed Internet network in the Pracharat Internet project will be able to create a cost-effective economic impact by creating

benefits for both the manufacturing sector, the household sector and the government sector thoroughly can help to develop by raising the living status of people, especially low-income households can strengthen the digital economy sector. It can help drive the country's GDP and be able to collect tax back more than the investment paid to benefit the community economy, quality of life.

Problems and obstacles

According to the information collecting from the Office of the Permanent Secretary, Ministry of Digital Economy and Society, it was found that the service of the Internet signal is still limited and is in the process of expanding the Internet installation point of the Pracharat Net Project within their own community because most communities have a wide area or looks that stretch along the road which houses are not next to each other. Internet usage can only be used in homes that are close to a few installation points. The Internet signal may not be distributed in coverage. Therefore, the budget must be used to expand more installation points, such as the area in front of the village and at the end of the village so that the signal can cover many homes and it will benefit more people in the community or add an installation point that is more suitable than the original installation point that people have not yet used as much as they should.

Another problem is the lack of public relations in the community about the service of the Pracharat Internet service, most of which are only staff responsible for installing and reporting to community leaders. The community leaders' perception of the benefits of the Internet, which is very important for the project's utilization of the Internet of people in the community because when community leaders see such benefits, they will publicize the existence of the project and encourage people in the villages to use the service while taking care of whether the Internet is still working well or not consistently, but if community leaders do not see the importance of this, they will not often publicize to the residents and will not take care of the facility including not paying attention whether the Internet of the project is available or not. As a result, people in such areas hardly know that there is the Internet of the project in the village and do not know the registration process including when the Internet is inactivate and won't know how to contact the staff to fix it.

10.2 Survey Results Obtained from the Sample Groups of the Private Business Sector

10.2.1 Data of the survey respondents

The survey of sample group of companies conducting in 7 target areas/regions, it consists of both online and offline surveys. There are 3,381 companies who have responded to the survey, which exceeds the target of 3,000 companies or 112%, which can be divided into 7 areas / regions throughout the country as follows:

Area

Table 89 Percentage of the sample group of private business sector by region

Regions	Number of samples	Percentage
Bangkok	1,230	36.4
Northern region	762	22.5
Southern region	345	10.2
Central region	308	9.1
Western region	346	10.2
Eastern region	263	7.8
Northeast region	127	3.8

Table 90 Percentage of the sample group of private business sector by the types of establishment

Types of establishment	Number of samples	Percentage
Limited company	2,688	79.5
Public limited company	53	1.6
Limited partnership	409	12.1
Registered Ordinary Partnership	11	0.3
Ordinary partnership	5	0.1
Household business	63	1.9
Single owner	152	4.5

Type of business

Regarding the sample data of private business sector, the 3 types of businesses with the highest proportions were agriculture business, food and beverage, and

construction materials. Most of them are companies with an average income of more than 1.8-50 million baht per year and 11-50 personnesl.

Table 91 Percentage of business types from the samples of private business entities

Type of business	Number of samples	Percentage
Agriculture and Food industry		
Agriculture business	608	18.0
Food and drink	310	9.2
Consumer goods		
Fashion	136	4.0
Household and office items	127	3.8
Financial business		
Bank	1	0.0
Capital and Securities	59	1.7
Insurance and life insurance	22	0.7
Industrial products		
Automotive	200	5.9
Industrial materials and machines	244	7.2
Packaging	70	2.1
Paper and printing material	69	2.0
Petrochemicals and Chemicals	101	3.0
Iron	56	1.7
Real estate and construction		
Constructioln materials	252	7.5
Construction services	163	4.8
Real estate development	28	0.8
Property Funds and Real Estate Investment Trusts	3	0.1
Rsources		
Energy and Utilities	86	2.5
Mine	20	0.6
Service		
Commerce	68	2.0
Medication	56	1.7
Media and publications	63	1.9

Type of business	Number of samples	Percentage
ad hoc service	27	0.8
Tourism and leisure	57	1.7
Transport and logistics	235	7.0
Technology		
Electronic components	148	4.4
Information and Communication Technology	115	3.4
Others	57	1.7

Table 92 Percentage of private business entities sample by average annual income

Number of personnel	Number of samples	Percentage
Not more than 1.8 million baht	397	11.7
More than 1.8-50 million baht	1,226	36.3
More than 50-100 million baht	623	18.4
More than 100-300 million baht	379	11.2
More than 300-500 million baht	183	5.4
501 million or more	30	0.9
Do not wish to provide information	543	16.1

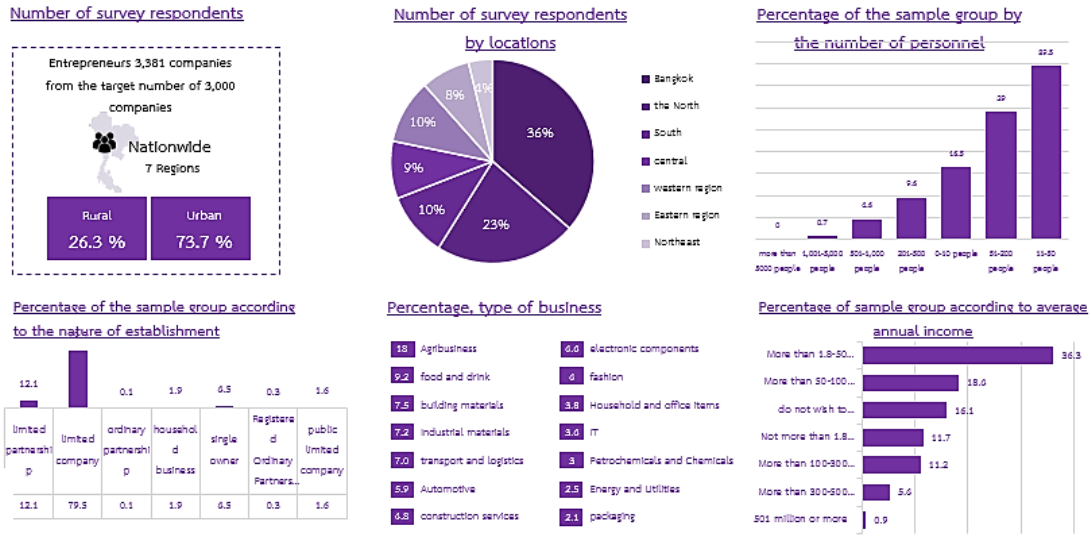
Table 93 Percentage of private business entities group by number of personnel

Number of personnels	Number of samples	Percentage
0-10 people	558	16.5
11-50 people	1,334	39.5
51-200 people	981	29.0
201-500 people	326	9.6
501-1,000 people	157	4.6
1,001-5,000 people	24	0.7
more than 5000 people	1	0.0

Table 94 Percentage of private business entities samples by area

Area	Number of samples	Percentage
in the municipality	2,492	73.7
outside the municipality	889	26.3

Figure 21 Diagram illustrating data of the private business entities sample group



10.2.2 Results of the sample distribution and statistical values

Results of the sample distribution

Preliminary statistics and distribution of company samples from the survey in 3D are as follows:

1. Size of business (Size) is divided into large enterprises (Large), medium enterprises (Medium), small enterprises (Small) and micro enterprises (Micro).
2. Age of business is expressed as the mean (Mean) and the standard deviation (Standard Deviation).
3. Distribution of samples in each region as follows:

Table 95 Percentage of samples distribution

Regions	Total number	Business size (percent)				Age of business (years)	
		Large enterprises	Medium sized enterprises	Small enterprise	Micro enterprise	Average	Standard deviation
Bangkok	1,230	9	430	633	158	7.0	6.7
North region	762	3	16	129	115	10.3	7.8
South region	345	0	35	174	99	12.1	7.7
Central region	308	38	511	203	10	16.0	12.2
western region	346	0	58	66	3	4.5	3.0
Eastern region	263	32	135	163	15	10.6	7.0
Northeast region	127	0	37	207	102	11.1	8.2

10.2.3 Survey results on internet usage

Internet usage patterns

From the survey of Internet usage among private business samples, there were 98.4% of the entities using the Internet and 1.6% using the Internet without using fixed broadband at 88.2%, followed by 15.6% using 4G mobile broadband and 15.6% using the Internet 3G mobile broadband at 2.1%, with the highest category of fixed broadband Internet cables being 1) 77.8% FTTx fiber cable 2) cabling type i.e. Hybrid Fiber Coaxial and Coaxial 16.3% and 3) copper cable type. xDSL eg ADSL, SDSL, VDSL 8.2%

The top 3 of Internet speeds used by most organisations are 1) 301-500 Mbps (27.9 %), 2) 101-300 Mbps (17.7%), and 3) 501-1,000 Mbps (15.7%).

Average monthly Internet expenses that most agencies pay are 1) less than 5,000 baht, 53.0% 2) 5,000-10,000 baht by 28.3% and 3) 10,001-50,000 baht by 17.9%.

Table 96 Percentage of organisations that use the internet

Does the organisation use the Internet?	Percentage
Yes	98.4
No	1.6

Table 97 Percentage of internet usage patterns

Internet usage patterns	Percentage
Use fixed broadband Internet	88.2
• Copper cable type xDSL such as ADSL, SDSL, VDSL.	8.2
• Cable type such as Hybrid Fiber Coaxial and Coaxial.	16.3
• FTTx fiber optic cable type	77.8
• Other types of lines such as leased line Internet circuits	4.1
• Wireless type, e.g. Fixed Wireless Access (for example, SIM-inserted Internet router)	3.9
• Satellite Internet (for example, IPSTAR), etc.	1.1
• I don't know / I'm not sure.	15.7
Use 3G mobile broadband Internet.	2.1
Use 4G mobile broadband Internet.	15.6
Use 5G mobile broadband Internet	1.5
Use Narrowband Internet Service	0.2
• Analogue Modem (Dial-up VIA Standard Phone Line)	0.2
• Mobile Internet that is lower than 3G technology such as 2G technology, GPRS technology, etc.	0.0
Don't know/not sure	4.5

Note: Percentage of calculation results in the table from questions with more than 1 answer

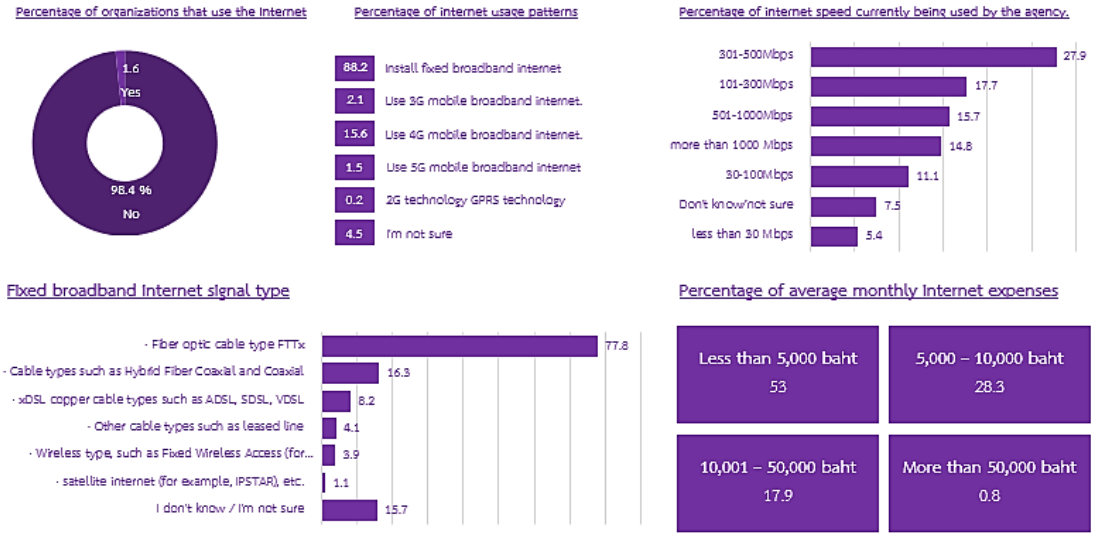
Table 98 Percentage of the internet speed being used by organisations currently

The speed of the Internet that the agency is currently using.	Percentage
less than 30 Mbps	5.4
30-100Mbps	11.1
101-300Mbps	17.7
301-500Mbps	27.9
501-1000Mbps	15.7
more than 1000 Mbps	14.8
Don't know/not sure	7.5

Table 99 Percentage of the average monthly internet expenses

Average monthly Internet cost	Percentage
less than 5,000 baht	53.0
5000-10,000 baht	28.3
10,001-50,000 baht	17.9
More than 50,000 baht	0.8

Figure 22 Diagram illustrating forms of internet usage



Objectives of the organisation's Internet use

The objectives for using the Internet of most agencies are 1) to support Internet searches at 75.2%, 2) to support 35.1% of business operations via online channels, and 3) to support access and use of the system of the agency 34.9%

According to the survey, 83.5% of agencies use the Internet to support remote work for more than 3 years at 53.2%, 1-3 years at 15.5%, 6-11 months active at 7.1%, less than 6 months at 7.8%.

Table 100 Percentage of the organisation's objectives on the internet usage

Objectives of the organisation's Internet use	Percentage
To support searching for information from the Internet	75.2
To support access and use of the system of the agency	34.9
To support business operations via online channels	35.1
To support data transmission between departments or branches	13.2
To use as a backup channel	2.4

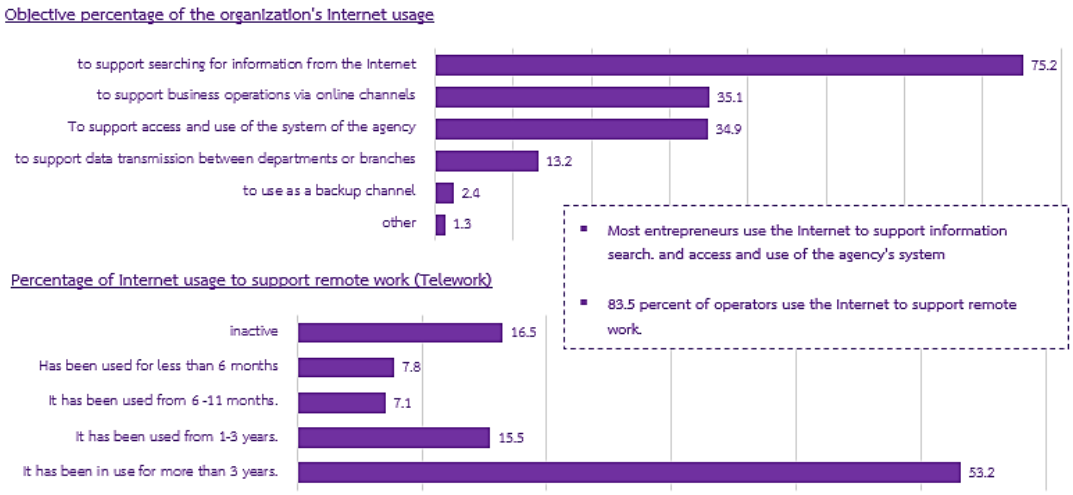
Objectives of the organisation's Internet use	Percentage
Others	1.3

Note: Percentage of calculation results in the table from questions with more than 1 answer. Survey data from "Other" responses did not contain statistically significant details.

Table 101 Percentage of using internet for telework

Using the Internet to support remote work (Telework)	Percentage
It has been in use for more than 3 years.	53.2
It has been used from 1-3 years.	15.5
It has been used from 6 -11 months.	7.1
Has been used for less than 6 months	7.8
Inactive	16.5

Figure 23 Diagram illustrating the agency's objectives in using the Internet



The epidemic of COVID-19 and the effect of the necessity in using Internet in the organisation

In the third phase of the survey, the duration of the COVID-19 epidemic was defined as follows: pre-COVID, which is between September-November 2020, and the COVID period, which is between December 2020 - July 2021.

According to the survey results of the impact of the COVID epidemic on the need for Internet use in organisations, it was found that before COVID or September-November 2020, most agencies viewed the Internet as a need in the same at 64.2%, the agency rated the Internet as a greater need at 33.2%, at 1.9% rated the Internet as unnecessary, and at 0.7% rated the Internet as a lesser necessity. During COVID-19 or December 2020 -

July 2021, the 56.9% of agencies saw the Internet as a need at 40.4% said the Internet was needed, at 1.7% less necessary and at 0.9% less necessary.

When considering the Internet usage, it was found that before COVID or September-November 2020, most agencies had the same Internet usage accounted for 65.7% of the total number of agencies. There were the 31.9% increase in Internet usage and at 2.4% less Internet usage during the COVID-19 pandemic, or December 2020 - July 2021, found that most of the agencies are using the Internet more accounted for 52.7% of the total number of agencies. There are departments using Internet remained the same at 44.6%, and there were 2.7% fewer organisations using the Internet.

However, when comparing the need and the amount of Internet usage before and during the Covid, it is evident that most agencies see the need for the Internet as a 23.7% increase and result of the 20.8% increase in traffic, mainly due to the agency's policy on employees to work, working from home according to the measures to control the epidemic of COVIDs, which is working via the Internet. It is the main and 1 reason due to the fact that agencies are increasingly using online channels to provide services and sell products to support the behavior of consumers who cannot travel outside the accommodation and use more online shopping for products and services.

Table 102 Percentage of using internet in organisations before and during COVID-19

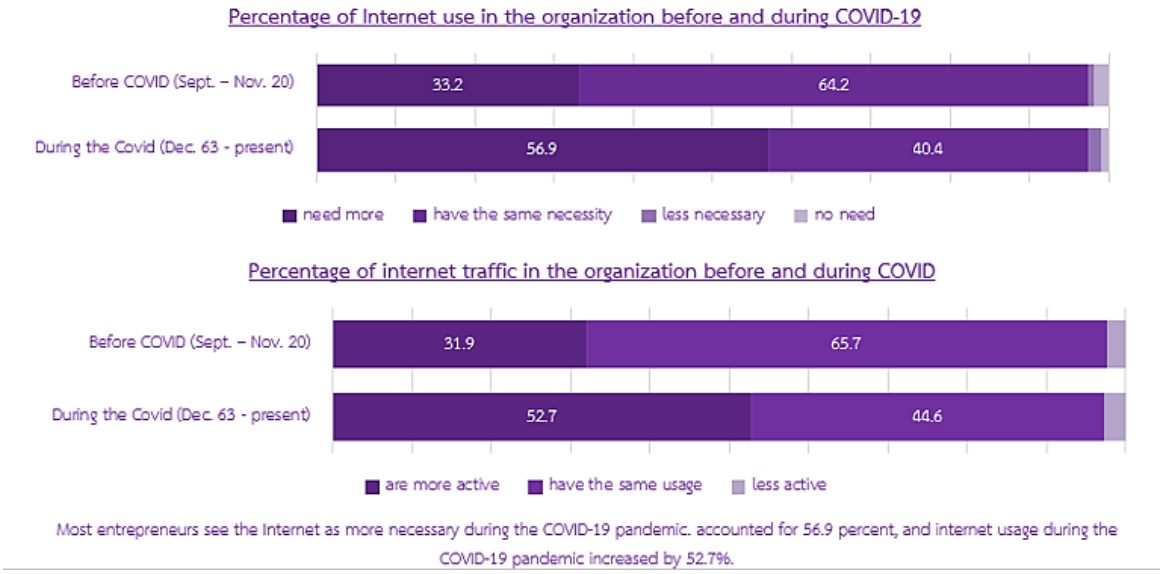
Covid epidemic is affect to the necessity in using the Internet in the organisation	Percentage	
	Before COVID (Sep–Nov 20)	During COVID (Dec 20-Jul 21)
Need more Internet	33.2	56.9
have the same necessity	64.2	40.4
Less need	0.7	1.7
No need	1.9	0.9

Table 103 Percentage of the internet traffic in the organisation before and during COVID-19

Covid epidemic is affect to the quantity need of Internet using in the department	Percentage	
	Before COVID (Sep–Nov 20)	During COVID (Dec 20-Jul 21)
More active	31.9	52.7
The same usage	65.7	44.6

Covid epidemic is affect to the quantity need of Internet using in the department	Percentage	
	Before COVID (Sep–Nov 20)	During COVID (Dec 20-Jul 21)
Less active	2.4	2.7

Figure 24 Diagram illustrating the COVID-19 pandemic and the effect on the use of internet within the organisations



10.2.4 Survey results on conducting business online

Distributing products or services through online

According to the survey, 73.9% of agencies had online channels for distribution of goods and services and the agencies had no online channels for distribution of goods and services accounted for 26.1% of the entities that had online distribution in the 12 months since pre-COVID, at 38.4% had online distribution in the 12 months during the coronavirus, at 52.6% no online distribution during the past 12 months, 9.1% of agencies with distribution channels receiving payment for goods or services via the Internet.

When considering the length of time the agency uses online channels to help the distribution or service found that there are companies that use online channels to help distribute or provide services for more than 3 years, with the highest proportion at 60.9%, the companies that use online channels to help distribute or service from 1 to 3 years at 22.2%, the companies that use online channels to help distribute or service from 6-11 months at 8.3% and the companies that use online channels to assist distribution or

service for less than 6 months at 8.6%, with 86.7% receiving payment for goods or services via the Internet, at 13.3% not receiving it.

The proportion of customers that companies have distributed products or services through online channels before COVID epidemic or September-November 2020 was 97.5% of domestic customers and 2.5% of foreign customers. During COVID or December 2020 – July 2021, it was the domestic customers at 96.8%, the group of foreign customers at 3.22%. When considering the comparison of before and during the COVID-19, it was found that the proportion of the majority of customers has not much changes. The companies distribute online products or services to customers in most countries with the proportion of foreign customers increased by 0.7%.

In terms of online channels used to distribute products or services, it was found that online channels were the most used during the pre-COVID period or September-November 2020, ranked in the top 3 rankings as follows: 1) Social media platforms such as Facebook Page, Line Official, Instagram, etc. 55.3% 2) e-Marketplace platforms such as Lazada, Shoppee, Kaidee, Lnwshop, etc., 49.2% 3) Website/Application e-tailers such as Amazon, eBay, Central, online accounted for 40.1%.

The most used online channels during the COVID-19 period or from December 2020 - July 2021 ranked in the top 3 as follows: 1) Social media platforms such as Facebook Page, Line Official, Instagram, etc. 71.2% 2) e- Marketplace platform such as Lazada, Shoppee, Kaidee, Lnwshop, etc. 54.7% 3) Website/Application 36.2% of the proportion of e-tailers such as Amazon, eBay, Central and online.

Considering the use of online channels to distribute products or services in the pre-COVID period and during the coronavirus period, social media use increased by 15.9%, and it was the online channel used by most companies in the pre-COVID period and during the pandemic COVID-19: E-Marketplace platform channels increased by 5.5% and website/application channels of E-tailers decreased by 3.9%, reflecting the shift of the agency to develop the use of online channels that can create an identity or being an online store of its own clearly with customers, including allowing customers to access and contact the agency directly. It also reduces the middleman fees in other online channels. There is a fee charged to the companu. It is considered an adjustment of the company that has adapted to distribute more products or provide services through their own online channels.

Considering the proportion of agencies that have customers using online channels, we found that in the pre-Covid period or September-November 2020, companies with a number of customers using online channels increased by 48.4%, companies with a number of customers using online channels that use the same service at 42.0%, and company with a number of customers who used online channels using online services decreased by 9.6%. During the COVID, services remained the same 18.2% and online services decreased 6.6%.

Comparing companies with customers who used online channels before and during the COVID-19 pandemic, it was found that there were companies that had an increase in a number of customers using online services. The proportion increased by 26.8%, reflecting the behavior of consumers who use online channels more and especially during the epidemic of the coronavirus who cannot travel. You can purchase products and services at the store including to reduce the risk of infection in public areas. In addition, stores and businesses have adapted to add more online channels, including the development of online channels to be more convenient to use with customers. Obviously, these are the catalysts for an increase in a number of customers using online channels.

From the survey data on average income/expenditure through online channels to all income and expenses, it was found that in the pre-Covid period or September-November 2020, the company has an average income from the sale of goods/services through online channels to the total revenue of the agency 23.6% and average expenditure from selling products/services through online channels to the total expenditure of the agency 13.5% during the Covid or December 2020 – July 2021 average income from the sale of goods/services through online channels to the total revenue of the organisation 30.4% and the average expenditure from the sale of goods/services through online channels to the total expenditure of the organisation at 15.2%.

Comparing the average income/expense through online channels to all income and expenses before and during the COVID-19, it was found that the average income from selling products/services through online channels to the total revenue of the agency increased by 6.8% and average expenditure from the sale of goods/services through online channels to the total expenditure of the agency up to 1.7%. It indicates that online channels are profitable very well before and during COVID. It can be seen that while the average income increases expenditures or costs have increased, but in a smaller

proportion resulting in higher profits, which is the strength of online channels that can support more sales without much higher costs because there is no need to invest in assets to expand sales points or service locations.

In terms of purchasing goods or services via the Internet, it was found that there were 28.0% of the organisations that ordered goods or services via the Internet and 72.0% of the companies that did not purchase the goods or services via the Internet. These included 1) 42.9% did not need Internet services, 2) 22.2% distrusted of technology, and 3) 20.1% used services through other channels.

There were 66.6% of companies paying for goods or services via the Internet. The top 3 motivating factors were 1) ease of contacting with sellers of goods and services at 32.0% 2) ease of payment for goods. 30.0% of services and 3) able to purchase goods at prices that are 25.9% lower than the general market, with 1.6% of other factors such as faster delivery times, the need to use a credit card to collect points, and the companies that did not pay for goods or services via the Internet, 32.3%. The top 3 of reasons for not paying for goods or services via the Internet are: 1) 60.1% more convenient to use services through other channels; 2) None of the need for services via the Internet (58.9%) and 3) 25.3% were concerned about the safety of using the service with 1.2% for other reasons such as the lack of convenience in the application process.

Table 104 Percentage of agencies with online channels for distribution of goods and services

The proportion of agencies that have online channels for distribution of products and services	Percentage
Have online channels for the distribution of products/services	73.9
Don't have any online channels	26.1

Table 105 Percentage of online distribution of goods and services in the past 12 months

Online distribution of goods and services in the past 12 months	Percentage
It has been available for sale in the 12 months and since pre-Covid.	38.4
Available during 12 months and during COVID.	52.6
No distribution in the past 12 months	9.1

Table 106 Percentage of the periods of online channels used to support the distribution or services

The amount of time that a company has used online channels to support distribute or provide services.	Percentage
It has been in use for more than 3 years.	60.9
It has been used from 1-3 years.	22.2
It has been used from 6-11 months.	8.3
Has been used for less than 6 months	8.6

Table 107 Percentage of a number of agencies accepting the payment for goods or services via the internet

Accepting the payments for goods or services via the Internet	Percentage
Yes	86.7
No	13.3

Table 108 Percentage of clients that the agency distributes products or services through online channels

Customer groups	Percentage	
	Before COVID (Sep–Nov. 20)	During COVID (Dec 20-Jul 21)
Domestic customers	97.5	96.8
Foreign customers	2.5	3.2

Table 109 Percentage of the online channels for products or services distribution

Online channels	Percentage	
	Before COVID (Sep–Nov 20)	During COVID (Dec 20-Jul 21)
Website/Application of e-tailers such as Amazon, eBay, Central, online, etc.	40.1	36.2
e-Marketplace platform such as Lazada, Shoppee, Kaidee, Lnwshop, etc.	49.2	54.7
Social media platforms such as Facebook Page, Line Official, Instagram, etc.	55.3	71.2
System (EDI Electronic Data Interchange)	2.1	2.3
Selling through government platforms	1.4	1.7

Online channels	Percentage	
	Before COVID (Sep–Nov 20)	During COVID (Dec 20-Jul 21)
Others	0.3	0.2

Note: Percentage of calculation results in the table from questions with more than 1 answer. Survey data from "Other" responses do not contain statistically significant details.

Table 110 Percentage of clients using online channels before and during COVID-19 in comparison

Using services via online channels	Percentage	
	Before COVID (Sep–Nov 20)	During COVID (Dec 20-Jul 21)
Using online services more	48.4	75.2
The use of online services decrease	9.6	6.6
Same	42.0	18.2

Table 111 Percentage of the average income/expenses through online channels

The amount of income and expenses through online channels	Percentage	
	Before COVID (Sep–Nov 20)	During COVID (Dec 20-Jul 21)
The average income from the sale of goods/services through online channels to the total revenue of the agency	23.6	30.4
The average expenditure from the sale of goods/services through online channels to the total expenditure of the agency	13.5	15.2

Table 112 Percentage of the products/service purchasing through the internet

Ordering goods or services via the Internet	Percentage
There is an order or service through the internet.	28.0
No purchases of goods or services are made via the internet	72.0
Reasons for not ordering goods or services on the Internet	**Percentage**
There are concerns about the safety of using the service.	15.7
It is more convenient to use the service through other channels.	20.1
No Internet service required.	42.9
Don't trust technology	22.2
Others	1.8

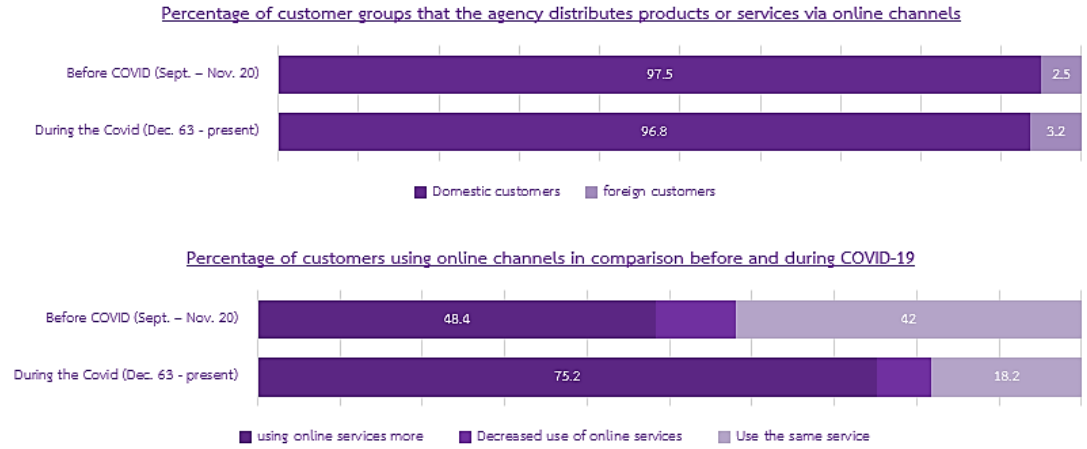
Note: Percentage of calculation results in the table from questions with more than 1 answer. Survey data from "Other" responses did not contain statistically significant details.

Table 113 Percentage of the payments for products or services via the internet

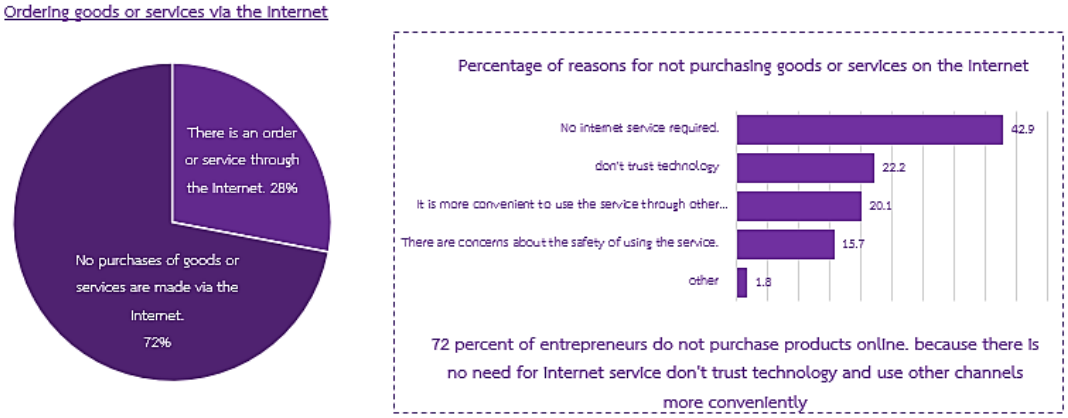
Payment for goods or services via the Internet	Percentage
The payment for goods or services is made via the Internet.	**66.6**
• Factors motivating to pay for goods and services via the Internet.	
Ease of contacting with vendors of goods and services	32.0
Convenience of payment for goods and services	30.0
The lower price than in the general market	25.9
Cost reduction	23.7
Business processes can run faster	15.1
Company partner's requirements	13.8
Others	1.6
No payment for goods or services via the Internet	**32.3**
• Reasons	
There are the concerns on the safety of using the service.	25.3
It is more convenient to use the service through other channels.	60.1
There is no need for Internet service.	58.9
Don't trust technology	23.9
There is a high service fee.	11.5
The contacted merchants do not accept payment for goods or services via the Internet.	2.7
Others	1.2

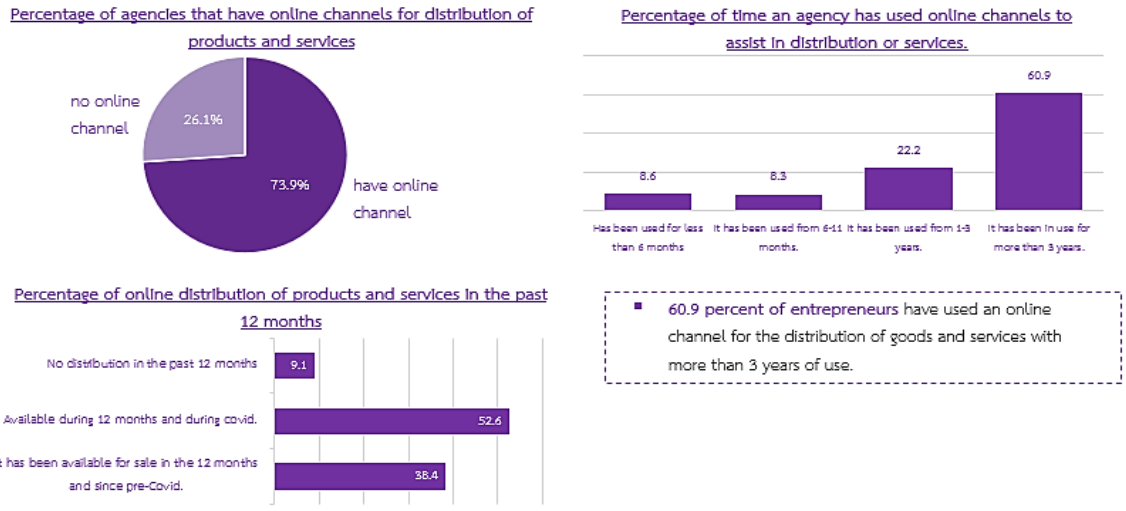
Note: Percentage of calculation results in the table from questions with more than one answer. The survey data from the "Other" responses were similar in the same way.

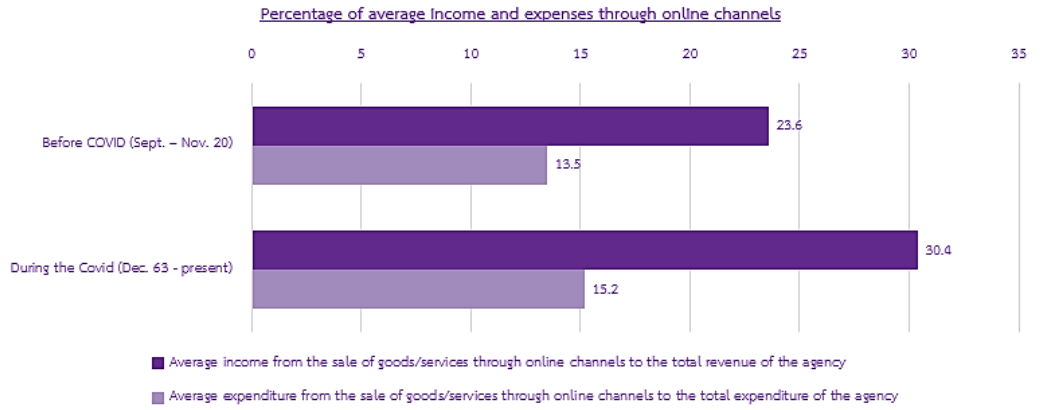
Figure 25 Diagram illustrating the online distribution of products/services



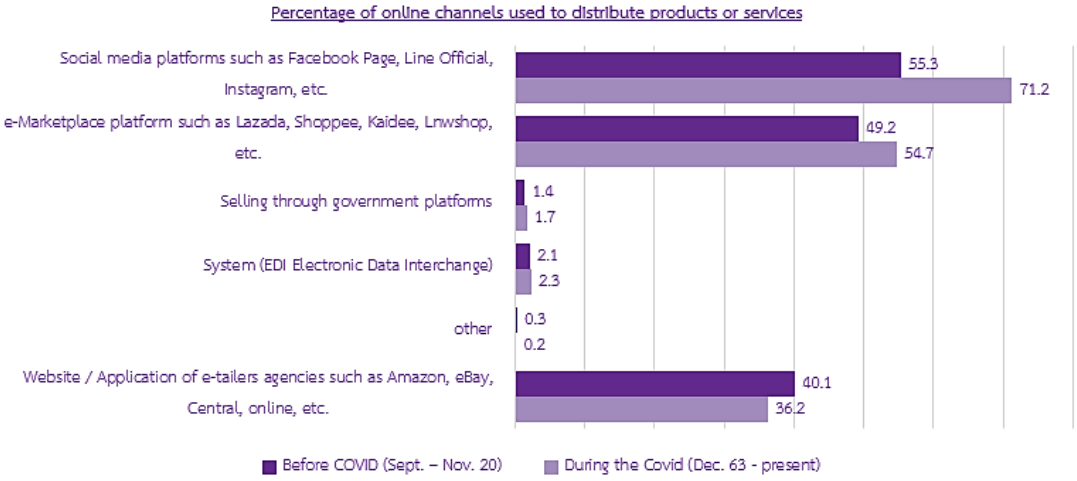
The majority of online customers are domestic customers, more than 90 percent, with a slight increase in the proportion of foreign customers during the Covid-19 outbreak.

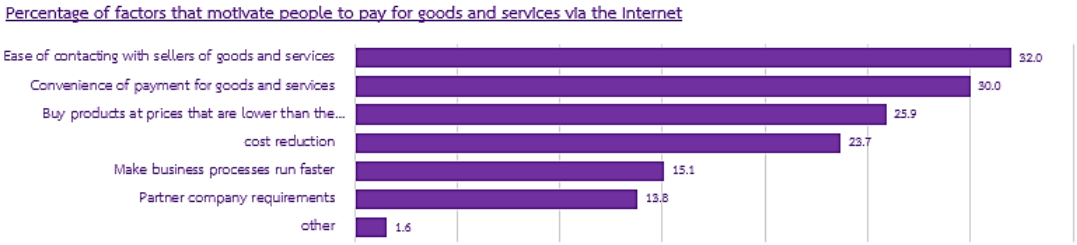


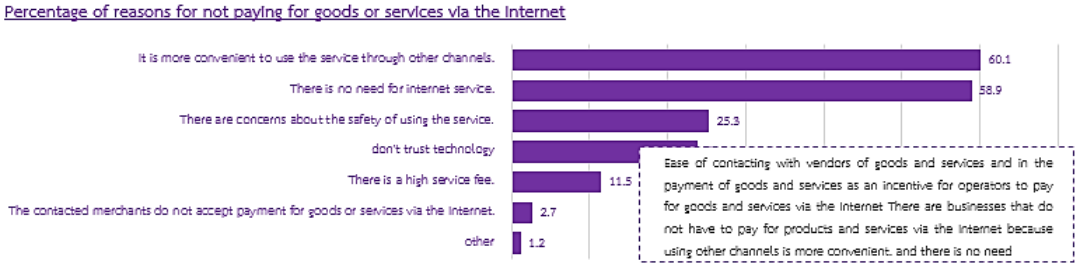




Online channels generate 30.4% of revenue for entrepreneurs during the COVID-19 pandemic. and increased from 23.6 percent before COVID. The spending of online channels has slightly increased.







Cloud Usage

According to the survey, the 46.8% used paid Cloud system in companies, employed 23.5% of paid Cloud services, 15.3% no Cloud usage, and 14.4% unknown/unsure. The objectives of purchasing Cloud services in the top 3 are 1) e-mail system 67.7% 2) Storage of files 45.2% and 3) support the system, office applications (Office software) 15.8%

Table 114 Percentage of Cloud service purchases

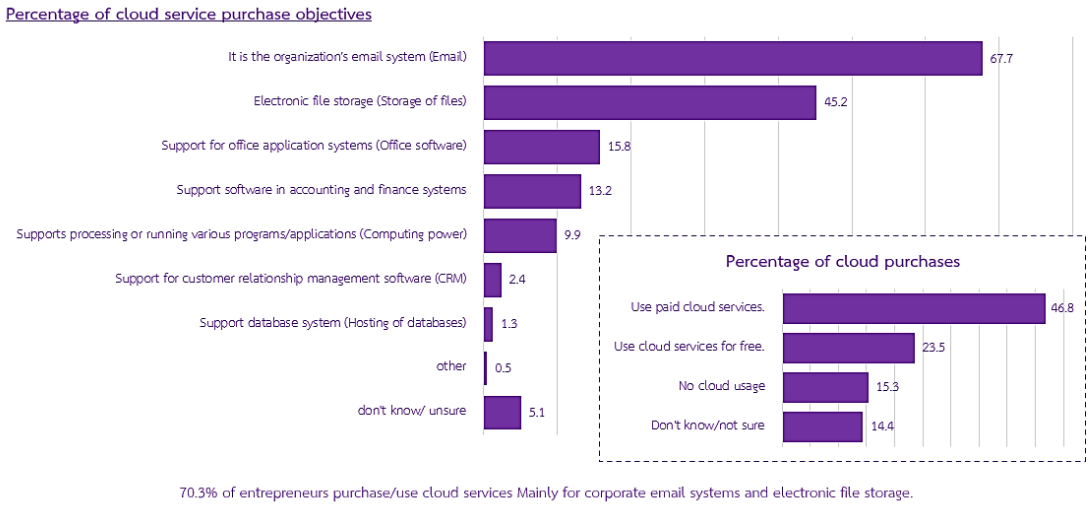
The proportion of purchasing Cloud services	Percentage
Use paid Cloud services	46.8
Use Cloud services for free	23.5
No Cloud usage	15.3
Don't know/not sure	14.4

Table 115 Percentage of the objectives in purchasing Cloud service

Cloud service purchase purpose	Percentage
It is the organisation's e-mail system (Email).	67.7
Electronic file storage (Storage of files)	45.2
Supports processing or running various programs/applications (Computing power)	9.9
Support for office applications (Office software)	15.8
Support software in accounting and finance systems	13.2
Support for customer relationship management (CRM) software	2.4
Support database system (Hosting of database)	1.3
Don't know/not sure	5.1
Others	0.5

Note: Percentage of calculation results in the table from questions with more than 1 answer. Survey data from “Other” responses did not contain statistically significant details.

Figure 26 Diagram illustrating the use of Cloud services



Data analysis and the purpose of applying the analyzed data

Regarding the survey result, it was found that 61.5% of the data analytics departments were analyzed, divided into 52.2% of the organisation's/internal data being analyzed and the data being purchased or received from external agencies at 9.3% and there was no data analytics unit and no purchase of such service at 25.0%, no data analytics but the data analysis service was purchased to promote 8.5% of the business, and at 5.0% unknown.

Most of the data analysis format was 75.7% having the work done by an in-house experts, 50.2% hiring an outside expert, 10.3% purchasing an external data analysis service, and 1.1% for others, such as using a software package.

The agencies that are analyzing the data have expected thiese benefits: 1) helping to analyze and identify the target customers with 61.2% efficiency for the business, 2) increasing of sales or customer spending rates (e.g. incentives through discounts or benefits to customers) at 58.2%, and 3) helping to improve the product development (products/services) that meets the needs of customers at 49.9%.

The proportion of agencies that have linked with the business partners for the data exchanges accounted for 53.8% and no data exchange link at 46.2%.

Table 116 Percentage of conducting data analytics to promote business operations

The proportion of data analytics (Data Analytics) to promote business operations	Percentage
There is data analysis (Data Analytics).	61.5
• Use the data of the organisation/internal for analysis.	52.2
• Use information purchased or obtained from outside agencies for analysis.	9.3
No data analytics (Data Analytics) but data analytics services are purchased to support business operations.	8.5
No data analytics were performed and no such service was purchased.	25.0
Don't know	5.0

Table 117 Percentage of data analysis format

Data analytics model to increase business efficiency	Percentage
Do it yourself by experts in the agency	75.7
Hire an outside expert to do this	50.2
Purchase a third-party analytics service.	10.3
Others	1.1

Note: Percentage of calculation results in the table from questions with more than 1 answer. The survey data from the "Other" responses were similar in same way.

Table 118 Percentage of the expected benefit from implementing data analysis

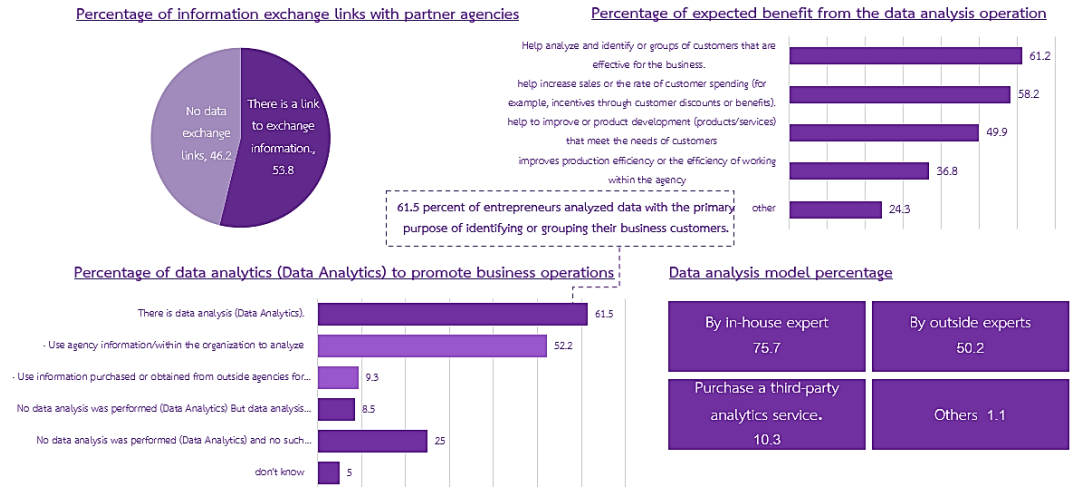
Expected Benefits of Performing Data Analysis	Percentage
Analyze and identify groups of customers that are effective for the business	61.2
Increase of sales or the customer spending rate (for example, incentives through customer discounts or benefits).	58.2
Improve the product development (products/services) that meets the needs of customers	49.9
Improve the production efficiency or the efficiency of working within the organisation	36.8
Others	24.3

Note: Percentage of calculation results in the table from questions with more than 1answer. The survey data from the "Other" responses were similar in same way.

