

The Measurement on Digital Contribution to GDP



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



The Measurement on Digital Contribution to GDP

Publication

The study on the efficiency enhancement for
the measurement of the digital contribution to GDP, 2021

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



Preface

The Office of the National Digital Economy and Society Commission (ONDE) has completed the project on measuring the digital contribution to GDP phase III for the fiscal year of 2021, with the intention on increasing the efficiency on database development and valuation of the digital economy and its growth to further capture the current situation of digital age, as continuing from the previous phase II of 2020.

The estimation of the digital contribution to GDP is based on the concept of the System of the National Accounts 2008 (2008 SNA) and the preliminary guidelines on the development of the Digital Supply and Use Table (DSUT) of the Organization of Economic Cooperation and Development (OECD), with the further aim on developing the Digital Economy Satellite Account (DESA), of which is one of the satellite accounts of the system of National income accounts of Thailand. The practice is consistent to both the definitions and statistical methodology according to the suggestions of the international organizations and could be used as an analytical tool for measuring the digital contribution including growth from digital economy to GDP, efficiently, up-to-dated, and internationally standardized. This could support relevant policy recommendations and be able to use as the key indicator for digital transformation and make international comparisons.

This report offers definitions, concepts, scopes, classifications, and methodology, of which is more up-to-date, including the results of the estimation of the digital contribution to GDP in all three conventional approaches of GDP measurement: Production, Income, and Expenditure, of year 2017 - 2021.

The Office of the National Digital Economy and Society Commission thanks to many public and private agencies and all the honored people who have continuously contributed the treasured data, including the constructive comments and corrective suggestions to the project on measuring digital contribution to GDP of Thailand in completion at this stage. ONDE wishes this report be useful for those relevant entities and scholars in any future fruitful applications it may further raise.

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Executive Summary



The Project on the Measurement of the digital contribution to GDP phase III for the fiscal year 2021 is issued by Office of the National Digital Economy and Society Commission (ONDE) with the aim on further studying and developing the measurement of the digital economy, as a continuation from the previous phase II of year 2020. This covers the definitions, scope of the digital economy, and internationally standardized measurement methodology to be appropriately applied for the Thai economy, including the balancing among economic activities, so as to be internationally credible and insightful for policy implications and policy recommendations to the digital economy and society of Thailand.

The study on digital contribution to GDP in year 2021 has been managed according to the guidelines on the Digital Supply and Use Tables (DSUT) of OECD. For this phase, the Digital Supply and Use Table for Thailand (TDSUT) is further established to continue the development of the Digital Economy Satellite Account (DESA), which is one of the Satellite accounts of the SNA, according to the definitions, scope, classifications and measurements, of the international standards, to be the analytical tool for measuring the digital contribution to GDP, its growth, and other macroeconomic statistics efficiently, up-to-dated, and internationally standardized, enabling for any comparison to other countries.

The concept framework for measuring the digital economy is applied from the OECD published paper in 2020 with definition of the digital economy as the economic activities arose from digital activities as the significant driving factor both digital technology, digital infrastructure, digital services and various data covering producers, consumers, and public authorities, for which brought digital technology as the factor for those economic activities.

For definitions of categories. OECD has released the conceptual framework on digital economy into four tiers with one alternative as follows:

The Core measure: digital economy as output produced by firms that are “intended to fulfil or enable the function of information processing and communication by electronic means, including transmission and display”. This includes computer devices and parts, connecting devices, digital communication devices, software, communication services in digital and internet services, digital content and electronic data services.

The Narrow measure: Core measure + “Economic activity reliant on digital inputs”. This includes smart devices, electronic commerce, platform services, business services, transportation services, travel and accommodation services, financial and insurance services, educational services, health services, entertainment services, sports and recreational services, and those with the digital transmission.

The Broad measure: Narrow measure + “Economic activity significantly enhanced by digital inputs”. This includes industrial production, agricultural production, general business activities, all those enhanced by the digital inputs, for example, electronic and digital devices, automation, robotics those become engaged or substitutes for human resources as factor production (labor substitutes) or services for customers.

The Digital Society: Broad measure + “Other activity reliant on or significantly enhanced by digital inputs”. This includes free digital services such as internet platform activities i.e. health knowledge sharing, information & experience exchange by individual or organizations, public information sharing, and Wikipedia or similar web-services.

The additional measure economic activity, digitally ordered and/or digitally delivered: The alternative measure of the digital economy considers characteristics of activity rather than output or production process, this would include “all goods and services that are digitally ordered and/or digitally delivered”.



The measurement of the digital contribution on GDP in this 3rd phase of 2021 covers the core and narrow measure, though still incomplete in some areas of the broad and digital society measure owing to the fact that the definitions are in the process of adoption and OECD case studies are in the pilot process. The study considers the characteristics of most economic activities within the economy whether they follow the OECD definition, thus this phase of measurement could still be underestimated due to the limited data resources representing such definition.

The research methodology for this phase III applies the abovementioned OECD definition, in a blend of the statistical possibility and resources, following all three GDP calculation approaches (production, expenditure & income approaches), according to the System of National Income Accounts by NESDC.

- Production approach: Calculation of value added from the production of commodities and services within the boundary of digital economy with the Thailand's Standard Industrial Classification (TSIC 2009) covering 134 five-digit activities.

- Expenditure approach: Calculation of final demand within the boundary of digital economy, of which composed of household final consumption, government final consumption, gross fixed capital formation, export & imports.

- Income approach: Calculation of the return to factors of production, which are return to labor (wages & salaries), operating surpluses, mixed income, depreciation, and net indirect taxes.

Sources of data are the secondary data from public and private sectors, covering digital product, digital platform, and digital services in many sectors. This includes data on the revenue and the expense of the production side, survey on the electronic commerce, survey on the software, financial transactions and insurance, socioeconomic survey, public spending from GFMS and ELAAS. For the primary source, the study surveys corporate business and household sample, including the public authorities and state agencies.