Table 119 Percentage of the data exchange with business partners

Links to exchange information with partner agencies	Percentage
There is a link for data exchange	53.8
No data exchange links	46.2

Figure 27 Diagram illustrating the data analysis process and the objectives of using the anayzed data



An overview of the benefits of digital technology

Regarding the overall picture of the benefits of digital technology, it is found that most organisations have the productivity increased with a moderate increase of 50.0%, a slight increase of 24.7%, a significant increase of 17.7% and no change of 7.7%. The first 3 benefits that organisations received are; 1) sales increasing at 36.8%, 2) reducing or controling the cost of a number of employees or other expenses at 29.1%, and 3) the personnels productivity increased by 27.4%.

Table 120 Percentage of the increased productivity of the agencies' use of digital technology

The productivity of the organisation is increased by using digital technology.	Percentage
greatly increased	17.7
moderate increase	50.0
slightly increase	24.7
no change	7.7

Table 121 Percentage of the expected benefit from the use of digital technology

Benefit from digital technology	Percentage
Sales increasing	36.8
Reduceing or controling costs, number of employees or expenses	29.1
Personnels are productive (Productivity) is higher	27.4

Benefit from digital technology	Percentage
Competing or providing better service	21.2
Supporting for the design and research (R&D) work	19.5
I don't see a clear benefit.	7.0
Others	1.3

Note: Percentage of calculation results in the table from questions with more than 1 answer. Survey data from "Other" responses did not contain statistically significant details.

10.2.5 Survey results on the use of government online services

From the survey results of online government serviecs, most of the organisations have ever used government online services at 88.5% and never used online government serviecs at 11.5%. The most popular characteristics of using government online services are; 1) used for searching for information 72.9% 2) used in submitting forms/documents via online channels 65.8% and 3)used for form/document downloads 40.4% and other services 2.2%, such as reporting problems and complaints.

In the pre-Covid period or September-November 2020, the top 3 of most popular government online services are; 1)filing tax forms/submitting accounting data online 85.1% 2) submitting employee/personnel information to government agencies online 58.1%, 3) payment of electricity/water/phone/utilities bills 36.2%.

During the COVID-19 period or from December 2020 – July 2021, the top 3 of of most popular government online services are; 1) 89.2% of online tax filing/reporting of accounting data, 2) submitting data at 60.2% of employees/personnel to the government online and 3) 38.3% of electricity/water/telephone/utilities bills paid.

Considering the comparison between before and during the COVID pandemic, it can be seen that most of the government online services that are used are still; 1)Filing tax forms/ submitting accounting information online, 2) Submitting employee / personnel information to the government online, 3) Paying electricity/water/bills Telephone/Utilities both before and during the COVID period. The proportion of the use of the 3 services with an increase of 4.1%, 2.1% and 2.1% respectively, with the search/reservation/ registration services and having the largest increase of 10.4%. This was due to the fact that people turned to do business and were registered more correctly services in bidding/selling goods and services through the online procurement system declined as high as 10.5%, possibly due to the government budget cuts and reduce a number of procurement.

Regarding the survey of satisfaction with using government services, it was found that 25.6% of the agencies were most satisfied, 59.5% were very satisfied, only 14.7% were unsatisfied with using government services 0.3% each by dissatisfied services such as complaints/grievance services Online fine/fee payment service.

In accordance with the data exchange with the government offices, there are agencies that have connection for the data exchange with government office at 59.3% and no data exchange links at 40.7%.The 3 most used services linking and exchanging information with government agencies are; 1) Web Service, Department of Development, Trade business 48.2% 2) Linkage Center, Department of Provincial Administration 34.2% and 3) Government Data Exchange Center, Digital Government Development Agency 8.1%

Table 122 Percentage of the use of government online serviecs

The proportion of using government services via online system	Percentage
Used to use government online serviecs	88.5
Never used government online services	11.5

Table 123 Percentage of the type of government online services

Characteristics of online government services	Percentage
Used to search for information	72.9
Used to download forms/documents	40.4
Used to submit forms/documents through online channels	65.8
Used to reserve rights or queue to use various services.	12.4
Others	2.2

Note: Percentage of calculation results in the table from questions with more than 1 answer. The survey data from the “Other” responses were similar in nature to the response

Table 124 Percentage of government online services proportion

Online government services	Percentage	
	Before COVID (Sep–Nov 20)	During COVID (Dec 20-Jul 21)
Filing tax forms / submitting account information online	85.1	89.2
Pay electricity/water/phone/utilities bills	36.2	38.3
Pay fines/fees online	11.1	13.2
Submit employee/personnel information to the government online	58.1	60.2

Online government services	Percentage	
	Before COVID (Sep–Nov 20)	During COVID (Dec 20-Jul 21)
Apply for tax benefits online	25.4	26.6
Apply for a license/certificate/renewal online.	5.6	3.0
Search/reserve/register a juristic person	10.2	20.6
Apply for various investment promotion privileges online	25.4	26.6
Bid price / sell products and services through the online procurement system.	29.3	18.8
Complaint/grievance to online agencies	11.8	13.2
Getting a car registration reservation service, driving license exam	4.1	5.1
Never used the service	10.3	11.5
Others	2.1	2.2

Note: Percentage of calculation results in the table from questions with more than 1 answer. Survey data from "Other" responses did not contain statistically significant details.

Table 125 Percentage of the satisfaction on using government services

The proportion of satisfaction on using government services	Percentage
Most satisfied	25.6
Very satisfied	59.5
Indifferent	14.7
Dissatisfied with government services	0.3

Table 126 Percentage of the proportion of data exchange with government agencies

The proportion of data exchanging with government agencies	Percentage
Have	59.3
Do not have	40.7

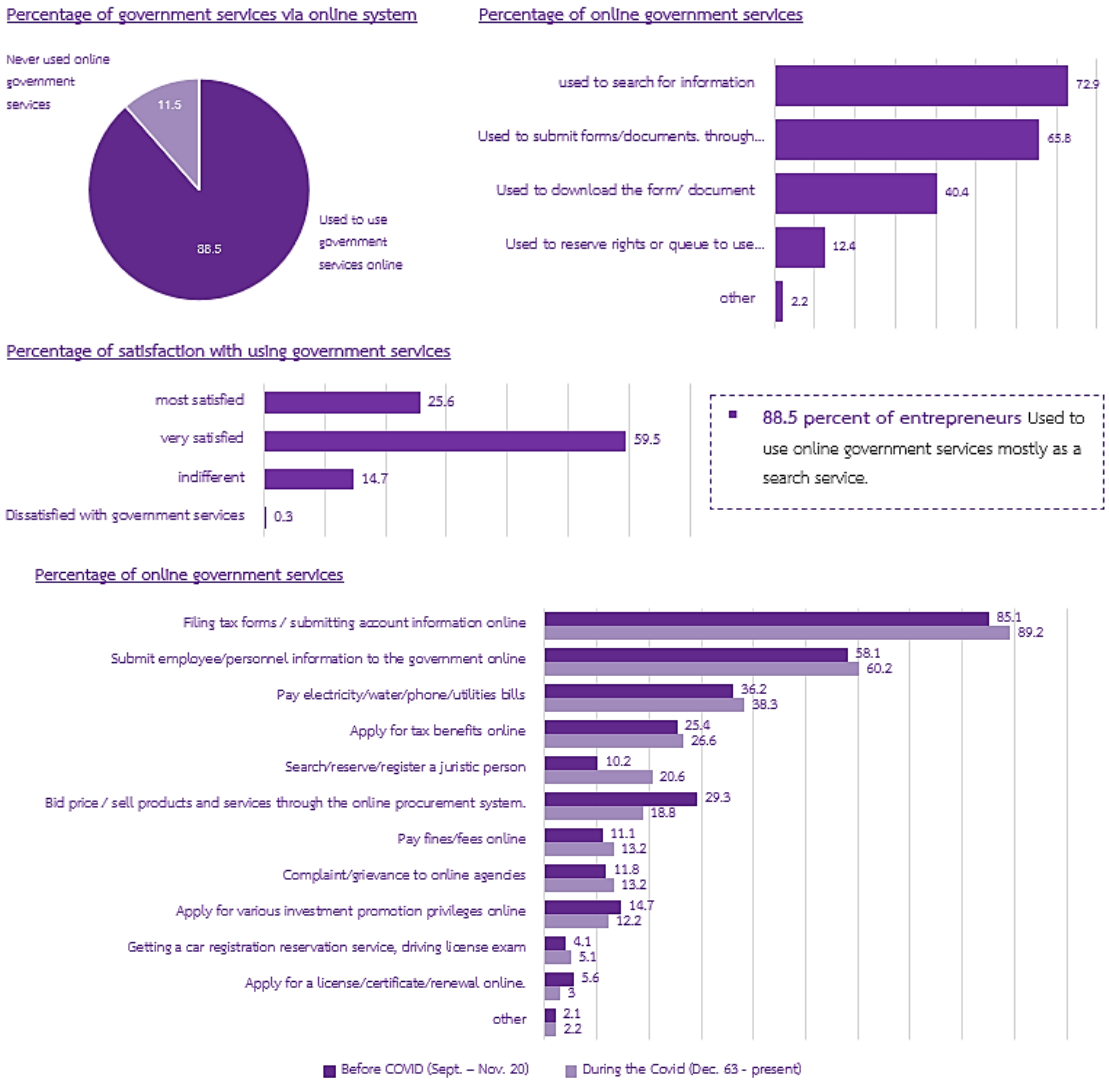
Table 127 Percentage of the data exchange with government agencies

Service and data exchange with government agencies	Percentage
Web Service Department of Business Development	48.2
Linkage Center Department of Provincial Administration	34.2
Government Data Exchange Center Digital Government Development Office	8.1
Integrated government services for business (Biz Portal)	5.5
System developed for special needs	1.5

Service and data exchange with government agencies	Percentage
Others	1.1

Note: Percentage of calculation results in the table from questions with more than 1 answer. Survey data from "Other" responses did not contain statistically significant details.

Figure 28 Diagram illustrating the use of online government services



10.2.6 Survey results on skills and digital working

Information Technology Personnel Statistics

The results of the survey found that there are organisations that employ staff or experts to perform their duties of Information and Communication Technology at 66.4%, no employment at 31.8%, with the average the proportion of employees/professionals in Information and Communication Technology to total employees at 5.9%.

Considering to compensation, it was found that the average salary of IT personnel in the top 3 support groups were; 1) in the range of 30,000-49,999 baht at 45.1%,

2) 15,000-29,999 baht at 29.0% and 3) 50,000-69,999 baht at 16.0% and the average salary of Information Technology system personnel in the top 3 of professional groups are; 1) 46.6% from 30,000-49,999 baht 2) 15,000-29,999 baht at 23.3% and 3) 50,000-69,999 baht at 20.7%.

Table 128 Percentage of hiring staff or experts to work in ICT

Hiring staff or professionals to perform Information and Communications Technology duties	Percentage
There is an employment.	66.4
• The proportion of number of IT personnel/professionals in Information and Communication Technology to total personnel.	5.9
No hiring	31.8
Don't know/not sure	1.8

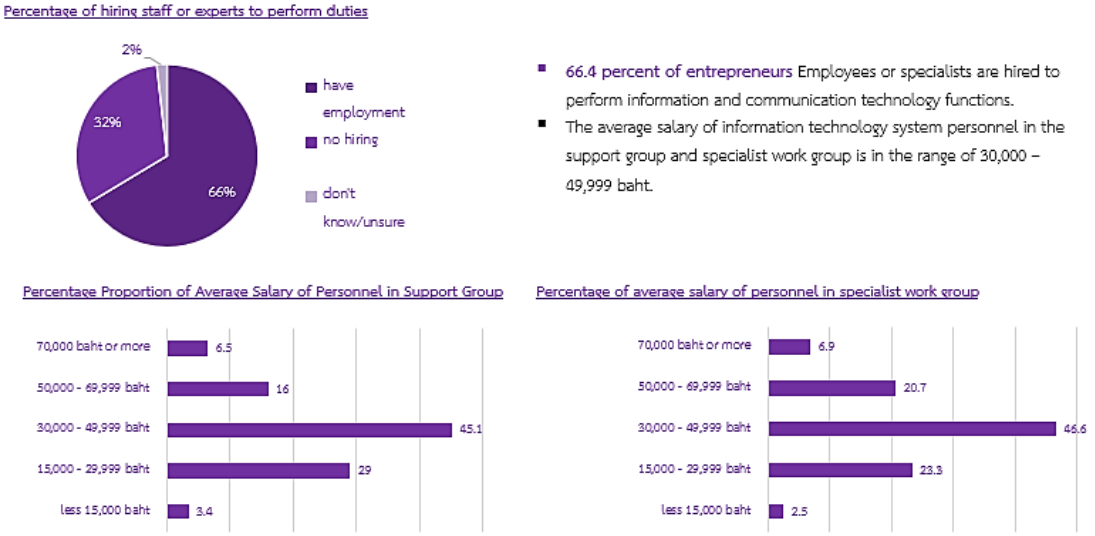
Table 129 Percentage of the average salary of IT staff support group

The average salary of Information Technology system personnel in the support groups	Percentage
70,000 baht or more	6.5
50,000-69,999 baht	16.0
30,000-49,999 baht	45.1
15,000-29,999 baht	29.0
less than 15,000 baht	3.4

Table 130 Percentage of the average salary of the IT expert group

The average salary of Information Technology system personnel in specialist work group	Percentage
70,000 baht or more	6.9
50,000-69,999 baht	20.7
30,000-49,999 baht	46.6
15,000-29,999 baht	23.3
less than 15,000 baht	2.5

Figure 29 Diagram illustrating the statistical data of IT personnel



The proportion of Information Technology operated by personnel within the organisation and external experts

From the survey results, it was found that the Information and Communication Technology of the organisation was the use of both internal and external personnel.

Most of the Information Technology care duties performed by internal personnel were; 1) 68.3% of operations technicians providing assistance in solving problems with ICT users (Information Technology and Communications Support), 2) General management personnel such as 33.7% of the Information Technology assets of the agency, 3) The maintenance staff of electronic business systems such as ERP CRM or database systems 32.4% with other duties at 0.1% such as system testers.

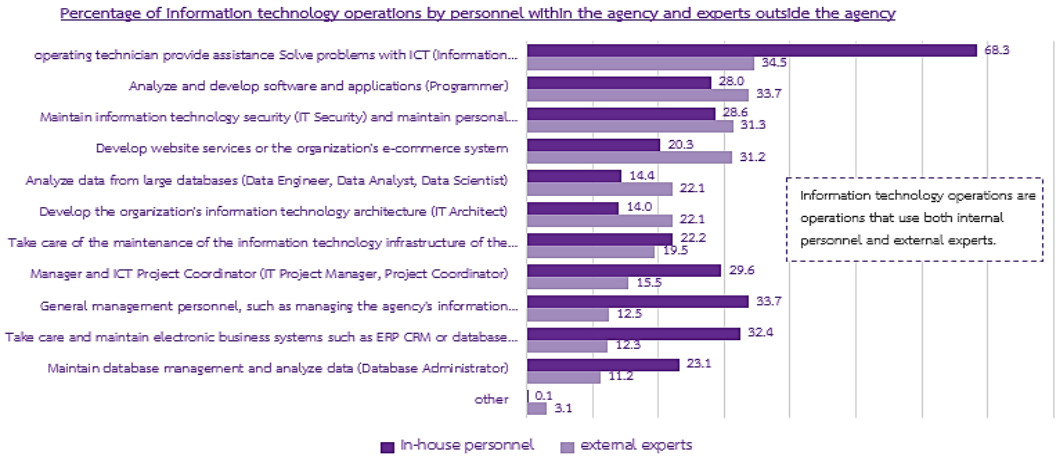
Most of the care duties performed by external experts; 1) Operations technicians assisting 34.5% of ICT (Information Technology and Communications Support) users, 2) Analyzing and developing software and applications (Programmer) at 33.7%, 3) Information Technology security officers (IT Security) and personal data protection at 31.3% and other duties at 3.1%, such as digital strategy consultants, system testers, business analysts.

Table 131 Percentage of IT operations by "in-house personnel" and "external experts"

Duty of care	Percentage	
	In-house personnel	External experts
Analyze and develop software and applications (Programmer)	28.0	33.7
Analyze data from large databases (Data Engineer, Data Analyst, Data Scientist)	14.4	22.1
Maintain database management and analyze data (Database Administrator)	23.1	11.2
Take care of the maintenance of the organisation's Information Technology infrastructure such as computers, Internet networks	22.2	19.5
Take care of maintenance of electronic business systems such as ERP, CRM or database systems	32.4	12.3
Develop website services or the agency's e-commerce system	20.3	31.2
Operate technician, provide assistance, solve problems with ICT (Information Technology and Communications support) users	68.3	34.5
Maintain Information Technology security (IT Security) and maintain personal information	28.6	31.3
ICT Project Manager and Coordinator (IT Project Manager, Project Coordinator)	29.6	15.5
Develop the organisation's Information Technology architecture (IT Architect)	14.0	22.1
General management personnel, such as managing the agency's Information Technology assets	33.7	12.5
Others	0.1	3.1

Note: Percentage of calculation results in the table from questions with more than 1 answer. The survey data from the “Other” responses were similar in the same way.

Figure 30 Diagram illustrating the percentage of IT implementation by 'internal staff' and external experts'



Skill development and training

As for the training for personnel in the agency to develop working skills, it was found that there were 36.6% of the agencies that provided training to personnel or specialists in Information and Communication Technology. 21.6% received communication training to all personnel, 53.7% did not provide training to personnel or specialists in Information and Communication Technology, and 9.7% did not know/not sure.

The top 3 of training courses in Information Technology and communication are 1) Software development 22.2% 2) General computer system administration (IT support) 20.8% and 3) Management. Database (Database Administration) 16.7% and others 0.2% such as training on new technology knowledge

As for providing training for personnel in the department, there are units that provide training for 69.5%, with the proportion of personnel receiving training to all personnel at 30.3%, and there are agencies that do not provide training at 28.0%.

The proportion of personnel working with computer equipment ranked highest in the 3 rankings: 1) 50-80% at 33.7% 2) more than 80% at 26.7% and 3) 30-49% at 15.2%

Table 132 Percentage of provided training for IT staff or experts

Training for personnel or experts Information and Communication Technology	Percentage
Training is provided.	36.6
• The proportion of trained personnel to total personnel	21.6
No training	53.7

Training for personnel or experts Information and Communication Technology	Percentage
I don't know / I'm not sure	9.7

Table 133 Percentage of ICT training course

Information and Communication Technology Training Courses	Percentage
Knowledge of Information and Communication Technology systems for executives and managers	10.8
Software development	22.2
IT Project Management	15.3
Database Administration	16.7
Data Analytics	9.2
System and Infrastructure administration	11.2
Administration of technology security (IT security)	9.1
General computer administration (IT support)	20.8
Innovation	4.4
Development of A.I. systems such as Python, R	3.5
Cloud development and maintenance	4.5
Others	0.2

Note: Percentage of calculation results in the table from questions with more than 1 answer. Survey data from "Other" responses were similar in the same way.

Table 134 Percentage of training provided to internal staff

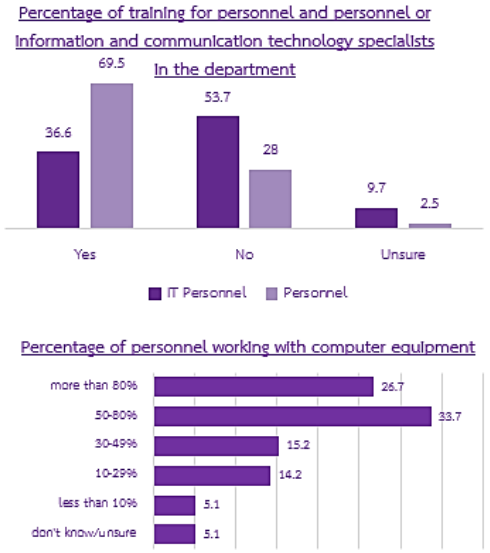
Training for personnel	Percentage
Training is provided	69.5
• The proportion of trained personnel to total personnel	30.3
No training	28.0
Don't know/not sure	2.5

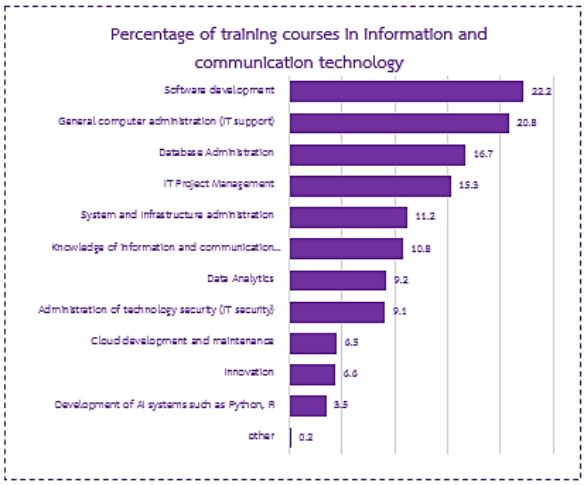
Table 135 Percentage of staff working with computers

Personnel working with computer equipment	Percentage
more than 80%	26.7
50-80%	33.7
30-49%	15.2
10-29%	14.2
less than 10%	5.1

Personnel working with computer equipment	Percentage
Don't know/not sure	5.1

Figure 31 Diagram illustrating skill development and training





Robotic technology application

According to the survey, most of the organisations at 66.1% were not using robotics, and 33.9% of the organisations were using it over 3 years, and 17.3% of the organisations were using it from 1 to 3 years, and 6.0% of the organisations are using it for 6-11 months, at 4.0% of the organisations were using less than 6 months at 6.6%. The top 3 of characteristics of robot technology use are; 1) production and production management, for example: robot in factory Robots in warehouses at 39.2%, 2) Service areas such as welcome robots at 21.2% of cleaning robots and 3) safety concerns, such as 20.7% of temperature-sensing robots, and 1.5% of other uses, such as fruit sizing robots and material quality testing robot.

The top 3 of factors influencing the decision to use robotic technology are; 1) there are 39.2% of experts in this field, 2) high productivity (Productivity gain) at 36.1% and 3)easy maintenance and low cost of 35.7% and other factors of 3.3% such as being able to be tested first without cost, reliable.

Table 136 Percentage of agencies that utilize robotic technology

The proportion of organisations using robotic technology	Percentage
It has been in use for more than 3 years.	17.3
It has been used from 1-3 years.	6.0

The proportion of organisations using robotic technology	Percentage
It has been used from 6-11 months.	4.0
Has been used for less than 6 months	6.6
Inactiveness	66.1

Table 137 Percentage of using robot technology

Characteristics of using robot technology	Percentage
Production and production management, such as factory robots robot in warehouse	39.2
Service areas such as welcome robots cleaning robot	21.2
For safety, such as a temperature measuring robot	20.7
Operational aspects such as delivery robots	17.1
Others	1.5

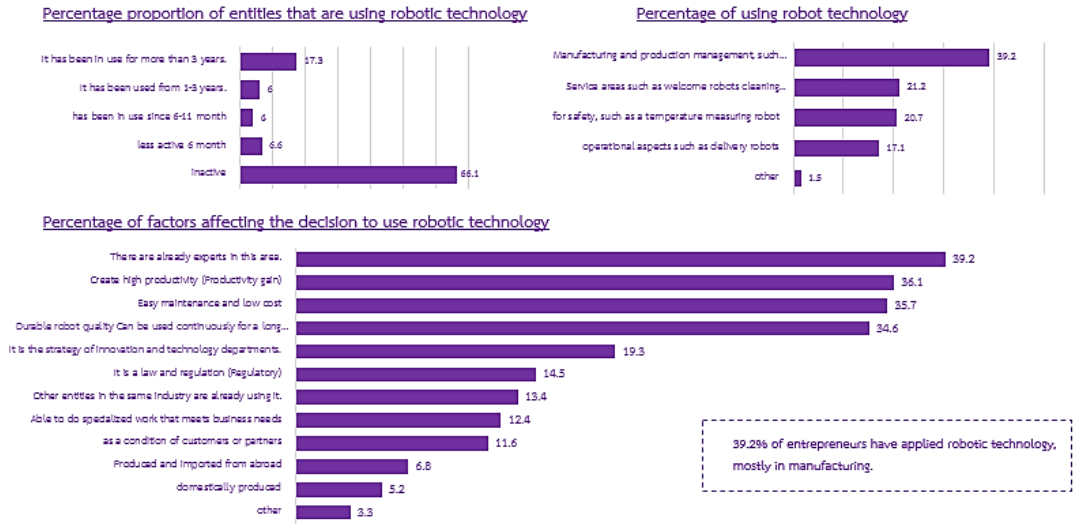
Note: Percentage of calculation results in the table from questions with more than 1 answer. Survey data from "Other" responses were in the same way.

Table 138 Percentage of the factors that affect to the decision making on using robot technology

Factors affecting the decision to use robot technology	Percentage
There are already experts in this area.	39.2
Easy maintenance and low cost	35.7
High productivity (Productivity gain)	36.1
It is the strategy of innovation and technology departments.	19.3
Durable robot quality can be used continuously for a long time	34.6
It is a regulatory law.	14.5
As a condition of customers or partners	11.6
Able to do specialized work that meets business needs	12.4
Domestically produced	5.2
Produced and imported from abroad	6.8
Other entities in the same industry are already using it.	13.4
Others	3.3

Note: Percentage of calculation results in the table from questions with more than 1 answer. Survey data from "Other" responses were in the same way.

Figure 32 Diagram illustrating the application of robotic technology



Application of Artificial Intelligence (A.I.) Technology

According to the survey, 41.0% of agencies have applied artificial intelligence (AI) technology and used it over 3 years, 8.5% from 1-3 years, and 14.4% from 6-11 months, 8.3% are active less than 6 months at 9.8. The Artificial intelligence (AI) technology in the top 3 most use are; 1) Customer relationship or answering service such as Chatbot 53.6%, 2) security such as face recognition (25.4%) and 3) process automation such as RPA (Robotic Process Automation) at 12.4%.

Factors affecting decision-making on the use of artificial intelligence (AI) technology are; 1) creating a high productivity gain (38.4%), 2) having 22.8% of experts in this field, and 3) being a strategy of Innovation and Technology Agency at 16.6%.

Table 139 Percentage of agencies that utilize artificial intelligence (A.I.) technology

The proportion of agencies using artificial intelligence (A.I.) technology	Percentage
It has been in use for more than 3 years.	8.5
It has been used from 1-3 years.	14.4
It has been used from 6-11 months.	8.3
Has been used for less than 6 months	9.8
Inactiveness	59.0

Table 140 Percentage of the use of Artificial Intelligence (A.I.) Technology

Characteristics of using artificial intelligence (A.I.) technology	Percentage
Customer relationship or answering information services such as Chatbot	53.6
Security such as Face Recognition	25.4

Characteristics of using artificial intelligence (A.I.) technology	Percentage
Process automation such as RPA (Robotic Process Automation)	12.4
Image analytics such as OCR	8.8
Data Analysis for Learning (Machine Learning)	5.2
data analysis for forecasting (Forecasting)	3.9
Others	1.1

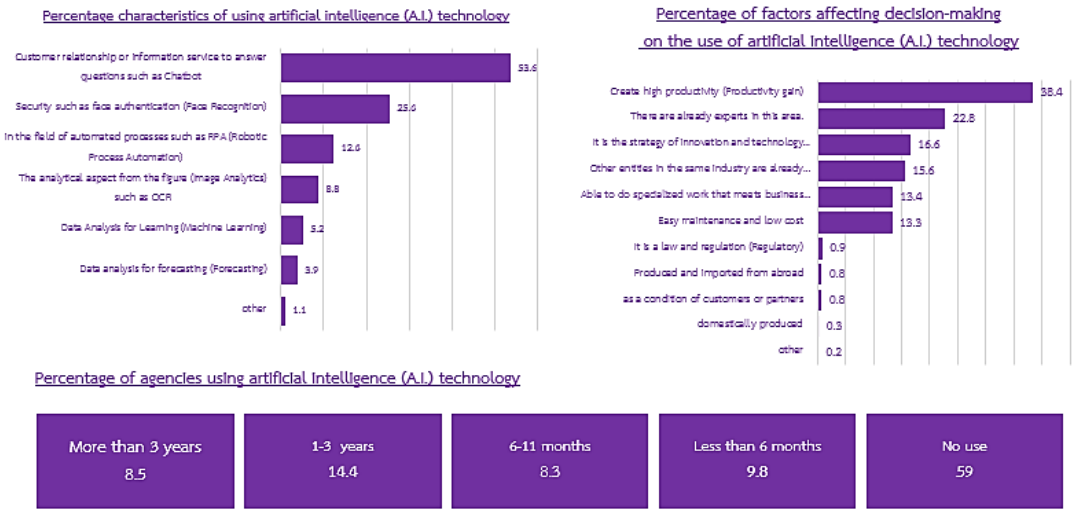
Note: Percentage of calculation results in the table from questions with more than 1 answer, survey data from "Other" responses did not contain statistically significant details.

Table 141 Percentage of factors that affect to decision making on using artificial intelligence (A.I.) technology

Factors affecting the decision to use artificial intelligence (A.I.) technology	Percentage
There are already experts in this area.	22.8
Easy maintenance and low cost	13.3
High productivity (Productivity gain)	38.4
It is the strategy of innovation and technology departments.	16.6
Durable robot quality Can be used continuously for a long time	9.2
It is a regulatory law.	0.9
As a condition of customers or partners	0.4
Able to do specialized work that meets business needs	14.2
Produced and imported from abroad	0.8
Domestically produced	0.3
Other entities in the same industry are already using it.	15.6
The business it operates has no need for artificial intelligence (A.I.) technology.	0.0
Others	0.2

Note: Percentage of calculation results in the table from questions with more than 1 answer. Survey data from "Other" responses did not contain statistically significant details.

Figure 33 Diagram illustrating the application of artificial intelligence (A.I.) technology



Other technology applications

The other technology applications in the field of 5G applications, there are 1.4% of the IoT applications of 5G, or 46 of the total surveyed agencies.

According to a survey of technology expenditures or budgets for both hardware and software in the latest year, it was found that the average technology expenditure or budget was 17.0% of the total budget of the organisation.

In addition to using a desktop computer/Notebooks/tablets/electronic devices/other technologies, it was 53.2% of the departments use other technologies and 40.9% are inactive. The top 3 of technologies with the highest use are; 1)VDO Conference System 72.1, 2) Customer Relationship Management : CRM 22.1% 3) Supply Chain Management : SCM 16.7%.

Table 142 Percentage of the 5G adoption

5G applications	Percentage
IoT	1.4
VR/AR	0.0
Robot	0.0
Others	0.0
Idle 5G	98.6

Table 143 Percentage of budgeting for techmology compared to the overall budget

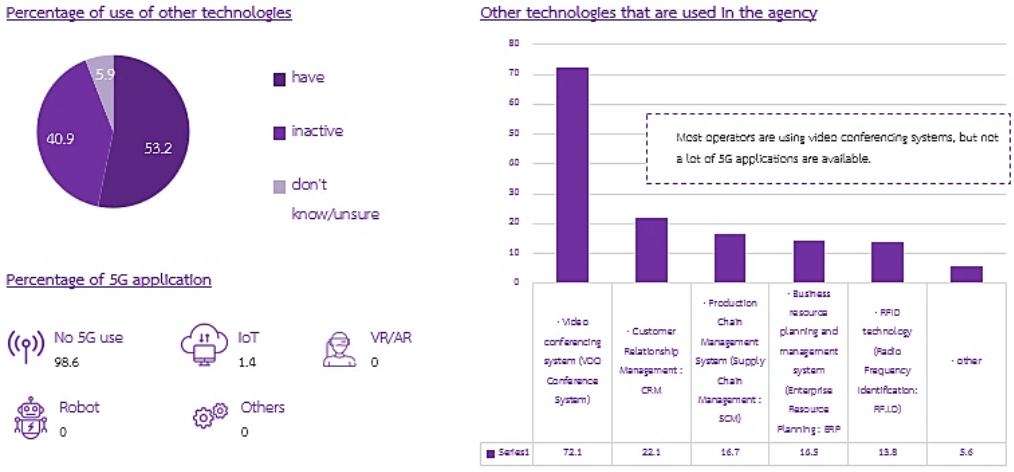
Technology expenditure or budget	Percentage
Technology expenditure or budget on both hardware and software	17.0

Table 144 Percentage of using other forms of technology

Other technology applications	Percentage
Availability	**53.2**
• Video Conference System (VDO Conference System)	72.1
• Supply Chain Management : SCM	16.7
• Enterprise Resource Planning : ERP	14.5
• Customer Relationship Management : CRM	22.1
• RFID Technology (Radio Frequency Identification: RFID)	13.8
• Artificial Intelligence (AI) technology	11.1
• Others	0.8
Inactiveness	**40.9**
Don't know/not sure	5.9

Note: Percentage calculation results in the table from questions with more than 1 answer. Survey data from "Other" responses did not contain statistically significant details.

Figure 34 Diagram illustrating the application of other types of techmology



Another dimension of technology use

The survey found that most agencies had no reduction in personnel from the technology adoption result of 64.8% and there was a reduction of 35.2%.

The top 3 of skills in recruiting new personnel were; 1)communication at 80.2%, 2) management at 77.9%, and 3) teamwork at 68.1%, and others such as having specific knowledge related to the job position at 11.1%

Table 145 Percentage of cutting down the number of staff as a result of techmology adopting

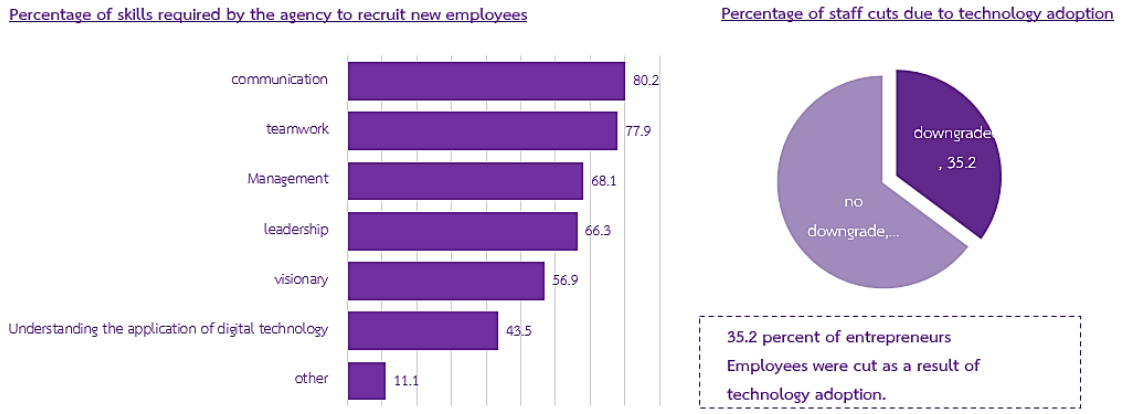
Employee cuts due to technology adoption	Percentage
Downgraded	35.2
No downgrade	64.8

Table 146 Percentage of the required skills when recruiting new staff

Key skills of personnel	Percentage
Communication	80.2
Management	77.9
Teamwork	68.1
Leadership	66.3
Visionary	56.9
Understanding the application of digital technology	43.5
Others	11.1

Note: Percentage of calculation results in the table from questions with more than 1 answer. The survey data from the "Other" responses were similar in the same way.

Figure 35 Diagram illustrating the application of other techmological dimensions



10.2.7 Survey results on trust and digital security

Proportion of Personal Data Protection Act (PDPA) and preparation for data protection

The proportion of Personal Data Protection Act and the preparation of employee data protection from the survey, it was found that agencies know the Personal Protection Act accounted for 80.5% and unknown 19.5%.

The readiness to control personal data in accordance with Personal Data Protection Act was found that 33.7% of the agencies were completely ready, 27.8% were in the process, and 25.3% were under the study.

As for the preparation of personal data, it was found that the agencies with the highest preparation for data collection were 88.9%, 59.1% of the data usage and 39.2% of the data disclosure.

Table 147 Percentage of the awareness of the Personal Data Protection Act (PDPA)

Perceived The proportion Personal Data Protection Act	Percentage
Know	80.5
Do not know	19.5

Table 148 Percentage of the readiness in managing personal data according to the Personal Data Protection Act

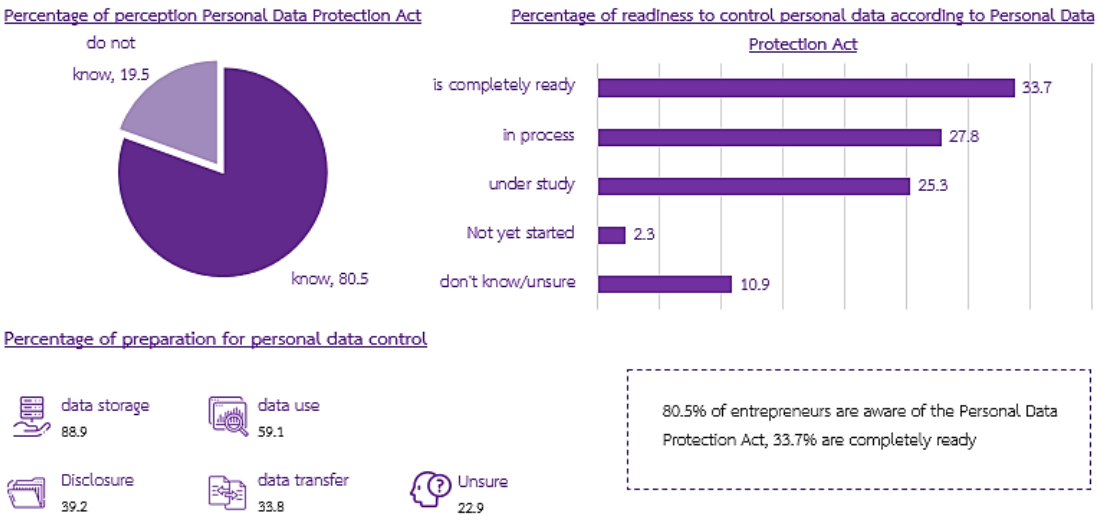
Readiness for supervision Personal data in accordance with Personal Data Protection Act	Percentage
Completely ready	33.7
In process	27.8
Under study	25.3
Not yet started	2.3
Don't know/not sure	10.9

Table 149 Percentage of the readiness in managing personal data

Preparing to control personal information	Percentage
Data storage	88.9
Data use	59.1
Disclosure	39.2
Data transfer	33.8
Don't know/not sure	22.9

Note: The results of percentage calculation in the table from questions with more than 1 answer

Figure 36 Diagram illustrating the awareness of the Personal Data Protection Act (PDPA) and readiness in managing the information



Security and issues in Information Technology

From the survey found that there were 27.1% of the agencies facing Information Technology security problems, 60.7% did not face the problem. The most common problems were 1) the organisation's device was infected with a virus (Virus)/Trojan. (Trojan)/Malware (Malware) until damage to the device or various data. 82.2% internally on the device 2) 19.8% of the organisation's privacy and security were compromised 3) lost money from phishing messages and traps from entering fake websites (Pharming) 17.5% credit/debit card hack including 4.8% of financial applications and 1.1% of other problems, such as a web page attack preventing customers from using the service. Personnel within the agency are the ones who disseminate company information without permission.

Information Technology security measures The top 3 of most commonly used measures were 1) 73.7% of the authentication system was used; 2) there was a system in place to prevent cyber-attacks, such as an antivirus system. 72.9% of firewall systems and 3) 52.3% of data is encrypted, 53.2% of personnel/employees are performed internally and 62.1% of external experts.

Table 150 Percentage of encountering problems in IT security

The proportion of facing problems in Information Technology security	Percentage
Get into trouble	27.1
No problem	60.7
Don't know/not sure	12.2

Table 151 Percentage of problems in IT security

Information Technology security issues	Percentage
The device of the unit is infected with virus (Virus) / Trojan (Trojan) / Malware until it damaged to the device or various data. inside the device	82.2
The personal information or privacy (Privacy and Security) of the agency has been violated.	19.8
Lose money from phishing messages/emails and get trapped by phishing attacks	17.5
Lost money from credit/debit card hack including financial applications	4.8
Others	1.1

Note: Percentage of calculation results in the table from questions with more than 1 answer. The survey data from the “Other” responses were similar in the same way.

Table 152 Percentage of the measures implemented to IT security

Information Technology Security Measures	Percentage
An identity verification system is used.	73.7
There are systems to prevent cyber attacks such as antivirus systems. firewall system	72.9
Data is encrypted	52.3
There is a backup of the organisation	44.4
Personnel awareness is created.	13.2
There is an internal unit that takes care of this specifically.	12.8
Experts are hired to check periodically.	10.5
No measures	15.3
Others	5.2

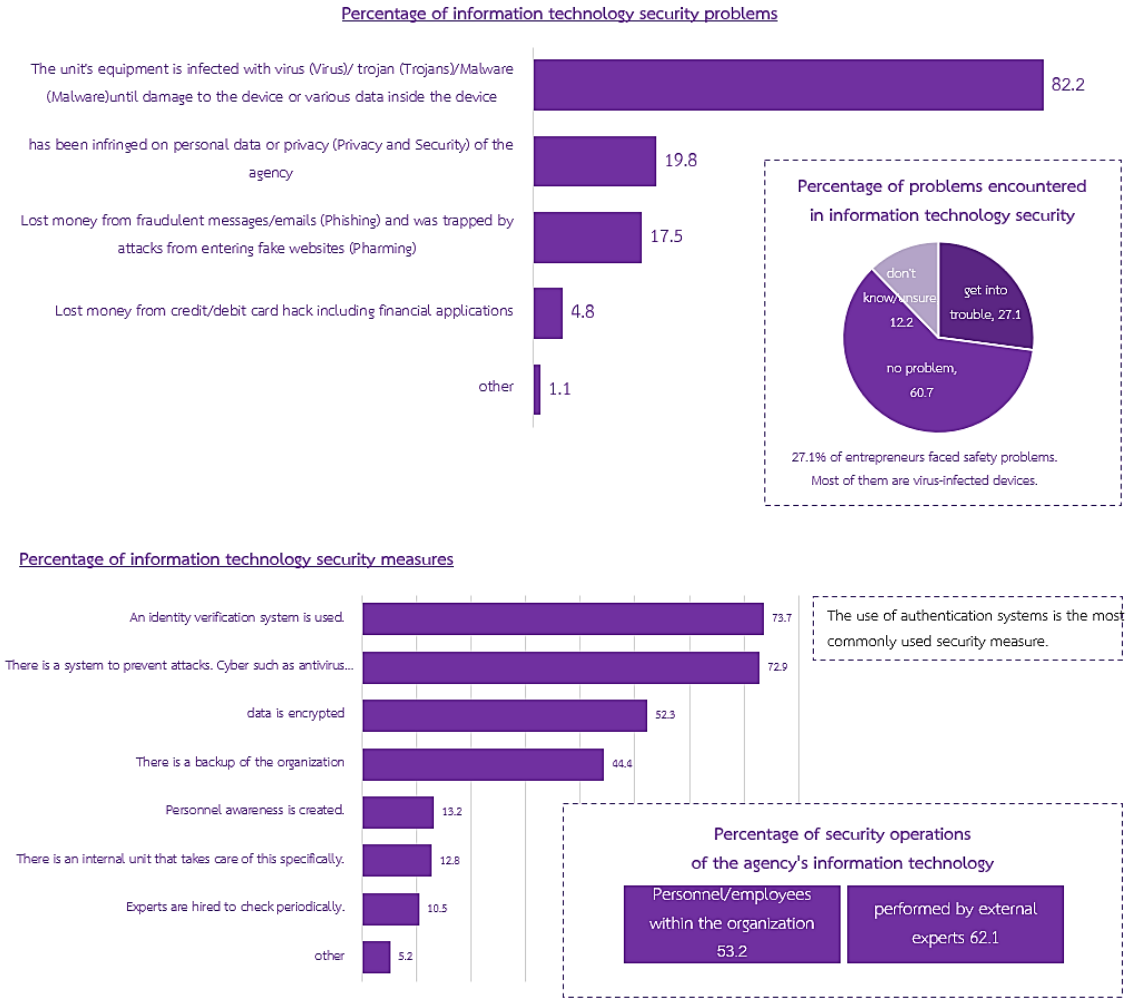
Note: Percentage of calculation results in the table from questions with more than 1 answer. Survey data from “Other” responses did not contain statistically significant details.

Table 153 Percentage of the measures implemented to IT security of each agency

Information Technology security operations of the agency	Percentage
Operated by personnel/employees within the unit	53.2
Performed by external experts	62.1
Others	0.0

Note: Percentage of calculation results in the table from questions with more than 1 answer, survey data from "Other" responses did not contain statistically significant details.

Figure 37 Diagram illustrating security and IT security incident issues



10.2.8 Survey results on the implementation of government digital policies and related measures

Regarding the survey of the government's digital policies and measures using a satisfaction assessment in a survey, it was rated from 1 to 5, with a score of 1 being the

least satisfied, score of 5 being the most satisfied. The government's digital policies and measures were assessed in the medium to very satisfied range.

The policy of measures to promote digital startups (Digital Startup) scored an average of 3.53% satisfaction achieving an average satisfaction score of 3.62%, the Pracharat Net project scored an average of 3.48%, the Digital Community Center project scored an average of 3.48%, the average satisfaction was 3.46%, the USO Net Internet Center Project (Community Internet Service Center) received an average score of 3.43%, the Thai Chana application was an average score of 3.61%, and the Anti-Fake News Center has an average satisfaction rating of 3.54%.

It found that respondents rated their satisfaction with the privacy law at an average of 3.62%, which was the highest score compared to any other digital measure. Most of the departments recognized the importance of personal data protection laws and agreed that the government has issued such laws to protect people's information which has been prepared and understood for a reasonable period of time.

Regarding the measures to promote digital startups (Digital Startup), it was found that most entrepreneurs are interested and see the importance of this measure. However, the government's lacks of the public relations with organisations that may not be in the Digital Startup group, which may close the opportunity for interested organisation.

The implementation of the Pracharat Internet project, Community Digital Center Project, USO Net Internet Center Project (Community Internet Service Center), most entrepreneurs are satisfied with and agree that it is a measure to benefit the General public in accessing the Internet or it can only benefit those who start a small online business.

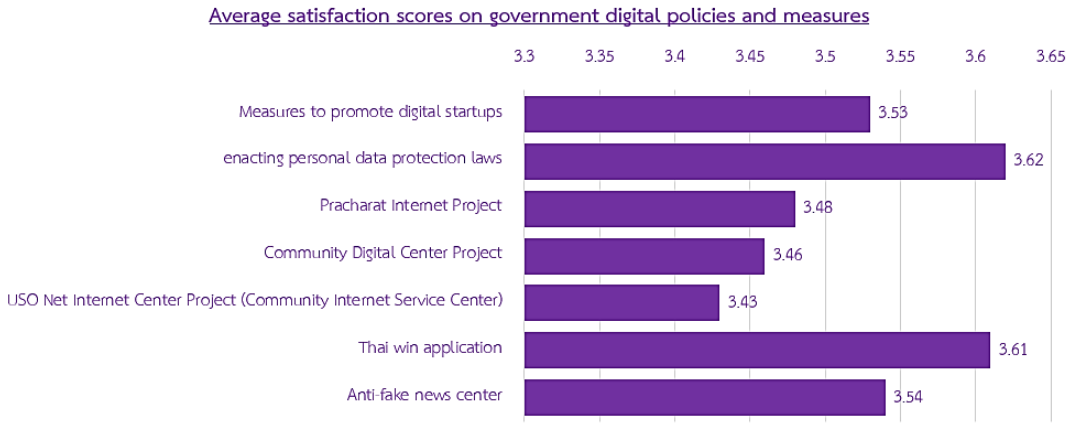
For the Thai Chana application, most organisations are satisfied with both the implementation policy and the quality of the easy-to-use application. There is a suggestion to continouly develop and enhance its performance in controlling COVID management and operation.

Anti-fake news center, most agencies are satisfied with the idea but it has not been much used or they have not seen a clear benefit from implementing this measure.

Table 154 Percentage of the average satisfaction on the government's digital policies

Implementation of government digital policies and measures	The average satisfaction score
Measures to promote digital startups	3.53
Enacting personal data protection laws	3.62
Pracharat Internet Project	3.48
Community Digital Center Project	3.46
USO Net Internet Center Project (Community Internet Service Center)	3.43
Thai Chana application	3.61
Anti-fake news center	3.54

Figure 38 Diagram illustrating the average satisfaction on the government digital policies and related measures



10.2.9 Problems and obstacles to implement the government's digital policies and measures to promote digital economic and social development

Most of the opinions from agencies pointing to the policy issues and government actions that still do not support business operations in the digital era especially to support the private sector in investing in digital technology. There is no clear project or policy in this regards. Developing digital workforce skills that still have a lot of shortages and access to government services that are more convenient and faster. Businesses and private sectors are also facing difficulties in accessing government online systems, most of them still need to visit the government office to do document transactions.

10.2.10 Additional recommendations and comments on the implementation of the government's digital policies and measures to promote digital economic and social development

There were additional comments on asking for concrete support from the government in digital technology investments both in the form of financial support and knowledge especially small organisations that do online business but still lacking of both experience and investment. It is unable to compete with large companies including the development of the government service system to be modern, easy to use, and reduce the use of documents for contacting services with different government agencies.

10.3 Survey results obtained from the primary unit sample group

10.3.1 Data of the survey respondents

A number of sample groups that are primary care units such as remote schools, Community Health Center, Community Hospital in conducting surveys in the 6 target areas / regions excluding Bangkok. It is mainly an online survey. There are 935 primary care units who have responded to the survey, which exceeds the target of 397agencies, which can be divided into 6 areas/regions across the country as follows:

Area

Table 155 Percentage of the sample group

Regions	Number of samples	Percentage
Northern	262	28.0
Southern	104	11.1
Central	26	2.8
Western	60	6.4
Eastern	108	11.6
Northeast	375	40.1

Type of organisation

From the classification of the sample number of the primary care units, there were 42.6% of Tambon Health Promoting Hospitals, Community Hospitals at 5.2%, schools at 51.7% and other organisation at 0.5% such as community health centers. In considering a number of personnels, organisation with the personnel number 11-50, the

unit with the highest the proportion in the sample group is 72.4% and containing the the units with 0-10 personnel at 24.1%, and there are hundreds of units outside the municipality at 89.8% and at 10.2% in municipalities, with an average operating life of 38.2 years for all departments.

Table 156 Percentage of the agency types

Unit type	Number of samples	Percentage
Tambon Health Promoting Hospital (Hospital Sat.)	398	42.6
Community Hospital (ARD)	49	5.2
School	483	51.7
Others	5	0.5

Table 157 Percentage of the staff numbers

Number of personnel	Percentage
0 - 10 people	24.1
11 - 50 people	72.4
51 - 200 people	1.4
201 - 500 people	1.9
501 - 1000 people	0.2
1,001 – 5,000 people	0.0
more than 5000 people	0.0

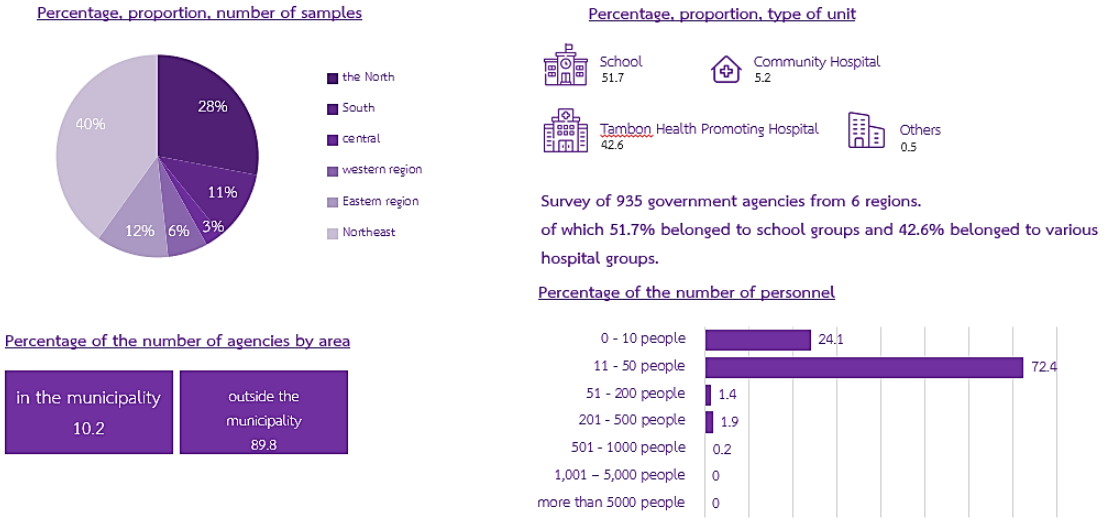
Table 158 Percentage of the agency numbers in each area

Area	Percentage
in the municipality	10.2
outside the municipality	89.8

Table 159 The average operating period of all agencies

Details	Ages
The average operating life of all units	38.2

Figure 39 Diagram illustrating data ofprimary service agencies sample group



10.3.2 Survey results on Internet usage

Regarding the sample group, it was found that 76.4% of the organisations used the Internet, and did not use the Fixed broadband Internet at 23.6%. The first top tree of Internet types that are most used are Fixed Broadband Internet at 91.6%, 2) 4G mobile broadband Internet at 21.2%, 3) 3G mobile broadband Internet at 111.1%.

The top 3 of Internet speeds were 1) 30-100 Mbps (40.2%), 101-300 Mbps (19.9%), and 3) 301-500 Mbps (13.4%).

The top 3 of of fixed broadband cabling types that are most used were 1) 80.2% FTTx fiber optic cabling, 2) cabling such as Hybrid Fiber Coaxial and Coaxcial at 13.1%, and 3) other cable types, for example, Leased Line at 11.3%. However, there are organisations that have installed high-speed Internet networks with fiber optic cables in the region of state by the Ministry of Digital Affairs, 65.9%, and no high-speed Internet network installed with fiber optic cable (Fiber Optic) of the government by the Ministry of Digital at 34.1% which was stablished and in use as a public Internet project for 18.7%, a project to expand high-speed Internet to improve quality of life 32.1%

As for the demand og 5G network installations, there are 99.9% of the organisation having 5G deployment requirements, and 0.1% of them has no demand.

The average monthly Internet cost, it was found that with organisation with the average monthly Internet expenses of less than 5,000 baht (80.2%), at 5.3% of the monthly expenses for Internet use of 5,001-10,000 baht, and monthly expenses of 10,001-50,000 baht at 0.4%.

The top 3 objectives of using the Internet are 1) to support Internet searches for 68.1%, 2) to use in online learning/teaching at 60.1% and 3) to use for communication at 46.1 and other purposes for 0.1% such as sending and receiving E-mail and online ordering.

Based on the survey data on the use of the Internet to support telework (Telework)/ Online Learning, it was found that there are organisations that use the Internet to support telework (Telework) / Online Learning (Online Learning) for 76.4%, classified by the highest the proportion, the top 3 of are: 1) used from 1-3 years for 68.9% 2) used from 6 months but less than 1 year for 3.9% and 3) less than 3 months for 1.7% and there are organisation that do not use the Internet to support telework (Telework)/Online Learning for 23.6%.

According to a survey of the effects during coronavirus period on Internet usage in organisations, Internet using was increased for 44.6%, decrease for 18.5% and the same for 36.9%.

Regarding the use of online government serviecs, it was found that 96.0% of organisations had used online government serviecs and never use at 4.0%. During the past 12 months, government services were available online. The top 3 of most active users were; 1) 41.1% of the use of internal information systems in the ministry, 2)39.9% of the use of electronic public finance and fiscal management systems, and 3)11.4% of the government registrar system and other systems of 1.2% such as online service systems, National Health Insurance Office, the public health system, health resource information system, and primary care units.

Table 160 Percentage of agencies with access to the internet

Organisations that use the Internet	Percentage
Internet avialability	76.4
No Internet	23.6

Table 161 Percentage of the internet speed of each agency

Internet speed	Percentage
less than 30 Mbps	8.4
30 - 100 Mbps	40.2
101 - 300 Mbps	19.9
301 - 500 Mbps	13.4
501 – 1000 Mbps	11.9

Internet speed	Percentage
more than 1000 Mbps	0.3
Don't know/not sure	5.9

Table 162 Percentage of the internet types

Type of Internet	Percentage
Installing fixed broadband Internet	91.6
• Copper cable type xDSL such as ADSL, SDSL, VDSL.	10.0
• Cable type such as Hybrid Fiber Coaxial and Coaxcial.	13.1
• FTTx fiber optic cable type	80.2
• Other types of lines such as leased line Internet circuits	11.3
• Wireless type, such as Fixed Wireless Access (for example, SIM card type Internet router)	9.1
• Satellite Internet such as IPSTAR	5.4
• Don't know/not sure.	14.4
Use 3G mobile broadband Internet.	11.1
Use 4G mobile broadband Internet.	21.2
Use 5G mobile broadband Internet	0.0
Use Narrowband Internet Service	9.2
• Type of telephone line connection (Analogue Modem, Dial-up VIA Standard Phone Line)	2.4
• Mobile Internet that is lower than 3G technology, such as 2G technology, GPRS technology.	0.0
Don't know/not sure	15.3

Note: Percentage of calculation results in the table from questions with more than 1 answer, survey data from "Other" responses did not contain statistically significant details.

Description:: DSL**,** short for Digital Subscriber Line, is a modem technology that makes a pair of ordinary copper cables to become a high-speed digital signal medium by using a technique to encode the signal (Modulation) in the frequency band that is higher than general phone use. This allows us to transmit data while using the phone.

Hybrid Fiber Coaxial Network (HFC) is a network that combines Optical Fiber Cable and Coaxial Cable by combining the advantages of each conductor. The transmission of signals, whether it is audio, images and data.

FTTx stands for Fiber To The x, where x is an abbreviation for various applications such as FTTH (Fiber To The Home) or FTTB (Fiber to the Building), etc. It is a network that uses Fiber Optic to Connect all the whole system whether starting at the junction Drag it to the destination, all using Fiber Optic.

Fixed Wireless Access is the transmission of Internet signals through wireless waves to the receiver and to allow this receiver to transmit the signal to the network in the building.

Table 163 Percentage of government installations of fiber optic-based high-speed Internet network by the Ministry of Digital Economy and Society

Installation of high speed Internet network with fiber optic cable (Fiber Optic) of the government by the Ministry of Digital	Percentage
Installation is done.	65.9
• Has/has been installed	
o Active	18.7
o Pracharat Internet Project	32.1
o High-speed Internet expansion project to improve quality of life	15.0
• Not in use	0.1
No high speed Internet is installed.	34.1

Note: Percentage of calculation results in the table from questions with more than 1 answer, survey data from "Other" responses did not contain statistically significant details.

Table 164 Percentage of the requirements to install 5G networks

5G network installation requirements	Percentage
There is a requirement to install	99.9
No need to install	0.1

Table 165 Percentage of the average monthly Internet expense

Average monthly Internet cost	Percentage
less than 5,000 baht	80.2
5,001-10,000 baht	5.3
10,001-50,000 baht	0.4
More than 50,000 baht	0.0
Don't know	14.1

Table 166 Percentage of the objectives in using Internet of each agency

Objectives of the organisation's Internet use	Percentage
to support searching for information from the Internet	68.1
to support access and use of corporate systems	43.3
to support data transmission between departments or branches	12.2
to use as a backup channel	5.6

Objectives of the organisation's Internet use	Percentage
for use in communication	46.1
for data analysis (Data Analytics)	3.4
to work	22.7
for use in online learning/teaching	60.1
others	0.1

Note: Percentage of calculation results in the table from questions with more than 1 answer, survey data from "Other" presents the same direction of answers.

Table 167 Percentage of using the internet to support teleworking/online learning

Using the Internet to support remote work (Telework) / Online Learning (Online Learning)	Percentage
More than 3 years	0.4
From 1-3 years	68.9
From 6 months but less than 1 year	3.9
From 3 months but less than 6 months	1.5
Less than 3 months	1.7
Inactiveness	23.6

Table 168 Percentage of the COVID-19 effect on the use of internet in each agency

Effects of Covid on Internet Use in Organisations	Percentage
More	44.6
Reduced	18.5
Same	36.9

Table 169 Percentage of using government online services

Using online government serviecs	Percentage
Ever	96.0
Never	4.0

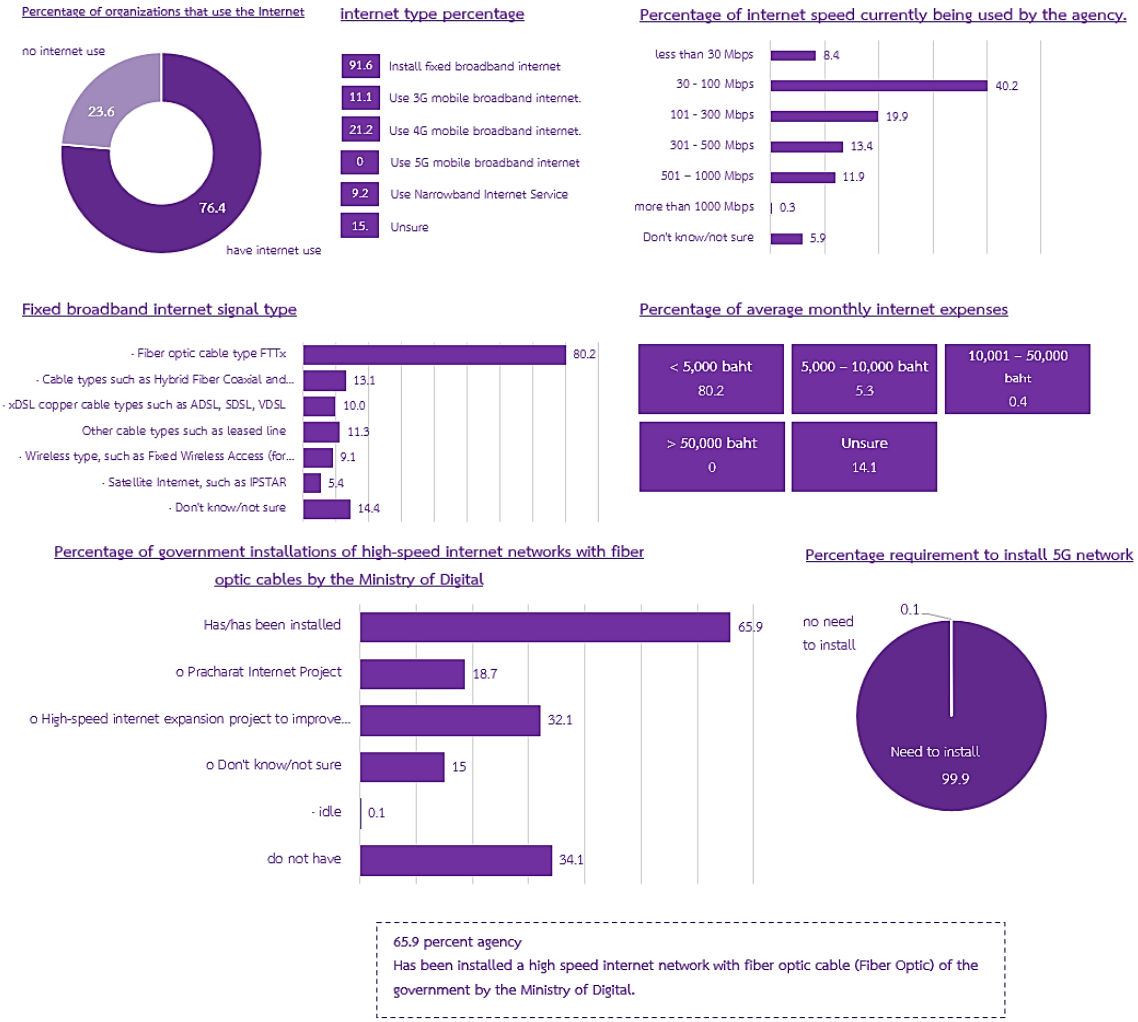
Table 170 Percentage of using government online services in the past 12 months

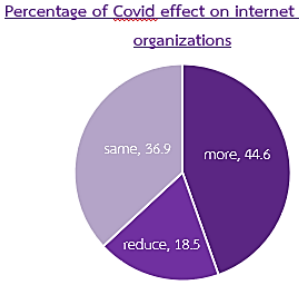
Online use of government services in the past 12 months	Percentage
Pay electricity/water/phone/utilities bills	6.7
Use the electronic government fiscal and financial management system	39.9
Use the service of information systems within the ministry (Intranet)	41.1
Personnel management system	9.8

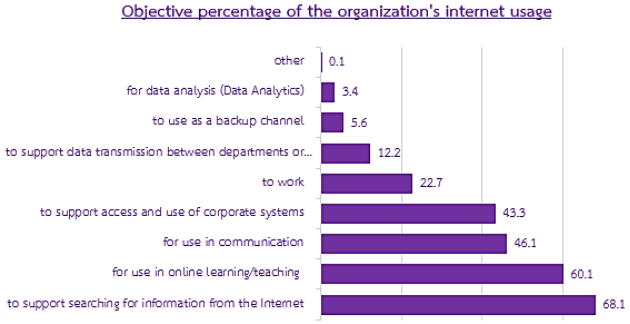
Online use of government services in the past 12 months	Percentage
Government registrar system	11.4
Others	1.2

Note: Percentage of calculation results in the table from questions with more than 1 answer. The survey data from the "Other" responses were similar in the same way.

Figure 40 Diagram illustrating statistical data on Internet usage

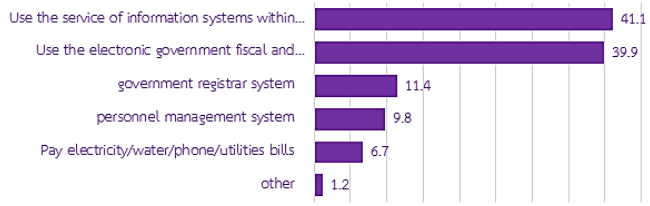




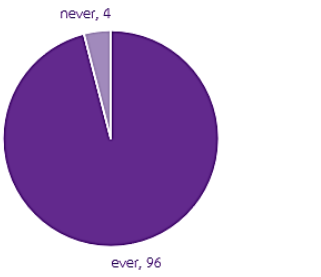


Percentage of internet use to support remote work (Telework)/Online Learning

	inactive	less than 3 months	From 3 months but less than 6 months	From 6 months but less than 1 year	from 1-3 years	more than 3 years
percentage	23.6	1.7	1.5	3.9	68.9	0.4



	other	Pay electricity/water/phone/utilities bills	personnel management system	government registrar system	Use the electronic government fiscal and financial management system	Use the service of information systems within the ministry (Intranet)
percentage	1.2	6.7	9.8	11.4	39.9	41.1



96% of agencies use online government services, most of which use the government fiscal and fiscal management system. electronic form and use of information system services within the Ministry

10.3.3 Survey results on the use of online services by the agencies

Survey results on general online services of organisations

As for the online services of the organisations, it was found that the top 3 online services that was provided were; 1) online learning services 80.5%, 2) public relations about the agency's information or receiving services of the agency 60.8%, 3) giving 57.2% of online knowledge and 2.6% of other services, such as chat and documents downloading.

Regarding the online channel to promote the mission or service, it was found that 85.9% of organisations had online channels for publicizing their missions or provided services, and 14.1% have no online channels. The top 3 highest rankings are; 1) Facebook 85.8%, 2) Website 38.6% and, 3) Line 31.2% and the highest proportion of top 3 of period in rank for online channels are; 1) more than 3 years at 69.1% 2) from 1-3 years at 24.0% and 3) from 6 months but less than 1 year at 3.8%.

However, there are 90.8% of organisations with online service recipients, and 9.2% without service recipients comparing to a number of service recipients before the Covid or September-November 2020 and during the Covid period or December 2020 - July 2021, it was found that there were 55.4% increase in a number of online users after the coronavirus, the 20.8% decline in a number of online users after the coronavirus, and the same number of online users at 23.8%, when considering the%age of change in order of the top 3 organisational units, it was found that 1) the change was less than 30%, 38.0%, 2) the change was 50%-99%, 25.6% and 3) change less than 50% 18.8%.

Table 171 Percentage of government online services providing in the past 12 months

The use of online government serviecs in the past 12 months	Percentage
Online education	57.2
Publicize the information of the agency or access to the services of the agency	60.8
Providing booking services to the public	13.5
Provide agency platform	9.1
Receive complaints/grievances	23.3
Online learning service	80.5
Service for booking appointments for medical treatment	14.5
Treatment service/meet a doctor online	14.4
Medical expenses/education expenses	6.5
Public relations activities	6.8
Others	2.6

Note: Percentage of calculation results in the table from questions with more than 1 answer, survey data from “Other” presents the same direction of answers.

Table 172 Percentage of online channels for promoting the mission or providing services

An online channel for publicizing the mission or providing services	Percentage
Online channels aviability	85.9
No online channels	14.1

Table 173 Percentage of online channels in promoting the organisation’s mission or providing services

Agency online channel format	Percentage
Website	38.6
Facebook	85.8

Agency online channel format	Percentage
Instagram	2.3
Youtube	9.5
Line	31.2
On government platforms	2.6
Tiktok	8.2
Others	1.6

Note: Percentage on calculation results in the table from questions with more than1 answer, survey data from "Other" responses did not contain statistically significant details.

Table 174 Percentage of the period of time that agencies have online channels

Length of time the agencies have online channels	Percentage
More than 3 years	69.1
From 1-3 years	24.0
From 6 months but less than 1 year	3.8
From 3 months but less than 6 months	2.0
Less than 3 months	1.1

Table 175 Percentage of agencies that have provided services to users through online channels

The agencies have service recipients through online channels	Percentage
There are the service recipients.	90.8
No have service recipients	9.2

Table 176 Percentage of the change in the number of onlie users before and after the COVID-19 pandemic

Changes in a number of subscribers of online channels	Percentage
Comparing between before and after COVID	55.4
Using online services has increased after the COVID-19 outbreak	20.8
Online service usage has declined after the COVID-19 pandemic	23.8

Table 177 Percentage of the change in the number of onlie users before and after the COVID-19 pandemic

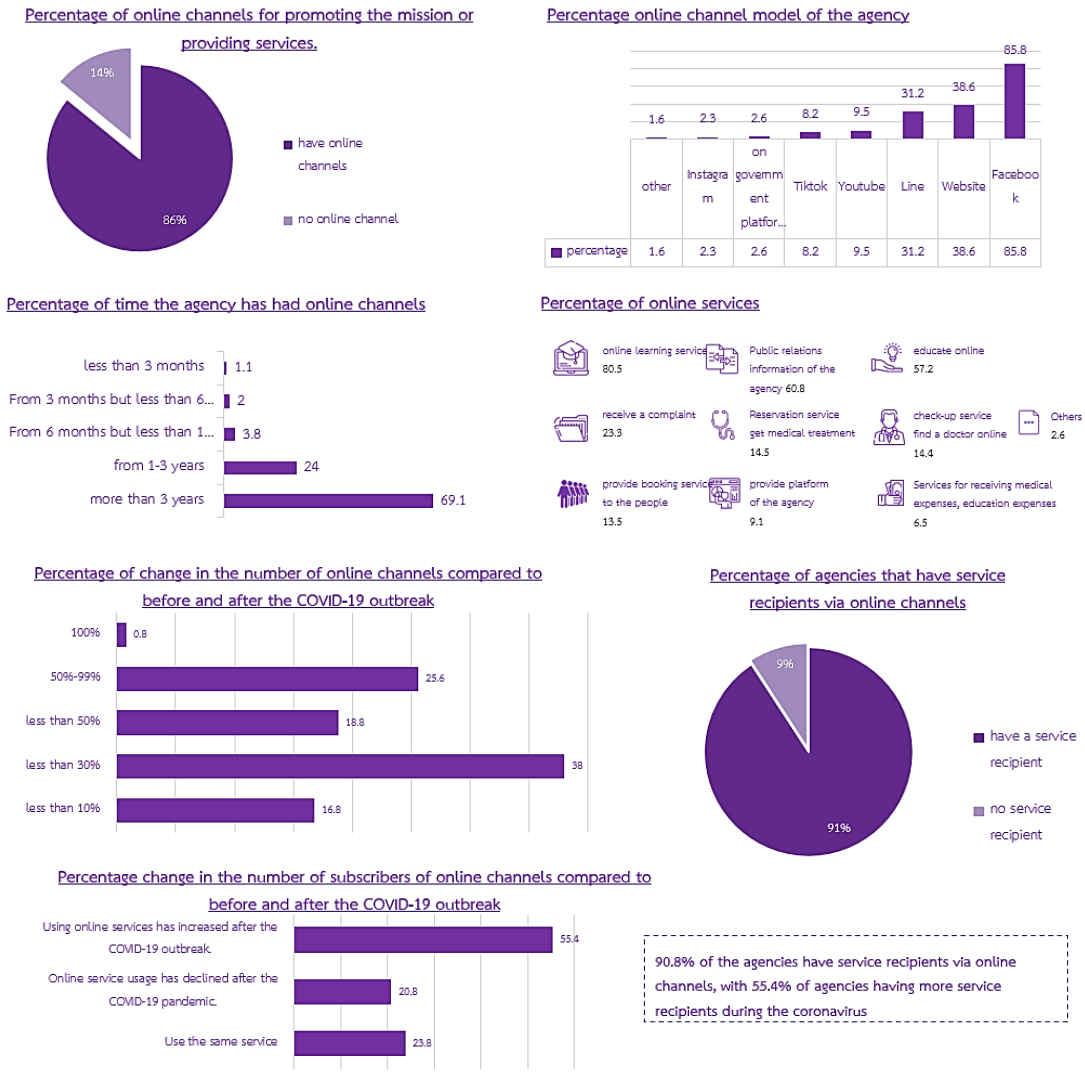
Changes in a number of subscribers of online channels	Percentage
Comparing between before and after COVID	0.8
100%	25.6

Changes in a number of subscribers of online channels	Percentage
50%-99%	18.8
less than 50%	38.0
less than 30%	16.8

Explanation: Pre-Covid is between September-November 2020.

The Covid period is from December 2020 - July 2021.

Figure 41 Diagram illustrating the information of online services providing



Survey results on Cloud service

Based on Cloud service usage survey data, it was found that 45.7% of the organisations used Cloud services, most of them have operated Cloud more than 3 years at 20.9%, been in operating of 1-3 years ago at 16.0% and been doing from 6 months to less than a year at 5.6%, with public Cloud 67.2%, government Cloud (GDCC), 30.9%, and enterprise Cloud (Private Cloud) at 2.1%.

The top 3 of objectives of Cloud usage were 1) 75.2% email system, 2) 39.9% storage of files, and 3) ffice applications (Office software) support at 14.8% and other purposes at 17.8% such as trial using to backup the system.

Table 178 Percentage of using Cloud services to support operations

The proportion of using Cloud services (Cloud) to support operations	Percentage
Operate for more than 3 years	20.9
It has been in operation for 1-3 years.	16.0
It has been in operation for 6 months, but less than 1 year.	5.6
It has been in operation for 3 months but less than 6 months.	2.0
It has been in operation for less than 3 months.	1.2
Inactiveness	27.5
Not sure	26.8

Table 179 Percentage of Cloud services in use

Cloud services in use	Percentage
Government Cloud (GDCC)	30.9
Private Cloud (Public Cloud)	67.2
Enterprise Cloud (Private Cloud)	2.1

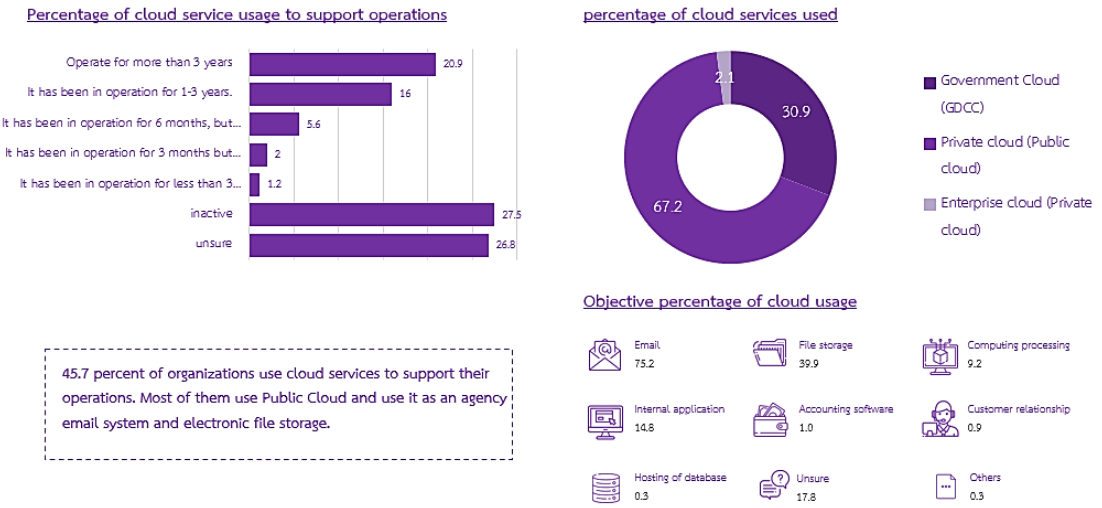
Note: Percentage of calculation results in the table from questions with more than one answer

Table 180 Percentage of the objectives in using Cloud services

The purpose of using the Cloud	Percentage
It is the organisation's e-mail system (Email).	75.2
Electronic file storage (Storage of files)	39.9
Supports processing or running various programs/applications (computing power)	9.2
Support for office applications (Office software)	14.8
Support software in accounting and finance systems	1.0
Support for customer relationship management (CRM) software	0.9
Support database system (Hosting of database)	0.3
Don't know/not sure	0.3
Others	17.8

Note: Percentage calculation results in the table from questions with more than 1 answer, survey data from “Other” responses did not contain statistically significant details.

Figure 42 Diagram illustrating the use of Cloud Services



Data analytics survey results

From the survey data on data analysis, it was found that 39.0% of the data analysis organisation were conducted, and 31.1% were not performed over 3 years, 22.2% had performed 1-3 years at 10.8% and 2.9% of them had been doing it for 6 months - but less than a year, and 95.4% of the model was self-operated and 4.6% of them purchased external analytics services.

The expected benefits from performing the top 3 of data analysis are 1) an increase in customer satisfaction by 73.2%, 2) analyzing and identifying 67.6% of recipients or groups of service recipients, and 3) improving the process of providing services that meet the needs of 63.9% and other benefits of 24.7% such as to track and manage expenses, personnel performance statistics analysis and management policy analysis. There are organisations that have links to data exchange with government or private organisation at 86.0%, and no link to data exchange with government or private organisation at 14.0%.

Table 181 Percentage of implementing data analytics to increase operational efficiency

Data analytic operation	Percentage
Operate for more than 3 years	22.2
It has been in operation for 1-3 years.	10.8
It's been in operation for 6 months - but less than 1 year.	2.9
It's been done for 3 - but less than 6 months.	2.4
It has been in operation for less than 3 months.	0.7
Unsure	29.9

Data analytic operation	Percentage
No action	31.1

Table 182 Percentage of the data analytics patterns

Data analytics patterns	Percentage
Organisation in self-operation	95.4
Purchase a third-party analytics service	4.6

Table 183 Percentage of the expected benefits from implementing data analysis

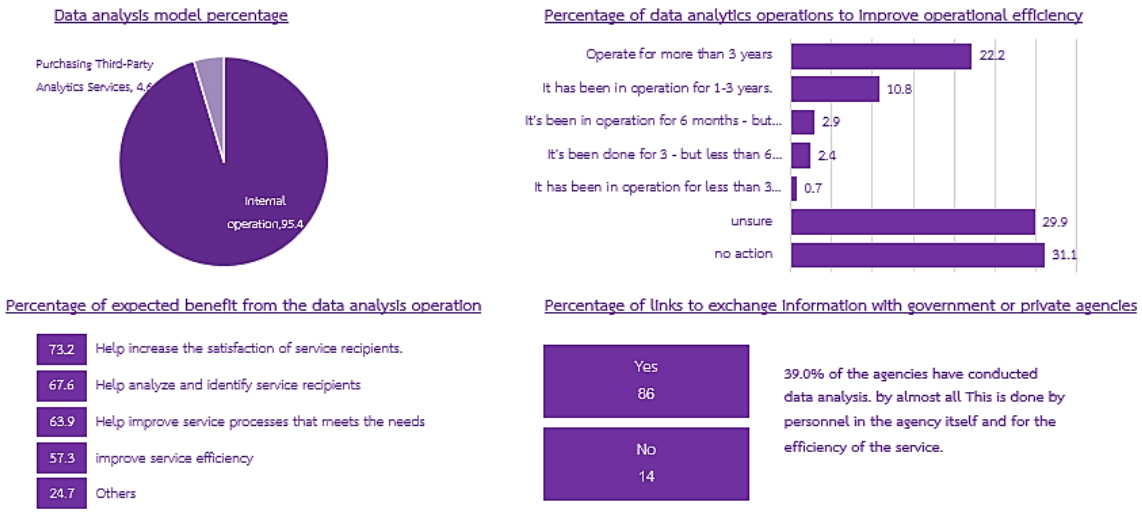
Expected benefits of implementing data analysis	Percentage
Analyze and identify service recipients or groups of service recipients. according to various characteristics	67.6
Increase the satisfaction of service recipients	73.2
Improve service processes that meets the needs	63.9
Improve service efficiency	57.3
Others	24.7

Note: Percentage of calculation results in the table from questions with more than 1 answer, survey data from "Other" responses did not contain statistically significant details.

Table 184 Percentage of data exchange with government or private agencies

Data exchange with government or private organisations	Percentage
Have	86.0
Do not have	14.0

Figure 43 Diagram illustrating the implementation of data analytics



10.3.4 Survey results on digital skills and work

According to the digital skills and workforce servey, the percentage of IT staff per total number of employees was found that there were 74.9% of units with IT staff per total number of employees. The total number of employees is 10-19%, representing 12.7%, and there are departments with IT staff per total number of employees 5-9%, representing 12.4%. The top 3 highest proportions are 1) 15,000-29,999 baht, 50.2% 2) less than 15,000 baht, 16.9%, and 3) 30,000-49,999 baht 3.2% because the salary information is not disclosed, resulting in an unknown proportion/ not sure at 28.4%.

When considering the Information and Communication Technology system operations, it was found that the hightest top 3 duties performed by personnel within the organisations are; 1) Website service development or e-commerce system of the agency 25.7% 2) maintaining the organisation's Information Technology infrastructure such as computers and Internet networks at 20.3% and 3) analyzing and developing software and applications (programmer) at 13.7% and other duties at 0.2%, such as website design officers, graphic staff and duties performed by outside experts, the top 3 are: 1) website service development or e-commerce system of the agency 24.1%, 2) analyzing and developping software and applications (programmer) at 16.5%, and 3) maintaining the organisation's Information Technology infrastructure such as computers, 15.2% of the Internet network, and other duties at 0.1%, such as staff who record information in the system.

In the survey of staff training by considering the organisations that have a percentage of training to staff comparing to the total number of officers ranked according to the proportion of the top 3 organisations: 1) organisations with trained staff 30-49% or 35.7%, 2) organisations with trained staff 10-29% representing 13.2%, and 3) organisations with more than 50% of trained staff, accounting for 10.9% in terms of training for IT staff, considering the percentage of organisations that provide training to staff. The IT aspect is compared to the training for all staff of the organisations according to the proportion of the highest 3 organisations: 1) the organisations that provides training for IT staff less than 10%, representing 43.1%, 2) the organisations that provides training for IT staff, 10-29%, representing 12.6%, 3) the organisations that provide training for more than 50% of IT staff at 11.7%.

From the survey data on the proportion of employees working with computers, the top 3 of are 1) organisations with more than 80% of staff, accounting for 34.2%,

2) organisations with less than 10 % employees representing 19.7% and 3) organisations with staff working with the computer equipment 50-80%, representing 16.1%.

In terms of applying robot technology to help increase operational efficiency, it found that 88.7% had no implementation and 11.3% had implemented over 3 years represented at 7.5% by 1to 3 years in operation at 1.8%, operation from 6 months but less than 1 year at 1.0%.

Table 185 Percentage of IT staff compared to all employees

The percentage of IT staff to total headcount	Percentage
more than 20%	0.0
10-19%	12.7
5-9%	12.4
less than 5%	74.9

Table 186 Percentage of the average monthly salary of IT staff

The average salary of IT staff	Percentage
70,000 baht or more	0.8
50,000-69,999 baht	0.5
30,000-49,999 baht	3.2
15,000-29,999 baht	50.2
less than 15,000 baht	16.9
Don't know/not sure	28.4

Table 187 Percentage of ICT systems operation

Details	In-house personnel	External experts
Analyze and develop software and applications (Programmer)	13.7	16.5
Analyze data from large databases (Data Engineer, Data Analyst, Data Scientist)	0.6	2.6
Maintain database management and analyze data (Database Administrator)	11.3	12.9
Take care of the maintenance of the organisation's Information Technology infrastructure such as computers, Internet networks.	20.3	15.2

Details	In-house personnel	External experts
Take care of maintenance of electronic business systems such as ERP, CRM or database systems.	0.6	2.2
Develop website services or the agency's e-commerce system	25.7	24.1
operating technician provide assistance Solve problems with ICT (Information Technology and Communications support) users.	10.8	11.2
Maintain Information Technology security (IT Security) and maintain personal information.	4.5	3.6
ICT Project Manager and Coordinator (IT Project Manager, Project Coordinator)	3.2	3.6
Develop the organisation's Information Technology architecture (IT Architect).	0.0	0.8
General management personnel, such as managing the agency's Information Technology assets	9.1	7.1
Others	0.2	0.1

Note: Percentage of calculation results in the table from questions with more than 1 answer, survey data from "Other" were similar in the same way.

Table 188 Percentage of the number of trained personnel compared to all agency's staff

Proportion of the number of trained staff	Percentage
More than 50%	10.9
30-49%	35.7
10-29%	13.2
Less than 10%	10.4
Not sure	26.7
No training	3.1

Table 189 Percentage of the number of trained iT personnel compared to all agency's staff

Proportion of the number of trained IT staff	Percentage
More than 50%	11.7
30-49%	5.2
10-29%	12.6
Less than 10%	43.1
Not sure	27.4
No training for IT staff	11.7

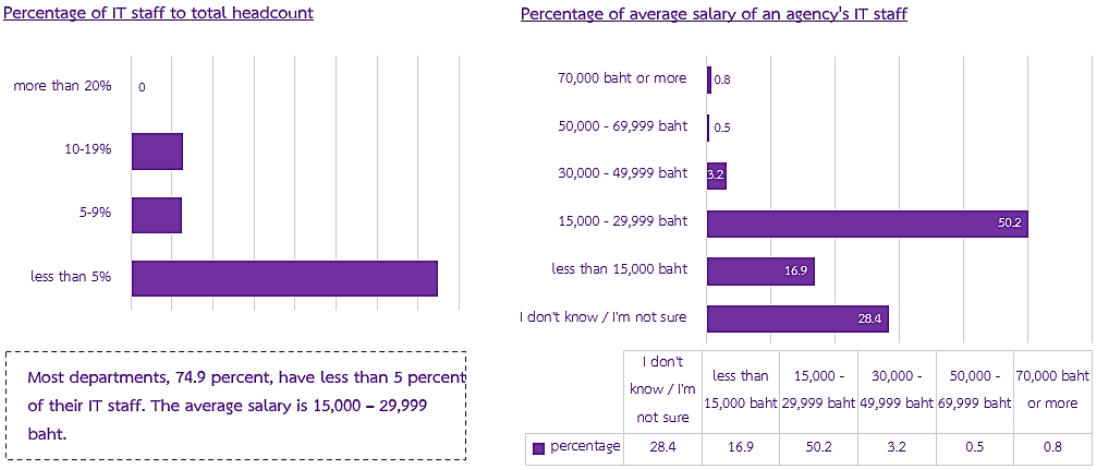
Table 190 Percentage of the staff working with computers

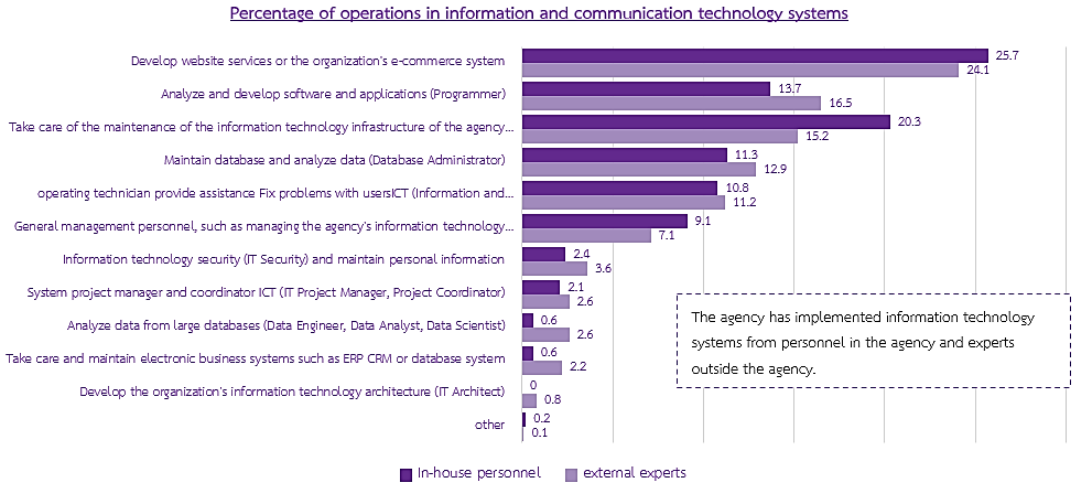
Number of staff working with computer equipment	Percentage
More than 50%	34.2
30-49%	16.1
10-29%	6.5
Less than 10%	10.5
Not sure	19.7
No training for IT staff	12.9

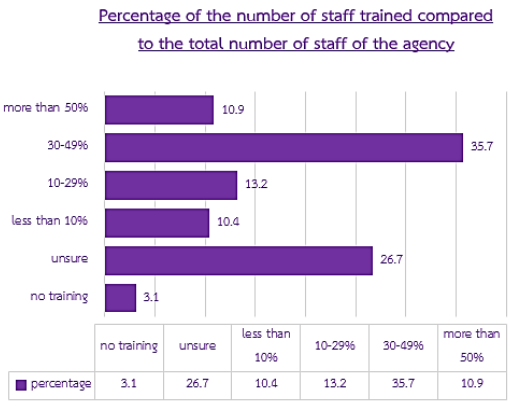
Table 191 Percentage of implementing robotic technology to increase operational efficiency

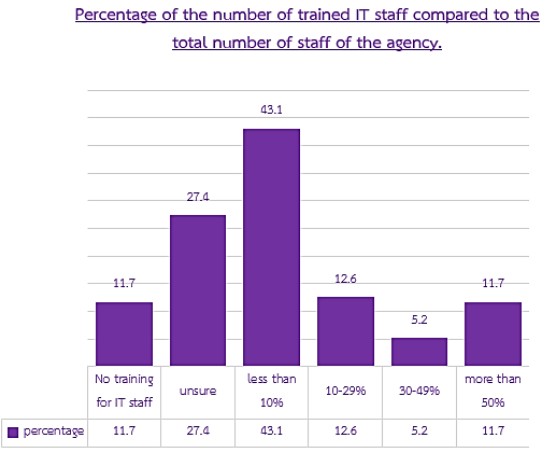
Using robot technology to improve operational efficiency	Percentage
Operate for more than 3 years	7.5
It has been in operation for 1-3 years.	1.8
It has been in operation for 6 months, but less than 1 year.	1.0
It has been in operation for 3 months but less than 6 months.	0.3
It has been in operation for less than 3 months.	0.7
Not in use	88.7

Figure 44 Diagram illustrating digital working skills

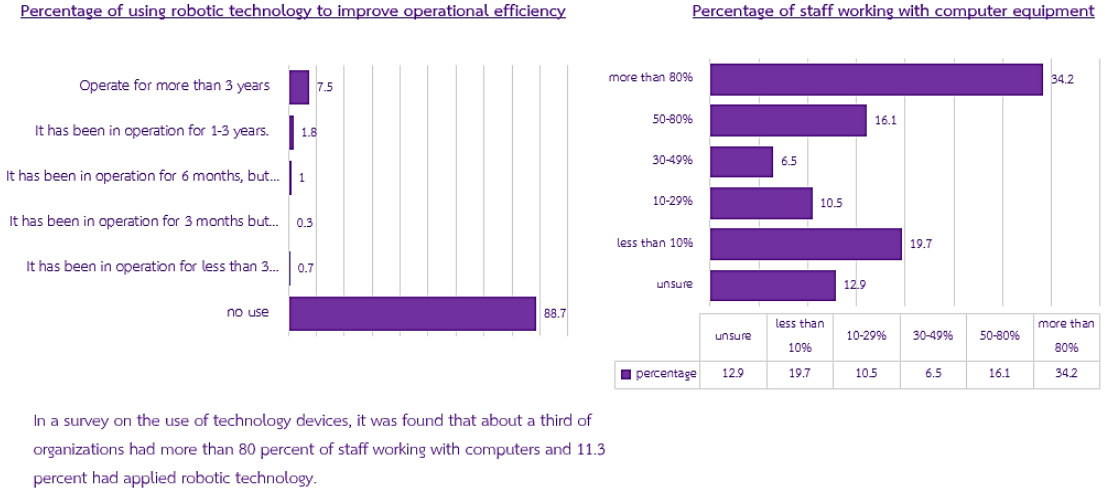








- Most agencies provide training for a larger proportion of their staff than their IT staff.
- by 38.6% of agencies that provide training to IT staff in the proportion of employees less than 10 percent



In a survey on the use of technology devices, it was found that about a third of organizations had more than 80 percent of staff working with computers and 11.3 percent had applied robotic technology.