Compilation applies the mixed methodology of direct and indirect methods, since the data and indicators of all three approaches still incomplete. Nevertheless, the measurement still beholds the statistical standard, which can represent the valuation and digital economic structure from the digital contribution to GDP. The valuation takes two pricing calculations:

- Measurement at current market prices: includes quantity and price level changes representing the digital contribution to GDP both value and percentage level within the economy.
- Measurement in real terms: using the technique of Chain Volume Measures: CVM, following the method employed for real GDP calculation. Real terms represent the change in quantity in a period of time, without the price effects. This shows the trend of changes or economic growth.



The report presents two arrangements, which are:

- Statistical table of annual series showing digital contribution to GDP in three approaches: Income, Expenditure and Production, both current market prices and CVM real terms from 2017-2021.
- Digital Economy Satellite Accounts: DESA, following OECD concept, which is Digital Supply and Use Table (2020) representing the digital economic structure with both supply and demand flows.



Economic valuation of the digital contribution to GDP for 2020 – 2021, is as following.

Production approach

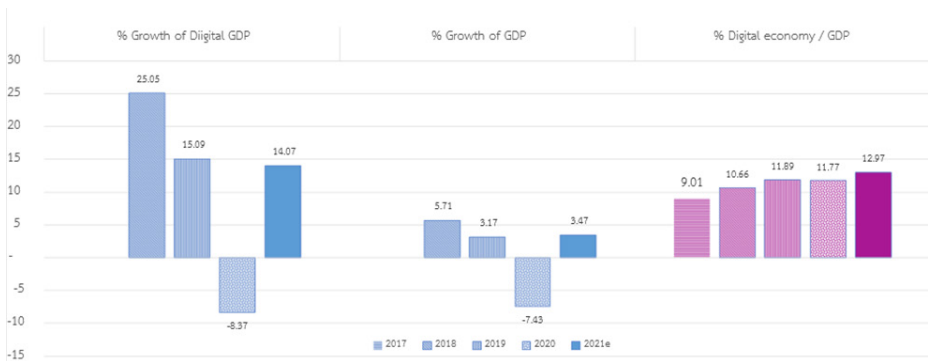
The gross output on production of the digital economy in 2020 decreases, with the value added in 2020 of 1,839,829 million baht at current market prices (or 8.37 percent decline), due to Covid-19 impacts. After the Covid-19 impact subsides in 2021, part of the economy has risen, especially the digital economy with a quick catch-up, to 2,098,627 million baht (or 14.07 percent growth) comparing to 2020.

Comparing to the GDP at current market prices of 15,636,891 million baht in 2020 (7.43% decline) and 16,178,719 million baht in 2021 (3.47% rise), the digital economy has the value added shares in GDP (digital contribution to GDP) of 11.77 percent and 12.97 percent in 2020 and 2021, respectively. The digital contribution has the rising trend through though a bit decline in 2019, reflecting the transition of the Thai economy to the new era, which concentrates on the higher portion of digital activities (ICT or internet) with higher adaptability comparing to the traditional economy.

Table Digital Contribution to GDP, 2017 - 2021e

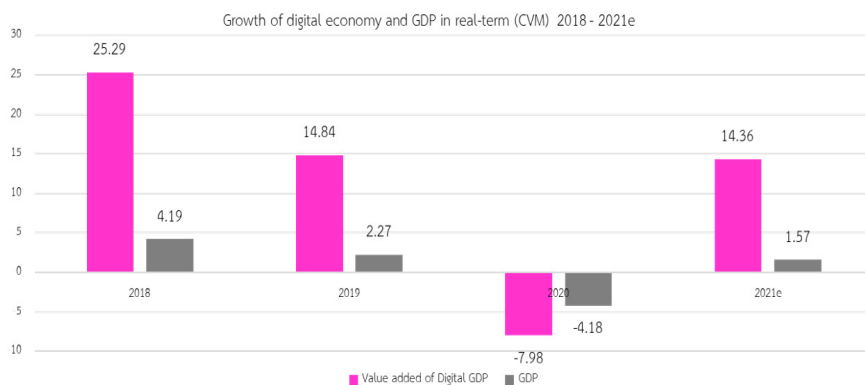
	Value at current market price (Million baht)					% change	
	2017	2018	2019	2020	2021e	2020	2021e
Value added of digital economy	1,395,095	1,744,618	2,007,827	1,839,829	2,098,627	-8.37	14.07
GDP	15,488,664	16,373,340	16,892,410	15,636,891	16,178,719	-7.43	3.47
% Digital Contribution to GDP	9.01	10.66	11.89	11.77	12.97	-	-

Figure comparison of growth of digital economy and GDP in real-term (CVM) 2018 - 2021e



For important digital sub-sectors, hardware, software, smart devices and ICT share the highest portion, with e-commerce and financial e-services, business services and other digital services are with lower portion, respectively.

The digital economy, in real-term CVM with 2017 as reference year, contracts for 7.98 percent and then expands for 14.36 percent in 2020 and 2021, respectively, reflects the adaptability from the rising trend of e-commerce, ICT, digital services and activities related to internet. The higher digital growth comparing to the real GDP (CVM) echoes the lower growth of other activities, which stems from the declining trend of export and tourism.



Income approach

For the measurement of the returns on the primary factors within the boundary of digital economy, the compensations of employee are worth 817,197 million baht and 965,951 million baht in 2020 - 2021, respectively, which share 44.42 percent and 46.03 percent of total returns. Operating surpluses and mixed income, which are the return on businesses both corporate and private, increases from 736,893 million baht in 2020 to 805,455 million baht, with digital industries and digital trade account 40.05 percent and 38.38 percent of total primary income (labor and operating & mixed income), accordingly.