10.3.5 Survey results on trust and the digital security

Regarding data from the digital trust and security survey, the Personal Data Protection Act (PDPA) found that 69.7% of agencies knew the Personal Data Protection Act and 30.3% were unknown, 31.6% are under study, 19.0% have not started, and 15.0% are in the process, with 14.6% of the units being fully ready.

In terms of security incidents in Information Technology (Security Incident), 39.7% of agencies had experienced problems and 60.3% had never encountered this problem. The most common problems in the last 12 months were 1) a device infected with virus (Virus)/Trojan (Trojan) / Malware (Malware) until it damaged to the device or various data within the device 70.2%, 2) personal data was breached or Privacy and Security 12.6% and 3) lost money from phishing messages and 9.3% of phishing attacks.

The top 3 of of highest IT security measures are as follows: 1) Have a system to prevent cyber attacks, such as an antivirus system. Firewall 61.0%, 2) 54.5% personnel awareness, 3) 33.3% authentication system and 0.1% other measures such as Internet termination.

Table 192 Percentage of the number of agencies that are aware of the Personal Data Protection ACT (PDPA)

Using robot technology to improve operational efficiency	Percentage
Know	69.7
Do not know	30.3

Table 193 Percentage of the agencies' readiness in managing personal data in accordance to the Personal Data Protection ACT (PDPA)

The readiness of the organisation to control personal data to comply with the Personal Data Protection Act	Percentage
Completeness	14.6
On process	15.0
Under study	31.6
Not yet started	19.0
Do not know / Not sure	19.7

Table 194 Percentage of IT security incidents

The readiness of the agency to control personal data	Percentage
To comply with the Personal Data Protection Act	70.2
The device is infected with a virus (Virus)/Trojan/Malware causing damage to the device or various data within the device.	12.6
Infringement of personal data or privacy (Privacy and Security)	9.3
Lose money from phishing messages/emails and get trapped by phishing attacks.	5.1
Lose money due to hacking of data and system	60.3

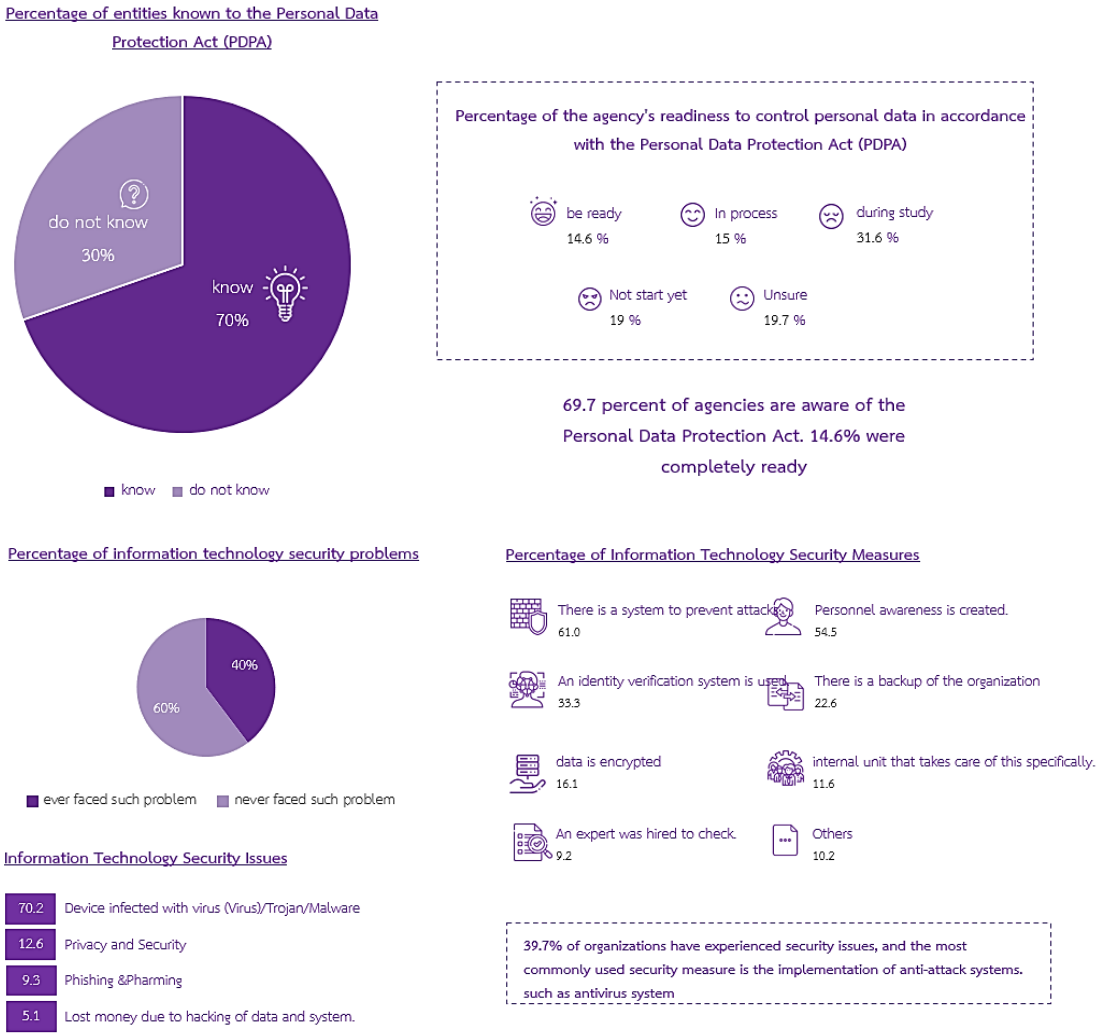
Note: Percentage of calculation results in the table from questions with more than 1 answer.

Table 195 Percentage of the security measures in IT

Information Technology Security Measures	Percentage
An identity verification system is used.	33.3
There are systems to prevent cyber attacks such as antivirus systems. firewall system	61.0
Data is encrypted.	16.1
There is a backup of the organisation.	22.6
Personnel awareness is created.	54.5
There is an internal unit that takes care of this specifically.	11.6
Experts are hired to check periodically.	9.2
No measures	18.7
Others	0.1

Note: Percentage of calculation results in the table from questions with more than 1 answer, survey data from "Other" responses did not contain statistically significant details.

Figure 45 Diagram illustrating data on trust and the digital security



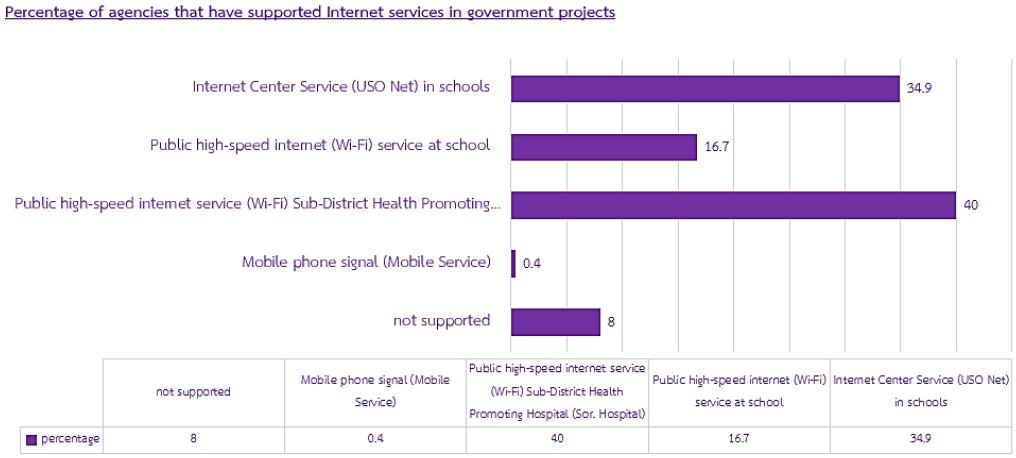
10.3.6 Implementing digital policies and measures to promote government digital economic and social development

As for the support of Internet services in government projects, it was found that 34.9% of schools supported Internet Center Services (USO Net), public high-speed Internet (Wi-Fi), 16.7% of schools, Internet services, public high speed (Wi-Fi) 40.0% of the sub-district health promoting hospitals, at 0.4% of the mobile phone signal (Mobile Service) with 8.0% of the unsupported organisations.

Table 196 Percentage of agencies receiving internet services support from government projects

Internet services support in government projects	The percentage
Internet Center Service (USO Net) in schools	34.9
Public high-speed Internet (Wi-Fi) service at school	16.7
Public high-speed Internet service (Wi-Fi) Sub-District Health Promoting Hospital	40.0
Mobile phone signal (Mobile Service)	0.4
No support	8.0

Figure 46 Diagram illustrating the percentage of agencies receiving the support on providing Internet services from the government project



10.3.7 Problems and obstacles in utilizing ICT for services providing in your organisation

From the survey data, it was found that most of the problems were the lack of skilled personnels in ICT technology to develop an efficient online service system and interest to users including the skills of ICT users such as teachers, medical personnel and other related personnel that must use the ICT system to provide services which still require knowledge and practice to understand how to use the online system to provide efficient service. It is lack of personnels and skills in producing interesting media and online content especially the media which are animated or short videos which requires a production process that requires specialized skills to provide online service system with useful and interesting content. It is lack of ICT personnel to maintain computer equipment. It is a cause of damaged equipment and cannot be used. That is worth the investment and the lack of key personnel to look after the quality of online services

when there are people using services such as tracking the progress of a service request or answering questions via online channels.

The lack of support budget is another major problem facing in many agencies. The budget for the development of the system to provide online services has a binding cost, such as the cost of the Internet, software purchase cost system, maintenance cost Including the cost of hiring external experts to develop the system and the content of the online service.

10.3.8 ICT issues requiring government assistance

Organisations will need the ICT assistance from the government in 5 issues that are: 1) Internet system, 2) device support, 3) development on ICT skills, 4) ICT personnels, and 5) budget support.

Internet system: it's a matter of requesting high-speed Internet access and the signal is distributed covering the work area of the organisation, such as installing a Wifi system in the organisation for personnels, staff, including students, service users in the organisation, able to use high speed Internet from any location Including Internet service fee at a special price for government organisation in the public use.

The request-to support the equipment or deices for the personnels. There should be a provision of the qualified and sufficient devices for a number of staff and the equipment is replaced when the time is right in order to be able to use various systems soon, including equipment for students, especially during the COVIDs that needs online learning. Students are facing the problem of lack of computer equipment and the Internet for online learning.

The development of ICT knowledge skills, it was asked for the support to organize skills training for new employees and personnels who are active in order to work on the system more proficiently which is the content of the use of various systems as basic software usage, general Internet usage and Internet security.

The issue of ICT personnel is a request for supporting more staff for operating and being responsible for the IT system in the unit or having a duty to take care of the system security of the organisations regularly.

Budget is for procurement of necessary computer equipment and software, providing development and system administration support, training arrangement Including additional expenses incurred due to the use of the Internet, such as electricity bills.

10.3.9 Recommendations and Comments

Most of the opinions agreed with the government's various ICT support measures, but suggested the acceleration to cover all departments especially for oraganizations that do not have Internet access and lack of IT equipment. They may consider providing budget to the cover the procurement themselves, but they can be audited in order to be able to operate more conveniently and flexibly, and suggested that there is an IT personnel development policy for local personnel in order to create jobs and disperse more people with IT skills to work in the area.

10.4 The impact of the COVID-19 epidemic

The coronavirus outbreak situation has had a severe and long-lasting impact on the economy, society and quality of life of the people. According to the data from the National Economic and Social Development Agency, in 2020, Thailand's gross national product was contracted by 6.1% as almost every industrial sector was severely affected. Production and business activities are interrupted or closed. The consumer income and the power of purchasing decreased. There was the high unemployment in major industries such as import and export which faced with the disruptions due to lockdown measures on the international border causing the exporting country to have oversupply while importing countries have issues of safety and epidemic prevention. The tourism business was hit hard. The number of tourists was reduced or almost nonexistent and it caused a sharp drop in domestic purchasing power. Many business, hotels and restaurants will be closed temporarily or permanently due to limitations and concerns on the spread of infection. There are no customers to get services because of the lockdown measures with a limited number of service recipients using the area. Although entrepreneurs and service provider in the telecommunications sector in the country are not affected much compared to other business sectors. If the overall economic condition has not recovered, there will have an increase in the unemployment rate, and the purchasing power of consumer will decrease.

Considering the impact on the public sector, the big problems are the health impact and the public health and medical services that are unable to relief this epidemic. The behavioral patterns in general have completely changed as well. Working from home relies more on digital platforms and online systems to replace traveling to the office which many organisations including workers may not be ready at the beginning which

affect to productivity that may be deteriorated from the work-from-home model or among students who cannot travel to educational institutions and have to comply online study. This is to modify both teaching methods, teaching materials, necessary equipment such as computers, notebooks, and equipment that teachers need to produce teaching materials or spending more free time on online. This is for the propose of watching online content, having communication on social media, gaming and online purchases due to inability to go outside of the residence. These behaviors has occurred in a long period of years until it is accepted to change behavior and is considered a new normal.

Another impact of the coronavirus pandemic is that this epidemic has catalyzed the problem of inequality in the access and use of digital technologies due to behavior arising from the impact of this covid outbreak. Either working from home or online studying, telecommunication and Internet services are required online which costs both service fees and equipment. People who still have income may not be much affected, but people who are poor or have no income will be greatly affected because they cannot provide or purchase services and equipment to access the Internet, or living in remote areas without telecommunication systems and internet services is making unable adaption with the people who are ready to access, or even the elderly or people who are not proficient in using online technology. This prevents them from using the right to access basic services and benefits as they should.

Another consequence is the need to develop digital skills and IT professionals. This is because the country and society have to rely more on technology systems, both business sectors who want to use online channels or develop platforms such as mobile applications as a service channel or increase the efficiency of management in the business and public sector with an attitude that accepts and focuses mainly on the use of digital technology but they may still lack of relevant digital skills such as maintaining and protecting online personal data or helping to monitor inappropriate online behaviors, especially among children and the youth.

The data from the survey results of the public sector and private businesses in the implementation of Thailand Digital Outlook Phase 3, in detail in each dimension, found that:

In terms of popular places to use the internet by comparing the information of popular places using the internet at different times both before and during the aforementioned covid, it can be seen that there is not much changed. The most popular

place is residence and work place showing the behavior of Internet users who have adapted to the situation of the epidemic of Covid since the beginning of 2020. It cleary see that residence and work place are places with the highest internet usage.

However, the proportion of the places before and during COVID has changed significantly. The majority of people using the Internet at their accommodation increased from 55.6% to 70.2% or increasing by 14.6%. Using internet at the workplace is declined by 15.8%, mainly due to the severe spread of COVID-19 during the COVID-19 pandemic, December 2020-present (2021), which is more severe than the recent outbreaks. People stay at home. Many companies and workplaces have adopted a work from home policy. Online learning has significantly reduced internet use in these places.

The comparison of the behavior of using internet in the pre-Covid period and during the Covid-19 period, it was found that most of the respondents were using the internet more frequently from almost every day in the pre-Covid period, but during the coronavirus pandemic, most of the respondents used the internet every day. The number of internet users is increasing every day at 24.9%, and the proportion of respondents who spent an average of 6-10 hours per day using the Internet increased by 11.5%. Comparing to the past 3 months, it was found that most of the respondents had the highest daily internet usage. They accounted for 77.2%, an increase of 2.9% from the coronavirus period, and spent an average of 6-10 hours a day the most at 39.4%, up from 8.2 % during the coronavirus period.

Considering the age range, it was found that the group under 20 years old was the group that uses the Internet at the highest level by using the internet every day and spending an average of 6-10 hours/day

The increasing internet usage activity in comparison of before and during covids are: 1) presenting online tax increased by 40.3%, 2) monitoring the situation of COVID increased by 35.2%, and 3) using online health services such as online queue bookings or online telemedicine consultation increased by 24.3%.

The decreased internet activity in comparison of before and during COVID-19 are: 1) the use of online transportation services decreased by 15.4%, 2) searching information from other academic sources decreased by 3.0%, and 3) creating a website or personal homepage is 1.6% down.

However, when considering the activities of using the Internet before and during the Covid in addition to using the Internet to present online tax, which is a time-limited

activity, in overall, the survey respondents were more interested in monitoring the coronavirus situation because during the survey data was a severe outbreak in Thailand. The number of deaths has been reported including service news and measures related to COVID that the public must closely monitor to know how to prevent themselves and having the rights to get vaccination and remedial measures and activities to use online health services such as online queue booking or online telemedicine consultation. The increase in telemedicine and the increase in online health care services, all medical and public health agencies have developed online channels and campaigning for people to use online channels as their main channel for obtaining services especially the registration to get vaccinated against COVID-19 and for convenience during measures of travel restrictions to help reduce the risk of covids spreading as well.

The activity with the highest percentage of usage decline is the use of online transportation services. This is mainly due to the spread of the coronavirus, causing many transportation service points to close or reduce their business hours. In addition, people will use transportation services only as needed to reduce the risk of the chance of contracting COVID from bringing items to the transport service point or employees come to pick up the stuff.

The impact of the coronavirus pandemic on Internet use, 28.5% of respondents had a significant increase in Internet use, and 25.8% had a slight increase, with only 2.5% having a significant increase in Internet use. There was a slight decrease in internet usage and 1.0% with a significant drop in internet usage. The forms of online services that are increasingly needed during the COVID-19 pandemic were 1) online teleconference at 85.4%, 2) online learning at 80.2%, and 3) following up on news such as the COVID-19 situation at 67.5%.

From the survey data, Internet use behavior clearly shows new normal behavior in using internet besides using internet in order to access social media, which is still the main activity of most people in using the Internet. Internet activities are supporting life during the COVID pandemic with travel restrictions. The service providers use online channels to provide services as the main channel resulting in online remote working activities, online learning, online shopping and payment and obtaining online medical and public health services which is the main activity with an increasing proportion because, during the survey period, it was the epidemic of COVID which was more severe than last time. There is a campaign to promote health care to prevent infection with

COVID and receive vaccination services. This may encourage more online use of healthcare and medical services as well.

In terms of government service usage, it was found that the top 3 most used characteristics of online government services are the online government services that have the highest percentage change: 1) Online incomimg tax refund with an increase of 42.7%, 2) Job search/ online registration increased by 28.9%, and 3) registering/receiving rights/checking rights for various government projects such as the Thai Chana Project, Rao Chana Project, Half and Half Project increased by 15.5% due to the increase in online incomimg tax filing services with the period for the payment of personal incomimg tax from January to June 2021. The increasing in the use of online job search / job registration services was mainly due to the economic slowdown that was affected by the spread of the coronavirus. People use government services to search for jobs, to be a channel to find a new job in the event of a job hunting, the government has issued various measures to help those affected by the COVID-19 outbreak by using online channels primarily for registration/receiving/validation. This is the reason why the use of government services in this matter has increased.

In terms of purchasing online goods and services, it was found that, when comparing the frequency of online shopping before and during the covids, there was an increase in the proportion of people who did online shopping at least once a week, but not every day (1-4 days a week) by 11.1%, and 1% increase in online purchases of services in daily or almost every day (5-7 days a week). It is indicating a behavioral of online purchases of goods and services are becoming more frequent during the COVID-19 pandemic.

In comparison of pre-Covid period and during the covid period, the 3 categories of service and products with the biggest increase were 1) medicines, up to 22.2%, 2) financial products such as stocks, insurance, etc., increased by 20.5%, and 3) consumer products. The type of service that had the biggest decrease was 1) cosmetics by 48.8% decrease, 2) clothing, shoes, sports equipment and accessories by 17.0% decrease, and 3) purchase/reserve movie tickets, concert tickets, tickets for various entertainment activities fell at 15.9%.

This reflects the behavior of using the Internet to support basic livelihoods during the COVID epidemic. It is to order medicines and consumer products because people avoid traveling and going out in public areas and the vendors of goods and services

provide services through online ordering mainly due to government measures and consumer behavior that wants convenience and reduce risks in covid infection. These are the main reasons for the increase in the purchase of products for this group of services and due to the concerns on the risks that may arise both financially, income and security in people's lives and health has also led to higher proportions of financial products such as stocks, insurance, and purchases made through online channels. In the category of cosmetics, clothing, shoes, sports equipment and accessories that decreased, it reflects the behavior of consumers who see less need for non-essential products and it may be a luxury that most citizens need to save money on including the reduction of movie tickets, concert tickets, tickets for various entertainment activities because the Thai government and regulatory agencies have measures to limit travel and announced the Lockdown measure that prohibited entertainment venues from opening or organizing activities.

The top 3 most used online payment formats by comparing before and during COVID-19 period: 1) Using the accumulated points to redeem products/services with the increase of 13.5%, 2) Payment via the website (Internet Banking) or a banking application (Mobile Banking) increased by 11.2%, 3) Payment via credit card up to 9.4%.

The most top 3 decreasing in online payment formats when compared to before and during the COVID-19 period are: 1) Cash on Delivery (COD) with a 20.5% decrease; 2) Counter services transfering, such as at banks or convenience stores, decreased by 15.2%, and 3) the use of online payment services such as PayPal, Google Pay decreased by 4.6%, demonstrating the preference for a form of payment that could use online channels conveniently especially the use of credit cards paying through the website (Internet Banking) or the banking application (Mobile Banking) that has clearly increased usage and the increase in the use of reward points to redeem products/services. This is due to the fact that the seller of goods and services is stimulating sales and marketing for consumers to collect and use points to pay for goods and services as if paying with money.

Online payment methods that require a staff to assist in the payment transaction including Cash on Delivery (COD) and money transfers via counter services such as at banks or convenience stores have a smaller proportion. This is because people avoid forms of contact with banknotes or meeting with officials. To help with transactions to reduce the risk of contracting COVID-19, people choose to use a standardized payment format directly from banks and financial institutions which accepts more payments than

using a service model by other companies or organisations. This makes online payment services such as PayPal and Google Pay decreased.

Considering the frequency of working remotely in the pre-Covid period or September-November 2020, it was found that 44.8% of respondents worked remotely more than once a week, 55.2% worked remotely once a week, and none of those who did not work remotely. During COVID or December 2020 - July 2021, there was 99.2% of people who worked remotely more than once a week and 0.8% worked remotely once a week and there were none of those who did not work remotely.

When comparing the frequency of working remotely, it was found that the proportion of people who worked remotely more than once a week with an increase of 44.0%, an increase from those who used to work remotely once a week to work remotely more than once a week. This shows the proportion of working remotely more frequently. This clearly reflects the New Normal working behavior by using an online system more clearly because many organisations have a policy for employees to work from home.

Considering activities related to working remotely, it was found, when comparing the proportion of changes in telework related activities, in the top 3 as follows: 1) using the agency/company's website, such as recording time in – out for the approval of leave of absence, etc., increased by 11.1%, 2) VDO conference, increased by 6.6%, and 3) access to documents of agencies/companies was a 5% increase, reflecting more activities related to telework and more fully online in addition to the VDO conference which is the main activity before and during the Covid.

From the survey of the frequency of online learning, it was found that in the pre-COVID period, or September-November 2020, the proportion of those who studied online more than once a week was 66.2 %, 33.8% of those who studied online once a week, and none of those who did not study online. During the COVID-19 period or December 2020 - July 2021, the proportion of those who studied online more than once a week was 71.0%, thouse who studied once a week was 29.0% and none of them did not attend online learning.

Comparing the change in the frequency of online learning, it was found that the proportion of those who studied online more than once a week increased by 4.8%, an increase from those who studied online once a week. It can see that online learning is more frequency from the measures to close the schools to prevent the spread of corona virus.

Comparing the changes in online learning-related activities, the top 3 activities with the highest proportion were the same both before and during the coronavirus. The top 3 activities with the largest proportion of growth were 1) online self-study increased by 6.4%, 2) submitting work via online system with an increase of 6%, and 3) VDO conference increased by 5.6%, indicating the use of other activities involved in an increasing number of online learning activities in addition to the main activities of attending self online classes.

Analyzing the statistics and frequency of service usage of government digital projects in the time before and during covid Including the past 3 months, it was found that there was a significant reduction in the number of users of Prachara Internet Project, USO Net, Internet Center and Community Digital Center especially in the past 3 months from the date of the survey. It was due to the spread of the coronavirus, service areas in many centers need to reduce service hours or close service according to government measures including people's concerning on coming to the service center because it is a common area and there may be a chance of coronavirus spreading.

However, even if the epidemic situation of the coronavirus has eased, the work-from-home or behavior change of people who are familiar with using the service should still be actived. This is because it provides flexibility for employees to stay healthy and safe and reduces operating costs for the business.

In the private business entities, it was found that, from the survey data on the impact of the COVID epidemic on the need for Internet use in agencies before COVID or September-November 2020, the 64.2% of agencies viewed the Internet as the same necessity, the 33.2% of agencies deemed the Internet as unnecessary at 1.9%, and agencies deemed the Internet necessary at 0.7% less during the COVID-19 period or December 2020 - July 2021, the 56.9 percent of the respondents saw the Internet as a need, the Internet as a necessity by 40.4%, the Internet as a lesser necessity by 1.7%, and no need internet at 0.9%.

In terms of internet usage, it was found that before COVID or September-November 2020, most agencies had the same internet usage accounted for 65.7% of the total number of agencies. There was a 31.9% increase in internet usage and at 2.4% less in internet usage during the COVID-19 period or December 2020 - July 2021. It found that most agencies are using more Internet in the year 2021 accounted for 52.7% of the total

number of agencies, by 44.6% of the organisations had the same internet usage and fewer internet usage by 2.7%.

However, when comparing the need and the amount of internet usage before and during the Covid, it is evident that most agencies saw the need for the Internet that increased by 23.7 % and resulted in a 20.8% increase in traffic, mainly due to the agency's policy to allow employees to work from home according to control measures of covid epidemic which is mainly working through the internet. Another reason is due to the fact that agencies are increasingly using online channels to provide services and sell products to support the behavior of consumers who cannot go outside and use more online shopping for products and services.

The proportion of customers that the agencies distribute products or services through online channels in the pre-Covid period or September-November 2020, representing 97.5% of domestic customers, representing 2.5% of foreign customers during the COVID-19 period or December 2020 - July 2021, it is 96.8 % of domestic customers and 3.2 % of foreign customers. The proportion of most customer groups has not much changed. The agency distributes online products or services to most customers in countries and the proportion of foreign customers increased by 0.7%.

As for online channels used to distribute products or services, it was found that online channels were the most use during the pre-Covid period or September-November 2020, in the top 3 rankings: 1) Social media platforms such as Facebook Page, Line Official, Instagram, etc. by 55.3%, 2) e-Marketplace platforms such as Lazada, Shoppee, Kaidee, Lnwshop, etc. by 49.2%, and 3) Website/Application, e-tailers such as Amazon, eBay, Central, online by 40.1%.

The most used online channels during the COVID-19 period or December 2020 - July 2021 ranked in the top 3 as follows: 1) Social media platforms such as Facebook Page, Line Official, Instagram. etc., 71.2 % 2) e-Marketplace platforms such as Lazada, Shoppee, Kaidee, Lnwshop, etc., account for 54.7 % 3) Website/Application, e-tailers such as Amazon, eBay, Central, online at 36.2%.

Considering the use of online channels to distribute products or services in the pre-COVID period and during the coronavirus period, social media using was increased by 15.9 %, and it was the online channel used by most agencies in the pre-COVID period and during the pandemic COVID-19. The E-Marketplace platform channels increased by 5.5% and website/application channels of E-tailers decreased by 3.9 %, reflecting the

shift of the agency to develop the use of online channels that can create an identity or being an online store of its own with customers, including being able to allow customers to access and contact the agency directly. It also reduces the middleman fees in other online channels. There is a fee charged to the agency. It is considered an adjustment of the agency that has adapted to distribute more products or provide services through their own online channels.

Considering the proportion of agencies that have customers using online channels, it was found that, in the pre-Covid period or September-November 2020, there were agencies with the number of customers using online channels increased by 48.4%, agencies with the number of customers using online channels that used the service remained the same at 42.0%, and agencies with a 9.6 % drop in the number of customers using online channels during the COVID-19 period or December 2020 - July 2021. The number of customers using online channels increased by 75.2%, using the same service by 18.2%, and using online services decreased by 6.6%.

Considering by type of business, it was found that the businesses with the highest use of online channels were 1) agribusiness increased by 54.6%, 2) transport and logistics business increased by 27.9%, and 3) Food and beverage business increased by 27.4%. The business with the largest decrease in online channels were 1) Tourism and Leisure with a decrease of 76.4%, 2) Fashion business with a decrease of 44.8%, and 3) Industrial Materials and Machinery Business, which decreased by 36.8%.

Comparing agencies with customers who used online channels before and during the COVID-19 pandemic, it was found that there were agencies that had an increase in the number of customers using online services with an increase of 26.8%, reflecting the behavior of consumers using more online channels especially during the Covid outbreak, unable to travel and buy products and services at stores including to reduce the risk of infection in public areas. In addition, stores and businesses have adjusted to add more online channels, including the development of online channels to be more convenient to use with customers. These are the triggers for the number of customers using online channels with the obvious increase.

In terms of income and expenses, regarding the survey data on average income / expenditure through online channels to the total income and expenses, it was found that, in the pre-COVID period or September-November 2020, the agencies had an average income from the sale of goods/services through online channels to the total revenue of

the agency was 23.6% and the average expenditure from selling products/services through online channels to the total expenditure of the agency was 13.5%. During the COVID-19 period or December 2020 - July 2021, the average income from the sale of goods/services through online channels to the total revenue of the organisation was 30.4% and the average expenditure from the sale of goods/services through online channels to the total expenditure of the organisation was 15.2%.

Comparing the average income/expense through online channels to all income and expenses before and during the Covid, it was found that the average income from the sale of goods/services through online channels to the total revenue of the agency increased by 6.8% and the average expenditure from the sale of goods/services through online channels to the cost of the agency increased by 1.2 %, indicating that online channels are profitable well before and during covid. It can be seen that while the average income increases expenditures or costs have increased, the smaller proportion was resulting in higher profits, which is the strength of online channels that can support more sales without much higher costs because there is no need to invest in assets to expand sales points or service locations.

In the pre-Covid period or September-November 2020, the top 3 most popular online government services were 1) Filling tax form submitting at 85.1% of accounting online data, 2) Submiting online employee/personnel information to the government at 58.1%, 3) Payment of electricity/water/telephone/utilities bills at 36.2%.

During COVID or December 2020 - July 2021, the top 3 most popular online government services were: 1) Filing tax forms/submitting accounting information online at 89.2%, 2) Submitting online employee/personnel information to the government at 60.2%, and 3) paying electricity/ water/telephone/utilities bills at 38.3%.

Considering the comparison of the period before and during the covid, it can be seen that most of the online government services that stil in use are: 1) Filing tax forms /submitting accounting information online, 2) Submitting employee/personnel information to the government online, 3) Paying electricity/water /bills Telephone/Utilities both in the pre- and during the covid period. An increase in the proportion of using all 3 services, with an increase of 4.1%, 2.1% and 2.1%, respectively, with an increase in searching/reservation/registration of juristic persons at 10.4%, which may be due to the fact that people turned to do business and had more accurate registration whereas services in bidding/selling goods and services through the online procurement system

declined as high as 10.5%, possibly due to the government budget cut and reduced the number of procurement.

As for the primary care units on the effects of COVID for internet use in their departments, internet use increased by 44.6%, decreased by 18.5% and remained unchanged by 36.9%.

In this regard, there were 90.8% of agencies with online service recipients, at 9.2% without service recipients compared to the number of service recipients before COVID or September-November 2020 and during the Covid period or December of 2018. From 2020 -July 2021, there were 55.4% increase in the number of online service recipients, after the COVID-19 outbreak at 20.8% and the number of online service recipients remained the same at 23.8%. When considering the percentage of the change in order of the top 3 agencies, it was found that 1) less change than 30% accounted for 27.8%, 2) the change of 50% - 99% accounted for 25.6%, and 3) less than 50% accounted for 12.7% with no change accounted for 22.3%.

Chapter 11: Overall Summary of Digital Development of Thailand in the Year 2021

Regarding the OECD - Going Digital Toolkit, the OECD has analyzed and considered the suitability and feasibility of the survey data collection for the Thai context of each 54 indicators including other factors; for example, the consistency and linkage of educational operations in the Thailand Digital Outlook Phase 1 and Phase 2 in the past, the recommendations and comments from the implementation of workshops, etc. to determine the scope of the indicators conducted under the study of Thailand Digital Outlook Phase 3 by summarizing the indicators that can be implemented for 47 out of 54 indicators. In addition to the OECD indicators framework, the ONED has studied other internationally standardized indicator frameworks presenting 10 additional indicators which are the indicators from the Thailand Digital Outlook Phase 2 and was considered in the implementation of the Thailand Digital Outlook Phase 3 for reflection. The picture of the digital development of Thailand (Thailand Digital Outlook) will be more completed with a total of 57 indicators in the summary of digital development in each dimension as follows.

Access

It assesses the accessibility to basic information technology including telecommunication systems and internet connectivity. From the results of the evaluation and analysis of indicators, it was found that all indicators showed improvement in access to technology and in better telecommunication systems. Comparing the results of the implementation of the Thailand Digital Outlook Phase 2 which included more comprehensive Internet services both fixed broadband internet and mobile broadband internet in the dimensions of the assessment of the public and household sector, the business sector, and the government first aid service in the assessment of inequality, the analysis revealed a lower disparity in internet usage in urban and rural areas including the price of using Internet services that are lower comparing to the income of the people.

Use

It is an assessment of internet and online usage behavior for both the public and private sectors including the use of online channels to benefit business and government services by applying technology. From the results of the assessment and analysis of the indicators, it was found that the general public use of the Internet increased and used online channels for purchasing goods and services including the higher use of government services and entrepreneurs sector with the higher use of online channels to do business as well. Internet usage and online channels are much higher than usual.

Innovation

It is an assessment of the industrial and national potential to support the development of the information technology, communication and digital industries and assess the environment and related factors. From the results of the assessment and analysis of indicators, it was found that the direct investments in the Information and Communication Technology industry and investment in startups have significantly increased. The proportion of the new entrepreneurs has also increased. This shows a factor supporting in expansion of the information technology and digital industry. However, an assessment of Research and Development (R&D) investment indicators of business groups in the information industry revealed that the proportion of investment value decreased a little. This may limit innovation development.

Jobs

It is a quantitative assessment of the overall condition of the workforce in the digital industry and assess supporting factors such as skills development actions and investment in the labor market. From the results of the assessment and analysis of indicators, it was found that the digital industry still faces problems in labor development. Many of the indicators in this dimension reflect the decline in labor on the overall size of the industry as well as the reduce of labor productivity. This reflects the labor shortage in terms of quantity and quality and also supporting factors that the average income of workers has a lower effect as well. From the information in this jobs dimension, it shows the importance of accelerating the development of workers in the digital industry to meet the needs of a fast growing industry.

Soceity

It is an assessment of social conditions in accessing and using information and digital technology and readiness for a digital society that everyone in society participates in the access and use of technology (Digital Inclusion) without disparities in gender, age, education and economic conditions, and creates benefits from technology for entire society. From the results of the assessment and analysis of the indicators, it was found that most of the indicators showed the status of a society that is more readily available for a digital society, such as an increase in the percentage of individuals living in a household with the household income was in the lowest range of 25% (1st quartile) using the Internet. An increase in the percentage of individuals who use digital tools for telework once a week or more, and the readiness of being a digital government. However, there are also indicators that have reduced outcomes or are still low in proportion, such as the percentage of individuals aged 55-74 years using the Internet and the proportion of women aged 16-24 years who are able to program.

Trust

It is an assessment of the confidence of both the public and the entrepreneurial sector in the use of technology and online channels. It is assessed based on usage behaviors, concerns and experiences with problems related to technology and data. From the results of the assessment and analysis of indicators, it was found that, overall, people and entrepreneurs were more confident in using technology and online channels. The contributing factor is the reduction of the proportion of online problems when people as consumers are more confident and entrepreneurs take care of digital systems and online channels to be more secure and reliable. The opportunities for the technology and digital industry to grow rapidly are even higher.

Market Openness

It is an assessment of the competitiveness of international business by using online channels to distribute products and provide services as well as creating added value in the economy. From the results of the assessment and analysis of indicators, it was found that the proportion of distribution of goods and services through online channels in the international market and businesses with digital services is increasing. The proportion of trade in ICT goods and services compared to the value of international trade is also very high.

Growth & Well being

It assesses the socio-economic condition and the overall impact of technology use. From the results of the assessment and analysis of the indicators, it was found that there were still issues of economic and social aspects that still need to be improved, such as the declining average annual growth rate of added value in the digital business sector, the impacts on quality of life from technology and internet use in the form of stress and anxiety. However, in terms of usability and reliability, there is a trend to improve, such as the increase in the use of digital tools for telework and a decrease in the percentage of people experiencing personal data or privacy breaches.

Table 197 Summary of Thai digital development indicators in 2021

No	Code	Indicators	Study result from Thailand Digital Outlook Phase 3
		Access with 10 indicators	
1	A1	Fixed broadband subscriptions per 100 inhabitants	16.87
2	A2	M2M (Machine-to-Machine) SIM cards per 100 inhabitants	1.9
3	A3	Mobile broadband internet subscription per 100 inhabitants	92.56
4	A4	Share of households with broadband connections	85.2
5	A5	Share of businesses with broadband contracted speed of 30 Mbps or more	89.8
6	A6	Share of the population covered by at least 4G mobile network	98
7	A7	Disparity in broadband uptake between urban and rural households	7.9
8	AX1	Fixed Broadband price to GNI per Capita)	2.78
9	AX2	Proportion of high-speed Internet connections with fiber optic cable	58.22
10	AX3	Proportion of Internet access of primary care units	76.4
		Use with 10 indicators	
11	U1	Internet users as a share of individuals (Between the ages of 16-74 years, according to the OECD difiniton)	84.3
12	U2	Share of individuals using the internet to interact with public authorities	64.2
13	U3	Share of internet users who have purchased online in the last 12 months	78.5

No	Code	Indicators	Study result from Thailand Digital Outlook Phase 3
14	U4	Share of small businesses making e-commerce sales in the last 12 months	36.5
15	U5	Share of businesses with a web presence	73.9
16	U6	Share of businesses purchasing cloud services	51.3
17	U7	Average monthly mobile data usage per mobile broadband supscription, GB	18 GB
18	UX1	Value of digital payment transactions per person Value of payment transactions via Mobile Banking per person per year Value of payment transactions via Internet Banking channels per person per year	 524,820 baht 434,981 baht
19	UX2	Proportion of cloud usage by government agencies to total cloud demand	53.2
20	UX3	Daily time spent on the internet	11 hours 25 minutes
		Innovation with 6 indicators	
21	I1	ICT investment as a percentage of GDP	2.02
22	I2	Business R&D expenditure in information industries as a percentage of GDP	0.07
23	I3	Venture Capital investment in the ICT sector as a percentage of GDP	0.098
24	I4	Share of start-up firms (up to 2 years old) in the business population	10.9
25	IX1	The number of patent applications in the information technology or related fields in Thailand	93
26	IX2	A number of robots being in used in Thailand's manufacturing sector per 10,000 manufacturing workers	45
		Jobs with 7 indicators	
27	J1	ICT task-intensive jobs as a percentage of total employment	1.15
28	J2	Digital-intensive sectors' share in total employment	27.2
29	J3	Workers receiving employment-based training, as a percentage of total employment	44.2
30	J4	New tertiary graduates in science, technology, engineering and mathematics, as a percentage of new graduates	22.39

No	Code	Indicators	Study result from Thailand Digital Outlook Phase 3
31	J5	Public spending on active labour market policies, as a percentage of GDP	0.061
32	JX1	Average wage of ICT specialists	26,568
33	JX2	Labor Productivity in Digital-intensive industries	19,306,920 baht per person
		Society with 8 indicators	
34	S1	Percentage of individuals aged 55-74 using the internet	48.8
35	S2	Percentage of individuals who live in households with income in the lowest quartile using the internet	83.2
36	S3	Women as a share of all 16-24 year-olds who can program	12.1
37	S4	Disparity in Internet use between men and women	(-)0.4
38	S5	Percentage of individuals who use digital equipment at work that telework from home once a week or more	36.7
39	S6	Top-performing 15-16 year old students in science, mathematics and reading	2.7
40	S7	OECD Digital Government Index	0.40
41	S8	E-waste generated, kilograms per inhabitant	9.2
		Trust with 5 indicators	
42	T1	Percentage of internet users experiencing abuse of personal information or privacy violation	6.3
43	T2	Percentage of individuals not buying online due to payment security concerns	5.4
44	T3	Percentage of individuals not buying online due to concerns about returning products	13.6
45	T4	Percentage of businesses in which ICT security and data protection tasks are mainly performed by own employees	28.6
46	T5	Health data sharing intensity	20
		Market Openness with 4 indicators	
47	M1	Share of businesses making e-commerce sales that sell across borders	3.2
48	M2	Digitally-deliverable services as a share of commercial services trade	13.52
49	M3	ICT goods and services as a share of international trade	20.66

No	Code	Indicators	Study result from Thailand Digital Outlook Phase 3
50	M4	Digital-intensive services value added embodied in manufacturing exports, as a percentage of manufacturing export value	23.1
		Growth & Well being with 7 indicators	
51	G1	Digital-intensive sectors' contribution to value added growth	36.3
52	G2-S5	Percentage of individuals who use digital equipment at work that telework from home once a week or more	36.7
53	G3	Workers experiencing job stress associated with frequent computer use at work	61.3
54	G4-S2	Percentage of individuals who live in households with income in the lowest quartile who use the Internet	83.2
55	G5	Students aged 15-16 who feel bad if no internet connection is available	71.2
56	G6-T1	Percentage of Internet users experiencing abuse of personal information or privacy violations	6.3
57	G7-S8	E-waste generated, kilograms per inhabitant	9.2

Chapter 12 : Comparative Data on the Study Results of the Indicators of Thailand and OECD countries

Table 198 Table of comparing results data of the indicators of Thailand and the OECD countries

Access

No	Code	Indicators	Average results of the OECD countries	Study result from Thailand Digital Outlook Phase 3
		Access with 10 indicators		
1	A1	Fixed broadband subscriptions per 100 inhabitants	31.8	16.87
2	A2	M2M (Machine-to-Machine) SIM cards per 100 inhabitants	16.3	1.9
3	A3	Mobile broadband subscription per 100 inhabitants	114.6	92.56
4	A4	Share of households with broadband connections	88.9	85.2
5	A5	Share of businesses with broadband contracted speed of 30 Mbps or more	73.5	89.8
6	A6	Share of the population covered by at least 4G mobile network	97.6	98
7	A7	Disparity in broadband uptake between urban and rural households	4.65	7.9
8	AX1	Fixed Broadband Price to GNI per Capita	No applicable	2.78
9	AX2	Proportion of fiber optic high speed internet connections	No applicable	58.22
10	AX3	Proportion of internet access of primary care units	No applicable	76.4

Use

No	Code	Indicators	Average results of the OECD countries	Study result from Thailand Digital Outlook Phase 3
		Use with 10 indicators		
11	U1	Internet users as a share of individuals (Between the ages of 16-74 years, according to the OECD difiniton)	89.3	84.3
12	U2	Share of individuals using the internet to interact with public authorities	37.5	64.2
13	U3	Share of internet users who have purchased online in the last 12 months	69.8	78.5
14	U4	Share of small businesses making e-commerce sales in the last 12 months	23.7	36.5
15	U5	Share of businesses with a web presence	77.9	73.9
16	U6	Share of businesses purchasing cloud services	40.2	51.3
17	U7	Average monthly mobile data usage per mobile broadband subscription, GB	5.8	18 GB
18	UX1	Value of digital payment transactions per person Value of payment transactions via Mobile Banking per person per year Value of payment transactions via Internet Banking channels per person per year	No applicable	524,820 baht 434,981 baht
19	UX2	Proportion of cloud usage by government agencies to total cloud demand	No applicable	53.2
20	UX3	Daily time spent on the internet	No applicable	11 hours 25 minutes

Innovation

No	Code	Indicators	Average results of the OECD countries	Study result from Thailand Digital Outlook Phase 3
		Innovation with 6 indicators		
21	I1	ICT investment as a percentage of GDP	2.37	2.02
22	I2	Business R&D expenditure in information industries as a percentage of GDP	0.39	0.07
23	I3	Venture Capital investment in the ICT sector as a percentage of GDP	0.031	0.098
24	I4	Share of start-up firms (up to 2 years old) in the business population	25.8	10.9
25	IX1	The number of patent applications in the Information Technology or related fields in Thailand	No applicable	93
26	IX2	A number of robots being used in Thailand's manufacturing sector per 10,000 manufacturing workers	No applicable	45

Jobs

No	Code	Indicators	Average results of the OECD countries	Study result from Thailand Digital Outlook Phase 3
		Jobs with 7 indicators		
27	J1	ICT task-intensive jobs as a percentage of total employment	1.15	27
28	J2	Digital-intensive sectors' share in total employment	27.2	28
29	J3	Workers receiving employment-based training, as a percentage of total employment	44.2	29
30	J4	New tertiary graduates in science, technology, engineering and mathematics, as a percentage of new graduates	22.39	30

No	Code	Indicators	Average results of the OECD countries	Study result from Thailand Digital Outlook Phase 3
31	J5	Public spending on active labour market policies, as a percentage of GDP	0.061	31
32	JX1	Average wage of ICT specialists	26,568	32
33	JX2	Labor Productivity in Digital-intensive industries	19,306,920 baht per person	33

Society

No	Code	Indicators	Average results of the OECD countries	Study result from Thailand Digital Outlook Phase 3
		Society with 8 indicators		
34	S1	Percentage of individuals aged 55-74 using the internet	48.8	34
35	S2	Percentage of individuals who live in households with income in the lowest quartile using the internet	83.2	35
36	S3	Women as a share of all 16-24 year-olds who can program	12.1	36
37	S4	Disparity in Internet use between men and women	(-)0.4	37
38	S5	Percentage of individuals who use digital equipment at work that telework from home once a week or more	36.7	38
39	S6	Top-performing 15-16 year old students in science, mathematics and reading	2.7	39
40	S7	OECD Digital Government Index	0.40	40
41	S8	E-waste generated, kilograms per inhabitant	9.2	41

Trust

No	Code	Indicators	Average results of the OECD countries	Study result from Thailand Digital Outlook Phase 3
		Trust with 5 indicators		
42	T1	Percentage of internet users experiencing abuse of personal information or privacy violations	6.3	42
43	T2	Percentage of individuals not buying online due to payment security concerns	5.4	43
44	T3	Percentage of individuals not buying online due to concerns about returning products	13.6	44
45	T4	Percentage of businesses in which ICT security and data protection tasks are mainly performed by own employees	28.6	45
46	T5	Health data sharing intensity	20	46

Market Openness

No	Code	Indicators	Average results of the OECD countries	Study result from Thailand Digital Outlook Phase 3
		Market Openness with 4 indicators		
47	M1	Share of businesses making e-commerce sales that sell across borders	3.2	47
48	M2	Digitally-deliverable services as a share of commercial services trade	13.52	48
49	M3	ICT goods and services as a share of international trade	20.66	49
50	M4	Digital-intensive services value added embodied in manufacturing exports, as a percentage of manufacturing export value	23.1	50

Growth & Well being

No	Code	Indicators	Average results of the OECD countries	Study result from Thailand Digital Outlook Phase 3
		Growth & Well being with 7 indicators		
51	G1	Digital-intensive sectors' contribution to value added growth	36.3	51
52	G2-S5	Percentage of individuals who use digital equipment at work that telework from home once a week or more	36.7	52
53	G3	Workers experiencing job stress associated with frequent computer use at work	61.3	53
54	G4-S2	Percentage of individuals who live in households with income in the lowest quartile who use the Internet	83.2	54
55	G5	Students aged 15-16 who feel bad if no internet connection is available	71.2	55
56	G6-T1	Percentage of Internet users experiencing abuse of personal information or privacy violations	6.3	56
57	G7-S8	E-waste generated, kilograms per inhabitant	9.2	57

Chapter 13: Study Results on Indicators of OECD Countries

Regarding the published information from the OECD Going Digital Toolkit website (goingdigital.oecd.org), the study results of the OECD countries on indicators can be summarized as follows:

Access

Indicator A1 : Fixed broadband subscription per 100 inhabitants

Countries	Results
Switzerland	47.481
France	45.573
Norway	44.562
Denmark	44.221
Germany	43.413
Netherlands	43.145
Korea	43.059
Canada	41.559
Belgium	41.042
England	40.922
Portugal	40.408
Sweden	40.369
Greece	39.884
Iceland	38.896
Luxembourg	37.268
United States of America	36.508
Czech republic	35.851
Australia	35.411
New Zealand	34.659
Japan	33.548
Hungary	33.491
Spain	33.474

Countries	Results
Finland	33.381
Estonia	32.733
Slovak Repulbic	31.161
Slovenia	30.762
Ireland	30.445
Italy	30.188
Austria	29.221
Lithuania	28.512
Israel	28.234
Latvia	26.502
Poland	21.814
Turkey	20.069
Costa Rica	19.433
Chile	19.317
Mexico	17.279
Colombia	15.737

Indicator A2 : M2M (machine to-machine) SIM cards per 100 inhabitants

Countries	Results
Sweden	162.983
Austria	69.996
United States of America	45.434
Netherlands	45.319
Italy	43.870
Germany	43.652
Norway	42.844
Belgium	35.454
New zealand	35.332
France	32.875
Ireland	31.602
Finland	31.464

Countries	Results
Iceland	30.770
Estonia	29.720
Denmark	28.072
Japan	24.928
Slovak Repulbic	23.029
Korea	22.148
Latvia	20.935
Switzerland	20.200
Spain	16.232
England	16.180
Hungary	13.728
Lithuania	13.252
Poland	12.509
Portugal	11.948
Luxembourg	11.678
Czech republic	11.307
Canada	10.214
Turkey	7.652
Greece	5.508
Slovenia	4.119
Chile	2.631
Mexico	2.172

Indicator A3 : Mobile broadband subscription per 100 inhabitants

Countries	Results
Japan	184.736
Estonia	164.754
Finland	156.055
United States of America	153.869
Latvia	140.180
Denmark	137.774

Countries	Results
Israel	133.222
Netherlands	127.688
Sweden	125.828
Poland	124.588
Australia	123.246
Luxembourg	116.844
Korea	115.566
Iceland	114.984
Lithuania	114.167
England	108.783
Austria	108.067
Ireland	105.095
Norway	104.522
Spain	103.968
Switzerland	101.625
Chile	99.598
France	95.784
Czech republic	94.484
Italy	92.974
Germany	91.373
New Zealand	90.931
Costa Rica	90.861
Belgium	89.622
Slovak Repulbic	88.332
Slovenia	86.799
Greece	86.214
Mexico	79.857
Turkey	78.707
Portugal	78.184
Hungary	75.447
Canada	71.678

Indicator A4 : Share of households with broadband connections

Countries	Results
Korea	99.7485
Netherlands	96.9534
Iceland	96.7212
Norway	96.0081
Spain	95.2835
Finland	94.8272
Germany	94.8271
Luxembourg	93.5729
Denmark	92.5007
Ireland	91.8229
Sweden	90.9997
Belgium	90.8610
Slovenia	89.9748
Turkey	89.8608
Poland	89.5686
Estonia	89.1093
Austria	89.1052
Czech Repulbic	88.0204
Latvia	87.5546
Hungary	87.2307
Canada	87.2000
Italy	86.7515
Slovak Repulbic	84.6838
Lithuania	81.8329
Portugal	81.6655
Greece	79.9556
Mexico	60.14840

Indicator A5 : Share of business with broadband contracted speed of 30 Mbps or more

Countries	Results
Denmark	75.4281
Sweden	69.3423
Belgium	67.6955
Portugal	65.6119
Luxembourg	62.4682
Netherlands	61.8986
Spain	61.6361
Lithuania	57.5775
Norway	55.7614
France	48.6731
Ireland	48.4772
Estonia	47.7463
Finland	47.1389
Germany	44.864
Greece	43.1033
Poland	42.768
Latvia	42.1109
Slovenia	41.2913
Austria	40.125
Italy	38.0187
Czech Repulbic	36.4465
Estonia	36.342
Ireland	36.295
Germany	35.9915
Hungary	35.7688
Czech Republic	34.4378
Austria	33.4958
Slovak Repulbic	33.3581
Italy	33.1235
Latvia	32.8499

Countries	Results
Slovak Republic	32.1226
Slovenia	31.8659
Lithuania	27.3482
Turkey	27.2338
Poland	26.4654
Netherlands	26.3411
Turkey	25.9875
Luxembourg	24.8073
Norway	24.642
France	24.4845
Hungary	23.6111
Belgium	23.4107
Portugal	22.5742
Finland	21.7013
Spain	19.8698
Denmark	17.7567
Sweden	17.0803

Indicator A6 : Share of the population covered by at least a 4G mobile network

Countries	Results
ASEAN countries - 8	93.62
Australia	99.4
Austria	98
Belgium	100
Brazil	88.75
Canada	99.5
Colombia	98
Costa Rica	93.8
Czech Republic	99.8
Denmark	100
Eastern Europe	93.357

Countries	Results
Estonia	99
Finland	99.9
France	99
G-20 countries	96.395
Germany	98.6
Greece	98.8
Hungary	99.2
Iceland	98.9
India	97.92
Indonesia	97.59
Ireland	90
Israel	94
Italy	100
Korea	99.9
Latin America and the Caribbean	82.18
Lithuania	99.99
Luxembourg	98
Mexico	90.75
Middle East and North Africa	82.765333
Netherlands	99
Norway	99.9
Poland	100
Portugal	99.8
Slovak Republic	97
Slovenia	99.7
South Africa	94.41
Spain	99.4
Sweden	100
Switzerland	99
Turkey	96.71
England	99.7

Indicator A7 : Disparity in broadband uptake between urban and rural households

Countries	Results
Korea	99.7485142
Netherlands	96.9534
Iceland	96.7212
Norway	96.0081
Spain	95.2835
Finland	94.8272
Germany	94.8271
Luxembourg	93.5729
Denmark	92.5007
Ireland	91.8229
Sweden	90.9997
Belgium	90.861
Slovenia	89.9748
Turkey	89.8608
Poland	89.5686
Estonia	89.1093
Austria	89.1052
Czech Republic	88.0204
Latvia	87.5546
Hungary	87.2307
Canada	87.2
Italy	86.7515
Slovak Republic	84.6838
Lithuania	81.8329
Portugal	81.6655
Greece	79.9556
Mexico	60.1484043

Use

Indicator U1 : Internet users as a share of individuals

Countries	Results
Iceland	99.0333
Norway	98.3963
Sweden	97.5515
Denmark	97.0633
Switzerland	96.50568
Luxembourg	96.4202
Korea	96.1575797
Netherlands	96.0478
England	95.5732
Finland	95.2912
Germany	92.9795
Spain	90.7187
Ireland	90.3436
Belgium	90.2754
Estonia	90.2326
Israel	89.5
France	89.3859
Austria	87.7522
Czech republic	87.0339
Costa Rica	86.3976938
Latvia	86.1355
United States of America	83.26
Slovenia	83.1084
Slovak Republic	82.8537
Lithuania	81.5819
Poland	80.4359
Hungary	80.3717
Brazil	75.8152479
Greece	75.6712

Countries	Results
Italy	75.5675
Portugal	75.3464
Turkey	73.9767
Mexico	72.9797033
Eastern Europe	63.56447
ASEAN	49.42321
Indonesia	47.6906
Middle East and North Africa	39.560259
G20 countries	38.434342
Latin America and the Caribbean	20.057093

Indicator U2 : Share of individuals using the internet to interact with public authorities

Countries	Results
Iceland	93.7087
Norway	91.8857
Denmark	90.6908
Finland	88.2258
Netherlands	86.1341
Sweden	85.7027
Estonia	80.2947
Canada	78.6
Latvia	76.2889
Austria	72.0371
Slovenia	67.1624
Germany	65.8682
Spain	62.9435
Luxembourg	62.8977
Slovak Republic	61.8355
Ireland	61.5773
Belgium	60.9016
Hungary	60.3285
Lithuania	57.7173

Countries	Results
England	57.3029
Czech republic	56.7474
EU countries	56.373
Greece	52.9285
Turkey	51.5411
Portugal	45.2003
Poland	41.9473
Italy	29.3782
Mexico	27.85367

Indicator U3 : Share of internet users who have purchased online in the last 12 months

Countries	Results
England	92.29233
Netherlands	91.17975
Denmark	90.37401
Germany	86.85677
Norway	86.66658
Sweden	86.34702
Iceland	83.20773
Ireland	80.88636
Czech Republic	80.4959
Luxembourg	79.73466
Belgium	78.90021
Finland	78.03571
Estonia	76.09766
Austria	74.47942
Korea	72.30065
EU countries	72.05594
Slovenia	71.83453
Poland	71.82263
Hungary	69.70715
Slovak Republic	68.48549
Spain	66.99427
Lithuania	64.26057

Countries	Results
Latvia	62.80348
Greece	58.92661
Portugal	55.99818
Turkey	41.68398

Indicator U4 : Share of small businesses making e-commerce sales in the last 12 months

Countries	Results
New Zealand	60.25
Ireland	39.073
Denmark	38.4012
Iceland	36.4374
Sweden	34.7688
Czech Republic	30.6236
Lithuania	29.1783
Austria	28.8292
Spain	27.3283
Belgium	25.8816
Slovenia	25.2721
Netherlands	25.2648
Finland	22.4687
Norway	21.9874
Portugal	20.513
Slovak Republic	20.3992
Estonia	20.0185
Germany	19.95
France	17.0652
Poland	16.4981
Hungary	16.3126
Italy	16.3004
Latvia	15.5093
Luxembourg	13.4635
Turkey	9.762

Indicator U5 : Share of businesses with a web presence

Countries	Results
Finland	95.9196
Denmark	92.7669
Austria	90.4229
Sweden	90.0491
Germany	88.3468
Belgium	86.6194
Netherlands	84.1399
Luxembourg	83.9826
Czech Republic	83.3165
New Zealand	82.76
Slovenia	80.7907
Estonia	79.7905
Norway	78.7557
Lithuania	78.1273
Slovak Republic	75.8213
Spain	75.2836
Ireland	75.2665
Italy	73.1121
Poland	71.3222
France	70.3522
Hungary	63.2305
Latvia	62.6167
Portugal	61.5465
Greece	60.1004
Turkey	53.7459

Indicator U6 : Share of businesses purchasing cloud services

Countries	Results
Finland	75.4878
Sweden	69.5064
Denmark	66.8984
Norway	63.7276
Italy	59.1428
Estonia	56.3223

Countries	Results
Belgium	53.2342
Netherlands	52.5061
Ireland	50.9
Slovenia	38.6035
Austria	38.1266
EU countries	36.0974
Germany	33.3223
Lithuania	30.7658
Luxembourg	29.089
Portugal	29.0048
Czech Republic	28.8925
France	26.8609
Spain	26.1548
Slovak Republic	25.5654
Hungary	25.2116
Poland	24.4228
Latvia	21.305
Greece	16.6973
Turkey	14.0946

Indicator U7 : Average monthly mobile data usage per mobile broadband subscription, GB

Countries	Results
Finland	30.988
Austria	25.748
Latvia	23.006
Lithuania	20.535
Iceland	16.7
Estonia	15.997
Chile	12.751
Sweden	11.99
Korea	11.048
Switzerland	10.522
Italy	9.843
France	9.702

Countries	Results
Ireland	9.51
Poland	9.317
Australia	9.256
Slovenia	8.967
Turkey	8.924
Norway	7.25
Denmark	7.19
Luxembourg	6.259
Hungary	5.575
Spain	5.427
England	5.293
New Zealand	4.602
Germany	4.573
Mexico	4.535
Portugal	4.449
Costa Rica	4.086
Netherlands	3.711
Greece	3.438
Canada	3.417
Belgium	3.414

Innovation

Indicator I1 : ICT investment as a percentage of GDP

Countries	Results
Czech Republic	1.33
Netherlands	1.08
Belgium	0.89
Denmark	0.84
Luxembourg	0.84
United States of America	0.61
Lithuania	0.56
Slovenia	0.5
England	0.47
Hungary	0.45

Countries	Results
Germany	0.42
Mexico	0.39
Austria	0.37
Israel	0.34
Italy	0.33
Australia	0.32
Finland	0.32
Slovak Republic	0.26
France	0.24
Greece	0.22

Indicator I2 : Business R&D expenditure in information industries as a percentage of GDP

Countries	Results
Israel	2.420774
Korea	2.035326
United States of America	0.941055
Finland	0.749392
Japan	0.606036
Iceland	0.364742
Germany	0.354063
Norway	0.347624
Estonia	0.314987
Czech Republic	0.290845
New Zealand	0.282667
Turkey	0.268999
England	0.235406
Poland	0.204394
Portugal	0.164284
Italy	0.157896
Slovenia	0.146789
Hungary	0.144442
Spain	0.098817
Lithuania	0.088351
Slovak Republic	0.069023

Countries	Results
Latvia	0.044128
Chile	0.007676
Mexico	0.006043

Indicator I3 : Venture Capital investment in the ICT sector as a percentage of GDP

Countries	Results
Finland	0.20812
Canada	0.183071
Korea	0.158346
England	0.117908
Netherlands	0.112896
Sweden	0.097895
Ireland	0.092717
Hungary	0.092497
France	0.089393
Belgium	0.083814
Switzerland	0.083434
Estonia	0.081255
Denmark	0.080048
Spain	0.071682
Luxembourg	0.069642
Germany	0.058298
New Zealand	0.039115
Norway	0.032672
Austria	0.027198
Slovak Republic	0.022845
Poland	0.021515
Italy	0.020476
Portugal	0.018819
Greece	0.011034
Lithuania	0.010776

Countries	Results
Latvia	0.006876
Czech Republic	0.006663
Slovenia	0.005683

Indicator I4 : Share of start-up firms (up to 2 years old) in the business population

Countries	Results
England	10.5
Sweden	9.4
Slovak Republic	9.0
Poland	8.7
Israel	8.3
New Zealand	8.0
Turkey	8.0
Hungary	7.8
Spain	7.0
Slovenia	6.9
Czech Republic	6.7
Lithuania	6.4
Finland	6.2
Austria	5.8
Italy	5.7
France	5.5
Norway	5.3
Latvia	4.7
Germany	4.3
Greece	3.9
Denmark	3.1
Belgum	2.9

Jobs

Indicator J1 : ICT task-intensive jobs as a percentage of total employment

Countries	Results
Luxembourg	21.68519
United States of America	17.8225
England	17.392
Sweden	16.58881
Lithuania	16.27694
Estonia	15.76142
Netherlands	15.73361
Switzerland	15.37265
Finland	15.22048
Norway	14.72047
Belgium	14.44826
Iceland	14.27687
Slovenia	13.19362
Latvia	12.48296
France	12.00835
Poland	11.12569
Austria	10.88416
Germany	10.4419
Czech Republic	9.219953
Spain	8.421205
Hungary	8.369766
Italy	7.254931
Slovak Republic	6.841666
Greece	6.675247

Indicator J2 : Digital-intensive sectors' share in total employment

Countries	Results
Netherlands	56.5105
Luxembourg	54.39771
Belgium	53.57978
United States of America	53.11909
Hungary	52.84689

Countries	Results
Germany	52.81498
England	52.59539
Canada	52.53335
Slovak Republic	52.42137
Spain	52.01783
France	51.80555
Japan	51.04036
Czech Republic	50.63351
Switzerland	50.62845
Austria	50.19829
Greece	49.60568
Slovenia	48.81734
Estonia	48.51929
Italy	48.43124
Finland	48.00922
Denmark	47.49922
Ireland	47.36482
Australia	46.66047
Lithuania	46.56186
Sweden	46.13028
Chile	45.21252
Poland	44.8623
Iceland	44.64848
Portugal	44.48793
Mexico	43.92844
Norway	42.54163
South Africa	42.20272

Indicator J3 : Workers receiving employment-based training, as a percentage of total employment

Countries	Results
Finland	76.38
Denmark	75.87
Netherlands	75.56
Norway	73.22

Countries	Results
Sweden	72.42
United States of America	70.69
Canada	68.55
Australia	67.81
Ireland	64.1
Estonia	63.3
Germany	62.04
Czech Republic	61.48
Austria	58.65
Korea	57.66
Spain	56.49
Japan	50.36
Poland	48.72
Slovak Republic	45.79
France	45.08
Italy	32.83

Indicator J4: New tertiary graduates in science, technology, engineering and mathematics, as a percentage of new graduates

Countries	Results
United States of America	449,853
Brazil	219,797
Mexico	174,485
Germany	146,199
England	126,985
Korea	107,923
Japan	106,626
Turkey	91,332
Poland	58,077
France	56,879
Colombia	56,302
Italy	51,756
Canada	51,750
Australia	43,840
Spain	37,503

Countries	Results
Chile	26,663
Netherlands	17,319
Switzerland	14,754
Greece	13,693
Ireland	12,691
Israel	12,107
Portugal	11,854
Belgium	10,760
Finland	10,523
New Zealand	10,333
Hungary	9,769
Czech Republic	9,348
Austria	8,721
Denmark	8,595
Sweden	6,370
Lithuania	5,213
Norway	5,129
Slovak Republic	4,011
Slovenia	2,303
Latvia	1,600
Estonia	1,340
Iceland	648
Luxembourg	107

Indicator J5 : Public spending on active labour market policies, as a percentage of GDP

Countries	Results
Austria	0.4
Denmark	0.35
Finland	0.35
France	0.26
Germany	0.18
Luxembourg	0.18
Belgium	0.17
Portugal	0.17

Countries	Results
Switzerland	0.15
Italy	0.13
Estonia	0.12
Ireland	0.11
Spain	0.11
Norway	0.09
Israel	0.07
Korea	0.07
Canada	0.06
Netherlands	0.06
New Zealand	0.06
Sweden	0.06
Latvia	0.05
Lithuania	0.04
Slovenia	0.04
Chile	0.03
United States of America	0.03
Hungary	0.02
Slovak Rebublic	0.02
Australia	0.01
Greece	0.01
Japan	0.01
Czech Republic	0
Mexico	0
Poland	0

Society

Indicator S1 : Percentage of individuals aged 55-74 using the internet

Countries	Results
Iceland	98.6653
Denmark	96.4874
Luxembourg	95.7788
Sweden	94.1263
Norway	92.6333

Countries	Results
England	92.2949
Finland	92.2241
Netherlands	91.9205
Canada	89.5
Korea	89.22946
Germany	85.4729
Ireland	83.6211
Spain	81.108
Belgium	80.9092
Latvia	74.2239
Slovak Republic	72.8633
Estonia	70.8442
Austria	69.89
Czech Republic	67.2959
Slovenia	66.8895
Costa Rica	66.70999
Hungary	62.8761
Italy	60.0038
Lithuania	59.9819
Poland	57.6869
Portugal	51.9357
Greece	50.1703
Mexico	43.38527
Turkey	41.9362

Indicator S2 : Percentage of individuals who live in households with income in the lowest quartile using the internet

Countries	Results
Iceland	99.4731
Denmark	98.661
Luxembourg	98.4596
Norway	97.6195
England	97.3206
Sweden	97.0802
Finland	96.9953

Countries	Results
Korea	96.50506
Canada	95.1
Germany	94.2999
Netherlands	94.0188
Spain	93.2056
Belgium	91.5264
Ireland	91.0143
Slovak Republic	89.9209
Estonia	89.0584
Latvia	88.898
Czech Republic	87.6016
Austria	87.5294
Slovenia	86.6013
Costa Rica	85.15786
Hungary	84.7712
Poland	83.1849
Lithuania	83.0556
Portugal	78.2614
Greece	78.1158
Italy	77.9465
Turkey	77.6696
Mexico	73.76014

Indicator S3 : Women as a share of all 16-24 year-olds who can program

Countries	Results
Denmark	21.66832
Portugal	17.99922
Iceland	15.36419
Finland	14.81812
Norway	14.28571
France	13.06966
Sweden	12.86003
England	12.4069
Austria	12.37322
Estonia	11.97687

Countries	Results
Spain	11.77037
Switzerland	11.07626
Netherlands	10.457
EU countries	9.887232
Italy	9.50738
Germany	9.091292
Lithuania	7.182225
Luxembourg	6.91569
Slovenia	6.545008
Czech Republic	6.426792
Latvia	5.643598
Poland	5.500525
Turkey	4.752886
Ireland	2.725026
Belgium	2.63016
Greece	1.979857
Hungary	1.084851

Indicator S4 : Disparity in Internet use between men and women

Countries	Results
Iceland	99.4731
Denmark	98.8199
Luxembourg	98.5397
Norway	98.0589
England	97.7598
Sweden	97.4608
Finland	97.1741
Korea	96.54319
Germany	95.0458
Netherlands	94.9757
Spain	93.4644
Belgium	92.1625
Ireland	91.9516
Slovak Republic	91.1834
Estonia	89.9268

Countries	Results
Latvia	89.5186
Austria	89.0121
Czech Republic	88.9982
Slovenia	87.5778
Hungary	86.0959
Poland	84.8337
Lithuania	83.7375
Italy	80.8309
Portugal	79.4699
Greece	78.6497
Turkey	78.2495
Mexico	73.76014

Indicator S5 : Percentage of individuals who use digital equipment at work that telework from home once a week or more

Countries	Results
Iceland	38
Norway	37
Netherlands	33
Finland	32
England	32
Greece	31
Luxembourg	28
France	28
Estonia	27
Spain	26
Slovenia	26
Denmark	26
EU countries	25
Hungary	25
Latvia	25
Slovak Republic	25
Belgium	24
Ireland	24
Poland	23

Countries	Results
Austria	21
Portugal	21
Italy	20
Lithuania	18
Germany	18

Indicator S6 : Top-performing 15-16 year old students in science, mathematics and reading

Countries	Results
Estonia	6.573
Korea	6.433
Japan	5.941
Canada	5.452
Netherlands	5.297
Poland	5.292
Finland	5.222
Germany	5.133
New Zealand	5.015
Sweden	4.805
England	4.585
United States of America	4.501
Australia	4.483
Belgium	4.35
Switzerland	4.081
Norway	3.851
Czech Republic	3.794
Slovenia	3.534
France	3.325
Austria	3.283
Ireland	3.178
Luxembourg	2.877
Denmark	2.848
Israel	2.77
Portugal	2.732
Iceland	2.259

Countries	Results
Hungary	2.045
Lithuania	1.985
Slovak Republic	1.755
Latvia	1.52
Italy	1.424
Turkey	1.177
Greece	0.5503
Chile	0.2749
Brazil	0.2673
Mexico	0.09349
Colombia	0.08054

Indicator S7 : OECD Digital Government Index

Countries	Results
Korea	0.74213
England	0.735831
Colombia	0.728848
Denmark	0.651528
Japan	0.645309
Canada	0.628646
Spain	0.621319
Israel	0.604232
Portugal	0.58034
France	0.573466
New Zealand	0.564222
Norway	0.549673
Luxembourg	0.538355
Italy	0.533776
Brazil	0.519102
Slovenia	0.512609
Estonia	0.47818
Latvia	0.473662
Austria	0.451784
netherlands	0.449524
Czech Republic	0.433702

Countries	Results
Ireland	0.411121
Chile	0.410829
Belgium	0.406045
Germany	0.398058
Lithuania	0.397089
Finland	0.355547
Greece	0.346857
Iceland	0.282184
Sweden	0.256691

Indicator S8 : E-waste generated, kilograms per inhabitant

Countries	Results
Norway	26
England	23.9
Switzerland	23.4
Denmark	22.4
Australia	21.7
Netherlands	21.6
Iceland	21.4
France	21
United States of America	21
Belgium	20.4
Japan	20.4
Canada	20.2
Sweden	20.1
Finland	19.8
Germany	19.4
New Zealand	19.2
Spain	19
Luxembourg	18.9
Austria	18.8
Ireland	18.7
Italy	17.5
Greece	16.9
Portugal	16.6

Countries	Results
Korea	15.8
Czech Republic	15.7
Slovenia	15.1
Israel	14.5
Hungary	13.6
Estonia	13.1
Slovak Republic	12.8
Lithuania	12.3
Poland	11.7
Latvia	10.6
Brazil	10.2
Turkey	10.2
Costa Rica	10
Chile	9.9
Mexico	9.7
South Africa	7.1
Colombia	6.3
Indonesia	6.1
India	2.4

Trust

Indicator T1 : Percentage of internet users experiencing abuse of personal information or privacy violations

Countries	Results
Chile	7.798927
Korea	6.29778
Italy	5.972715
Turkey	5.155457
Spain	5.032546
Luxembourg	4.397346
Portugal	4.056336
Costa Rica	3.966504
Mexico	3.629075
England	3.477298

Countries	Results
EU countries	3.436246
Hungary	3.433817
Sweden	3.361148
Norway	3.342049
Denmark	3.247261
Netherlands	3.158861
Belgium	3.043701
France	3.029008
Austria	2.921239
Poland	2.838641
Slovak Republic	2.615442
Switzerland	2.605576
Germany	2.531244
Estonia	2.504266
Iceland	2.331234
Canada	2.0775
Greece	1.697411
Finland	1.688784
Slovenia	1.472716
Ireland	1.437684
Latvia	1.356032
Lithuania	1.281826
czech republic	0.842516

Indicator T2 : Percentage of individuals not buying online due to payment security concerns

Countries	Results
Finland	64.42721
Portugal	60.8759
Switzerland	54.75977
Spain	48.23008
Turkey	45.81075
Hungary	42.28547
France	40.84349
Sweden	39.91206

Countries	Results
England	36.34703
Norway	35.54435
Austria	31.19888
Netherlands	29.81795
Iceland	25.92126
Germany	25.12184
EU countries	24.3086
Greece	23.22381
Denmark	18.77055
Slovenia	18.36815
Slovak Republic	18.31045
Belgium	18.12961
Ireland	16.8304
Lithuania	13.79941
Luxembourg	12.39042
Latvia	11.26785
Czech Republic	9.814267
Italy	8.159797
Poland	6.025776
Estonia	4.357608

Indicator T3 : Percentage of individuals not buying online due to concerns about returning products

Countries	Results
Portugal	51.07621
Switzerland	49.22826
Finland	46.96071
Spain	40.65151
Hungary	37.60756
Iceland	26.55182
Turkey	25.14415
netherlands	23.33238
Lithuania	22.90572
England	21.31299
Sweden	18.05926

Countries	Results
Norway	18.04864
EU countries	17.25651
Austria	16.72749
Germany	16.45007
Slovak Republic	14.94759
France	14.23637
Denmark	13.27322
Greece	9.599324
Italy	9.380008
Belgium	9.16428
Czech Republic	8.857784
Latvia	8.105389
Slovenia	6.584446
Luxembourg	6.451037
Poland	5.99294
Estonia	3.968984
Ireland	3.234247

Indicator T4 : Percentage of businesses in which ICT security and data protection tasks are mainly performed by own employees

Countries	Results
Latvia	40.47
Estonia	35.76
Finland	33.35
Sweden	27.94
England	27.11
Czech Republic	26.93
Luxembourg	26.91
Denmark	24.36
Slovenia	23.59
Germany	23.5
Austria	23.41
Ireland	22.67
Netherlands	22.57
EU countries	22.01

Countries	Results
Belgium	21.95
Poland	21.55
Spain	21.28
Hungary	19.81
Norway	19.56
Lithuania	19.44
Portugal	19.1
Slovak Republic	19.06
Italy	17.06
France	16.94
Greece	15.02

Indicator T5 : Health data sharing intensity

Countries	Results
Denmark	100.0
Finland	100.0
Norway	100.0
Australia	91.1
Estonia	91.1
France	84.4
Canada	82.5
Belgium	80.0
United States of America	80.0
England	71.1
Netherlands	62.0
Luxembourg	60.0
Slovenia	60.0
Israel	57.5
Latvia	55.0
Germany	53.3
Korea	51.1
Sweden	42.2
Japan	40.0
Austria	35.6
Czech Republic	0.0

Countries	Results
Ireland	0.0

Market Openness

Indicator M1 : Share of businesses making e-commerce sales that sell across borders

Countries	Results
Austria	62.49403
Luxembourg	61.36482
Czech Republic	54.27419
Slovenia	53.18729
Belgium	52.86187
Lithuania	52.76018
Portugal	52.51887
Germany	51.25103
Latvia	51.11577
Netherlands	50.16771
Slovak Republic	48.26615
Italy	48.152
Ireland	47.53298
Estonia	46.58964
EU countries	43.74966
Iceland	42.7412
Hungary	38.70369
Poland	38.2966
Spain	37.85715
Greece	37.6978
France	36.54109
Sweden	34.21325
England	33.68351
Denmark	33.5447
Finland	32.1897
Turkey	28.22437
Norway	23.02158

Indicator M2 : Digitally-deliverable services as a share of commercial services trade

Countries	Results
G20 countries	1,277,387.00
United States of America	298,272.00
England	147,157.60
Ireland	126,217.00
BRIICS economies - Brazil, Russia, India, Indonesia, People's Republic of Chinaand South Africa.	118,754.80
Germany	91,802.95
Netherlands	87,468.00
Luxembourg	73,067.38
Switzerland	63,303.00
India	62,909.00
Japan	59,611.00
France	52,939.00
Sweden	26,446.51
Belgium	26,413.01
Canada	23,784.40
Italy	21,205.93
Spain	20,966.00
Korea	15,221.10
Israel	14,225.96
Finland	11,463.57
Austria	11,086.43
Poland	8,622.00
Denmark	8,424.06
Australia	7,601.30
Norway	5,555.00
Czech Republic	5,054.00
Hungary	5,013.35
Brazil	4,342.00
Mexico	3,736.10
Portugal	2,458.16
Turkey	2,251.00
South Africa	2,098.25
Greece	2,041.97

Countries	Results
Indonesia	1,686.00
New Zealand	1,680.40
Slovak Republic	1,426.00
Costa Rica	1,326.00
Latvia	1,148.00
Estonia	897.00
Slovenia	876.00
Chile	860.30
Iceland	744.04
Lithuania	734.06

Indicator M3 : ICT goods and services as a share of international trade

Countries	Results
Ireland	41.91281
Israel	28.30189
Korea	28.25135
Luxembourg	22.56456
ASEAN	20.36622
Czech Republic	16.80759
India	16.21753
Slovak Republic	15.83368
Mexico	15.06226
Sweden	13.5568
Latvia	13.41115
Hungary	13.1547
G20 countries	12.75182
Estonia	12.74792
Finland	11.88861
United States of America	11.03117
Netherlands	10.63855
Costa Rica	10.20527
Poland	9.525847
England	8.799976
Japan	8.641761
Eastern Europe	8.449099

Countries	Results
Denmark	7.72016
Germany	7.364702
Latin America and the Caribbean	7.202927
France	7.156004
Austria	7.136075
Greece	5.535731
Portugal	5.523589
Spain	5.258122
Belgium	4.430839
Italy	3.622887
Indonesia	3.53804
Canada	3.510208
Norway	2.899495
Slovenia	2.619677
Australia	2.186636
Turkey	1.964558
South Africa	1.634961
Brazil	1.405522
Colombia	1.210183
Chile	0.791789

Indicator M4 : Digital-intensive services value added embodied in manufacturing exports, as a percentage of manufacturing export value

Countries	Results
Ireland	38.59
Sweden	12.82
Finland	12.37
Norway	11.34
England	10.49
Estonia	8.52
Germany	8.4
Czech Republic	8.16
Slovenia	8.12
Iceland	8.06
Hungary	7.94

Countries	Results
Australia	7.64
Korea	7.57
Slovak Republic	7.37
Spain	7.24
Indonesia	7.11
Italy	6.64
Turkey	6.61
Portugal	6.41
United States of America	6.34
Poland	6.27
netherlands	6.2
Japan	6.14
Luxembourg	6.12
France	5.95
Costa Rica	5.91
Denmark	5.87
Latvia	5.74
Brazil	5.69
Chile	5.57
People's Republic of China	5.08
Austria	4.96
Greece	4.59
Belgium	4.52
South Africa	4.43
Russia	4.08
Lithuania	3.94
New Zealand	3.77
Switzerland	3.41
India	3.39
Canada	3.17
Israel	3.08
Colombia	2.66
Mexico	1.41

Growth & Well being

Indicator G1 : Digital-intensive sectors' contribution to value added growth

Countries	Results
England	86.0
Belgium	82.0
France	73.8
Sweden	73.8
Czech Republic	70.7
Mexico	69.4
Netherlands	66.6
Hungary	65.2
Spain	64.4
Denmark	62.4
Poland	60.1
Slovak Republic	59.5
United States of America	57.8
Estonia	48.3
Austria	47.4
Slovenia	45.2
Iceland	42.9
Luxembourg	39.4
Canada	35.5
Italy	27.1
Finland	12.9
Greece	-9.1

Indicator G2-S5 : Percentage of individuals who use digital equipment at work that telework from home once a week or more

Countries	Results
Iceland	38
Norway	37
Netherlands	33
Finland	32
England	32
Greece	31

Countries	Results
Luxembourg	28
France	28
Estonia	27
Spain	26
Slovenia	26
Denmark	26
EU countries	25
Hungary	25
Latvia	25
Slovak Republic	25
Belgium	24
Ireland	24
Poland	23
Austria	21
Portugal	21
Italy	20
Lithuania	18
Germany	18

Indicator G3 : Workers experiencing job stress associated with frequent computer use at work

Countries	Results
England	79.29
Sweden	78.49
France	78.4
Greece	76.15
Spain	73.32
New Zealand	69.67
Brazil	69.66
Denmark	62.68
Korea	61.92
Israel	61.45
Hungary	61.4
Belgium	61.03
Turkey	59.61

Countries	Results
Australia	57.88
Lithuania	56.87
Costa Rica	54.59
Poland	52.84
Japan	51.91
Latvia	51.19
Ireland	49.94
Mexico	49.44
Slovak Republic	48.83
Finland	47.05
Italy	46.5
Luxembourg	46.28
Slovenia	45.53
Chile	44.53
Germany	44.05
Switzerland	43.66
Estonia	42.73
Austria	42.23
Iceland	41.65
Czech Republic	41.43

Indicator G4-S2 : Percentage of individuals who live in households with income in the lowest quartile using the internet

Countries	Results
Iceland	99.4731
Denmark	98.661
Luxembourg	98.4596
Norway	97.6195
England	97.3206
Sweden	97.0802
Finland	96.9953
Korea	96.50506
Canada	95.1
Germany	94.2999
Netherlands	94.0188

Countries	Results
Spain	93.2056
Belgium	91.5264
Ireland	91.0143
Slovak Republic	89.9209
Estonia	89.0584
Latvia	88.898
Czech Republic	87.6016
Austria	87.5294
Slovenia	86.6013
Costa Rica	85.15786
Hungary	84.7712
Poland	83.1849
Lithuania	83.0556
Portugal	78.2614
Greece	78.1158
Italy	77.9465
Turkey	77.6696
Mexico	73.76014

Indicator G5 : Students aged 15-16 who feel bad if no internet connection is available

Countries	Results
England	79.29
Sweden	78.49
France	78.4
Greece	76.15
Spain	73.32
New Zealand	69.67
Brazil	69.66
Denmark	62.68
Korea	61.92
Israel	61.45
Hungary	61.4
Belgium	61.03
Turkey	59.61

Countries	Results
Australia	57.88
Lithuania	56.87
Costa Rica	54.59
Poland	52.84
Japan	51.91
Latvia	51.19
Ireland	49.94
Mexico	49.44
Slovak Republic	48.83
Finland	47.05
Italy	46.5
Luxembourg	46.28
Slovenia	45.53
Chile	44.53
Germany	44.05
Switzerland	43.66
Estonia	42.73
Austria	42.23
Iceland	41.65

Indicator G6-T1 : Percentage of internet users experiencing abuse of personal information or privacy violations

Countries	Results
Chile	7.798927
Korea	6.29778
Italy	5.972715
Turkey	5.155457
Spain	5.032546
Luxembourg	4.397346
Portugal	4.056336
Sample average (3 OECD member countries)	4.001452
Costa Rica	3.966504
Mexico	3.629075
England	3.477298
EU countries	3.436246

Countries	Results
Hungary	3.433817
Sweden	3.361148
Norway	3.342049
Denmark	3.247261
Netherlands	3.158861
Belgium	3.043701
France	3.029008
Austria	2.921239
Poland	2.838641
Slovak Republic	2.615442
Switzerland	2.605576
Germany	2.531244
Estonia	2.504266
Iceland	2.331234
Canada	2.0775
Greece	1.697411
Finland	1.688784
Slovenia	1.472716
Ireland	1.437684
Latvia	1.356032
Lithuania	1.281826
Czech Republic	0.842516

Indicator G7-S8 : E-waste generated, kilograms per inhabitant

Countries	Results
Norway	26
England	23.9
Switzerland	23.4
Denmark	22.4
Australia	21.7
netherlands	21.6
Iceland	21.4
France	21
United States of America	21
Belgium	20.4

Countries	Results
Japan	20.4
Canada	20.2
Sweden	20.1
Finland	19.8
Germany	19.4
New Zealand	19.2
Spain	19
Luxembourg	18.9
Austria	18.8
Ireland	18.7
Italy	17.5
Greece	16.9
Portugal	16.6
Korea	15.8
Czech Republic	15.7
Slovenia	15.1
Israel	14.5
Hungary	13.6
Estonia	13.1
Slovak Republic	12.8
Lithuania	12.3
Poland	11.7
Latvia	10.6
Brazil	10.2
Turkey	10.2
Costa Rica	10
Chile	9.9
Mexico	9.7
South Africa	7.1
Colombia	6.3
Indonesia	6.1
India	2.4

Chapter 14 Summary of the Findings and Comparison on the Operational Performance of Thailand Digital Outlook in Phase 1, Phase 2 and Phase 3

14.1 Findings of the study to review the Thailand Digital Outlook Phase 1

ONDE conducted the Thailand Digital Outlook Research Project Phase 1 in the fiscal year of 2018 with the objective to study the international best practices for assessing the digital development policies through various economic indicators. The data were collected from primary and secondary sources both public and private sectors to process and present the overview of problems and obstacles of Thailand in driving the country following the Digital Thailand Policy. This will lead to the summary of recommendations and approaches for reforming Thailand's digital development policy to reach international standards in order to promote the country's digital economy. ONDE refers to the digital development policy assessment framework based on the Organisation for Economic Co-operation and Development (OECD) in the study. A total of 13 pilot economic indicators were selected according to the OECD Going Digital Toolkit framework and the data of indicators were collected in the 3 pilot provinces 3; Ratchaburi, Kanchanaburi and Suphan Buri.

14.1.1 Results of the internet use survey

ONDE collects and extracts the information from the sources including the information from Pracharat Internet project operation of the Ministry of Digital Economy and Society (collected by TOT Public Company Limited) and the information cordially provided by True Corporation Public Company Limited (TRUEMOVE-H mobile phone service provider). Therefore, ONDE has made the preliminary summary as follows:

- The general use of digital technology in Thailand (public sector including students and university students) is for social media and entertainment purposes whereas the use for education and research or the use to access government services is still considered in much smaller proportion.

- In the 3 pilot provinces, most internet users are in the age group of 30-39 years old, followed by the group of 40-49 years old and the group of 20-29 years old. However, the overall users of all ages tend to use the internet at a steadily increasing rate continually.
- The services that are used via the internet include browsing services, online shopping-selling services, E-Banking services, job search services, health services, etc.

14.1.2 Findings of the study on the indicators of Thailand Digital Outlook Phase 1

ONDE refers to the digital development policy assessment framework based on the Organisation for Economic Co-operation and Development (OECD) in the study. The 13 pilot economic indicators were selected according to the OECD Going Digital Toolkit framework. Then, the pilot provinces were selected for the survey. In Phase 1 of the Project, the 3 selected pilot provinces are Ratchaburi, Kanchanaburi and Suphan Buri. Regarding the gathering and collection of information of the mentioned indicators, the information was collected and extracted from the sources including the information from Pracharat Internet project operation of the Ministry of Digital Economy and Society (collected by TOT Public Company Limited) and the information cordially provided by True Corporation Public Company Limited (TRUEMOVE-H mobile phone service provider).

Table 199 List of indicators studied in the Thailand Digital Outlook Phase 1

No.	Indicators studied in the Thailand Digital Outlook Phase 1		
	Dimensions	Indicators	Sources
1	Access	Data Usage	■ TOT ■ TRUEMOVE-H
2	Use	Total Daily Internet Users	■ TRUEMOVE-H
3		Diffusion of Selected Activities	■ TRUEMOVE-H
4		Diffusion of Selected Online Activities Among Students	■ TRUEMOVE-H
5		Individuals Who Order Online	■ TRUEMOVE-H
6	Innovation	Individuals Who Use Digital Technology for Research	■ TRUEMOVE-H
7	Jobs	Individuals with Independent Work	■ TRUEMOVE-H

No.	Indicators studied in the Thailand Digital Outlook Phase 1		
	Dimensions	Indicators	Sources
8	Society	Time Spent on the Internet by Students Outside Schools	▪ TRUEMOVE-H
9		Internet Users by Age Group	▪ TRUEMOVE-H
10		Individuals Who Use E-Government	▪ TRUEMOVE-H
11		Individuals Who Use E-Banking	▪ TRUEMOVE-H
12		Individuals Who Use Digital Technology for Jobs and Health	▪ TRUEMOVE-H
13	Trust	Individuals Who Use Social Network	▪ TRUEMOVE-H

The findings of study can be summarized as below:

- **1st Indicator: Data Usage**
  - In the TRUEMOVE-H case, the internet usage in all 3 provinces increased in the same direction. However, the Pracharat internet was especially active only in certain months.
  - The usage increased for both uploading and downloading within a period of 1 year. Most of the usage were downloading data more than uploading data. This represented that most users are content consumers rather than content creators.
  - The data from the Pracharat Internet Project had a significantly high volume of data usage in February, March, June, July and August.
- **2nd Indicator: Total Daily Internet Users**
  - The number of internet users continues to increase in the same direction in all 3 provinces having Ratchaburi to have higher number of users than the other 2 provinces.
- **3rd Indicator: Diffusion of Selected Activities**
  - The most used website type is Social networking or social media such as Facebook, Instagram, followed by Streaming Media or video websites such as Youtube, followed by Google search, Webmail, chat programs, online games, etc.
  - The online shopping for goods and services has the 6th highest number of users. This represents the relatively high percentage of online spending implying more heading towards a higher digital society.