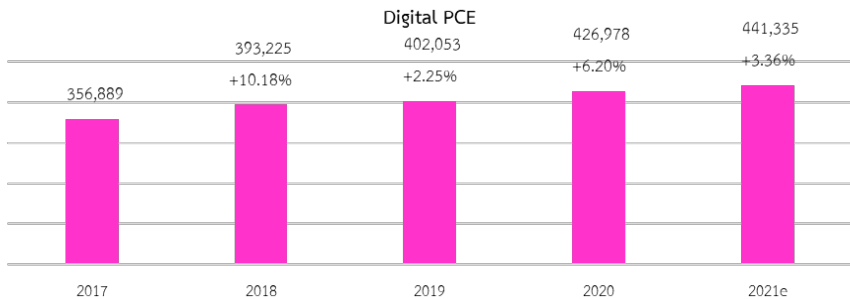
**Table Returns on the factors of production in digital economy
2017 - 2021e (million baht)**

	Value (Million Baht)					Share (%)	
	2017	2018	2019	2020	2021	2020	2021e
Compensation of employee	737,437	930,824	945,038	817,197	965,951	44.42	46.03
Operating surplus & Mixed income	447,165	570,961	797,466	736,893	805,455	40.05	38.38
Net taxes on production	82,170	95,626	108,002	106,332	122,894	5.78	5.86
Depreciation	128,323	147,208	157,321	179,408	204,326	9.75	9.74
Total	1,395,095	1,744,618	2,007,827	1,839,829	2,098,627	100.00	100.00

Expenditure approach

Private final consumption expenditure on digital activities at current market prices accounts for 426,978 million baht in 2020, 441,335 million baht in 2021.

Figure Private final consumption expenditure on digital activities 2017 - 2021e (million baht)

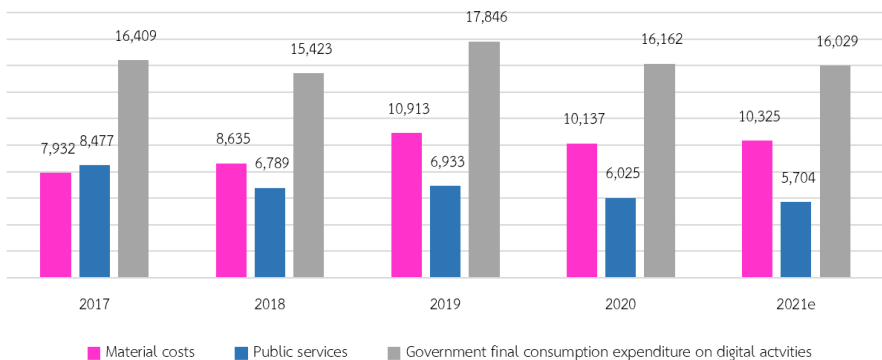


ICT expenditure, including telephone and internet bills is the highest with value of 246,220 million baht and 254,915 million baht in 2020 - 2021, respectively. This accounts about 57.67 percent and 57.76 percent. Expenditure on entertainment and culture, which includes the purchase of televisions and computers, accounts the share of 12.37 percent on average and miscellaneous items, which contain financial and insurance services, gains 12.07 percent, correspondingly.

Real-term private final consumption expenditure on digital activities (CVM) expands 6.45 percent in 2020 and 3.28 percent in 2021. ICT expenditure hugely expands to 15.59 percent in 2020, but shrinks 3.55 percent in 2021.

Government final consumption expenditure on digital activities at current market prices accounts 16,162 million baht and 16,029 million baht in 2020 – 2021, respectively. This includes material costs, which comprise computer repairs and electronic devices, website development services, banking fee and computer parts, for 10,137 million baht and 10,325 million baht in 2020 and 2021. Public services, which comprise telephone bill and internet expense, account 6,025 million baht and 5,704 million baht in 2020 and 2021.

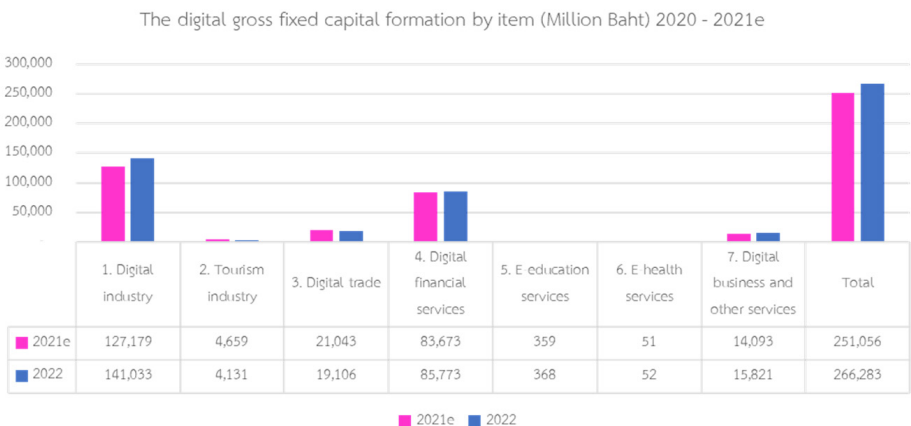
Figure Government final consumption expenditure on digital activities 2017 - 2021e (million baht)



Real-term Government final consumption expenditure on digital activities declines in 2020 as a consequence of the drop in material costs and public services expenses of 6.41 percent and 13.10 percent, respectively, as following the decline in telephone and internet services expenses. In 2020, the real-term Government final consumption expenditure continuously contracts with an adjust to drop only 1.01 percent from the expansion of material costs, importantly on computer and fixing expenses, while public services drop continuously.

The digital gross fixed capital formation at current market prices in 2020 - 2021 accounts 251,056 million baht, and 266,283 million baht, respectively. By item, the gross fixed capital formation on equipment and engines reaches the highest value of 164,813 million baht and 170,729 million baht, respectively, or about 65.65 and 64.12 percent of the total gross fixed capital formation on digital activities in 2020 - 2021. The second rank is the buildings, of which account of 34,339 million baht and 38,410 million baht. The third rank is the software & application development expenses of 3,887 million baht and 4,040 million baht or at 1.55 percent and 1.52 percent of gross fixed capital formation in 2020 - 2021, respectively.

Figure The digital gross fixed capital formation by item 2017 - 2021e (million baht)



The real-term digital gross fixed capital formation (CVM) in 2020 declines 8.75 percent, as a consequence of the contraction of the hardware products, especially computers and parts, telephone and parts, television/radio and parts. For 2021, the real-term contracts 3.92 percent from the decline in digital hardware such as electronics and computer parts and medical electronics equipment, except smart devices, sonar and control equipment, watches, radioactive equipment, and software.