- The use of news websites is at the 10th rank reflecting that the access or interest of people on the news is not very high.
- Overall, it was found that the use of technology and digital information by individuals also focuses on the use for entertainment and communication purposes. The purposes of usage for information seeking and acquiring knowledge are still much smaller proportion.

- **4th Indicator: Diffusion of Selected Online Activities Among Students**
  - The Internet websites used by students and university students do not rank very differently than the average users. It shows that there is not much difference between the people's and the students' interest and use of technology.
  - The use of educational websites is at the least. It can be concluded that students and university students in the 3 provinces still rarely use the internet for the purpose of education.
- **5th Indicator: Individuals Who Order Online**
  - During June and July, the users who visited the online shopping websites were significantly less than other months in all provinces surveyed in this research project.
  - The users in Kanchanaburi had less usage of online trading websites than the users in Ratchaburi and Suphan Buri every month.
- **6th Indicator: Individuals Who Use Digital Technology for Research**
  - Very few people use digital technology for research with less than 1% of users.
- **7th Indicator: Individuals with Independent Work**
  - There are very few users with independent occupations in the pilot area with less than 1% of users.
- **8th Indicator: Time Spent on the Internet by Students Outside Schools**
  - More and more students and university students in all 3 provinces tend to use the internet outside school hours each quarter. Ratchaburi had the highest average hours of use, followed by Suphan Buri and Kanchanaburi, respectively.

- **9th Indicator: Internet Users by Age Group**
  - The internet users in the age group of 30-39 years were the largest in all 3 provinces. The age group of 40-49 years and 20-29 years were the second largest number. The number of Internet users is quite high.
  - The users in the age range of 50-59 years and 60 years and over were still not very high proportion compared to the total number of internet users.
- **10th Indicator: Individuals Who Use E-Government**
  - There are still very few internet users who use government websites. The proportion of users is about 5% to 10%.
- **11th Indicator: Individuals Who Use E-Banking**
  - The service users in Kanchanaburi have a lower proportion of electronic financial service users than those in Ratchaburi and Suphan Buri Province every month. It is in the same direction as online trading user data.
- **12th Indicator: Individuals Who Use Digital Technology for Jobs and Health**
  - The proportion of internet users who are interested in job and health information is approximately 20% to 30%. The lowest proportion is during June and December
  - The service users in Kanchanaburi has a smaller proportion of service users in the field of job seeking and health services than in the other 2 provinces which is in line with other indicators.
- **13th Indicator: Individuals Who Use Social Network**
  - The number of Facebook and LINE users is in the 1st and 2nd ranks with the proportion of users exceeding 50% of the total number of users which is greater than the proportion of other indicators. It shows that many internet users have confidence and interest in using social networking services.
  - The service users in Kanchanaburi are in the smaller proportion than in the other 2 provinces. It is in the same direction as other indicators representing that the service users in Kanchanaburi may have fewer confidence than elsewhere. As a result, there are less users of internet services in Kanchanaburi than in all other provinces. If the government wants to push any policy related to the digital economy, it is possibly

necessary to consider the issue of different area from another as in this particular case.

The operational performance of the project in Phase 1 have observations regarding the conformity of the Thailand Digital Outlook which can be summarized as follows:

- The 13 pilot indicators cover only the first 6 dimensions within the framework established by the OECD; 1) Access, 2) Use, 3) Innovation, 4) Jobs, 5) Society, and 6) Trust. It still lacks 7) Market Openness and 8) Growth & Well-being.
- From considering the details of the 13 pilot indicators, it was found that 9 indicators may not be consistent with or does not exist within the framework of the current OECD Going Digital Toolkit making it necessary to consider and revise its scope and details of the indicators to be surveyed and/or to be collected the data under the project in Phase 2.
- An early project study carried out data collection by collecting data only from secondary sources from the government (information from the Pracharat Internet Project) and the private sector (all information received from True Corporation Public Company Limited). Therefore, in the implementation of the Thailand Digital Outlook Phase 2 project, it is necessary to adjust the criteria for collecting new indicators such as data collection through the response form, data collection from other secondary sources, data collection through model to estimate various values, etc., in accordance with the framework of OECD.

In considering the framework of indicators according to the guidelines of the OECD, ONDE has combined the 13 indicators studied in the Phase 1 project into the study in the Thailand Digital Outlook Phase 2 in order to create the correspondence and connection between the 2 phases of study. However, some inconsistencies that occurred in some indicators made the Thailand Digital Outlook Phase 2 necessary to adjust the scope, redefine the data collection approaches, and guidelines for presenting some indicators to be accurate and more compliant with the OECD Framework.

14.2 Findings of the study to review the Thailand Digital Outlook Phase 2

In implementing the Thailand Digital Outlook Phase 2, the OECD has developed the “OECD Going Digital Toolkit” as the framework for assessing digital development at

the national level. Besides, additional indicators have been set to cover all 8 dimensions; 1) Access, 2) Use, 3) Innovation, 4) Jobs, 5) Society, 6) Trust, 7) Market Openness and 8) Growth & Well-being. ONDE has considered and defined the scope of indicators in the study to compile and organize. The data were collected in the context of Thailand based on the OECD Going Digital Toolkit framework of 36 indicators and from recommendations for organizing the stakeholder brainstorming meeting. ONDE has expanded the study scope and collected other indicators outside the framework of the OECD for additional 8 indicators to create a more complete reflection of Thailand Digital Outlook and to summarize the total number of 44 indicators as follows.

Table 200 List of indicators studied in the Thailand Digital Outlook Phase 2

No.	Indicators studied in the Thailand Digital Outlook Phase 2	
	Dimensions	Indicators
1	Access	Fixed broadband subscriptions per inhabitants
2		M2M machine to machine SIM cards per inhabitants
3		Mobile broadband subscription per inhabitants
4		Average monthly mobile data usage per mobile broadband subscription, GB
5		Share of households with broadband connections
6		Share of businesses with broadband contracted speed of Mbps or more
7		Fixed Broadband Price to GNI per Capita
8		Share of fiber-optic high-speed Internet connections
9	Use	Internet users as a share of individuals
10		Share of individuals using the internet to interact with public authorities
11		Share of internet users who have purchased online in the last 12 months
12		Share of small businesses making e-commerce sales in the last 12 months
13		Share of businesses purchasing cloud services
14		Value of digital payment transactions per person
15		Proportion of government cloud usage by an agency to total required agency
16	Innovation	ICT Investment as a Percentage of GDP
17		Business R&D Expenditure in Information Industries as a Percentage of GDP
18		Venture Capital Investment in the ICT Sector as a Percentage of GDP
19		Share of Start-up Firms (up to 2 years old) in the Business Population
20		The number of patent applications in the information technology or related fields in Thailand

No.	Indicators studied in the Thailand Digital Outlook Phase 2	
	Dimensions	Indicators
21		A number of robots being in used in Thailand's manufacturing sector per 10,000 manufacturing workers
22	Jobs	ICT task-intensive jobs as a percentage of total employment
23		Digital-intensive sectors' share in total employment
24		Workers receiving employment-based training, as a percentage of total employment
25		New tertiary graduates in science, technology, engineering, and mathematics, as a percentage of new graduates
26		Public Spending on Active Labor Market Policies, as a Percentage of GDP
27		Average wage of ICT specialists
28		Labor Productivity in Digital-intensive industries
28	Society	Percentage of individuals aged 55-74 using the internet
29		Percentage of individuals who live in households with income in the lowest quartile using the internet
30		Percentage of individuals who use digital equipment at work that telework from home once a week or more
31		Women as a share of all 16-24 year-olds who can program
32		Top-performing 15-16 year old students in science, mathematics and reading
33		E-waste generated, kilograms per inhabitant
34	Trust	Percentage of internet users experiencing abuse of personal information or privacy violations
35		Percentage of individuals not buying online due to payment security concerns
36		Percentage of individuals not buying online due to concerns about returning products
37		Percentage of businesses in which ICT security and data protection tasks are mainly performed by own employees
38	Market openness	Share of Businesses Making E-commerce Sales that Sell Across Borders
39		Digitally-deliverable services as a share of commercial services trade
40		Share of predominantly digitally delivered services in commercial services trade
41		Digital-intensive services value added embodied in manufacturing exports, as a percentage of manufacturing export value
42		Digital-intensive sectors contribution to value added growth

No.	Indicators studied in the Thailand Digital Outlook Phase 2	
	Dimensions	Indicators
43	Growth and Well-being	Workers experiencing job stress associated with frequent computer use at work
44		Students aged 15-16 who feel bad if no internet connection is available

Exploring and collecting the indicators based on the survey were conducted with 2 sample groups. Surveying the sample of general users was conducted for at least 400 samples per province, 77 provinces across the country. A total of 32,967 sample users were surveyed from a total of 31,036 samples to be surveyed (accounting for 106.2% of the targets). The responses were received from the company samples for totaling 3,178 samples from the targets that need to be surveyed for not less than 3,000 samples (accounting for 105.9% of the targets).

The important results of the survey and study are as follows:

14.2.1 Results of the survey on the internet use of general people

The survey respondents use the mobile internet the most accounting for 82.2% of all survey respondents, followed by fixed internet use of 37.3% and Narrowband Internet use of 2.5%, respectively. Most respondents have the highest percentage of internet use in their residences accounting for 73.0%, followed by workplaces accounting for 38.4% and residences of others accounting for 27.2%, respectively.

71.7% of the survey respondents use internet 5-7 days a week. Especially the respondents aged 0-19, 20-29, and 30-39, the proportion of survey respondents uses the internet 5-7 days a week for more than 85%. For the period of internet use, it was found that 17.7% of respondents use internet for more than 60 hours per week. Most of the survey respondents were aged 0-19, 20-29, and 30-39 as well.

The impact of COVID-19 has affected the internet behavior of the survey respondents but not much. Only about 16.7% of the total respondents has increased the internet use (with an average increase of 59 minutes per day). Meanwhile, more than 81.8% of respondents had approximately the same amount of internet use as before the outbreak of the virus.

14.2.2 Results of the survey on digital activities and the use of digital technology by general people

Over 35.3% of respondents use e-government services. The services used the most are the payment of electricity/water/telephone/utilities bills (56.0%), online tax filing (40.2%), and social security rights management (25.2%). Consequently, the impact of COVID-19 causes the survey respondents to increasingly use e-government services, such as those who pay for utilities online. There was an increase in usage by 8.8%, an increase in online tax filing services by 5.0%, and a 7.8% increase in social security service users, etc.

The most popular online activities are 1) chatting via applications such as LINE, Facebook Messenger, etc., and 2) using social media such as Facebook, Instagram, Twitter, etc. It was found that the impact of COVID-19 resulted in a significant increase in the use of certain online services such as online learning/attending, online training courses, and Work from Home/Teleworking.

Regarding the purchase of goods/services through online channels, it was found that approximately 1-3 of the respondents or 37.7% had purchased goods/services through online channels. The goods/services that are popularly purchased through online channels are clothing, shoes, sports equipment and accessories. It was found that the main reason why the respondents did not purchase goods/services through online channels was because they liked to go to the stores. Besides, they had no interest to use the service and they concern about the quality of products and services.

14.2.3 Results of the survey on other matters of general people

- One-sixth or 17.4% of survey respondents use the internet for teleworking. The Covid-19 crisis resulted in the survey respondents who are active on the internet for teleworking at a significant 4.4% increase.
- The respondents knowing Personal Data Protection Act B.E.2562 represented 44.5%.
- Over 33.4% of the respondents had used internet services under the Pracharat Internet Project. The main purpose of using the internet is to use for the benefits of learning (in this case including searching for information), followed by the use of public relations and for using e-government services, respectively.

- Most respondents are satisfied with the implementation of government digital policies and measures at the moderate level. The “Thai Chana” Application is the government's digital policies and measures that received the most satisfaction scores.

14.2.4 Results of the survey on the internet use of the private companies

Over 85.1% of survey respondents use the fixed while about 18.0% of mobile internet was used and about 0.5% of narrowband was used. The survey respondents companies with internet speeds greater than 30 Mbps are accounted for 78.4% of the total samples. Bangkok was the area with the highest fixed internet usage of 90.9%.

14.2.5 Results of the survey on digital activities and the use of digital technology by private companies

The survey respondents use government services online accounting for 48.2% of the total samples. The most popular types of e-government services are filing tax forms/documents and sending account information. More than 85.2% of companies used such services followed by the delivery of employee information and utility payments. The service rate is accounted for 35.3% and 29.2%, respectively.

It was also found that more than 2-3 of survey respondents or 66.7% have not yet sold their products or services online. However, the consequences of the COVID-19 crisis show that there are companies that start adapting to distribute more products or services online.

In general, the COVID-19 crisis has clearly affected the e-commerce sector of companies in Thailand both trading electronic commerce with domestic and international markets. From the survey, it was found that almost all types of businesses had lower distribution to domestic and international customers. Especially the wholesale and retail business, hotel accommodation and food service sectors, they have been affected resulting in a significantly lower distribution of sales than in the pre-Covid crisis.

14.2.6 Other survey results of private companies

- 25.6% of survey respondents purchase or pay for using the cloud service.
- 26.7% of survey respondents apply the data analysis to promote their business operations.
- 60.2% of survey respondents are familiar with the Personal Data Protection Act and more than 97.9% of survey respondents are prepared to take care of personal

data in the data collection with the highest mean. However, in preparing to take care of personal information of employees in other areas, the proportion of Thai entrepreneurs is still not very high.

- The majority of respondents are quite satisfied with the government's digital policies and measures, especially the measures to promote digital enterprises to start and legislation to protect personal information for public information protection.

14.2.7 Results of the study on the indicators of Thailand Digital Outlook Phase 2

Indicators in the dimension of Access

- **A1 Fixed broadband subscriptions per 100 inhabitants** It was found that in 2019, the access rate of fixed broadband service accounted for 14.6% of the total Thai population. The proportion of broadband internet connection for fixed fiber optic was 52% of all high-speed internet connections.
- **A2 M2M Machine to Machine SIM cards per inhabitants** *It was found that in 2019, the registered SIM card connection rate of M2M was expected to be 1.8% of the total Thai population or accounting to the number of SIM cards 1.2 million connections.*
- **A3 Mobile broadband subscription per 100 inhabitants** It was found that in 2019, the mobile broadband internet usage rate covered 88% of the total Thai population or *accounting* for 60.5 million people.
- **A4 Share of households with broadband connections** It was found that in 2019, the average data usage of mobile broadband internet users was 11.8 gigabytes per month.
- **A5 Share of business with broadband contracted speed of 30 Mbps or more** It was found that Thai households with internet connection accounted for 66.5% of the total number of households in the country.
- **AX1 Fixed Broadband Price to GNI per Capita** It was found that the price of such internet service was at 2.9 per cent per person's income.
- **AX2 Proportion of fiber optic high speed internet connections** It was found that there were more than 5.01 million users and connected to fiber optic high-

speed internet in Thailand in 2019 or 51.7% of internet connections of all fixed broadband in the country (*accounting for* 9.69 million).

Indicators in the dimension of Use

- **U1 Internet users as a share of individuals** It was found that such proportion of Thailand was 66.7%.
- **U2 Share of individuals using the internet to interact with public authorities** The data from the survey on Thailand Digital Outlook Research Project Phase 2, 2020, revealed that Thailand had 35.3% proportion of people who use e-government services to internet users.
- **U3 Share of internet users who have purchased online in the last 12 months** The data from the survey on Thailand Digital Outlook Research Project Phase 2, 2020, revealed that Thailand had 38.6%.
- **U4 Share of small businesses making e-commerce sales in the last 12 months** The data from the survey on Thailand Digital Outlook Research Project Phase 2, 2020, revealed that Thailand had 29.2%.
- **U5 Share of businesses with a web presence** The data from the survey on Thailand Digital Outlook Research Project Phase 2, 2020, revealed that Thailand had 25.6%.
- **UX1 Value of digital payment transactions per person** *It was found that in 2019, Thailand had the value of payment transactions via Mobile Banking service at 394,808 baht per person and the value of payment transactions via Internet Banking service at 366,713 baht per person.*
- **UX2 Proportion of cloud usage by government agencies to total cloud demand** It was found that as of October 2020, there were a number of government cloud services under the Government Data Center and Cloud service (GDCC) development project by the Ministry of Digital Economy and Society for more than 21,048 VMs and more than 22,788 VMs are still waiting for service to government agencies in need.

Indicators in the dimension of Innovation

- **I1 ICT Investment as a Percentage of GDP** It was found that in 2019, the investment in the information and communication technology industry accounted for 1.53% of the gross national product value or the value of 258,311 million baht.

- **I2 Business R&D Expenditure in Information Industries as a Percentage of GDP** It was found that in 2018, the investment in research and development in the industrial sector accounted for 0.08% of the gross national product value or the value of 12,721 million baht.
- **I3 Venture Capital Investment in the ICT Sector as a Percentage of GDP** It was found that in 2018, the investment value from the venture capital business and information technology business sector accounted for 2,229 million baht or 0.014% of the gross national product value.
- **I4 Share of Start-up Firms (up to 2 years old) in the Business Population** It found that in 2019, the percentage of 2-year-old businesses that are still in operation amounted to 68,516 companies or 25.9% of the total number of businesses that are still in operation.
- **IX1 The number of patent applications in the Information Technology or related fields in Thailand** It was found that in 2018, Thailand had 93 patent applications in information technology-related fields accounting for 10.3% of the total number of patent applications.
- **IX2 A number of robots being used in Thailand's manufacturing sector per 10,000 manufacturing workers** It was found that in 2019, the number of robots used in the manufacturing sector in Thailand accounted for 59 pieces per 10,000 workers in the manufacturing sector, increasing from the number of robots in 2016 at 45 pieces per workforce in the industrial sector for the production of 10,000 workers

Indicators in the dimension of Job

- **J1 ICT task-intensive jobs as a percentage of total employment** It was found that in 2019, Thailand has employed people in information technology jobs accounting for 3.5% of all employed people.
- **J2 Digital-intensive sectors' share in total employment** *It was found that in 2019, Thailand had 34.6% of all employed people in the digital business sector.*
- **J4 New tertiary graduates in science, technology, engineering, and mathematics, as a percentage of new graduates** It was found that in 2019, all graduates in Thailand graduated from the majors for 21.6% of all graduates.

- **J5 Public Spending on Active Labor Market Policies, as a Percentage of GDP** It was found that in 2019, the government has invested in labor market policies accounting for 0.05% of GDP.
- **JX1 Average wage of ICT specialists** It was found that Thai workers with information technology positions had the average income of 26,808 baht per month which is growing rapidly with a cumulative average of 21.4% per year since 2015 at 23,010 baht per month.
- **JX2 Labor Productivity in Digital-intensive industries** It was found that as of 2019, the productivity of all workers in industries related to digital technology in the business group with high digital technology and business groups that use digital technology from moderate to high level at 19,723,230 baht per person.

Indicators in the dimension of Society

- **S1 Percentage of individuals aged 55-74 using the internet** The data from the survey on Thailand Digital Outlook Research Project Phase 2, 2020, revealed that Thailand had 67.4%.
- **S2 Percentage of individuals who live in households with income in the lowest quartile using the internet** The data from the survey on Thailand Digital Outlook Research Project Phase 2, 2020, revealed that Thailand had 60.8%.
- **S3 Women as a share of all 16-24 year-olds who can program** The data from the survey on Thailand Digital Outlook Research Project Phase 2, 2020, revealed that Thailand had 35.7%.
- **S4 Disparity in Internet use between men and women** The data from the survey on Thailand Digital Outlook Research Project Phase 2, 2020, revealed that Thailand had 6
- **S5 Top-performing 15-16 year old students in science, mathematics and reading** It was found that in 2018, students with high scores in all 3 subjects accounted for 2.7 percent of the total number of students taking assessment tests.
- **S6 E-waste generated, kilograms per inhabitant** It was found that in 2019, the amount of electronic waste generated in Thailand was 621 kilotons or 9.2 kg per person.

Indicators in the dimension of Trust

- **T1 Percentage of internet users experiencing abuse of personal information or privacy violations** The data from the survey on Thailand Digital Outlook Research Project Phase 2, 2020, revealed that Thailand had 11.5%.
- **T2 Percentage of individuals not buying online due to payment security concerns** The data from the survey on Thailand Digital Outlook Research Project Phase 2, 2020, revealed that Thailand had 9.5%.
- **T3 Percentage of individuals not buying online due to concerns about returning products** The data from the survey on Thailand Digital Outlook Research Project Phase 2, 2020, revealed that Thailand had 12.7%.
- **T4 Percentage of businesses in which ICT security and data protection tasks are mainly performed by own employees** The data from the survey on Thailand Digital Outlook Research Project Phase 2, 2020, revealed that Thailand had 26%.

Indicators in the dimension of Market Openness

- **M1 Share of Businesses Making E-commerce Sales that Sell Across Borders** It was found that in 2019, Thailand had the share of products/services being distributed through online channels in the international market accounting for 20.8% of all distribution business of goods/services through online channels.
- **M2 Digitally-deliverable services as a share of commercial services trade** It was found that in 2019, Thailand had the value of imports and exports of digital services as high as 9% of the total value of export and import services.
- **M3 ICT goods and services as a share of international trade** It was found that in 2015, the average share of the added value of digital services to the total export value of goods in the country accounted for 23.1% of the total export value of the manufacturing industry.

Indicators in the dimension of Growth & Well-being

- **G1 Digital-intensive sectors' contribution to value added growth** It was found that during 2014-2019, the average annual growth rate of added value in the digital business sector was over 3.7%.
- **G2 Percentage of individuals who use digital equipment at work that telework from home once a week or more** The data from the survey on Thailand Digital

Outlook Research Project Phase 2, 2020, revealed that Thailand had 16.4% of employees who were stressed when using computers to work.

- **G3 Workers experiencing job stress associated with frequent computer use at work** The data from the survey on Thailand Digital Outlook Research Project Phase 2, 2020, revealed that Thailand had 65.2%.

14.2.8 Summary on the policy recommendations from the implementation of Thailand Digital Outlook Phase 2

14.2.8.1 Policy recommendations for reforming the country's digital development policies by dimensions

Access

- The internet use should be promoted from the Pracharat Internet and the Border Net Project in rural and remote areas so that all people in every area in each province can access and be able to take advantage of the internet. There may also be the development on digital services that meet the needs and demand for the use of people in each area and promote the utilization of digital community centers in facilitating digital services and devices.
- The telecommunication service providers should be promote and enabled to establish fiber optic networks after the Internet service point of the Pracharat Internet Project and border net projects to people's households because the current service may not meet the needs of people in terms of convenience in using all day . This enables telecom operators to haul fiber optic cables bringing light from the internet service point from the Pracharat internet network and the border internet network to reach people and charge the service at a reasonable and affordable level which people can pay. This makes it possible to improve people's quality of life in utilizing the internet to access important digital services in their daily lives and can be used to generate income for households
- The policy should be formulated for laying fiber optic networks into buildings, premises and residences to enhance the efficiency of broadband internet service to create a fiberglass network bringing all the light from the internet access point to the household (full-fiber network) to enhance the efficiency of the network and the internet signal to a download speed of more than 1 gigabit per second along with supporting the use of digital services more.

- The establishment of network of alliances between businesses in the IoT service chain should be promoted to facilitate the development of IoT services and knowledge integration. The policy guidelines should be formulated with the rules that are essential to IoT service development, whether it is a device manufacturer, partners in target industries including government agencies. This will lead to an ecosystem of IoT development and rapid service development.
- The pilot project of IoT services should be invested and developed to enable businesses and the public to see concrete utilization of IoT technology. The government should support the development of IoT services in all industries and support tax and funding benefits for the development of pilot services in each industry. The model service can be created for businesses and the public sector to see the benefits and value of such services in a concrete way.
- The standards for IoT services should be stipulated to enhance the efficiency and security of using IoT services to the public sector. The development of digital services, standard of service, security and quality of equipment for IoT services are the issues which must be supervised by the government in order to provide guidelines and service efficiency to provide security to users or take advantage of IoT services.

Use

- The distance learning model should be improved to make it more accessible to students. The educational institutes in the country have used distance learning channels that still require expensive communication equipment. The supervisory authority in education should increase the distance teaching channels through devices that are not very expensive so that many students can have access.
- The attention should be paid to the protection of company information security due to the cyber threat which is becoming a problem for companies to formulate the measures of teleworking. Thus, the government agencies should encourage more data protection within these companies.
- The digital payments should be supported for a more diverse users. This is because the online payments are quite complicated for the elderly. Therefore, the agencies developing digital payments should facilitate the use to become fast

at minimal transaction costs. The digital payments can be driven to become a part of everyday life for everyone.

- The purchaser protection measures should be increased and the online shopping should be promoted in all areas through collaboration between the public and private sectors. At present, the current trading of products through online channels still has problems such as poor quality products, counterfeit products, and products that do not match the referred picture. Therefore, there should be more measures to regulate and control the qualifications of online operators. Moreover, internet access is still a problem for community entrepreneurs in various provinces to become part of the online market. As the project that supports accessibility does not cover all areas, there should be projects arising from cooperation between government agencies and the private sector to support Internet infrastructure. The internet use including online marketing support should encourage many community businesses in various areas to conduct the online business.
- The provision system of government services should be developed in various forms to be connected for the convenience of people to use. The online government services still have limitations in linking information from all agencies causing people to have to face obstacles in applying for different services. Therefore, agencies that operate a variety of government services should be aware of connectivity of all government services in order to upgrade the service to be more convenient.

Innovation

- The policies are required to drive the investments in software development for more researchers and developers and software investors in Thailand. At present, the government has a policy to attract foreign investors for software in Thailand through tax benefits but for the benefit of the use and utilization of emerging technologies such as 5G technology, AI technology, etc., The indirect benefit is to accelerate the investment in information technology infrastructure and services. This will result in the sustainable development of innovation of the country.

- The creation of researchers and development should be supported by applying the Hub and Spoke Cluster model. The innovative network can be created by allowing the innovation leaders to facilitate the promotion of innovators.
- The venture capital business fund for start-up enterprises should be established for the investment in potential information and communication technology businesses. This is the extension from the original investment focusing only on smart city services and expanding the business group in more investment. The knowledge on such investments should be provided to the public sector. As this investment is an investment in an emerging business, people may still lack knowledge and understanding of investment.
- The Regulatory Sandbox should be established as a testing and experimenting space for innovations and digital services in order to enable the rapid development and commercialization of commercial services under the supervision of regulators in each industry.
- The business sector should be encouraged especially SMEs to be more able to apply information technology in the management and operation of entrepreneurs. The focus can be on the development and upgrading of integrated business. It starts with evaluating the level of digitality of a business and analyze the technology needs of the business. This is because the ability and need to apply digital technology for different types of businesses are not the same. The business funding should be provided as needed to promote continuity and success in the development as well as the promotion of business sector in a concrete way.

Job

- Various recruitment information dissemination activities gathered in the same Web Portal as a website for news tracking, providing career guidance information including recruitment of government agencies is quite scattered making it difficult for workers who want to get information about the labor market to follow up with government agencies in charge of recruiting. Therefore, various recruitment information dissemination activities should be gathered in the same Web Portal so that workers can follow information more conveniently and easily. In addition, government agencies should focus on supporting the recruitment of information technology jobs in particular in order to solve this labor shortage problem.

- The emphasis should be placed on building a wider network between the education sector and the business sector. As projects that are currently collaborative between the education sector and the business sector are still quite a few, the government agencies should support building a strong network between educational institutes and businesses to create understanding of the labor skill requirements of entrepreneurs and educational institutes. The courses that can meet the needs of a broader range of business sectors, both at the vocational level and undergraduate level should be developed.
- Various groups of foreign workers in information technology who come to work in the country should be classified. As the competence and income qualifications of foreign workers set by the government are quite high, the foreign workers who come to work are still limited to meet the needs of business groups. Therefore, this policy should group foreign workers who will come to work in the industry according to their qualifications to facilitate more foreigners with such skills to come to work in the country.

Society

- The government should promote greater use of the internet and digital services for the elderly as the elderly group has access to smart phone devices at a relatively high level. However, the use of e-government services among the elderly is still limited. Therefore, the government should promote such use through state-of-the-art devices such as robots, for example, in order to teach them how to use the basic service which are not complicated for the elderly to easily understand.
- The government should encourage women to play a greater role in development in the technology and information industry. This can create job opportunities and promote competence as wellas building on skills related to technology and information equally such as programming skills and development of artificial intelligence (AI) skills. This will lead to full gender equality and create a variety of creative ideas in Thai society.
- The government should promote the development of skills necessary for living in the age of globalization for Thai children and youth. There can be guidelines for upgrading learning into 2 dimensions; 1) Developing basic learning skills for life to

be strong and fast through the application of digital devices in teaching and learning for Transformation to be up-to-date with changing information and make the most of the development of teaching materials from the advancement of technology; and 2) promoting the extension and opening the world of learning. The courses should be improved to keep pace with developments in all dimensions of the globalization era. The new approaches may be applied in the curriculum development.

- All citizens should be encouraged to recognize the need for waste segregation and reduction of electronic waste by considering replacing and discarding electronic equipment as needed. This includes supporting people to cooperate in creating the "Zero Waste Community".

Trust

- The awareness of personal data protection laws should be raised to make it more accessible and understandable to the public. As many people still do not know about personal data protection laws, the government agencies should pay more attention to publicizing the law and making people aware of the existence of the law by increasing measures to encourage more companies or organisations to seek consent from data subjects. This can enable the people who own the data to know the benefits they derive from the law and to reduce concerns about the security of personal data.
- The control measures should increased for all financial service providers to prevent the risk of identity theft in online financial transactions and promote the quality of after-sales service of online products. This is because concerns about the security of the payment system are one of the reasons that prevents a certain number of people from buying goods and services through online channels. The regulators should enhance the security of online financial transactions through strict enforcement of requirements for financial service providers to access user data. In addition, there is a problem with the confidence of shoppers online that the online trading regulators should encourage pushing on the quality of after-sales service to build more shoppers' confidence in online marketplaces.
- The cooperation between the public and private sectors should be increased to control the development of information security systems in the company due to

ongoing incidents of data attacks and data leaks. This reflects that measures to control and supervise safety standards are needed to be develop for more stringent. The government agency is an important agency that can build relationships with private companies to control information security measures of information.

Market Openness

- The export of Thai products should be promoted through e-commerce channels by pushing for more international cooperation to break the restrictions on international shipping. The number of online operators in the international market is still a small proportion caused by concerns about the cost during international shipping. Therefore, the agencies that supervise and promote should push for more international cooperation to break the limitation on the international shipping cost.
- The digital services that are the country's strengths should be developed to promote digital services that Thailand has potential. The digital services in the digital content segment of Thailand is creative and has high cultural identity. It has been accepted by many countries. Therefore, government agencies should promote and develop the quality of these services to be more in demand among foreign customers.
- The links among businesses, government and related agencies should be built to increase the ability to apply digital technology in the operations of the manufacturing industry for export. Due to the policies that the government has implemented at present, many small and medium-sized companies cannot be pushed to adopt digital technology in their production processes. As a result, the government should support the use of technology in this business more as well. Encouraging connections between businesses of all sizes, research institutes and government agencies involved in technology development in the manufacturing industry to cooperate in upgrading technology in the manufacturing industry to be more efficient.

Growth & Well-being

- The businesses should be encouraged to invest more in digital technology by pushing the business group with low to medium level of digital technology to be

upgraded as a business group with medium to high level of technology. The business group that has the use of medium to high level digital technology is a business group that creates added value in the business sector.

- The public awareness on Digital Mental Health should be raised by publicizing and educating people on health care and to support healthcare startups in developing technology and programs. This can promote good health of people along with advanced technology.

14.2.8.2 Recommendations for practical guidelines in assessing Thai digital development policies to meet international standards

The Thailand Digital Outlook Research Project Phase 2 has collected and developed 36 Thai indicators in line with the OECD Framework of Best Practices. However, the aforementioned approaches for assessing the digital development policy of Thailand operated by ONDE is only part of the assessment of the country's digital development policy to be in line with international standards.

Considering the indicators, indices or rankings related to the digital development of the country under the framework of other indicators apart from the OECD indicator framework is thus an important approach to help improving the assessment of the country's policies and measures and in accordance with international standards. At the same time, there are still indicators that may not be studied and stored data under the implementation of the Thailand Digital Outlook Research Project Phase 2. From this reason, expanding the study scope and the number of indicators studied is another important approach to help improving the assessment of the country's policies and measures in consistence with the assessment set by the OECD.

Finally, the OECD framework indicators that have already been surveyed, archived and established, such as in the Thailand Digital Outlook Research Project Phase 2 is still necessary to conduct a survey and continually collect such indicators in order for ONDE and related agencies to have information on the country's key digital development indicators that can be used to assess and evaluate the digital development policy of Thailand according to established and accepted international standards. In the future, the results of the project can be used to compare the changing trends of various indicators of the country as well as forecasts or estimates of the country's key indicators.

14.2.8.3 Recommendations for the approaches in implementing Thailand Digital Outlook Research Project for the next phase

ONDE has prepared recommendations and operational approaches for the next phase of the project in order to build on the results of this project and bring tangible benefits to the digital development of the country. It can be classified into 3 issues as follows:

- In order to increase the benefits of data collection and analysis in this project, ONDE proposes that this project be continued in order to collect data, exchange and integrate metric data of telecommunication statistics, information technology, and digital and related information such as in this project. The national digital statistical database should be created to be beneficial to use in a wide range to measure the efficiency of policy implementation and forecast Thailand's economy in the future.
- The scope of the indicators study should be expanded to include the dimensions that need to be studied and referenced in the OECD Full Framework for Measuring the Digital State of Development or "Measuring the Digital Transformation" in order to collect indicators that need to be kept intact and continue to work from the Thailand Digital Outlook Research Project Phase 2 which has clearly laid out the framework.
- The preparation of Memorandum of Understanding (MOU) and the establishment of a joint working group can lead to the linking of information to each department for access and use of the information in the central database for issuing policy plans and measures to promote the development of the digital economy of Thailand or supporting business operations.

Limitations in comparison of the results: Thailand Digital Outlook Research Project Phase 1 collected the data by extracting data from sources such as data from the implementation of the Pracharath Internet Project of the Ministry of Digital Economy and Society (Collected by TOT Public Company Limited) and information provided by True Corporation Public Company Limited (TRUEMOVE-H mobile operator). It is very useful in presenting a wide picture especially the general behavior of internet use and digital technology of people in the 3 pilot provinces.

However, several observations were found such as the inconsistency of some of the indicators studied in the Thailand Digital Outlook Research Project Phase 1 with the OECD indicator framework. This resulted in the implementation of the Thailand Digital Outlook Research Project Phase 2 with the scope, definitions, storage guidelines needed to be modified. The guidelines for presenting information on certain indicators to be accurate is more compliant with the OECD Framework and causes problems. Comparing the results of some studies from the Thailand Digital Outlook Phase 1 and Phase 2 projects has limitations and may not be directly compared in that it cannot use the information provided by all 3 mobile operators used survey data and collected data from a sample of individuals. Under the implementation of the second phase of the project, the results will be processed and analyzed instead to be accurate in line with the OECD Framework more. It can also be linked to the study results of the above 2 phases of the project as much as possible.

14.3 Comparison of indicators in implementing Thailand Digital Outlook Phase 2 and Phase 3

The study and comparison on the results of indicators for the implementation of the Thailand Digital Outlook Research Project Phase 2 and Phase 3 is for more clearly analyzing the progress and changes in the Digital Outlook of Thailand.

Table 201 Data for the comparison on the indicators for the implementation of the Thailand Digital Outlook Phase 2 and Phase 3 (Percentage)

No.	Code	Indicators	Results of study from the Thailand Digital Outlook Phase 2	Results of study from the Thailand Digital Outlook Phase 3
		Access with 10 indicators		
1	A1	Fixed broadband subscriptions per 100 inhabitants	14.6	16.87
2	A2	M2M (machine-to-machine) SIM cards per 100 inhabitants	1.8	1.9
3	A3	Mobile broadband subscription per 100 inhabitants	88	92.56
4	A4	Share of households with broadband connections	67.7	85.2

No.	Code	Indicators	Results of study from the Thailand Digital Outlook Phase 2	Results of study from the Thailand Digital Outlook Phase 3
5	A5	Share of businesses with broadband contracted speed of 30 Mbps or more	78.4	89.8
6	A6	Share of the population covered by at least 4G mobile network	No data collection	98
7	A7	Disparity in broadband uptake between urban and rural households	No data collection	7.9
8	AX1	Fixed Broadband Price to GNI per Capita	2.9	2.78
9	AX2	Proportion of fiber optic high speed internet connections	51.7	58.22
10	AX3	Proportion of internet access of primary care units	No data collection	76.4
		Use with 10 indicators		
11	U1	Internet users as a share of individuals (Between the ages of 16-74 years, according to the OECD difiniton)	66.7	84.3
12	U2	Share of individuals using the internet to interact with public authorities	35.3	64.2
13	U3	Share of internet users who have purchased online in the last 12 months	38.6	78.5
14	U4	Share of small businesses making e-commerce sales in the last 12 months	29.2	36.5
15	U5	Share of businesses with a web presence	No data collection	73.9
16	U6	Share of businesses purchasing cloud services	25.6	51.3

No.	Code	Indicators	Results of study from the Thailand Digital Outlook Phase 2	Results of study from the Thailand Digital Outlook Phase 3
17	U7	Average monthly mobile data usage per mobile broadband subscription, GB	11.8 GB	18 GB
18	UX1	Value of digital payment transactions per person Value of payment transactions via Mobile Banking per person per year Value of payment transactions via Internet Banking channels per person per year	366,713 Baht 394,808 Baht	524,820 Baht 434,981 Baht
19	UX2	Proportion of cloud usage by government agencies to total cloud demand	48	53.2
20	UX3	Daily time spent on the internet	No data collection	11 hours 25 minutes
		Innovation with 6 indicators		
21	I1	ICT investment as a percentage of GDP	1.53	2.02
22	I2	Business R&D expenditure in information industries as a percentage of GDP	0.08	0.07
23	I3	Venture Capital investment in the ICT sector as a percentage of GDP	0.014	0.098
24	I4	Share of start-up firms (up to 2 years old) in the business population	3 values in the report are 8.9, 29.8, and 25.9	10.9
25	IX1	The number of patent applications in the Information Technology or related fields in Thailand	93	93
26	IX2	A number of robots being used in Thailand's manufacturing sector per 10,000 manufacturing workers	59	45

No.	Code	Indicators	Results of study from the Thailand Digital Outlook Phase 2	Results of study from the Thailand Digital Outlook Phase 3
		Jobs with 7 indicators		
27	J1	ICT task-intensive jobs as a percentage of total employment	3.5	1.15
28	J2	Digital-intensive sectors' share in total employment	34.4	27.2
29	J3	Workers receiving employment-based training, as a percentage of total employment	21.1	44.2
30	J4	New tertiary graduates in science, technology, engineering and mathematics, as a percentage of new graduates	21.6	22.39
31	J5	Public spending on active labour market policies, as a percentage of GDP	0.05	0.061
32	JX1	Average wage of ICT specialists	26,808	26,568
33	JX2	Labor Productivity in Digital-intensive industries	19,723,230 Baht per person	19,306,920 Baht per person
		Society with 8 indicators		
34	S1	Percentage of individuals aged 55-74 using the internet	67.4	48.8
35	S2	Percentage of individuals who live in households with income in the lowest quartile using the internet	60.8	83.2
36	S3	Women as a share of all 16-24 year-olds who can program	No survey	12.1
37	S4	Disparity in Internet use between men and women	No survey	(-)0.4
38	S5	Percentage of individuals who use digital equipment at work that telework from home once a week or more	35.7	36.7

No.	Code	Indicators	Results of study from the Thailand Digital Outlook Phase 2	Results of study from the Thailand Digital Outlook Phase 3
39	S6	Top-performing 15-16 year old students in science, mathematics and reading	2.7	2.7
40	S7	OECD Digital Government Index	No data collection	0.40
41	S8	E-waste generated, kilograms per inhabitant	9.2	9.2
		Trust with 5 indicators		
42	T1	Percentage of internet users experiencing abuse of personal information or privacy violations	11.5	6.3
43	T2	Percentage of individuals not buying online due to payment security concerns	9.5	5.4
44	T3	Percentage of individuals not buying online due to concerns about returning products	11.5	13.6
45	T4	Percentage of businesses in which ICT security and data protection tasks are mainly performed by own employees	26.0	28.6
46	T5	Health data sharing intensity	No data collection	20
		Market Openness with 4 indicators		
47	M1	Share of businesses making e-commerce sales that sell across borders	20.8	3.2
48	M2	Digitally-deliverable services as a share of commercial services trade	9	13.52
49	M3	ICT goods and services as a share of international trade	No data collection	20.66
50	M4	Digital-intensive services value added embodied in manufacturing	23.1	23.1

No.	Code	Indicators	Results of study from the Thailand Digital Outlook Phase 2	Results of study from the Thailand Digital Outlook Phase 3
		exports, as a percentage of manufacturing export value		
		Growth & Well being with 7 indicators		
51	G1	Digital-intensive sectors' contribution to value added growth	52.6	36.3
52	G2-S5	Percentage of individuals who use digital equipment at work that telework from home once a week or more	35.7	36.7
53	G3	Workers experiencing job stress associated with frequent computer use at work	16.4	61.3
54	G4-S2	Percentage of individuals who live in households with income in the lowest quartile who use the Internet	60.8	83.2
55	G5	Students aged 15-16 who feel bad if no internet connection is available	65.2	71.2
56	G6-T1	Percentage of Internet users experiencing abuse of personal information or privacy violations	11.5	6.3
57	G7-S8	E-waste generated, kilograms per inhabitant	9.2	9.2

14.4 Conclusion and comparison of results from the indicators used in the operation of the Thailand Digital Outlook Phase 2 and Phase 3

From conducting studies and collecting data to evaluate a total of 57 performance indicators of the Thailand Digital Outlook Phase 3 in 8 dimensions based on the OECD Framework and other additional indicators to provide a more complete analysis of the Digital Outlook of Thailand overall, it was found that the assessment results reflected the development of digital indicators. Almost all indicators were in the improved direction compared to the results from the implementation of the Thailand Digital Outlook Phase

2, especially the Access and Use dimensions. However, in the Jobs dimension, there are some indicators that still point out the development opportunities that must be accelerated. The summary can be made as follows.

14.4.1 Access

In the Access dimension, it assesses the access to basic information technology including telecommunication systems and internet connectivity. From the results of assessment and analysis of indicators, it was found that all indicators showed improvement in access to technology and better telecommunication systems compared to the results of the implementation of the Thailand Digital Outlook Research Project Phase 2 which included more comprehensive internet services both fixed broadband internet and mobile broadband internet in the dimensions of the assessment of the public sector and the household sector, the business sector, and the government primary service unit. In the assessment of disparity, the analysis revealed that there was a lower disparity in internet usage in urban and non-urban areas. In addition, the price of using Internet services is lower compared to the income of the people. Each indicator has the results in the following changes.

- The share of fixed broadband internet users per 100 population resulted in a 2.27% increase due to the increasing competition in the telecommunications market for more comprehensive services with higher internet speed offers for the same low or same price and with the price offers and promotions of service providers in order to have internet users more fixed broadband causing people to use internet services more regularly.
- The share of registered SIM cards of M2M per 100 population resulted in 0.1% higher. The increase in this indicator is due to greater adoption of IoT technology. However, a statistically increased 0.1 percent was not considered a significant change. Therefore, it may be assessed as a whole that there is no change in this dimension.
- The share of mobile broadband internet users per 100 population showed a higher result of 4.56% due to the population's preference for using the Internet via mobile devices for the highest proportion in the category of internet use. This requires the use of mobile broadband internet service. In the telecommunication market, there is competition in more comprehensive

service. With the price offers and promotions of service providers, people increasingly use mobile broadband internet services.

- The share of mobile broadband internet users per 100 population showed a higher result of 4.56% due to the population's preference for using the internet via mobile devices for the highest proportion in the category of internet use. It requires the use of mobile broadband internet service. In the telecommunication market, there is competition in more comprehensive service. With the price offers and promotions of service providers, people increasingly use mobile broadband internet services.
- The share of households with internet access resulted in a 17.5% higher result due to the increasing importance and necessity of people to use Internet. As well as in the telecommunication market, there is more competition in providing comprehensive services both in urban areas and remote areas with higher internet speed offers for the low or same price. With a price offer and the service provider's promotional program in order to have more internet users, people and households use more internet services.
- The share of businesses with internet speeds of 30 Mbps or more has the results of 19.60% higher demonstrating the importance of the internet for businesses and the ability to invest in the installation of high-speed Internet.
- The share of 98% of the population in 4G or faster areas demonstrated the 4G coverage of telecom operators.
- The disparity of broadband internet access between urban and non-urban areas was 7.9%. The indicator was not collected in the Thailand Digital Outlook Research Project Phase 2 study. However, compared to the same dataset in previous years, the disparity will have better outcomes. The disparity decreased by 4.0% due to more comprehensive broadband internet services, especially in suburban or remote areas where the internet is difficult to access.
- The share of fixed broadband price to GNI per Capita showed a 0.12% improvement. It indicate a higher price for the internet that people were able to afford caused by the mechanism of competition in the market. This allows

service providers to use strategies to reduce prices to increase the number of customers.

- For the share of of fiber optic high speed internet connections, the results were 6.52% higher because it was a technology that could provide faster internet speeds than other technologies at present and the installation cost is not higher than other technologies. This makes the service providers push the use of fiber-optic high-speed Internet connection technology increasingly. The consumers also more accept because they get high speed internet at the same or lower price.
- The share of internet access of primary service agencies was 76.4% which is the implementation of a comprehensive internet service policy with primary service agencies.

14.4.2 Use

In the Use dimension, it is an assessment of internet and online use behavior for both the public and private sectors including the use of online channels to benefit business and government services by applying technology. From the results of the assessment and analysis of indicators, it was found that the general public use of the internet increased and used online channels for purchasing goods and services including higher use of government services and entrepreneurs sector with higher use of online channels to do business as well. However, the outcome data can be obtained from surveys gathered during the severe Coronavirus outbreak in Thailand. This may cause the usage of internet and online channels to be much higher than usual.

Each indicator has the results in the following changes.

- The share of individuals who use internet was 17.6% higher as people saw the importance and need for higher internet use.
- The share of individuals who use digital government services resulted in a 28.9% higher result due to the impact of the COVID-19 making Line the main channel to provide public welfare services of the government sector and people have adapted to use online channels more as well.
- The share of Internet users who purchased goods/services online in the past 12 months result increased by 39.9% due to the impact of the COVID-19 making online channels the main channel for entrepreneurs to distribute

products and provide services including the fact that people have adapted to use online channels more as well from convenience, speed and greater safety.

- The share of small entrepreneurs who have distributed products or services online in the past 12 months increased by 7.3% due to small operators using online channels to distribute more products or services in response to consumer behavior. Especially during the COVID-19 pandemic, the use of online channels is much higher and the online channels can support the distribution of products or services with convenience and low investment which is suitable for small entrepreneurs.
- The share of businesses that have an online presence at 73.9% is due to operators who have adapted to using online channels more both for creating awareness and distributing products and services.
- The share of entrepreneurs who purchase cloud services was 25.7% increase in results attributed to lower cost of cloud services and no investment in easy-to-buy assets. There are also more variety of cloud service providers causing more entrepreneurs to turn to cloud services.
- The average monthly data use among mobile broadband internet subscribers (Gigabytes/month/subscriber) resulted in a 6.2 GB increase due to higher internet usage. With higher average usage time, people use it to access more content in the form of images and videos, resulting in higher average traffic.
- Digital payment transaction value per person
  - The value of payments made through Mobile Banking channels per person per year increased by 158,107 baht.
  - The value of payment transactions via Internet Banking channels per person per year increased by 40,173 baht caused by the people's convenience and have more confidence in making payments through digital channels including the increasing number of operators who accept payments through these digital channels.
- The share of government cloud usage by agency to total required agencies was 5.2 percent increase showing that agencies are increasingly seeing the

need for cloud adoption. The service providers can provide more services to the agencies that need it.

- The average number of hours of internet usage per day among citizens was 11 hours 25 minutes. The indicator was not collected in the Thailand Digital Outlook Research Project Phase 2. However, if compared with the same data set in the previous year, it was found that the average number of internet usage hours among citizens was 1 hour and 3 minutes higher, reflecting longer Internet usage behavior as it meets the needs of various applications in both recreational business and communication.

14.4.3 Innovation

In the Innovation dimension, it is an assessment of the industrial and national potential in supporting the development of the information technology, communication and digital industries. It also assesses the environment and related factors. From the results of the assessment and analysis of indicators, it was found that investments in the information and communication technology sectors directly and investments in startups were significantly higher. The share of new entrepreneurs has also increased. This shows a factor supporting the expansion of the information technology and digital industry. However, an assessment of research and development (R&D) investment indicators of business groups in the information industry revealed that the share of investment reduced a bit. This may limit innovation development.

Each indicator has the results in the following changes.

- The percentage of investment in the information and communications technology sector to GDP (Gross National Product) resulted in a higher result of 0.49% demonstrating that the relevant government and private sectors agreed with the importance of information and communication technology to the economic and social development of the country.
- The percentage of expenditure on research and development (R&D) investments by businesses in the information industry to GDP (Gross National Income) resulted in a slight decrease of 0.01%. It shows the seriousness of developing, improving efficiency and creating new things in the information industry. The 0.01% change was statistically considered to be no significant change. It may be concluded that the overall percentage of research and

development (R&D) investment expenditures by business groups in the information industry has not changed. This is still considered a negative result due to the lack of improvements and innovations in the information industry.

- The percentage of investment value of venture capital firms in the information and communications technology sector as a result of GDP (Gross National Income) increased by 0.08% reflecting the potential of entrepreneurs in the information technology sector. The higher communication can attract investors to invest for the development and growth of both entrepreneurs and in the industry as a whole.
- For the share of new entrepreneurs (business age not over 2 years) per total number of entrepreneurs, the result was at 10.9%. However, the data in the Thailand Digital Outlook Research Project Phase 2 was unclear making it impossible to compare. The business age of not more than 2 years has an increasing trend reflecting the expansion in the business sector with more new entrepreneurs.
- The number of patent applications in Thailand in information technology-related fields have the same results. This is considered a negative result because it reflects that Thailand has not developed any new innovations on the information technology arising from the knowledge of the country.
- The number of robots used in the manufacturing sector in Thailand per 10,000 industrial workers was a decrease of 14. Statistically, there was no significant change. However, unchanging in this dimension reflects the negative effect. This is because it shows that the efficiency and productivity of the industry may not be increased because robotic technologies that can improve efficiency and productivity are not adopted for more use.

14.4.4 Jobs

In the Job dimension, it is quantitative assessment on the overall condition of the workforce in the digital industry to assess supporting factors such as skills development actions and investment in the labor market. From the results of the assessment and analysis of indicators, it was found that the digital industry still faces problems in labor development. Many of the indicators in this dimension reflect the decline in labor on the overall size of the industry as well as reducing labor productivity. This reflects the labor

shortage in terms of quantity and quality. There are also supporting factors that the average income of workers has a lower effect. From the information in this dimension of Jobs, it shows the importance of accelerating the development of the workforce in the digital industry to meet the needs of the fast growing industry.

Each indicator has the results in the following changes.

- The percentage of IT staff per total workforce was a 2.35% reduction in outcome, indicating a recession in technology adoption in the enterprise and in the industry as a whole due to lack of skills and personnel in information technology.
- The share of digital business employed to total employed people was a decrease of 7.20%, indicating the problem of the digital business sector with a shortage of experts. This may also reflect the contraction of the digital business sector.
- The percentage of employed workers receiving work-related skills training per total number of workers was a 23.1% increase, demonstrating that entrepreneurs and related agencies focused on developing workforce skills.
- The percentage of graduates with higher education in science, technology, engineering and mathematics per total number of graduates was a 0.79% increase in outcomes, indicating that youth and students showed higher interest in the field.
- The percentage of government expenditure on labor market policies to GDP (Gross National Income Product) resulted in a 1.10% increase, demonstrating the seriousness of government action in skill development of labor to a higher quantity and capacity.
- The average income of workers with information technology jobs was a decrease of 240 baht, which could be caused by the hiring situation of entrepreneurs or organisations that want to reduce personnel costs.
- The labor productivity in industries related to digital technology was a reduction of 416,310 baht per person, reflecting the problem of unskilled labor as well as a shortage of personnel in industries related to digital technology.

14.4.5 Society

In the Society dimension, it is an assessment of social conditions in accessing and using information and digital technology and readiness for a digital society that everyone in society participates in the access and use of technology (Digital Inclusion) without disparities in gender, age, education and economic conditions. It can create benefits from technology to society overall. From the results of the indicators assessment and analysis, it was found that most of the indicators showed the state of a society that was more readily available for a digital society, such as an increase in the percentage of individuals living in households that with household income levels in the lowest 25% range (1st quartile) using the Internet an increase in the percentage of individuals who have the use of digital tools for working remotely from home once or more per week and on the readiness of the digital government. There are also indicators that have reduced outcomes or are still relatively low, such as the percentage of individuals aged 55-74 using the internet and the proportion of women aged 16-24 who are able to program.

Each indicator has the results in the following changes.

- The percentage of individuals aged 55-74 years using the internet showed a decline of 18.6 percent, reflecting Thailand's entry into an aging society. However, the majority of the elderly are still adapting to keep up with the technology.
- The percentage of individuals in households with the lowest level of household income (25%) using the Internet were 22.40% higher results, reflecting that Internet access was achieved at a lower cost.
- The share of women aged 16-24 years who can program is 12.1%, compared to the OECD average of 27.8%. This is much lower because the course of study does not have adequate support in this area.
- The share of internet usage difference between males and females was -0.4%. This is lower than the OECD national average of 1.48%.
- The percentage of individuals who used digital tools for working remotely once or more per week had a 1.0% higher outcome due to people working more remotely, especially during Covid. However, the 1.0% change is a very low changeover value. This was because the share of people working

remotely during the Thailand Digital Outlook Phase 2 and Phase 3 surveys were not much different.

- For the percentage of students aged 15-16 who achieved a high (level of 5 or higher) PISA score in Reading, Mathematics and Science in PISA (per total number of students taking the PISA assessment), the same result was at 2.7%.
- The digital Government Index scores 0.40. Compared to the OECD national average of 0.51, Thailand is considered to have performed better than many other OECD countries.
- For the amount of e-waste generated by the country (unit: kg per capita), the same result was at 9.2 kg per capita.

14.4.6 Trust

In the Trust dimension, it is an assessment of the confidence of both the public and the entrepreneurial sector in the use of technology and online channels. It is assessed based on usage behaviors, concerns and experiences with problems related to technology and information. From the results of the assessment and analysis of indicators, it was overall found that people and entrepreneurs had more confidence in using technology and online channels. The contributing factor is the reduction in the proportion of online problems. When people as consumers are more confident and entrepreneurs have to take care of digital systems and online channels to be more secure and reliable, the opportunities for the technology and digital industry to grow rapidly are even higher.

Each indicator has the results in the following changes.

- The percentage of people experiencing personal data breach or privacy (to all Internet users) had better results. The percentage of people experiencing data breaches of personal data or privacy decreased by 5.2% indicating that people are knowledgeable and competent in preventing personal data breaches. Implementing different measures from the government, such as the issuance of the Personal Data Protection Act and Entrepreneurs, there are more effective measures in this area.
- The percentage of people who do not choose products/services through online channels due to concerns about the security of the payment system (to all Internet users) has better results. The percentage of people who did

not choose to purchase goods/services via online channels decreased by 4.1%, indicating greater confidence in the security of the payment system.

- The percentage of people who do not choose products/services through online channels due to concerns about returning the product (to all Internet users) showed a 2.1% higher result, indicating the distrust of consumers with the credibility of operators in online trading of goods and services.
- For the percentage of companies operating in IT security or data protection operated by personnel employees within the company, the results were 2.6 percent higher, demonstrating a greater focus on IT security by operators.
- The share of people's health data sets (Data sets) that can be exchanged between agencies was 20% which shows their initial credibility of the public health information system.

14.4.7 Market Openness

In the Market Openness dimension, it is an assessment of the competitiveness of international business by using online channels to distribute products and provide services including creating added value in the economy. From the results of the evaluation and analysis of indicators, it was found that the proportion of distribution of goods and services through online channels in the international market and businesses with digital services is increasing. And the proportion of trade in ICT goods and services compared to the value of international trade is also very high.

Each indicator has the results in the following changes.

- The share of companies that distribute products/services through online channels in the international market (Cross-border e-commerce) had a 17.6% drop due to the increasing number of companies distributing goods and services online to domestic customers causing the proportion of companies that distribute products/services through online channels in the international market decreased.
- The share of trade in services in businesses that provide digital services to all trades has the results (taking into account both import and export of services) of 4.52% higher demonstrating a greater adaptation of businesses to digital services. Because digital technology can increase service efficiency, it can reach more targeted customers and cost lower than offline trading services.

- The share of trade in ICT goods and services compared to the value of international trade is 20.66%, which is due to Thailand being a country that produces ICT products among the top in the world and has a high import value for ICT equipment.
- For the percentage of added value of goods exports resulting from the utilization of digital services or digital technology to the value of exports of the entire manufacturing industry, the results are the same and unchanged.

14.4.8 Growth & Well-being

In the dimension of Growth & Well-being, it is an assessment of socio-economic conditions and the impact of technology use. Overall, from the results of the assessment and analysis of indicators, it was found that there were still economic and social issues that needed to be improved, such as the average annual growth rate of added value in declining digital business sector Impacts on quality of life from using technology and the internet in the form of stress and anxiety. However, in terms of usability and reliability, there is a trend to improve, such as the increase in the use of digital tools for remote work and a decrease in the percentage of people experiencing personal data or privacy breaches.

Each indicator has the results in the following changes.

- The average annual growth rate of added value generated in the digital sector was a 16.3% drop in results, indicating that digital businesses and the use of technology to drive the country's economic growth were unable to do so effectively.
- The percentage of individuals who use digital tools for working remotely once a week or more was a 1.0% higher which was caused by people having working more remotely, especially during the COVID-19 pandemic. However, the 1.0 percent change is a very low changeover. This was because the proportion of people working remotely during the Thailand Digital Outlook Phase 2 and Phase 3 surveys were not much different.
- The share of employees who experience stress during work that uses computers for more than half of the total working time was 44.9% higher outcome attributed to longer computer use time from remote work and

online learning which requires focus and interaction at all times thus causing significantly higher stress.

- The percentage of individuals in households with the lowest level of household income (25%) using the internet were 22.40% higher reflecting that Internet access was achieved at a lower cost.
- The share of students aged 15-16 who feel anxious when they are unable to use or connect to the internet was 6.0% higher, demonstrating the impact of technology use on the quality of life for the general public.
- The percentage of people experiencing personal data breach or privacy (to all Internet users) had better results. The percentage of people who have experienced personal data breaches or privacy decreased by 5.2% which shows that people have knowledge and ability to prevent personal data breach problems including implementing different measures from the government, such as the issuance of the Personal Data Protection Act. Moreover, the entrepreneurs have more effective measures in this area.
- The amount of e-waste generated by the country (unit: kg per population) was the same at 9.2 kg per population.

14.5 Conclusion and comparison of survey results from the Thailand Digital Outlook Phase 2 and Phase 3

From conducting the survey on public, private, business sectors and primary service agencies, the key points from the analysis and comparison of survey results from the Thailand Digital Outlook Phase 2 and Phase 3 can be summarized as follows:

14.5.1 Internet usage and behavior

From the results of the survey of the use of the Internet in the public sector in conducting the Thailand Digital Outlook Phase 3, it was found that the most common form of internet usage was broadband internet, 4G mobile and fixed broadband internet. This is consistent with the results of the survey in the implementation of the Thailand Digital Outlook Phase 2 which has the highest proportion of mobile Internet usage, followed by fixed internet usage. Bangkok is the area where respondents have the highest percentage of regular internet use.

For fixed broadband internet speeds above 30 Mbps, this is considered high-speed internet and meets OECD standards. A survey in the Thailand Digital Outlook Phase 3

found that the share of fixed broadband internet exceeds 30 megabits per second with 85.8%. Meanwhile, the survey results in the Thailand Digital Outlook Research Project Phase 2 accounted for 52.2% representing an increase of 33.3%. It reflects the number of fixed broadband internet services with more active and where service providers want to expand their customer base.

If considering the province-by-province data, it was found that the provinces with the share of fixed internet connections with speeds higher than 30 megabits per second in the top 3 ranks are Nonthaburi Provinces, followed by Chonburi Province and Pathum Thani Province, respectively. Stationed at speeds higher than 30 megabits per second, the least top 3 are Amnat Charoen Province, followed by Roi Et Province and Chaiyaphum Province, respectively.

As for internet usage devices, it was found that mobile phones/smart phones are the devices that survey respondents use to use the internet the most. According to the results of the Thailand Digital Outlook Phase 2 and Phase 3, notebook computers are the second most used device according to survey results from both the Thailand Digital Outlook Phase 2 and Phase 3 while tablets are the devices that are used the most in the 3rd rank from the results of the Thailand Digital Outlook Phase 3. For the 2nd most used devices from the Thailand Digital Outlook Phase 2 results, it reflects the use of devices for Use the internet from homes more.

In terms of the popular places to use the internet, the 2 most popular places were self-residence and work place. This was consistent with the results of the survey of Thailand Digital Outlook Phase 2 and Phase 3. However, the places that were ranked 3rd were different. The hospitals are the 3rd most popular place to use the internet in the period before and during the epidemic of the coronavirus. According to the results of the Thailand Digital Outlook Phase 2, other people's accommodation is the 3rd most popular place. This was due to the fact that in the Thailand Digital Outlook Phase 3, it was a severe epidemic period and limited travel to stay in the main accommodation make use of the internet from. There are very few other people's residences.

The average frequency and time of internet use from the survey results of the Thailand Digital Outlook Phase 3 revealed that most of them use the internet every day, spending an average of 6-10 hours/day, 5-7 days a week at most. The age ranges with the highest use in frequency and mean time were 0-19 years, 20-29 years and 30-39 years,

consistent with the survey results in the Thailand Digital Outlook Phase 3 and Phase 2 of the survey.

The impact of COVID affects the Internet use behavior of the survey respondents. There is a significant increase in usage. According to the survey results of the Thailand Digital Outlook Phase 3, it was found that the proportion of people who use the Internet every day increased by 24.9% and those who used the Internet on average of 6-10 hours per day increased by 11.5%. The survey results of the Thailand Digital Outlook Phase 2 showed that the increase was not much. Most of the users have the same average internet usage. This may be a result of the severity of the COVID epidemic being more severe causing the increase in Internet usage in the survey of the Thailand Digital Outlook Phase 3 evidently.

The most popular online activities according to the results of the Thailand Digital Outlook Phase 3 study survey during the COVID-19 pandemic were 1) work-related activities such as online meetings or work from home, 2) online learning, and 3) chatting through applications such as Line, Facebook messenger. Meanwhile, for the results of the Thailand Digital Outlook Phase 2, the most popular online activities are 1) conversations/chat via applications such as LINE. , Facebook Messenger, etc. 2) the use of social media such as Facebook, Instagram, Twitter, etc., and 3) Internet phone calls or video calls (VDO Call) which represents a change in the use of the internet by changing from using the Internet for recreation or to relax is to use the internet for activities that are more consistent with work or livelihood considering the proportion of change in online activities.

According to the results of the Thailand Digital Outlook Phase 3, it was found that the increasing activity of internet usage in comparison before and during the COVID-19 outbreak are; 1) online tax filing which increased by 40.3%, 2) monitoring the COVID situation which increased by 35.2%, and 3) using online health services such as online queue bookings or online telemedicine consultation increased by 24.3%.

Meanwhile, for the survey results of the Thailand Digital Outlook Phase 2, internet usage activities increased significantly. It is an online learning activity/attending an online training course and online teleworking (Work from Home/Teleworking) which demonstrates how people are adapting and using the Internet to work and study online as normal in life. They are awake in the use of the internet to access health care services

and news due to the increased spread of COVID from the survey of the Thailand Digital Outlook Phase 2.

In the activities using the internet to generate income apart from online shopping and services, the survey results from both Thailand Digital Outlook Phase 2 and Phase 3 found that people use the internet for content creation in order to generate additional income as well. The results of the survey in the Thailand Digital Outlook Study Phase 3 found that content creation or most of the content is making content on social media such as Youtube, Instagram, Tiktok and receiving product reviews, online training. For the survey results of the Thailand Digital Outlook Phase 2, it was found that most of the content was made for entertainment rather than content to earn extra money. The results of the survey in the Thailand Digital Outook Phase 3 found that the age range of online content in general is 0-19 years old, and the age range that receives the most product reviews through online channels is the age range of 20-29 years. Whereas, the results of the Thailand Digital Outlook Phase 2 found that the age range of 30-39 years was the age range with the most objective in creating content or content for entertainment, followed by the age range of 60 years and over. The age range 0-19 and 20-29 years has the same proportion of content creation or entertainment content.

From the in-depth analysis of the survey results in the Thailand Digital Outlook Phase 3, people aged 0–19 years are considered the group with the highest online activity usage in all activities, especially in activities related to the use of social media communication, online payment, online learning as well as online activities related to entertainment, such as accessing and using entertainment media, playing online games, etc. Such information shows that the group of people in that age group is a group of people who grew up in an era where the Internet is an accessible service and the online world has a high influence on their daily lives, such as receiving information and communicating through social media platforms, entertainment media consumption and buying/selling products online, etc.

Considering other age groups, it was found that the increasing age group had a lower proportion of online activity. Among older respondents, such as those aged 50-59 and 60 and over, they tended to use online activities only in terms of social media use. There may be access and use of entertainment media and materials from time to time.

Table 202 Comparing the results of internet usage and behaviors

Internet usage and behaviors	Survey results of the Thailand Digital Outlook Phase 2	Survey results of the Thailand Digital Outlook Phase 3
Percentage of fixed broadband internet above 30 Mbps in the country	52.2	85.8
Top 3 provinces with the highest share of fixed Internet connections with speeds above 30 Mbps (percent)	1. Phrae Province (68.2) 2. Nonthaburi Province (67.6) 3. Nakhon Ratchasima Province (66.5)	1. Nonthaburi Province (92.2) 2. Chonburi Province (91.7) 3. Pathum Thani Province (91.2)
Top 3 provinces with the lowest proportion of fixed Internet connections with speeds above 30 Mbps (percent)	1. Phichit Province (30.8) 2. Roi Et Province (29.3) 3. Kalasin Province (18.2)	1. Amnat Charoen (40.1) 2. Roi Et Province (39.9) 3. Chaiyaphum Province (39.8)
Top 3 devices with the highest internet usage (percentage)	1. Mobile Phone)/Smart Phone (93.0) 2. Tablet (35.8) 3. PC (20.4)	1. Mobile Phone/Smart Phone (97.9) 2. Notebook (39.6) 3. Tablet (37.9)
Top 3 Most Popular Places to Use the Internet (Percent)	1. Own residence (73.0) 2. Workplace (38.4) 3. Other people's residence (27.2)	1. Own residence (70.2) 2. Workplace (22.2) 3. Hospital (22.1)
Top 3 highest internet usage age (percentage)	1. Age 0-19 years old (89.8) 2. Age 20-29 years old (87.6) 3. Age 30-39 years old (82.9)	1. Age 0-19 years old (95.5) 2. Age 20-29 years old (94.6) 3. Age 30-39 years old (88.2)
Top 3 most popular online activities (percentage)	1. Conversations/chat via applications such as LINE, Facebook Messenger (79.6) 2. Use of social media (75.1) 3. Internet Phone Calls or Video Calls (51.5)	1. For work such as online meeting or Work from home (83.1) 2. For online learning (82.5) 3. Conversation / chat via applications such as Line, Facebook messenger (73.8)
Top 3 Increased Internet Use Activity Compared Before and During COVID (Percent)	1. Online learning/attending online training courses (8.2)	1. File your taxes online (40.3)

Internet usage and behaviors	Survey results of the Thailand Digital Outlook Phase 2	Survey results of the Thailand Digital Outlook Phase 3
	2. Work remotely online (4.5) 3. Chat through the applications (3.4)	2. Follow up on the COVID situation (35.2) 3. Use online health services (24.3)

14.5.2 People's behavior of purchasing goods and services through online channels

According to the survey results of the Thailand Digital Outlook Phase 3, it was found that 76.6% of the people bought goods and services online. Meanwhile, the results of the Thailand Digital Outlook Phase 2, only 37.7% had traded online service products which is a proportion that has increased significantly. This is mainly due to the increasing proportion of internet users and the epidemic situation of the coronavirus that has stimulated the use of online channels a lot.

The main reason why respondents do not purchase goods/services through online channels, which is the same main reason from the survey results of Thailand Digital Outlook Phase 2 and Phase 3, is because they are not interested in using the service. They prefer to go to the store and there are concerns about the reliability of the store including product quality.

According to an in-depth analysis of the survey results of the Thailand Digital Outlook Phase 3, it was found that the top 3 types of online services that people purchase during the COVID-19 pandemic are; 1) food/drink ordering services from restaurants. (including ordering through applications) such as Grab, LINE Man, Food panda, etc. 2) Consumer goods and 3) Medicine.

The products that are popular from the survey results of the Thailand Digital Outlook Phase 2 in purchasing products/services via online channels are clothing, shoes, sports equipment and accessories, consumer goods and cosmetics. It can be seen that the popularity for the group of goods that are not essential to life such as clothing, shoes, sports equipment and accessories is declining, perhaps not just online, but also through regular trading channels. As people are unable to travel or do activities outside their residence, there is no need to purchase these product groups. At the same time, people

have to rely on online shopping for services and products that are necessary for their livelihood, including food, consumer products and medicine, etc.

According to the survey results of the Thailand Digital Outlook Phase 3, it was found that the popularity of online shopping and services varies in each age group. However, most will be a food service product group consumer goods, for example:

- Most respondents aged 0-19 years prefer to use food ordering services and entertainment-related services such as streaming services, online games, etc.
- The respondents aged 60 and over mostly preferred consumer/consumer products, medicine, etc.

According to the results of the survey in Thailand Digital Outlook Phase 3, the top 3 online payment formats with the highest proportion of users during the COVID-19 period or December 2020 - July 2021 are 1) Internet Banking or a banking application (Mobile Banking), 2) payment via credit card, and 3) use of reward points to redeem products or services. Meanwhile, the results of the Thailand Digital Outlook Phase 2 revealed that online payment formats with the highest proportion of users were 1) web money transfers or bank applications, 2) cash on delivery, and 3) Online payment service. This shows that online payment forms via websites (Internet Banking) or banking applications (Mobile Banking) are the most popular channels. Due to the cash on delivery (COD) section, there has been a considerable reduction in usage. This is because people avoid forms of contact with banknotes or having to meet with the authorities to help with the transaction. In order to reduce the risk of contracting the virus and people, they choose to use a standardized payment format directly by banks and financial institutes. Accepting more payments than using a service model by other companies or organisations makes online payment services such as PayPal and Google Pay decrease.

According to the detailed analysis of the survey results in the Thailand Digital Outlook Phase 3, it was found that payments made by money transfer via bank applications and credit card payments are used in a high percentage of respondents aged 20–59 because they are a fixed income group and can do transactions with a variety of banks, such as making their own credit cards. Whereas, the respondents aged 0–19 years may not yet have their own credit cards. They use their parent's credit cards. Therefore, it still has a smaller percentage of use than other age respondents.

Table 203 Comparing the results of study of the behaviors of people buying goods and services through online channels

Behaviors of people buying goods and services through online channels	Survey results of Thailand Digital Outlook Phase 2	Survey results of Thailand Digital Outlook Phase 3
Percentage of people who purchase products and services online	76.6	37.7
Top reasons why survey respondents do not purchase goods/services through online channels (percentage)	1. Not interested in using the service (50.3) 2. Prefer to go to the stores (40.3) 3. There are concerns about the reliability of the stores including product quality (24.6)	1. Not interested in using the service (45.9) 2. Prefer to go to the stores (42.1) 3. There are concerns about the reliability of the stores including product quality (33.6)
Top 3 types of online services that people buy the most (percent)	1. Clothing, shoes, sports equipment and accessories (74.0) 2. Food/drink ordering service from restaurants (67.6) 3. Cosmetics (39.3)	1. Food/drink ordering service from restaurants (89.2) 2. Consumer goods (67.2) 3. Medicine (63.4)
Top 3 forms of online payment (percentage)	1. Money transfer via web or banking application (68.2) 2. Cash on delivery (57.2) 3. Online payment service (32.9)	1. Payment via website (Internet Banking) or banking application (Mobile Banking) (61.3) 2. Payment via credit cards (36.9) 3. Use accumulated points to redeem products/services (25.2)

14.5.3 Online business operations and the application of digital technology

According to a survey of private business entities in the implementation of the Thailand Digital Outlook Phase 3, it was found that 98.4% of agencies or entrepreneurs used the internet, which was the highest fixed broadband internet, 4G mobile broadband

internet service, and 3G mobile broadband internet services. This is consistent with the proportion of internet formats used by operators from the survey data in the Thailand Digital Outlook Phase 2 with internet usage. Fixed broadband was the highest at 85.1% followed by Mobile broadband and using Narrowband Internet services, respectively.

According to the survey results in the Thailand Digital Outloo Phase 3, the proportion of entrepreneurs who use broadband internet at speeds above 30 Mpbs, representing the national average, is 87.2% which is higher than the percentage of those who use broadband internet at speeds above 30 Mpbs. The usage of broadband internet at speeds above 30 Mbps was 78.4%. A survey of the Thailand Digital Outlook Phase 2 shows that operators have higher jobs using fixed broadband internet for reasons. The price of internet services is lower and there is a continuous stimulation of sales from internet service providers. Bangkok, the southern region, the western region, the eastern region and the northeastern region are the areas where operators are actively using broadband internet fixed at speeds above 30 megabits per second, respectively.

Regarding the availability of online channels for distribution of products and services, it was found that in the survey of the Thailand Digital Outlook Phase 3, 73.9% of entrepreneurs had online channels for distribution of goods, services. This is higher than the survey results in the Thailand Digital Outlook Phase 2. 29.9% of entrepreneurs have online channels for distribution of products and services which shows that the adjustment of entrepreneurs to use online channels is increasing. To support consumer behaviors, it is necessary to use online channels from the Covid situation.

When considering the average income from selling products through online channels of entrepreneurs compared to total income, it was found that the average income through online channels of entrepreneurs in the survey of the Thailand Digital Outlook Phase 3 showed that while the survey results in the Thailand Digital Outlook Phase 2 showed a decline which may be because during the survey of Thailand Digital Outlook Phase 2, people still have the option to purchase goods and services through normal channel. The entrepreneurs have not accelerated the sales of products and services through online channels. This is different from the survey period of the Thailand Digital Outlook Phase 3, where people need to use online channels. To reduce the risk of the epidemic of severe coronavirus, many entrepreneurs are turning to online channels for business survival.

For the online channels used to distribute products or services that are used the most, the survey results in the Thailand Digital Outlook Phase 3 and Phase 2 are social media channels. It was the second most used channel according to the results of the Thailand Digital Outlook Phase 3 and the third most from the results of the Thailand Digital Outlook Phase 2.

When considering the types of businesses that sell products and services through online channels the most during Covid or December 2020 – July 2021 from the survey results in the Thailand Digital Outlook Research Project Phase 3, it was found to be banking, information technology and food and drink. Products and services are distributed through online channels the most. As for the survey results of the Thailand Digital Outlook Phase 2, it was found that the hotel business computer manufacturing and information is the business with the most distribution of products and services through online channels.

When considering online customer groups according to a survey in the Thailand Digital Outlook Phase 3, it was found that during the Covid-19 period, more than 96.8% of customers who sell goods and services via online channels are domestic customers. However, according to the results of the Thailand Digital Outlook Phase 2, it accounted for 74.1%. The results of the survey in the Thailand Digital Outlook Phase 3 revealed that the proportion of online customers who were high domestic customers declined by 0.8%. Meanwhile, the results of the survey in the Thailand Digital Outlook Phase 2 revealed that the share of online customers who were domestic customers decreased by 18.6%. The online customers were foreign customers. According to the survey results in the Thailand Digital Outlook Phase 3, the proportion increased by 0.7%. Whereas, the survey results in the Thailand Digital Outlook Phase 2 found that the proportion of online customers who were domestic customers decreased by 18.4%. This reflects the majority of online customers who are still domestic customers. The share of customers from the survey results in the Thailand Digital Outlook Phase 3 has not changed much because the economic conditions during the survey period have not changed much and it is the period when entrepreneurs still need clarity from the government in driving the economy.

Table 204 Comparing the results of online business operation and application of digital technology

Online business operation and application of digital technology	Survey results of Thailand Digital Outlook Phase 2	Survey results of Thailand Digital Outlook Phase 3
Percentage of entrepreneurs with Internet use	No analysis	98.4
Top 3 most used internet service forms (percentage)	1. Fixed Broadband Internet (85.1) 2. Mobile broadband internet (18.0) 3. Narrowband internet (0.5)	1. Fixed Broadband Internet (88.2) 2. 4G Mobile broadband internet (15.6) 3. 3G Mobile broadband internet (2.1)
Percentage of operators with broadband internet usage greater than 30 Mbps	78.4	87.2
Area with the highest proportion of operators using fixed broadband internet in the top 3 (percent)	1. Bangkok (92.9) 2. Central Region (87.4) 3. Southern region (84.4)	1. Bangkok (99.2) 2. Southern region (90.5) 3. Western region (83.8)
Percentage of entrepreneurs who have online channels for distribution of goods and services	29.9	73.9
Top 3 online channels used to distribute products or services (percentage)	1. Social Media Channels (67.0) 2. Company's website (61.3) 3. E-marketplace (38.0)	1. Social Media Channels (71.2) 2. E-marketplace (54.7) 3. Company's website (36.2)
Top 3 business types with the highest distribution of products and services via online channels (percentage)	1. Accommodation (69.5) 2. Computer Manufacturing (48.2) 3. Information (38.8)	1. Banking Business (100) 2. Information Technology (100) 3. Food and beverage (88.3)
Share of online channel customers (percent)	1. Domestic customers (74.1) 2. Overseas customers (25.9)	1. Domestic customers (96.8) 2. Overseas customers (3.2)

Online business operation and application of digital technology	Survey results of Thailand Digital Outlook Phase 2	Survey results of Thailand Digital Outlook Phase 3
Average income through online channels	Decrease by 16.3%	Increase by 6.8%

14.5.4 Using e-government services

According to a survey in the Thailand Digital Outlook Phase 3 on the use of online government services, it was found that 60.7% of the respondents used/received government services online. Meanwhile, the survey results in the Thailand Digital Outlook Phase 2 found that there are 35.3% of online government service users/receiving services, which reflects the increased use of online services from the public sector due to the government's development of more online channels in providing services and using it as a main channel for providing services during the Covid.

For survey respondents who do not use/receive government services online, it was found that the top 3 reasons why respondents did not use/receive government services online were: 1) No need to submit forms/documents through the online, 2) Lack of competence and knowledge and the complicated use of the website, and 3) have more confidence in sending documents in paper to the agency directly. The reasons for not using government online services from the survey results in the Thailand Digital Outlook Phase 2 are: 1) no need to submit forms/documents via online channels; 2) lack of a website to provide services at want to use 3) wanting to contact the staff partly as a result of liaison with the government. Most need to get services at government offices and must use original documents to verify identity or the accuracy of the information. As a result, some respondents do not need to use/receive government services online. The government online channels can be complicated making contact with officials more convenient.

The types of online government services that people use the most from both the survey results of the Thailand Digital Outlook Phase 2 and Phase 3 are 1) searching or requesting information, 2) downloading forms/documents, and 3) submitting forms/documents via online channel.

The features of online government services that are most used during COVID-19 or December 2020 - July 2021 from the survey results of the Thailand Digital Outlook Study Phase 3 are 1) paying electricity/water bills/telephone bills/utilities bills, 2) filing income tax forms online, and 3) registering/receiving rights/checking social security eligibility. For

online government services with the largest percentage change, the top 3 are: 1) file income tax returns online increased by 42.7%, 2) Job search/registration online increased by 28.9%, and 3) registering/receiving rights/ validation of various government projects such as the Thai Chana Project, Kon La Kreung Project with an increase of 15.5%.

Meanwhile, the survey of Thailand Digital Outlook Phase 2 found that the 3 most commonly used government services are; 1) payment of electricity/water/phone/utilities bills, 2) online tax filing, and 3). Social Security Rights Management. This reflects the changing nature of government services that people use. The highest usage was both in the Thailand Digital Outlook Phase 2 and Phase 3 projects and the online income tax service still had a high proportion of usage. However, the government services on the news of the coronavirus outbreak include job search due to the impact of Covid that causes many people to lose their jobs. This is a result of the severe spread of the coronavirus during the Thailand Digital Outlook Phase 3.

As for the use of online government services by private business entities, the results of the survey in the Thailand Digital Outlook Phase 3 found that the majority of entrepreneurs, 88.5%, had used government services online. This is an increase from 48.2% from the survey in Thailand Digital Outlook Phase 2, ranked by region with the most online government service operators. The survey results in the Thailand Digital Outlook Phase 3 study were 1) the western region, 2) the central region, 3) the eastern region, 4) Bangkok, 5) the northeastern region, 6) the southern region, and 7) the northern region. Thailand Digital Outlook Phase 2 is 1) the western region, 2) Bangkok, 3) the central region, 4) the eastern region, 5) the northeastern region, 6) the southern region, and 7) the northern region, which is a change arising from economic expansion. This includes the proportion of entrepreneurs operating businesses that need to coordinate with the government sector that has expanded in the eastern and northeastern regions.

According to the survey data in the Thailand Digital Outlook Phase 3, the types of online government services that are most used are 1) for searching for information, 2) for submitting forms/documents via online channels, and 3) for downloading the forms/documents. The types of online government services that are most used in the survey data in the Thailand Digital Outlook Phase 2 are 1) filing or submitting electronic forms/documents, 2) requesting information or documents through the government agency's website, and 3) document/license approval service.

The nature of online government services that are used the most from the survey data of the Thailand Digital Outlook Phase 3 during the COVID-19 period includes 1) submitting tax forms/ submitting account information online, 2) submitting employee/personnel information to the government online, and 3) paying for electricity/water/bills, Telephone/Utilities.

According to the results of the survey in the Thailand Digital Outlook Phase 2, the online government services used the most are 1) filing tax forms/documents, 2) submitting employee data and paying utilities, and 3) submitting accounting data. It can be seen that the most popular online government services are also related to tax and tax rights, utility bill payment and employee information and financial accounting information.

In considering the level of use of online government services among Thai people, the share of people who use the service has been taken to compare to the rates of fixed internet access among survey respondents per province. As a result of such analysis, it was concluded that the top 10 provinces in which survey respondents have the largest proportion of online government services are 1) Nonthaburi 76.85%, 2) Songkhla 74.5%, 3) Chiang Mai 73.2%, 4) Nakhon Si Thammarat 69.52%, 5) Nakhon Pathom Province 69.3%, 6) Ubon Ratchathani Province 68.9%, 7) Bangkok 65.4%, 8) Chonburi Province 65.3%, 9) Khon Kaen Province 65.3%, and 10) Nakhon Ratchasima Province 64.4%.

It can be seen that these provinces are the urban nature provinces with high fixed internet coverage. As a result, people can easily access various online services.

In dividing the provinces from the share of people who use government services online and the share of fixed internet access, the provinces of Thailand can be grouped into 4 groups as follows:

1) Provincial groups that have the share of online government service users and the share of fixed internet access higher than the national average of 26 provinces are among the provinces with internet access and the high use of online government services compared to other provinces of the country.

2) Provincial groups with higher than average percentage of online government service users. However, the share of regular internet access is lower than the average of 13 provinces. These provinces are considered provinces with high online government services. It may be that most of the users using online government services through other forms of mobile internet instead.

3) Provincial groups with lower than average percentage of online government service users. However, the share of fixed internet access is higher than the average of 12 provinces. These provinces are considered to be provinces with high percentage of internet access. However, the percentage of online government services is still lower than the national average.

4) Provincial groups with the share of online government service users and the share of fixed internet access below the national average of 24 provinces. These provinces are considered to be among the provinces with a low percentage of internet access. As a result, the proportion of online government services is not high compared to other provinces of the country.

Table 205 Comparing the results of study on e-government service usage

E-government service usage	Survey results of Thailand Digital Outlook Phase 2	Survey results of Thailand Digital Outlook Phase 3
Percentage of people who use services/receive government services online	35.3	60.7
Top 3 reasons for not using/receiving government services online the highest in the public sector (percentage)	1. No need to submit forms/documents via online channels (43.0) 2. Lack of website to provide the desired service (16.2) 3. Need to contact the officials (15.1)	1. No need to submit forms/documents via online channels (62.2) 2. Lack of talent and knowledge including complicated use of the website (58.9) 3. Have more confidence in sending documents in paper to the agency directly (47.7)
Top 3 types of online government services that people use the most (percent)	1. Searching or obtaining information (76.5) 2. Submit forms/documents via online channels (57.7) 3. Download forms/documents (56.9)	1. Searching or obtaining information (48.8) 2. Download forms/documents (26.4) 3. Submit forms/documents via online channels (24.7)

E-government service usage	Survey results of Thailand Digital Outlook Phase 2	Survey results of Thailand Digital Outlook Phase 3
Top 3 most used online government services (percentage)	1. Pay for electricity/water/telephone/utilities bills (64.8) 2. File income tax forms online (45.2) 3. Register/receive rights/check social security rights (33.0)	1. Pay for electricity/water/telephone/utilities bills (86.7) 2. File income tax forms online (68.9) 3. Register/receive rights/check social security rights (64.2)
Percentage of entrepreneurs who use/receive government services online	48.2	88.5
Top 3 Regions with the Most Entrepreneurs Using Online Government Services (Percent)	1. Western region (62.2) 2. Bangkok (52.2) 3. Central Region (48.3)	1. Western region (94.6) 2. Central Region (93.2) 3. Eastern Region (90.1)
Top 3 types of online government services that entrepreneurs use the most (percent)	1. Filing or submitting electronic forms/documents (75.6) 2. Request information or documents through the website of government agencies (40.6) 3. Document/license approval service (14.6)	1. Used to search information (72.9) 2. Used to submit forms/documents through online channels (65.8) 3. Used to download forms/documents (40.4)
Top 3 types of online government services that entrepreneurs use the most (percent)	1. Filing of tax forms/documents (85.2) 2. Submit employee information and pay utilities (35.3) 3. Submit accounting information (29.2)	1. File a tax form/Submit account information online (89.2) 2. Submit employee/personnel information to the government online (60.2) 3. Pay for electricity/water/telephone/utilities bills (38.3)

Table 206 List of provinces of Thailand divided by the share of e-government users and share of fixed internet access

Provinces of Thailand divided by the share of e-government users and share of fixed internet access	Number of Provinces	Provinces
1) Group of provinces that have the higher share of e-government service users and share of regular internet access than the average	26	1. Krabi 2. Bangkok 3. Chainat 4. Chumphon 5. Chiang Mai 6. Nakhon Nayok 7. Nakhon Pathom 8. Nakhon Si Thammarat 9. Nakhon Sawan 10. Narathiwat 11. Nan 12. Buriram 13. Pattani 14. Phra Nakhon Si Ayutthaya 15. Phatthalung 16. Phichit 17. Yasothon 18. Loei 19. Sisaket 20. Sakon Nakhon 21. Satun 22. Sa Kaeo 23. Saraburi 24. Surin 25. Uthai Thani 26. Ubon Ratchathani
2) Group of provinces that have the share of e-government service users higher than the average but have the share of regular internet access lower than the average	13	1. Kanchanaburi 2. Kamphaeng Phet 3. Trang 4. Nonthaburi 5. Pathum Thani 6. Rayong

Provinces of Thailand divided by the share of e-government users and share of fixed internet access	Number of Provinces	Provinces
		7. Phang Nga 8. Ratchaburi 9. Roi Et 10. Lopburi 11. Songkhla 12. Samut Prakan 13. Surat Thani
3) Group of provinces that have the share of e-government service users lower than the average but have the share of regular internet access higher than the average	12	1. Phuket 2. Sakon Nakhon 3. Satun 4. Sa Kaeo 5. Saraburi 6. Singburi 7. Surin 8. Nong Khai 9. Nong Bua Lamphu 10. Angthong 11. Amnat Charoen 12. Udon Thani
4) Group of provinces that have the share of e-government service users and the share of regular internet access lower than the country's average	24	1. Kalasin 2. Chanthaburi 3. Chachoengsao 4. Chaiyaphum 5. Chiang Rai 6. Trat 7. Tak 8. Nakhon Phanom 9. Phitsanulok 10. Phetchaburi 11. Phetchabun 12. Phrae 13. Maha Sarakham 14. Yala 15. Ranong

Provinces of Thailand divided by the share of e-government users and share of fixed internet access	Number of Provinces	Provinces
		16. Lampang 17. Lamphun 18. Bueng Kan 19. Samut Songkhram 20. Samut Sakhon 21. Sukhothai 22. Suphanburi 23. Uttaradit 24. Amnat Charoen

Remark: The average percentage of e-government service users equal to 61.1% and the average share of internet access equal to 85.4%

It can be seen that 36 provinces in Thailand still have the share of e-government users below average especially in the provinces with the shre of e-government service users. The share of regular internet access is lower than the national average, which is as many as 37 provinces, and infrastructure development for greater accessibility so that people in these provinces can access the services and enjoy the convenience of using online services.

14.5.5 Teleworking with an online system

In the survey of teleworking with an online system, the survey results in the Thailand Digital Outlook Phase 3 revealed that the proportion of people working remotely via online systems was 29.5%. Meanwhile, the survey results in the Thailand Digital Outlook Phase 2 were 17.4%. Most agencies/companies issue policies for employees/employees to work from home and use the system to work online as it is a mandatory measure to control the spread of COVID. The businesses with the largest increase in online remote work were 1) Information and communication technology which increased by 48.0%, 2) Food and beverages which increased by 42.0%, and 3) funds and securities which increased by 32.3%.

If considering the types of teleworking activities with the highest proportion, the top 3 results from the survey in the Thailand Digital Outlook Phase 3 were activities of 1) VDO Conference, 2) Used for sending and receiving emails by the unit of agencies/companies,

3) Access to information documents of agencies/companies. It is the activity with the highest proportion of actions respectively during the Covid period or December 2020 - July 2021.

Meanwhile, the results of the Thailand Digital Outlook Phase 2 survey found that 1) access to corporate email, 2) Work from Home/Teleworking, and 3) VDO Conference which from the proportion of activities that have changed from the Thailand Digital Outlook Phase 2 and Phase 3 reflect the type of activities that are more fully online work activities, such as video conference calls via VDO conference. From the use, the 3rd place event in Thailand Digital Outlook Phase 2 is the highest use in Thailand Digital Outlook Phase 3 because the meeting is 1 of the important activities of working and using the application system that has been used. Jobs have risen beyond just using the company email system which has become a regular activity.

If considering the career with teleworking, the results of the survey in Thailand Digital Outlook Phase 3 found that the top 3 occupations with the most online remote workwere 1) civil servants/employees/government workers, 2) private employees/ employees, and 3) personal/trading businesses. Meanwhile, the survey results of the Thailand Digital Outlook Phase 2 found that the top 3 occupations with teleworking via online systems were 1) civil servants, 2) state enterprise employees/employees, and 3) private sector employees. The government officials are the group with the highest online teleworking, both in the Thailand Digital Outlook Phase 2 and Phase 3 surveys, and private employees/employees are the occupation groups that work in this manner.