Exports of digital commodities and services at current market prices (FOB) value 2,030,530 million baht, and 2,270,808 million baht for 2020 - 2021, respectively, with the rising trend. of that amount, exports of digital commodities account 1,484,604 million baht and 1,776,171 million baht, which share 73.11 percent and 78.22 percent in 2020-2021. However, there is the decline of the digital services from 545,926 million baht in 2020 to 494,637 million baht in 2021, which share 26.89 percent and 21.78 percent, respectively.

Imports of digital commodities and services give rise from 1,727,856 million baht to 2,026,287 million baht in 2020 - 2021. Of that amount, imports of digital commodities account 1,294,420 million baht and 1,604,053 million baht, which share 74.91 percent and 77.86 percent in 2020 - 2021. There is a rise of the import of digital services from 433,437 million baht in 2020 to 456,234 million baht in 2021, which share 25.09 percent and 22.14 percent, respectively.

Summary on calculation of digital contribution to GDP on expenditure approach as in table following :

	2017	2018	2019	2020	2021e
Million baht					
Private Final Consumption Expenditure	356,889	393,225	402,053	426,978	441,335
Government Final Consumption Expenditure	16,409	15,423	17,846	16,162	16,029
Gross Fixed Capital Formation	133,014	139,405	137,865	139,614	170,740
Export of Goods & Services (+)	2,381,293	2,377,962	2,283,258	2,030,530	2,270,808
Import of Goods & Services (-)	1,868,856	1,986,468	1,898,947	1,727,856	2,060,287
Net export of goods & services	512,437	391,494	384,311	302,674	210,521
Gross Domestic Expenditure	1,018,749	939,547	942,075	885,428	838,625
% share					
Private Final Consumption Expenditure	35.03	41.85	42.68	48.22	52.63
Government Final Consumption Expenditure	1.61	1.64	1.89	1.83	1.91
Gross Fixed Capital Formation	13.06	14.84	14.63	15.77	20.36
Export of Goods & Services (+)	233.75	253.10	242.36	229.33	270.78
Import of Goods & Services (-)	183.45	211.43	201.57	195.14	245.67
Net export of goods & services	50.30	41.67	40.79	34.18	25.10
Gross Domestic Expenditure	100.00	100.00	100.00	100.00	100.00

Summary on calculation of digital contribution to GDP on expenditure approach in real-term (CVM) as as in table following :

	2017	2018	2019	2020	2021e
Million baht					
Private Final Consumption Expenditure	356,889	392,725	401,939	427,861	441,910
Government Final Consumption Expenditure	16,409	15,391	17,777	16,175	16,013
Gross Fixed Capital Formation	133,014	140,782	139,212	141,661	173,704
Export of Goods & Services (+)	2,381,293	2,310,767	2,177,040	1,903,097	2,027,351
Import of Goods & Services (-)	1,868,856	1,928,011	1,756,941	1,522,261	1,708,105
Growth rate (%)					
Private Final Consumption Expenditure		10.04	2.35	6.45	3.28
Government Final Consumption Expenditure		-6.21	15.50	-9.01	-1.01
Gross Fixed Capital Formation		5.84	- 1.12	1.76	22.62
Export of Goods & Services (+)		-2.96	-5.79	-12.58	6.53
Import of Goods & Services (-)		3.17	-8.87	-13.36	12.21

Digital contribution to GDP as the size of the digital economy is a part of the system of national accounts called digital economy satellite accounts. Thus, it is appropriate to apply for various economic analyses on macroeconomic measurement of the economy for the analyses with the national income accounting for the overall economy. With this kind of dataset, it is the main basic determinant for policy planning and further policy decision taking from the appropriate and logical strategic planning for both public and private sectors, considering some statistical indicators e.g. percentage share of digital economy to GDP, overall growth of digital economy. This dataset could be applied to support the policy planning and economic strategies including monitoring the success assessment for both public and private sectors. Time series data from all three approaches are useful for economic modeling in order to estimate the parameters to study the related policy impacts. This also includes the advantage on international comparison, as from the same concept and standard of measurement of the digital economy, it could effectively pave the way to assess the advancement of the economic development of each country in comparison.

Currently, there are still many limitations on measuring the digital contribution to GDP e.g. definition framework, scope of digital activity, data availability on measuring regarding the three SNA approaches. Issues such as valuation of the public digital services, valuation of inventory on digital products/services, measurement on digital services in international trade as part of expenditure side are to be further determined in the future. Nevertheless, the results of digital contribution to GDP of 2017-2021 in this report are able to echo the size of the digital economy and its vital components, those are the national engine of growth other than traditional economic drivers. Entities and interested parties are contented to apply this report of statistical indicators, yet to ponder the inadequacies as aforementioned.

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



1. Introduction

The Office of the National Digital Economy and Society Commission (ONDE), as the main entity driving the policies for digital economy and society, has noticed the importance of the measurement of the digital contribution to GDP and its growth, which is currently vital to the economic system. With the pandemic as one main factor that increases the importance of the technology transition and internet in the digital age, ONDE, thus, puts forward developing the economic tool to monitor the digital contribution on economic growth in 2021. The phase III is managed to follow the measurement concept of the international organization and SNA's production, income, and expenditure approaches, including balancing, so as to be reliable for the macroeconomic measurement and to designate the policy implications to further enhance the digital competitiveness of Thailand.

2. Objectives and Targets

The project on the measurement of the digital contribution to GDP is meant to provide the statistical indicators for strategic planning and policy implications for the digital development of Thailand, with the primary objective on setting up the framework, including definitions, scope, and guidelines, on the measurement of the digital economy in line with the international concept, covering the digital activities in all production, markets, transportation and logistics, and consumption. And this, in turn, is applied as the tool for the valuation of the digital economy according to the international standard of Systems of National Accounts (SNAs) comprising all production, expenditure, and income approaches of calculation, with at least seven groups of sectors those are digital industry, digital tourism, digital trade, digital services, digital finance, digital education, digital health, and other services, of which being categorized in, at least, fifty sub-sectors, continuing from the previous phase and reports in series of 2017-2021 (of these, the year 2021 is mostly preliminary valuation)

3. Definitions and Measurements

The framework on digital contribution to GDP has been administered according to the international standards, of which are the Systems of National Accounts 2008: SNA2008 and the guidelines on the Digital Supply and Use Tables (DSUT) of OECD. For this phase, the development is further established to be in accordance to the definitions, scope, classifications and measurements, of the international standards, to be the tool for measuring the digital contribution to GDP, its growth, and macroeconomic statistics efficiently, up-to-dated, and internationally standardized, enabling for any comparison to other countries.