Table 207 Comparing online teleworking study results

Online teleworking	Survey results of Thailand Digital Outlook Phase 2	Survey results of Thailand Digital Outlook Phase 3
Percentage of share of people for teleworking via online system	17.4	29.5
Top 3 activities of teleworking activities (percentage)	1. Access to company's email (71.5) 2. Work from Home/Teleworking (64.8) 3. VDO Conference (64.6)	1. VDO Conference (93.2) 2. Used for sending emails of agencies/companies (82.2) 3. Access to information sheets of agencies/companies (53.2)

Online teleworking	Survey results of Thailand Digital Outlook Phase 2	Survey results of Thailand Digital Outlook Phase 3
Top 3 occupations with online teleworking (percentage)	1. Government officials (26.1) 2. Occupation of state enterprise employees / workers (24.0) 3. Private employees (23.1)	1. Government officials/employees/workers (88.3) 2. Private employees/workers (85.1) 3. Private business/Trade (82.2)

14.5.6 Online studying

In the survey of online learning activities, a survey in the Thailand Digital Outlook Phase 3 study found that the proportion of online learning distance learning participants was 34.0%, while the survey results in the Thailand Digital Outlook Phase 2 were 25.6%.

From the survey of the frequency of online learning, it was found that in the pre-COVID period or September-November 2020, there were 66.2% of those who studied online more than once a week. 33.8% studied online once a week and no one did not study online. During the COVID-19 pandemic or December 2020 - July 2021, the share of those who study online more than once a week is 71.0%. 29.0% studied online once a week and no one did not study online.

When comparing the change in the frequency of online learning, it was found that the proportion of those who studied online more than once a week was a 4.8% increase. It was an increase from those who took online classes once a week indicating an increased frequency of online learning from the school closure measures to prevent the spread of COVID-19.

For the highest online learning-related activities in the pre-Covid period or September-November 2020, it was found that the top 3 rankings were 1) 88.9% attended online classroom sessions, 2) 63.6% attended VDO conferences, and 3) 29.5% access to educational materials. For the highest online learning-related activities during the COVID-19 period or December 2020 - July 2021, the top 3 rankings were 1) 92.2% attended online classroom sessions, 2) VDO conferences for 69.2%, and 3) access to information materials of educational institutions for 31.1%.

Comparing the changes in online learning-related activities, the top 3 activities with the highest proportion were the same both before and during the coronavirus. The top 3

activities with the largest proportion of increase were 1) online self-study increased by 6.4%, 2) submitting work via online system increased by 6.0%, 3) VDO Conference increased by 5.6% indicating the use of other activities involved in online learning that is increasing beyond the main activities of online attendance alone.

As for the systems used in online learning, the 3 most used are 1) Zoom program for 2.1%), 2) Google Classroom (85.6%), and 3) Google Meet for 34.9%.

In the opinion poll on being able to study online effectively, it was found that the majority of online learners agreed with 57.3%, strongly agreed with 26.5%, disagreed with 12.0% and strongly disagreed with 4.2%. The top 3 utilization of online systems in distance learning were 1) lack of learning equipment such as computers, laptops, tablets, and mobile phones for 44.2%; 2) the home or accommodation environment for 39.4%, and 3) lack of effective computer equipment for 22.3%. 57.8% of respondents agreed that online learning can replace traditional learning while 42.2% thought that online learning cannot replace traditional learning.

Table 208 Comparison of online study results

Online study	Survey results of Thailand Digital Outlook Phase 2	Survey results of Thailand Digital Outlook Phase 3
Share of people who study online (percent)	25.6	34.0

14.5.7 Digital skills

To explore people's digital skills, the results of the Thailand Digital Outlook Phase 3 survey found that 88.3% of the respondents were unable to program a computer and 11.7% of the respondents were able to program a computer program. The top 3 steeples with the highest proportions are 1) Taking photos, 2) Shooting videos, and 3) Copy-Paste Move-Text on devices or clouds, computers, tablets, phones, smartphones, smart TVs. The ability to use the lowest proportion of programs/applications are 1) Modify the security of your web browser, 2) Install or uninstall operating systems such as Microsoft Windows, and 3.) Modify and check application software.

The age ranges with the most overall digital skills were 1) 30-39 years old, 2) 40-49 years old, and 3) 20-29 years old. The occupations with the most overall digital skills

were 1) personal business/commerce, 2) State enterprise employees/workers, 3) Freelance/daily workers

Meanwhile, the survey results of the Thailand Digital Outlook Phase 2 found that the top 3 ability to use programs/applications were 1) the ability to program/edit documents, 2) the ability to use the program to create and calculate in data tables, and 3) the ability to send emails by attaching different file types.

Table 209 Comparing the study results of Digital Skills

Digital Skills	Survey results of Thailand Digital Outlook Phase 2	Survey results of Thailand Digital Outlook Phase 3
Share of competence to use programs/applications that people have the highest in the top 3 (percentage)	1. Ability to program/edit documents (65.6) 2. Ability to use the program to create-calculate in the data table (49.7) 3. 3) Ability to send emails by attaching different file types (46.3)	1. Taking photos (85.4) 2. Shooting video (81.2) 3. 3) Copy-Paste Move-Text (77.3)

14.5.8 Digital implementation of entrepreneurs and primary service agencies

For businesses in Thailand, different entities use digital technology differently. The agencies or business sectors with large businesses are more likely to use digital technology for business operations in a larger proportion than companies or business sectors with smaller businesses. This is partly because the larger the organisation, the more complex internal organisation management is required. The need to integrate digital technology into management also increases efficiency in business operation.

Proportion of hiring information technology professionals

From the survey results in the Thailand Digital Outlook Phase 3, it was found that private business entrepreneurs who hired staff or experts to perform IT and communications technology were 66.4%. 31.8% were non-employment with the proportion of employees/ professionals in information and communication technology to total employees averaged 5.9%. Thailand Digital Outlook Phase 2 found that only 26.0% of employment and the proportion of employees/professionals in Information and

Communication Technology to total employees was on average 4.0%, reflecting that entrepreneurs provide importance of information technology and having an information technology officer to maintain systems more.

When considering the proportion of hiring of IT staff according to the size of the operators, it was found that the proportion of the employment varied according to the size of the operators. For large enterprises or large enterprises, the number of entrepreneurs who employ information technology workers accounted for 96.3%, followed by medium-sized enterprises and small enterprises, respectively which accounted for 86.1%, 58.9% and 36.7%, respectively. This is in line with the survey results in the Thailand Digital Outlook Phase 2 with large entrepreneurs having a 75.2 percent employment proportion, followed by medium-sized entrepreneurs, small entrepreneur and small operators which accounted for 54.8%, 19.0% and 4.5%.

When comparing the proportion of employees in the field of information technology between the survey results of the Thailand Digital Outlook Phase 2 and Phase 3, it can be seen that entrepreneurs see the necessity of using information technology to improve business efficiency and need personnel in this field. The fact is that large operators employ such specialists or have a department for such specialists to perform the duties of controlling and supervising the company's work system to be orderly and efficient.

Table 210 Comparing the results of the study of the proportion of hiring information technology specialists

Hiring information technology specialists	Survey results of Thailand Digital Outlook Phase 2	Survey results of Thailand Digital Outlook Phase 3
Percentage of private business operators who employ staffs or professionals to perform information and communications technology functions	26.0	66.4
Average number of information and communications technology employees/ professionals per total employee (%)	5.9	4.0

Hiring information technology specialists	Survey results of Thailand Digital Outlook Phase 2	Survey results of Thailand Digital Outlook Phase 3
Proportion of hiring of IT staff according to size of entrepreneur ((%))	1. Large enterprises (75.2) 2. Medium-sized enterprises (54.8) 3. Small enterprises (19.0) 4. Sub enterprises (4.5)	1. Large enterprises (96.3) 2. Medium-sized enterprises (86.1) 3. Small enterprises (58.9) 4. Sub enterprises (36.7)

Operational duties in the information technology sector

From the survey results in the Thailand Digital Outlook Phase 3, it was found that the most tasks in the information technology sector carried out by personnel within the organisation were 1) Operations technicians to help solving problems with users of ICT (Information Technology System) and communication support, 2) general management personnel such as managing the information technology assets of the agency, 3) maintenance personnel for electronic business systems such as ERP, CRM, or database systems. The results of the survey in Thailand Digital Outlook Phase 2 found that the duties in the information technology sector carried out by personnel within the organisation the most were: 1) Operations in the maintenance of information and communication technology infrastructures (ICT), 2) IT security activities, and 3) website or e-commerce system administration activities.

Most of the duties in the information technology sector are carried out by external experts. From the survey data in the Thailand Digital Outlook Study Project Phase 3, namely 1) Operational technicians provide assistance in solving problems with users of ICT (Information Technology and Communications Support), 2) Analyzing and developing software and applications (Programmer), 3) Information technology security officer (IT Security) and personal information protection. From the survey data in the Thailand Digital Outlook Phase 2 project, namely 1) operations in the information and communication technology (ICT) infrastructure maintenance section, 2) software support and service operations, and 3) operations in the area of website development activities or e-commerce systems.

Table 211 Comparing the results of the study of the duties in the information technology sector

Operation in the information technology sector	Survey results of Thailand Digital Outlook Phase 2	Survey results of Thailand Digital Outlook Phase 3
Proportion of duties in the information technology sector carried out by personnel within the top 3 departments (percentage)	1. Operations in the division of information and communication technology infrastructure maintenance (64.6) 2. IT security activities (27.5) 3. Website maintenance activities or e-commerce systems (22.2)	1. Operations technicians provide troubleshooting assistance to users of ICT (Information and Communications Technology System Support) (68.3) 2. General management personnel such as information technology asset management of the agency (33.7) 3. Maintenance staffs for electronic business systems such as ERP CRM or database systems (32.4)
Top 3 roles in the information technology sector performed by external experts (percentage)	1. Operations in information and communication technology infrastructure maintenance department (9.5) 2. Operation of software support and service (6.6) 3. Operations in the area of website development activities or e-commerce systems (5.5)	1. Operations technicians provide troubleshooting assistance to ICT users (34.5) 2. Analysis and development of software and applications (Programmer) (33.7) 3. IT Security Officer (31.3)

Proportion of personnel working with computer equipment

According to a survey in the Thailand Digital Outlook Phase 3, it was found that the group of entrepreneurs with personnel who work with computers at 50-80% is the highest proportion, followed by entrepreneurs with personnel who work with computers more than 80% and entrepreneurs with personnel who work with computers 30-49%.

Meanwhile, the survey of the Thailand Digital Outlook Phase 2 found that the proportion of the use of electronic devices in employees' work accounted for 53.4%.

Businesses with the largest percentage of employees who use computers From the survey results in the Thailand Digital Outlook Phase 3, namely 1) agribusiness 2) food and beverages and 3) transportation and logistics. The survey results in the Thailand Digital Outlook Phase 2 project are 1) Finance and Insurance 2) Communications and 3) Public Administration.

Table 212 Comparing the results of the study of the proportion of personnel working with computer equipment

Personnel working with computer equipment	Survey results of Thailand Digital Outlook Phase 2	Survey results of Thailand Digital Outlook Phase 3
Top 3 Businesses with the Proportion of Employees Using Computer Devices (Percentage)	1. Finance and Insurance(86.8) 2. Communication (84.4) 3. Public Administration (79.1)	1. Agricultural business (88.3) 2. Food and beverage (83.7) 3. Transport and logistics (82.4)

Use of technology in business operation

According to the survey in Thailand Digital Outlook Phase 3, it was found that 53.2% of entrepreneurs are using technology in their business operations. The 3 mostly-used technology include 1) VDO Conference System, 2) Customer Relationship Management (CRM) and 3) Supply Chain Management (SCM). According to the results of the Thailand Digital Outlook Research Project Phase 2, it was found that there were the use of technology in business operations for 31.6%. The top 3 technologies being used were 1) VDO Conference System, 2) Customer Relationship Management (CRM), and 3) Enterprise Resource Planning (ERP).

Table 213 Comparing the results of the study of the technology use in the business operation

Technology use in the business operation	Survey results of Thailand Digital Outlook Phase 2	Survey results of Thailand Digital Outlook Phase 3
Percentage of entrepreneurs using technology in their business	31.6	53.2
Top 3 Most Used Technologies (Percent)	1. VDO Conference System (88.1)	1. VDO Conference System (72.1)

Technology use in the business operation	Survey results of Thailand Digital Outlook Phase 2	Survey results of Thailand Digital Outlook Phase 3
	2. Customer Relationship Management (CRM) (19.4) 3. Enterprise Resource Planning (ERP) (17.3)	2. Customer Relationship Management (CRM) (22.1) 3. Supply Chain Management (SCM) (16.7)

Organisation of training

In organising training for personnel in the department to develop their skills in working according to the survey in the Thailand Digital Outlook Phase 3, it was found that 36.6% of entrepreneurs provided training to personnel or specialists in information and communication technology. 21.6% received training to all personnel. From the survey in the Thailand Digital Outlook Phase 2, it was found that entrepreneurs who organized training for personnel or professionals in information and communication technology was 24.7%. Medium-sized entrepreneurs training for such personnel is the highest. According to the survey results in the Thailand Digital Outlook Phase 3, large entrepreneurs have the highest training for such personnel. From the survey results of the Thailand Digital Outlook Phase 2, the overall reflects the medium and large entrepreneurs due to the necessity of using such personnel to manage complex company operations.

Training for personnel in the agency according to the survey results of the Thailand Digital Outlook Phase 3, 69.5% of entrepreneurs have provided training for their personnel. Meanwhile, the survey results of the Thailand Digital Outlook Phase 2 found that there are entrepreneurs who have training for personnel accounted for 36.2%, which shows that the adjustment of entrepreneurs to develop the skills of employees more seriously.

Table 214 Comparing the results of the training organisation

Training organisation	Survey results of Thailand Digital Outlook Phase 2	Survey results of Thailand Digital Outlook Phase 3
Percentage of entrepreneurs who provide training to personnel or professionals in information and communication technology	24.7	36.6
Percentage of entrepreneurs who provide training to personnel in the agency	36.2	69.5

Use of cloud services

According to the survey results of the Thailand Digital Outlook Phase 3, it was found that 70.3% of entrepreneurs used cloud services. Meanwhile, the survey results in the Thailand Digital Outlook Phase 2 showed that entrepreneurs had the use of cloud services (Cloud) for 25.6%. When considering the size of entrepreneurs from the survey in the Thailand Digital Outlook Phase 3, it was found that large and small entrepreneurs higher percentage of cloud services are used by small and medium-sized enterprises. The results of the Thailand Digital Outlook Phase 2 survey found that large enterprises used cloud services the most and small operators have the lowest usage of cloud services which results in higher use of cloud services significantly. The smaller entrepreneurs are increasingly using the cloud. It reflects how entrepreneurs see the benefits of cloud technology including the investment in using the service as an actual payment without the need to invest in the purchase of high-value assets. This is suitable for managing costs and expenses of small entrepreneurs. Large entrepreneurs have already invested a lot in information technology systems making the system change to use cloud services. Therefore, it is difficult to make and may be a redundant investment in the short term. This allows large operators to use less cloud services and adapt more slowly than smaller operators.

For cloud use purposes, the survey results of the Thailand Digital Outlook Phase 3 study found that the main objectives were 1) to be an organisation's email system, 2) Storage of files, and 3) software. The survey of Thailand Digital Outlook Phase 2 found that the main objectives were 1) to be an organisation's e-mail system, 2) to use the cloud for working with software, and 3) to use with accounting system software.

Table 215 Comparing the results of the study on the use of cloud service system

Use of cloud service system	Survey results of Thailand Digital Outlook Phase 2	Survey results of Thailand Digital Outlook Phase 3
Percentage of entrepreneurs who use cloud services	25.6	70.3
Proportion of entrepreneurs using cloud services by business size (percent)	1. Large enterprises (48.0) 2. Medium-sized enterprises (43.6) 3. Small enterprises (24.7) 4. Sub enterprises (10.3)	1. Large enterprises (89.9) 2. Medium-sized enterprises (65.7) 3. Small enterprises (68.5) 4. Sub enterprises (78.4)
Top 3 Cloud Implementation Objectives	1. Organisation's email system (78.1) 2. Use of Cloud for Work Software (31.0) 3. Use with accounting system software (30.9)	1. Organisation's email system (67.7) 2. Electronic file storage (45.2) 3. Support for office application systems (15.8)

Data analysis and objectives of applying the analyzed data

From the survey results in the Thailand Digital Outlook Phase 3, it was found that 61.5% of entrepreneurs conducted the Data Analytics. The survey results in the Thailand Digital Outlook Phase 2 revealed that 26.7% of entrepreneurs conducted the Data Analytics. This shows that operators are paying more attention to the implementation of data analytics.

The objectives of applying data analysis according to the survey results in the Thailand Digital Outlook Phase 3 are 1) helping to analyze and identify effective customers or groups for the business, 2) helping to increase customer sales or spending (e.g. incentives through discounts, or benefits to customers), and 3) helping to improve or product development (products/services) that meet the needs of customers. From the survey results of the Thailand Digital Outlook Phase 2, the objectives of applying data analysis for entrepreneurs are 1) to develop products or services, 2) to identify customer groups, 3) to increase sales. The objectives of applying data analysis depend on the business strategy of the entrepreneur during various situations. It can be seen that most operators have changed the strategies for using data to increase sales and identifying

target customers rather than product or service development. This can assist in running a highly competitive business to reach customers more.

From the survey results in the Thailand Digital Outlook Phase 3, businesses that have data analysis for the purpose of identifying or targeting customers with the highest business performance are food and beverage business. The business with the analysis conducted for the purpose of maximizing sales or customer spending is food and beverage business. The business with data analysis for the purpose to improve or develop products is the transport and logistics business. This reflects that the food and beverage business is a highly competitive retail business. There is a variety of product groups and target customers. There has been a rapid change in consumer behaviors. This makes it a business that requires a lot of data and analytics. The transport and logistics business has to compete in fast service and low operating costs. Therefore, data analysis is essential to improve service quality. The results of the Thailand Digital Outlook Phase 2 survey revealed that the industries with the highest proportion of data analysis were finance and insurance industries, followed by hotel industry academic activities and communication industry.

Table 216 Comparing the results of the Data Analysis

Data Analysis	Survey results of Thailand Digital Outlook Phase 2	Survey results of Thailand Digital Outlook Phase 3
Percentage of operators who have done data analysis	26.7	61.5
Top 3 Data Analysis Implementation Objectives (Percentage)	1. To develop products or services (66.4) 2. To identify customer groups (56.6) 3. To increase sales (53.3)	1. Help analyzing and identifying groups of customers that are effective for the business (61.2) 2. Help increasing the sales or customer spending rate (58.2) 3. Help improving or developing the products (49.9)

Data Analysis	Survey results of Thailand Digital Outlook Phase 2	Survey results of Thailand Digital Outlook Phase 3
Businesses with the highest percentage of data analytics adoption (percentage)	1. Finance and Insurance Industry (73.3) 2. Accommodation Industry (60.4) 3. Academic Activities (58.3)	1. Capital and Securities (95.4) 2. Food and beverage (70.3) 3. Transport and logistics business (68.4)

Application of robotic technology

According to the survey of Thailand Digital Outlook Phase 3, it was found that 66.1% of entrepreneurs did not use robotic technology and 33.9% of entrepreneurs used robot technology. 17.3% used robot technology for more than 3 years. 6.0% used robot technology for 1-3 years. 4.0% used robot technology 6-11 months while 6.6% used robot technology less than 6 months. The top 3 uses of robot technology include 1) production and production management such as robots in factories, robots in warehouses for 39.2%, 2) service areas such as reception robots, cleaning robots for 21.2%, and 3) safety concerns such as temperature-sensing robots for 20.7% and 1.5% of other uses such as fruit sizing robots, material quality testing robots. The business groups have features of production in the agricultural business with raw material processing, electronic components, and packaging business.

Application of artificial intelligence technology

According to the survey, 41.0% of organisations have applied artificial intelligence (AI) technology, with usage over 3 years for 8.5%, from 1-3 years for 14.4%, from 6-11 months for 8.3%, for less than 6 months for 9.8%. The 3 mostly uses of artificial intelligence (AI) technology are 1) Customer relationship or answering service such as Chatbot for 53.6%, 2) security such as face recognition (25.4%), and 3) process automation such as RPA (Robotic Process Automation) for 12.4%. The businesses that use artificial intelligence (AI) technology are the business group that focuses on services such as funds and securities, information and communication technology, insurance and life insurance.

14.5.9 Digital Confidence and Security

Recognition of the Personal Data Protection Act (PDPA)

According to the general survey of trust and digital security, the results of the Thailand Digital Outlook Phase 3 study found that 43.6% of the people knew about the

Personal Data Protection Act (PDPA). The results of the Thailand Digital Outlook Phase 2 study found that there are 44.5% of people who know the Personal Data Protection Act (PDPA) which is a similar proportion. When considering the age range, it was found that the working age range is 40-49 years old, 30-39 years old, and those aged 20-29 years have the highest proportion of people who know the Personal Data Protection Act (PDPA), respectively. According to the survey results of the Thailand Digital Outlook Phase 3 study, it is consistent with the results of the Thailand Digital Outlook Phase 2 survey that those in the age ranges of 30-39 years old, 20-29 years old, and 40-49 years old had the highest proportion of people who knew the Personal Data Protection Act (PDPA) showing that workers or companies are alert about the protection of personal data in the company's work process and their personal information.

In terms of private business sector according to the survey in the Thailand Digital Outlook Phase 3, it was found that 80.5% of entrepreneurs were aware of the Personal Data Protection Act (PDPA). The results of the Thailand Digital Outlook Phase 2 found that 60.2 know the Personal Data Protection Act (PDPA), which shows the alertness of entrepreneurs in preparing for this action. According to a survey in the Thailand Digital Outlook Phase 3 study, it was found that 33.7% of operators are ready to control and take care of personal data in accordance with the Personal Data Protection Act (PDPA). This is the highest readiness in data storage. It is consistent with the survey results of the Thailand Digital Outlook Project Phase 2, where entrepreneurs are most prepared to take care of personal data in the matter of data collection.

Considering the size of the operator, the survey results in the Thailand Digital Outlook Phase 3 found that medium-sized enterprises and the small size has the highest proportion of perception followed by large enterprise operators and small enterprise operators. The survey results in the Thailand Digital Outlook Phase 2 found that large enterprises and the medium had the highest perceived proportion followed by small and micro-enterprises. This reflects the increasing awareness of small and medium-sized enterprises to take action on personal data control.

Table 217 Comparing the results of general digital confidence and safety

General digital confidence and safety	Survey results of Thailand Digital Outlook Phase 2	Survey results of Thailand Digital Outlook Phase 3
Percentage of Citizens Knowing the Personal Data Protection Act (PDPA)	44.5	43.6
Percentage of Proportion of the Age of Citizens Knowing the Personal Data Protection Act (PDPA)	1. Age range of 30-39 years (51.7) 2. Age range of 20-29 years (51.5) 3. Age range of 40-49 years (49.0)	1. Age range of 40-49 years (52.2) 2. Age range of 30-39 years (50.7) 3. Age range of 20-29 years (42.1)
Percentage of private business operators aware of the Personal Data Protection Act (PDPA)	60.2	80.5
Percentage of private business operators known to the Personal Data Protection Act (PDPA) - by business size	1. Large enterprises (80.8) 2. Medium-sized enterprises (76.4) 3. Small enterprises (58.8) 4. Sub enterprises (46.5)	1. Large enterprises (83.2) 2. Medium-sized enterprises (91.1) 3. Small enterprises (89.0) 4. Sub enterprises (55.5)

Concerns about Disclosure of Personal Information

From the survey concerning the disclosure of personal information, the survey in the Thailand Digital Outlook Phase 3 found that 44.6% of people were concerned about the disclosure of personal information when using online services. The survey in the Thailand Digital Outlook Phase 2 found that 65.5% of people are concerned about the disclosure of personal information when using online services. This reflects the greater public confidence in providing personal information for online transactions. When considering the age range according to the results of the Thailand Digital Outlook Phase 3, it was found that the age groups who were most concerned about personal information disclosure were 30-39 years old, 40-49 years old, and 20-29 years old. The results of the Thailand digital Outlook Phase 2, found that the age ranges to be worried about the disclosure of personal information the highest were 0-19 years old, 30-39 years old, and 20-29 years old, respectively. This reflects the age range of working age and having experience using online systems for various transactions both recreation and work due to more experience and caution in disclosing information. They are the age groups

that are most nervous. However, when considering in detail the survey results from the Thailand Digital Outlook Phase 3, it was found that the age range 0-19 years is the age when people feel anxious but agree to disclose the highest proportion of information.

Table 218 Comparing the study results of concern on personal information disclosure

Concern on personal information disclosure	Survey results of Thailand Digital Outlook Phase 2	Survey results of Thailand Digital Outlook Phase 3
Percentage of people who are concerned about the disclosure of personal information when using online services	65.5	44.6
Percentage of people concerned about disclosure of personal data when using online services – by age	1. Age range of 0-19 years (76.1) 2. Age range of 30-39 years (68.6) 3. Age range of 20-29 years (67.6)	1. Age range of 30-39 years (50.5) 2. Age range of 40-49 years (45.2) 3. Age range of 20-29 years (42.6)

Problem encountering and prevention of information technology security

From the survey of information technology security problems, the survey in the Thailand Digital Outlook Phase 3 revealed that 43.1% of people had experienced this problem. The survey in the Thailand Digital Outlook Phase 2 found that 29.8% of the people had experienced problems. The increase in the proportion of people who faced problems with information technology security was a result of the increased use of online users. The chances of facing problems in information technology are therefore higher.

For the types of problems in information technology security, the results of the survey in Thailand Digital Outlook Phase 3 and Phase 2 found that most of the top 3 problems were consistent including 1) infected devices (Virus)/Trojan/Malware) until damage to the device or various data, 2) breach of Privacy and Security, and 3) loss of money from fraudulent messages/emails (Phishing) and traps from Pharming. This shows that these types of problems are still the main problems that most people face.

In terms of how to prevent information technology attacks, the results of a survey in the Thailand Digital Outlook Phase 3 found that the top 3 most used protection methods were 1) changing passwords regularly, 2) setting device lock codes and lock every time in case of not using, and 3) do not tell the personal password to other people.

As for the solution to the problem of information technology attacks, the results of the survey in the Thailand Digital Outlook Phase 3 found that the top 3 most commonly used IT attacks were addressed as follows: 1) Report the attack to government agencies such as the police station, the security agencies, and the government agencies to prevent personal data breaches, 2) Installing and using the software service to prevent IT attacks, 3) Report the attack to ISPs/change ISPs. The results of the Thailand Digital Outlook Phase 2 survey revealed that the top 3 most frequently used problem solving methods are 1) installing and using software services to prevent technological attacks, 2) stopping personal data sharing in social media, 3) Reporting the attack to ISPs/Change of ISPs. It shows that the majority of people are aware of the ways to correct and prevent information technology attacks. However, there are also some people who have experienced the attack but did not take any action to solve the problem. Therefore, the government should educate about prevention and solve this information technology attack as well as encouraging people to be aware of the impact that will occur.

In the private business sector, the survey in the Thailand Digital Outlook Project Phase 3 found that 27.1% of entrepreneurs were facing problems in information technology security. The survey result of Thailand Digital Outlook Phase 2 found that 13.6% of entrepreneurs were facing problems in information technology security. The increase in the proportion of entrepreneurs experiencing this problem is due to the increasing number of entrepreneurs using information technology and online systems. This creates more opportunities to face information technology problems accordingly.

When considering the problem type, the entrepreneurs suffer the most. The results were consistent both from the survey results in the Thailand Digital Outlook Phase 3. The results of the survey in the Thailand Digital Outlook Phase 2 are 1) the device of the agency is damged by Virus, Trojan, Malware until damage to the device or various data, 2) Personal data breaches that accounted for a proportion of those encountered, and 3) money lost from phishing, respectively.

The information technology security measures that entrepreneurs have used the most according to the survey results in the Thailand Digital Outlook Study Phase 3 are 1) the use of authentication systems, 2) there are systems to prevent cyber-attacks, such as antivirus systems, firewall system, and 3) data encryption. From the survey results of the Thailand Digital Outlook Phase 2, there are 1) systems to prevent cyber attacks, such as antivirus systems; Firewall system, 2) Spam filtering measures, and 3) Authentication

system. This shows that most entrepreneurs have various guidelines and measures in information technology security.

Table 219 Comparing the study results of problem encountering and prevention of information technology security

Study on the problem encountering and prevention of information technology security	Survey results of Thailand Digital Outlook Phase 2	Survey results of Thailand Digital Outlook Phase 3
Percentage of people facing information technology security problems	29.8	43.1
Top 3 most common types of information technology security problems People sector (percent)	1. Device is damged by Virus, Trojan, Malware (66.1) 2. Breach of Privacy and Security (39.5) 3. Loss of money from phishing (25.1)	1. Device is damged by Virus, Trojan, Malware (69.4) 2. Breach of Privacy and Security (25.6) 3. Loss of money from phishing (14.2)
Top 3 Most Popular IT Attack Prevention Methods Public Sector (Percent)	No analysis	1. Change password regularly (45.3) 2. Set a device lock code and always locked in case of inactivity (42.1) 3. Not share personal password to anyone (39.9)
Top 3 most popular IT attack solutions people sector (percent)	1. Installing and using software services to protect against technological attacks (40.5) 2. Stop Sharing Personal Information on Social Media (30.6) 3. Reporting an attack to an Internet Service Provider (28.6)	1. Reporting an attack to a government agency (35.2) 2. Installing and using software services to protect against technological attacks (33.4)

Study on the problem encountering and prevention of information technology security	Survey results of Thailand Digital Outlook Phase 2	Survey results of Thailand Digital Outlook Phase 3
		3. Reporting an attack to an Internet Service Provider (20.1)
Percentage of encountering problems in information technology security in private business sectors	13.6	27.1
Top 3 most common types of information technology security problems in private sector (percent)	1. Device is damged by Virus, Trojan, Malware (77.4) 2. Breach of Privacy and Security (22.2) 3. Loss of money from phishing (15.4)	1. Device is damged by Virus, Trojan, Malware (82.2) 2. Breach of Privacy and Security (19.8) 3. Loss of money from phishing/bit (17.5)
Top 3 most used information technology security measures in private sector (percent)	1. System to prevent cyber attacks such as antivirus systems, Firewall System (76.7) 2. Spam screening system measures (64.5) 3. Identity verification system (55.2)	1. Use of authentication systems (73.7) 2. System to prevent cyber attacks such as antivirus systems, Firewall System (72.9) 3. Data encryption (52.3)

14.5.10 Stress and uneasiness of using the internet

Stress on computer use

The results of the stress survey from working with computers and the survey in the Thailand Digital Outlook Phase 3 study found that 61.7% of people experience stress from working with computer for more than half of their working hours. This increased from the survey results of the Thailand Digital Outlook Phase 2 that the proportion of people who are stressed is 55.7%. This is mainly due to the survey period of the Thailand Digital Outlook Phase 3, during the severe outbreak of the coronavirus. The workers have to work from home through online systems, especially the use of VDO Conference system. The students have to study online all day long causing the number of hours that

computer users have to focus on the computer for interaction in meetings via VDO Conference and learning via online systems rather than using computers for working in the form of document data or e-mail access.

When considering the age range with the highest proportion of people experiencing stress from working with computers, it was found that the age range with the most stress from the survey results of the Thailand Digital Outlook Phase 2 and Phase 3 was consistent with age 0. -19 years. It was the age range with the most stress, followed by 20-29 years old and 60 years old and over in the Thailand Digital Outlook Phase 2 and 30-39 years in the Thailand Digital Outlook Phase 3, respectively.

In terms of occupations with the highest proportion of stress to computer use at work, the survey results in the Thailand Digital Outlook Phase 3 study were 1) students/university students, 2) private employees, and 3) personal business. From the survey results in the Thailand Digital Outlook Phase 2, occupations with stress proportion to computer use at work are 1) students/university students, 2) private business, 3) state enterprise employees. This reflects the nature of occupations with regular use of computers such as students/university students, personal trading business and employees in organisations with a high proportion of stress from using computers more and in a manner that requires constant online interaction.

Table 220 Comparing the study results of stress from using computer

Stress from using computer	Survey results of Thailand Digital Outlook Phase 2	Survey results of Thailand Digital Outlook Phase 3
Percentage of people experiencing stress from working with computers	55.7	61.7
Top 3 age groups of people with the most computer-related stress (percentage)	1. Age range of 0-19 years (65.3) 2. Age range of 20-29 years (53.3) 3. Age range of 60 years and over (50.5)	1. Age range of 0-19 years (68.1) 2. Age range of 20-29 years (63.4) 3. Age range of 30-39 years (61.0)
Top 3 occupations with the highest proportion of stress to computer use at work (percentage)	1. Students/university students (63.7) 2. Private business (56.7) 3. State enterprise employees (53.0)	1. Students/university students (65.1) 2. Private employees (50.5) 3. Private business (46.7)

Discomfort from no internet access

From the survey of the discomfort of not having access to the internet, the results of the survey in Thailand Digital Outlook Phase 3 and Phase 2 found that the proportion of people who are unhappy with the lack of Internet access is 75.0% and 76.1%, respectively, which are similar proportions. This indicates the importance of the internet today for carrying out everyday activities. When considering the age range, it was found that the age range of 0-19 years was the age range with the highest proportion of people who were unsatisfied, both from the survey results of the Thailand Digital Outlook Phase 2 and Phase 3, between the ages 20-29. The age range of 40-49 years is the age range that has a high proportion of people who are unhappy, followed by the survey results of the Thailand Digital Outlook Phase 3, and the age range of 30-39 years. The age range 40-49 years is the age that there is a proportion of people who are very unsatisfied, followed by the results of the survey in the Thailand Digital Outlook Phase 2. Overall, it can be seen that the age of school and working days is the age when they are most uncomfortable when they do not have access to the internet. Internet access is essential and necessary for studying and working a lot during the study period that must be studied online and working remotely through online systems.

Considering the frustration of not having access to the Internet by occupation, the survey results in the Thailand Digital Outlook Study Phase 3 found that students/university students, private business/trade and freelance/daily hired are the group of professionals who are most uncomfortable with it. From the survey results in the Thailand Digital Outlook Phase 2 project, it was found that civil servants, private workers and occupation of state enterprise employees are the group of professionals who are most uncomfortable with it. It can be seen that a career that is not in the top from the survey in the Thailand Digital Outlook Phase 2, namely private business / trading and freelance/daily hired where the proportion of dissatisfaction is high. In the survey of the Thailand Digital Outlook Study Project Phase 3, these occupations rely on the internet for business or income generation and the Internet is the main channel used to contact customers and or provide services making access to the Internet is very necessary.

Table 221 Comparing the study results of discomfort from no internet access

Discomfort from no internet access	Survey results of Thailand Digital Outlook Phase 2	Survey results of Thailand Digital Outlook Phase 3
Percentage of people who are uneasy when they do not have access to the Internet	76.1	75.0
Top 3 age groups of people who are uneasy when they do not have access to the Internet (percentage)	1. Age range of 0-19 years (83.3) 2. Age range of 30-39 years (80.8) 3. Age range of 40-49 years (80.2)	1. Age range of 0-19 years (82.4) 2. Age range of 20-29 years (81.1) 3. Age range of 40-49 years (78.3)
Top 3 occupations were most uncomfortable when they did not have access to the Internet (percentage).	1. Civil servants (83.7) 2. Private employees (82.6) 3. State enterprise employees (82.6)	1. Students/university students (90.9) 2. Private business / trading (85.4) 3. Freelance/daily hired (83.2)

14.5.11 Implementation and satisfaction with government digital policies and measures

Government digital project services

From the survey of government digital services and projects, the survey in the Thailand Digital Outlook Phase 3 found that 50.2% of people had used the Pracharat internet project, up from 33.4% in the Thailand Digital Outlook Phase 2. However, considering the time period used, it was found that there was a relatively high difference in the proportion of people who were active in the past 3 months. They accounted for 9.2% from the survey of the Thailand Digital Outlook Phase 3 and 23.6% from the results of the Thailand Digital Outlook Phase 2. Due to the spread of the coronavirus, most of the people had to stay at home. This makes access to the signal or internet service of the Pracharat Net Project become less.

The purpose of using the Pracharat Internet Project from the survey results of the Thailand Digital Outlook Phase 3, it was found that the applications were 1) for learning, searching for information 2) to access online services of government and private sectors, and 3) online shopping, respectively. The Thailand Digital Outlook Phase 2 found that the

usage was 1) for learning, searching for information, 2) using for public relations, and 3) using online government services, respectively.

When considering the proportion of service users by age during the past 3 months, it was found that the survey results from the Thailand Digital Outlook Phase 2 and Phase 3 projects were consistent, with the age group 0-19 years using the service the most, followed by the age range of 30-39 years and the age range of 20-29 years.

As for the USO Net Internet Center project, it was found that 44.4% of people had used the project, with the top 3 objectives being 1) for learning, searching for information, 2) to access online services of the public and private sectors, and 3) to use to publicize the news. When considering the proportion of service users by age, it was found that the age range 0-19 years used the service the most, followed by the age range of 30-39 years and the age range 20-29 years throughout the 3 last months from all past use.

As for the community digital center project, it was found that 43.5% of people had used the project, with the top 3 purposes of use being 1) for learning, searching for information, 2) to access online services of the public and private sectors, and 3) trading online products. When considering the proportion of service users by age, it was found that during the past 3 months, the age group 0-19 years used the most services, followed by the age range 40-49 years and the age range 20-29 years. All the past periods, it was found that the 0-19 year olds used the service the most, followed by the 20-29 year old and the 30-39 year old.

Table 222 Comparing the study results of service use of the Pracharat Internet Project

Service use of the Pracharat Internet Project	Survey results of Thailand Digital Outlook Phase 2	Survey results of Thailand Digital Outlook Phase 3
Percentage of people who used to use the Pracharat internet project	33.4	50.2
Top 3 Objectives for Using the Pracharat Internet Project (Percent)	1. For learning, searching for information (73.8) 2. Use to publicize the news (22.9) 3. Access online services of the public sector (21.7)	1. For learning, searching for information (48.4) 2. Access online services of the public and private sectors (13.6) 3. Trading online products (9.7)

Service use of the Pracharat Internet Project	Survey results of Thailand Digital Outlook Phase 2	Survey results of Thailand Digital Outlook Phase 3
Top 3 age ranges of people who used to use the Pracharat internet project (percentage)	1. Age range of 0-19 years (29.2) 2. Age range of 30-39 years (24.5) 3. Age range of 20-29 years (24.4)	1. Age range of 0-19 years (31.1) 2. Age range of 30-39 years (26.8) 3. Age range of 20-29 years (25.5)

Satisfaction with government digital policies and measures

From the satisfaction survey on government digital policies and measures, the results of the survey in the Thailand Digital Outlook Phase 3, the people were most satisfied with the Pao Tang application. This was because during the Thailand Digital Outlook Phase 3, the government had policies and measures to help people through using the wallet application. Many measures made people like the Pao Tang application. According to the results of the Thailand Digital Outlook Phase 2 survey, people were most satisfied with the Pao Tang application. Thai Chana application is an application that is used in public places throughout the country widely, such as shopping malls, restaurants and hotels, etc. Such applications can record the date, time and place of people who use the service in that location to prevent the spread of coronavirus according to government measures which makes people see the benefits and show satisfaction according to the survey results of the Thailand Digital Outlook Project Phase 2.

In the private business sector, the survey in the Thailand Digital Outlook Phase 3 study found that entrepreneurs had the highest satisfaction with privacy laws compared to other digital measures. Most operators have recognized the importance of personal data protection laws and agree that the government has implemented such laws to protect public information and have been prepared and understood for a reasonable period of time. The survey in the Thailand Digital Outlook Phase 2 project found that entrepreneurs are also satisfied with the legislation on personal data protection the most.

Table 223 Comparing the study results of average satisfaction scores on government digital policies and measures

Satisfaction on government digital policies and measures	Survey results of Thailand Digital Outlook Phase 2	Survey results of Thailand Digital Outlook Phase 3
Digital policies and measures to promote digital development for the government's economy and society	No analysis	3.19
Pracharat Internet Project	3.02	3.21
USO Net Center	No analysis	3.19
Community Digital Center	3.01	3.14
Thai Chana application	3.16	3.38
Pao Tang application	No analysis	3.41
Anti fake news center	3.08	3.09

14.5.12 Potential of electronic commerce trade by province in 2021

To assess the potential of e-commerce trade especially in terms of purchasing goods or using online services of Thai people in each province in 2021, the data on the proportion of online purchasers of goods or services were used to compare with the product per province per capita (GPP per capita). It will be possible to analyze and assess which province is a province with a high level of economic development and e-commerce trade in high, moderate, and low level. This needs to be developed and upgraded more. The results of the analysis according to the above guidelines revealed that the top 10 provinces in Thailand where survey respondents purchase online goods or services are as follows:

1) Chonburi Province has the proportion of online purchasers for 63.3%, 2) Bangkok for 62.8%, 3) Nakhon Ratchasima for 62.5%, 4) Nonthaburi for 59.3%, 5) Songkhla for 59.1%, 6) Samut Prakan Province for 58.8%, 7) Prachinburi for 55.3%, 8) Satun for 51.2%, 9) Sisaket for 49.9%, and 10) Phrae for 49.8% which are mostly provinces in Bangkok and surrounding areas or is a province in each region of Thailand.

When comparing the products per province per capita (GPP per capita), the provinces can be grouped by the provinces of Thailand according to the potential of e-commerce trade into 4 groups as follows:

14 provinces with a higher proportion of e-commerce users and GPP per capita than the national average are considered to be those provinces that have a high level of

economic development and e-commerce trade when compared to other provinces of the country.

24 provinces with higher than average share of e-commerce users but GPP per capita are lower than average. These provinces are considered to be those provinces with moderate economic development and e-commerce trade when compared to other provinces of the country which can encourage entrepreneurs in these provinces to do business online (Electronic commerce) because people in the province already have a large percentage of people in the province who want and buy goods or services online.

For 7 provinces with lower than average share of e-commerce users but GPP per capita higher than average, these provinces are considered to have moderate economic development and e-commerce trade. When compared to other provinces of the country, it can enhance the potential of the electronic commerce market in such provinces through stimulating and encouraging local people to buy more products or receive services online (increase the number of users).

For 32 provinces with a lower percentage of e-commerce users and GPP per capita than the national average, these provinces are considered provinces with low economic development and e-commerce trade. When compared to other provinces of the country, the potential of the province can be raised. It is necessary to proceed and increase the income level of the people in the province promoting the business sector to turn to more utilization of e-commerce trade.

Table 224 List of provinces of Thailand in each group of provinces

Group of provinces in Thailand according to potential e-commerce trade	Number of provinces	Name list of provinces
1) Provinces with higher percentage of E-commerce users and GPP per capita than the national average	12	1. Bangkok 2. Chanthaburi 3. Chonburi 4. Nakhon Pathom 5. Nonthaburi 6. Prachuap Khiri Khan 7. Phra Nakhon Si Ayutthaya 8. Phuket 9. Rayong 10. Lamphun

Group of provinces in Thailand according to potential e-commerce trade	Number of provinces	Name list of provinces
		11. Samut Prakan 12. Saraburi
2) Provinces with higher percentage of e-commerce users than average but GPP per capita below average	27	1. Kanchanaburi 2. Khon Kaen 3. Chainat 4. Chaiyaphum 5. Chiang Rai 6. Chiang Mai 7. Nakhon Ratchasima 8. Nakhon Si Thammarat 9. Narathiwat 10. Pattani 11. Phichit 12. Phitsanulok 13. Phetchabun 14. Phrae 15. Roi Et 16. Lopburi 17. Loei 18. Sakon Nakhon 19. Songkhla 20. Singburi 21. Surin 22. Nong Khai 23. Angthong 24. Amnat Charoen 25. Uttaradit 26. Uthai Thani 27. Ubon Ratchathani
3) Provinces with lower percentage of e-commerce users than average but with GPP per capita higher than average	9	1. Krabi 2. Chachoengsao 3. Chumphon 4. Pathum Thani 5. Prachinburi

Group of provinces in Thailand according to potential e-commerce trade	Number of provinces	Name list of provinces
		6. Phang Nga 7. Ratchaburi 8. Samut Sakhon 9. Surat Thani
4) Provinces with lower percentage of E-commerce users and GPP per capita than the national average	28	1. Kamphaeng Phet 2. Trang 3. Trat 4. Tak 5. Nakhon Nayok 6. Nakhon Phanom 7. Nakhon Sawan 8. Nan 9. Bueng Kan 10. Buriram 11. Phayao 12. Phatthalung 13. Phetchaburi 14. Mahasarakham 15. Mukdahan 16. Mae Hong Son 17. Yasothon 18. Yala 19. Ranong 20. Lampang 21. Sisaket 22. Satun 23. Samut Songkhram 24. Sa Kaeo 25. Sukhothai 26. Suphanburi 27. Nong Bua Lamphu 28. Udon Thani

Remark: The average percentage of e-commerce users is 76.15% and the average GPP per capita is 175,716 hundred thousand baht.

Therefore, it can be said that There are still more than half of Thailand's provinces (65 provinces) that can promote electronic commerce to be a factor in driving the country's digital economy, especially in 36 provinces that have enough potential to some extent and need additional policies or supporting measures, such as creating knowledge, understanding the benefits of adopting digital technology and e-commerce to help promoting and creating business opportunities for entrepreneurs in different provinces or promoting consumers in different provinces turn to buy more products or receive services online, etc.

Office of the National Digital Economy and Society Commission (ONDE)

120 Moo 3, 9 Floor, The Government Complex Commemorating His Majesty,
Chaeng Watthana Road,Thung Song Hong, Khet Laksi Bangkok 10210
Telephone : 0 2142 1202
Website www.onde.go.th www.facebook.com/thailanddigitaloutlook

www.onde.go.th

www.facebook.com/
thailanddigitaloutlook