3.1 Concept and Definition

The study on the measurement on the digital contribution to GDP refers to the OECD paper, Digital supply–use tables : A step toward making digital transformation more visible in economic statistics in OECD toolkit note No.8 (2020), which gives primary concern on the ICT sector & content and media sector, including e-commerce which relates to the trade, advertisement through electronic channels such as telephone, television, radio broadcasts, internet. Nevertheless, the OECD document: **‘A Roadmap toward a common framework for measuring the digital economy (2020)’** has defined the digital economy as:

“The Digital Economy incorporates all economic activity reliant on, or significantly enhanced by the use of digital inputs, including digital technologies, digital infrastructure, digital services and data. It refers to all producers and consumers, including government, that are utilizing these digital inputs in their economic activities”

Furthermore, OECD (2020) also gives the scope on the measurement of the digital economy for four tiers as follows:

The Core measure: digital economy as output produced by firms that are “intended to fulfil or enable the function of information processing and communication by electronic means, including transmission and display”. This includes computer devices and parts, connecting devices, digital communication devices, software, communication services in digital and internet services, digital content and electronic data services.

The Narrow measure: Core measure + “Economic activity reliant on digital inputs”. This includes smart devices, electronic commerce, platform services, business services, transportation services, travel and accommodation services, financial and insurance services, educational services, health services, entertainment services, sports and recreational services, and those with the digital transmission.

The Broad measure: Narrow measure + **“Economic activity significantly enhanced by digital inputs”**. This includes industrial production, agricultural production, general business activities, all those enhanced by the digital inputs, for example, electronic and digital devices, automation, robotics those become engaged or substitutes for human resources as factor production (labor substitutes) or services for customers.

The Digital Society: Broad measure + **“Other activity reliant on or significantly enhanced by digital inputs”**. This includes free digital services such as internet platform activities i.e. health knowledge sharing, information & experience exchange by individual or organizations, public information sharing, and Wikipedia or similar web-services.

The additional measure economic activity, digitally ordered and/or digitally delivered: The alternative measure of the digital economy considers characteristics of activity rather than output or production process, this would include **“all goods and services that are digitally ordered and/or digitally delivered”**.

The measurement of the digital contribution on GDP in this 3rd phase of 2021 covers the core and narrow measure, though still incomplete in some areas of the broad and digital society measure owing to the fact that the definitions are in the process of adoption and OECD case studies are in the pilot process. The study considers the characteristics of most economic activities within the economy whether they follow the OECD definition, thus this phase of measurement could still be underestimated due to the limited data resources representing such definition, with the wait for the further formal framework and in progress OECD guidelines.

Following the academic progress, it can be said that the internationally acceptable definitions and the exact meanings of the digital economy consequently began to be more definite but in the guideline development process, concerning the current transitional situation, for the conclusive international standard applicable for all countries.

For Thailand, to follow the international organization and become domestically acceptable, the Office of the National Economic and Social Development Committee (NESDC) has applied the definition of the digital economy as follow:

“System of economy and society with the digital application to enhance the efficiency on production of commodities and services and to improve the facilitation for people. This covers the devices, ICT infrastructure, ICT services, hardware & software for computers and digital devices, digital media, digital information, knowledge & entertainment, including the trading transactions, financial and insurance, and logistics, which operates via internet.”



3.2 Valuation

The measurement of the digital contribution on GDP follows the international concept on Systems of the National Accounts: SNA2008, especially the three GDP calculation approaches: Production approach, Expenditure approach, and Income approach. This could represent the linkages of the macro economy and the digital economy through digital demands and supplies accordingly. The measurement on digital economy regarding SNA comprises of categorization, measurement methodology, and necessary details for developing the Digital Supply and Use Table, which requires to be in line with the country's Supply and Use Tables. Three approaches on SNA can be summarized as follows:

1) Production approach means the approach on value added calculation from the commodities /services production processes.

Value added is calculated by the Gross Output or the revenue which could be calculated from the quantity produced multiplied by the associate commodity (or service) prices.¹ The summation of all value added of all sectoral activities is the Aggregate Supply or Gross Domestic Products: GDP from the total production in the country, of this case within the boundary of the digital economy. This study collects data for the digital contribution measurement with the category of 134 sub-activities.

¹There are three types of prices for GDP calculation according to the System of National Accounts: purchasers' prices, producers' prices (which are purchasers' prices deducted by trade margin and transportation costs), and basic prices (which are producers' price deducted by taxes on products).

Value added = Gross output - Intermediate cost

Gross output means the value of commodities and services produced from the production activities (In this case, calculated only digital economic activities) in according to the accounting period at producer prices, which exclude trade margins and transportation costs, but include tax on production such as value added taxes paid to the government.

Intermediate cost means the intermediate expenses belong to the producers (who operate the digital businesses) which are consumable or spent within the production processes in the accounting period (e.g. one year) such as expenses on raw materials, material costs, packaging costs, public services, fixing costs, office operation costs which follow the concept of the System of the National income accounts

In short, the calculation for the digital contribution to GDP for the production approach is to find the value added of the digital production and the summation of all digital production activities is equal to the digital contribution to GDP (current price). This study measures both at the current market prices and real prices, similar to the national nominal GDP and the real GDP or GDP at Chain volume measure: CVM).

There are many sources of data for production measurement, both primary and secondary sources e.g. businesses' financial statements, survey for electronic commerce, survey for software services, sample survey on entrepreneurs for digital market output, etc.



2) Expenditure approach is the final consumption expenditure calculation approach or Aggregate Final Demand of the economy. It comprises of:

(1) **Private Final Consumption Expenditure: PCE.** Estimating from the overall Final Expense, mostly, from the secondary survey such as the Socioeconomic survey of the National Statistical Office (NSO), releases annually, which is the main source for digital PCE calculation, and the household survey on the digital expenses, including the survey on digital content of the Digital Economy Promotion Agency (DEPA). Other methods applied to estimating the PCE are Commodity Flow Method, which is the indirect estimation of the household expenses using the value of production deducted by the export value of commodity/service and added up by the import value of that commodity/service, including margin and transportation cost, and other methods those are appropriate for different items e.g. services production, using the direct expenses instead.

(2) Government Final Consumption Expenditure: GCE obtains from the current consumption of the authorities comprising of the central government, in the case of Thailand are ministries and their subsidiaries, independent entities, public entities, public fund, and non-profit state enterprises. For local government composes of Bangkok Metropolitan Area, municipal cities, Provincial administration organizations, Tambon administration organizations and Pattaya City special administrative organization. These data are collected from the expenses from both the National Budget and Off-National Budget.

For the case of Digital GCE, this study collects the secondary data from the Comptroller General's Department, Ministry of Finance, for the expenses on digital commodities/services of the central government via the GFMS² system and from the Department of Local Administration for the local government via the e-laas³ system, including the survey from many entities both from public and private sectors for the direct expenses related to the digital activities.

² means Government Fiscal Management Information System or GFMS

³ Electronic Local Administrative Accounting System (e-laas)

(3) Gross fixed capital formation: GFCF, in SNA, comprises of buildings and machinery. Investment in machinery, in digital part, or in other words, digital GFCF in this context covers only digital machinery & software, of which being used more than one year. For private sector, it could be calculated by the commodity flows or the direct-surveyed data such as from the financial statement in the investment section of the digital entrepreneurs or digital businesses, while the public gross fixed capital formation for digital machinery collects the data from the central government and local governments and the direct survey from the central and local authorities, the same as the method used for the government final consumption expenditure.

(4) Exports and Imports of goods and services: the values are obtained from the international trade statistics according to the Harmonized Commodity Description and Coding System of the tariff statistics (HS Code) of the Custom department, Ministry of Finance and the calculation on the international trade of digital commodities/services considers only the digital commodities e.g. ICT and Content & Media. For the international trade on digital services, the values mostly obtained from the details of the Balance of Payments, Bank of Thailand.



3) **Income approach** measures in the boundary of the digital economy with the calculation of income or compensation of the primary factors, which are Compensation of employees or the return to labors, Depreciation, the production taxes, and Operating surplus which is the return on capital or rent, and in SNA, there is an item classified as mixed income, or the income/returns for private/personal businesses to be separately measured. This could apply with the data from the income statement of corporations and the survey sampling of the private/personal businesses with the data from the production measurement, to give more details on income from digital activities.

4. Methodology

The research methodology for the phase III, as continuing from phase I & II in both concept framework and data collection, for example, OECD's DESA conceptual framework, SNA 2008, National Income Accounts by NESDC, digital economy measurement studies by other countries, with data collections, and recommendations from related parties in public and private sectors, academic scholars and digital economy development specialists covering digital product, digital platform, and digital services through research project period. The research approach is also a combination of both qualitative research and quantitative research, of which including surveys on secondary data, either statistical or financial data from related data sources, and primary data from the private sectors. The project also has the focus groups for quality research, both public and private sectors, and interview visits in various local areas to gather the viewpoints from the related parties, including local authorities and entrepreneurs, and to capture the transitional situation concerning the digital transformation.

5. Procedures for the phase III are

Collection of data selection both primary and secondary sources from documentation, reports, and necessary resources such as balance sheet and financial statement from the Department of the Business Development (DBD), the Comptroller General's Department (CGD), the Department of the Local Administration (DLA), the National Statistics Office (NSO), NESDC, Bank of Thailand, Digital Economy Promotion Agency (DEPA), ETDA, etc.

The study follows the estimation of the digital contribution to GDP in all three approaches of GDP calculation: Production, Income, and Expenditure approaches as ever mentioned. The development of Digital Supply and Use Table under the OECD framework, for which represents the linkages of the calculation of the digital contribution to GDP of all three approaches, especially the value added by digital activities, including all other relevant data to obtain the digital Contribution to GDP.

6. Estimated measurement of the Digital Economy in 2020 - 2021

6.1 Production approach

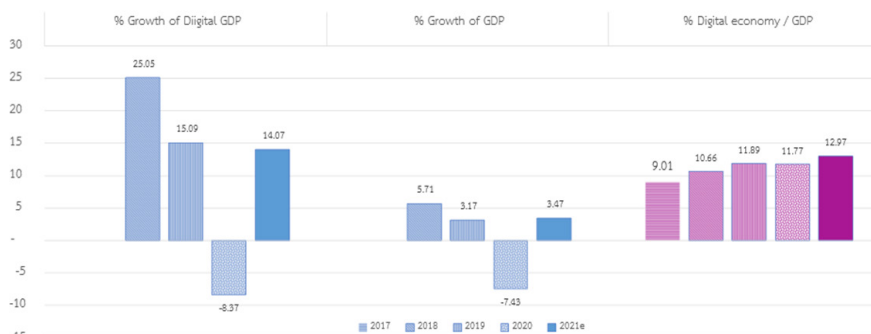
The gross outputs measured in the boundary of the digital economy have the value of 3,872,152 million baht and 4,416,368 million baht in 2020 and 2021, respectively. With the value added on production of the digital economy in 2020 decreases from 2019 to 1,839,829 million baht at current market prices (or 8.37 percent decline), due to Covid-19 impacts with the sharp effects on the economy both digital and non-digital. After the Covid-19 impact subsides in 2021, part of the economy has risen, especially the digital economy with a quick catch-up, to 2,098,627 million baht (or 14.07 percent growth) comparing to 2020.

Comparing to the GDP at current market prices of 15,636,891 million baht in 2020 (7.43% decline) and 16,178,719 million baht in 2021 (3.47% rise), the digital economy has the value added shares in GDP (digital contribution to GDP) of 11.77 percent and 12.97 percent in 2020 and 2021, respectively. With the Covid-19 impacts subsiding and the government policies loosening, the digital contribution has the quicker rising trend through comparing to other non-digital sectors, reflecting the transition of the Thai economy to the new era, which concentrates on the higher portion of digital activities (ICT or internet) with higher adaptability comparing to the traditional economy. It could also be seen that the overall economy of 2021 grows a little lower than the growth of digital economy.

Table 1 Digital Contribution to GDP, 2017 – 2021e (million baht)

Current market prices	Unit	2017	2018	2019	2020	2021e
Gross output of Digital Economy	Mil Baht	3,020,699	3,619,562	4,005,594	3,872,152	4,416,368
Value added (Digital Contribution)	Mil Baht	1,395,095	1,744,618	2,007,827	1,839,829	2,098,627
Growth rate of Value added (Digital)	%		25.05	15.09	-8.37	14.07
GDP at current market prices	Mil Baht	15,488,664	16,373,340	16,892,410	15,636,891	16,178,719
Percentage of Digital Contribution to GDP	%	9.01	10.66	11.89	11.77	12.97
Growth rate of GDP (current market price)	%		5.71	3.17	-7.43	3.47

Figure 1 Comparison of Growth of Digital Economy and GDP in Current Market Prices 2018-2021e



For digital sectors, which are classified according to the ONDE's digital transformation policy into 7 major categories, it is found that the economic structure of the digital economy significantly transforms. Digital industry which comprises of the hardware production for ICT e.g. smart devices, electronics parts, computer parts, network cable system and computer-connected devices including those software developers generally is export-oriented, especially hard disk drives, digital services, communication, digital content.

This makes this sector constitute the highest value added of 61.24 percent and 61.91 percent of the total value added of the digital economy, which calculates to be 1,126,652 million baht in 2020 and 1,299,243 million baht in 2021. The important sub-sectors in this category is Hardware and ICT. For Hardware, which composes of electronic parts and hard disk drives with the previously significant revenue generating role, dwindled a little in 2020 from the lower export, while in 2021, it returns to 28.90 percentage share of the total digital economy with the value of 606,492 million baht. For ICT, it shares 18.92 percentage of the total digital economy with the value of 397,035 million baht in 2021.

This comes from the higher business and household demand for e-commerce or online trade. Digital trade becomes continuously lower with the value of 528,140 million baht in 2021 or percentage share of 25.17. The reason is the decline of the wholesale and retail trades on digital products from the Covid-19 impacts, which decreases overall purchasing power. Whereas digital related trading which is on line retail trading in common with the related services, rise in 2021 from the fall in 2020. Other digital sub-sectors grip smaller share, e.g. tourism, financial e-services, except business services and other digital services are higher with small portions, respectively.

For 50 digital sub-sectoral categorization (applied from the TSIC standard category rev. year 2009), ranking by value, Electronics and Integrated Circuit are with the highest value of 304,457 million baht and 411,273 million baht or 16.55 and 19.60 percentage share of the total digital economy in 2020 and 2021, respectively. The second ranking is the wireless communication of 340,242 million baht and 356,403 million baht or 18.49 percentage and 16.98 percentage of the total, while the third ranking is internet retail of 266,199 million baht and 285,692 million baht or 14.47 and 13.61 percentage of the total. The fourth ranking is Computer production and connecting devices with 145,967 million baht and 144,886 million baht or 7.93 and 6.90 percentage share, whereas the fifth ranking is wholesale trade on digital products with 136,993 million baht and 143,734 million baht or 7.45 and 6.85 percentage share of the total digital economy. For other interesting sub-sectors, e.g. household appliances with the higher value and percentage share from smart device development, logistics on parcel and messenger services with the continuously rising trend, and other activities with lower percentage shares, correspondingly.

Most are the supporting activities related to the abovementioned sub-sectors e.g. financial services which grows from the adaptability of the financial institutions to provide more online service activities, including software and consulting and computer services which expand following the digital transformation of the domestic businesses, as following.

Figure 2 Percentage share of digital economy classified by digital sectors 2020 – 2021e

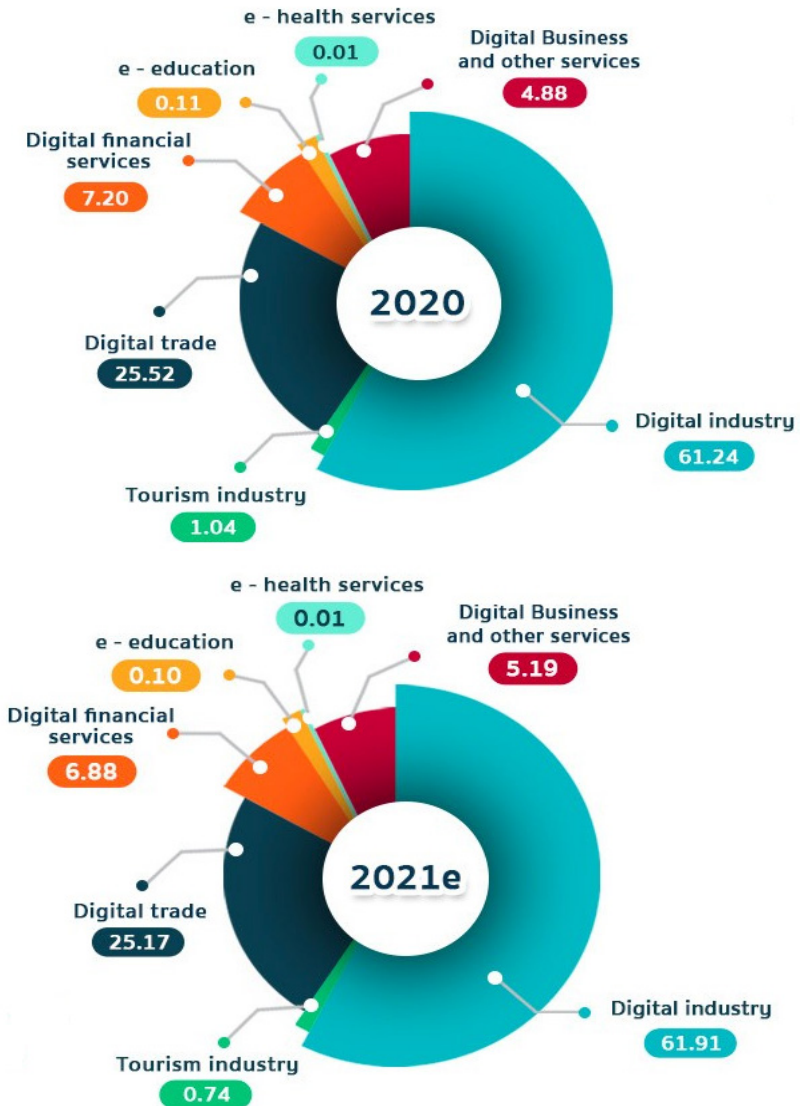


Table 2 Digital Economy classified by digital sectors from 2017 – 2021e
(million baht)

	Value Added					%	
	2017	2018	2019	2020	2021e	2020	2021e
1. Digital Industries	793,959	925,646	980,678	1,126,652	1,299,243	61.24	61.91
1.1 Smart devices	52,406	78,677	87,059	88,719	129,232	4.82	6.16
1.2 Hardware	354,427	345,592	311,323	500,226	606,492	27.19	28.90
1.3 Software	66,509	69,554	75,994	51,451	52,442	2.80	2.50
1.4 Digital services (Services on digital platform digital order digital delivery)	63,074	73,433	88,178	61,957	64,937	3.37	3.09
1.5 Communication	192,007	292,668	355,203	379,792	397,035	20.64	18.92
1.6 Digital content	65,536	65,722	62,921	44,507	49,105	2.42	2.34
2. Digital Tourism	35,893	42,029	35,963	19,092	15,506	1.04	0.74
2.3 Transport equipment rental	8,318	10,553	12,459	8,363	7,490	0.45	0.36
2.4 Travel agencies and other reservation services	25,237	28,359	19,401	6,995	3,461	0.38	0.16
2.5 Cultural activity	29	59	17	38	54	0.00	0.00
2.6 Sport and recreation activity	2,309	3,059	4,086	3,696	4,501	0.20	0.21
3. Digital trade	317,597	533,152	685,162	469,529	528,140	25.52	25.17
3.1 Trade on digital goods	144,714	151,903	234,305	201,344	240,415	10.94	11.46
3.2 Online trade	172,883	381,249	450,857	268,185	287,726	14.58	13.71
4. Digital financial services	136,891	140,939	140,782	132,465	144,476	7.20	6.88
4.1 Digital banking services	95,353	96,870	95,225	90,432	88,737	4.92	4.23
4.2 Other financial services	41,538	44,069	45,556	42,033	55,738	2.28	2.66
5. e-education services	2,290	1,093	1,468	2,076	2,127	0.11	0.10
5.1 e-education services	2,290	1,093	1,468	2,076	2,127	0.11	0.10
6. e-health services	197	206	229	266	272	0.01	0.01
6.1 e-health services	197	206	229	266	272	0.01	0.01
7. Digital business and other services	108,268	101,554	163,546	89,749	108,862	4.88	5.19
7.1 Postal and courier services	86,455	79,262	139,383	73,585	82,780	4.00	3.94
7.2 Other digital business services	21,813	22,292	24,163	16,164	26,082	0.88	1.24
Total	1,395,095	1,744,618	2,007,827	1,839,829	2,098,627	100.00	100.00

Note: Sectors not shown in Table are sectors with no available digital activities

Figure 3 Ranking by Value of the Digital Economy by 50 Sub-sectors in 2020-2021e (million baht)



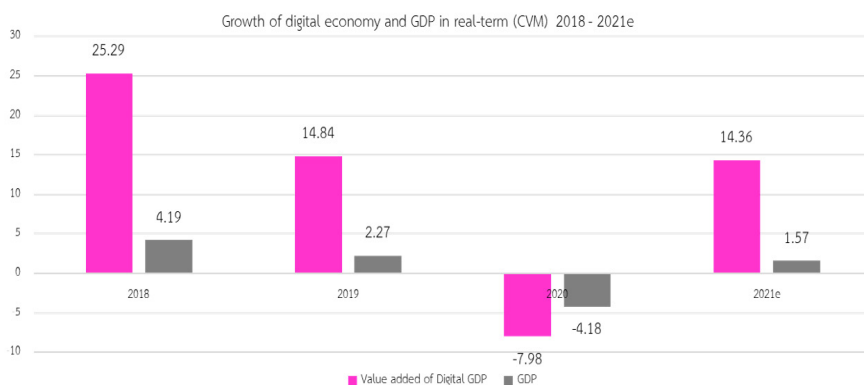
The digital economy, in real-term CVM with 2017 as reference year, exhibits the value of 1,847,164 and 2,112,363 million baht in 2020 and 2021. Chain index shows 132.40 and 151.41 correspondingly. By growth, the digital economy contracts for 7.98 percent and then expands for 14.36 percent in 2020 and 2021, respectively, reflects the adaptability from the rising trend of e-commerce, ICT, digital services and activities related to internet, whilst the real GDP in CVM shrinks by 4.18 percent in 2020 and returns with 1.57 percent expansion in 2021. The higher digital economic growth in 2021, of which rises during 2017-2019 but declines in 2020 from the weakening of the overall economy resulting from the Covid-19 impacts, significantly represents the rising role of the digital economy from the expansion of the digital trade comparing to the lesser growth of real GDP (CVM) that echoes the lower growth of other activities, of which stems from the falling trend of export and tourism, as reported in National Income Accounts of Thailand 2020 and Quarterly GDP by NESDC.

Table 3 Real value of the digital economy and Real GDP (CVM)

	2017	2018	2019	2020	2021e
Real term in chain volume measure					
Digital Economy in Real term (Ref = 2017)	1,395,095	1,747,880	2,007,347	1,847,164	2,112,363
Real GDP (Ref 2015)	10,259,941	10,689,791	10,923,286	10,246,535	10,407,026
Chain index					
Digital Economy in Real term (Ref = 2017)	100.0	125.3	143.9	132.4	151.4
Real GDP (Ref 2015)	177.8	185.3	189.5	181.6	192.4
Growth rate					
Digital Economy in Real term (Ref = 2017)	-	25.29	14.84	-7.98	14.36
Real GDP (Ref 2015)	4.18	4.19	2.27	-4.18	1.57

Note: GDP refers to report on national income accounts of Thailand year 2020 and Quarterly GDP of NESDC

Figure 4 Real Growth of the Digital Economy (CVM) in 2018 - 2021e



6.2 Income approach

Total income is categorized by the primary factor returns. The income-approach valuation of the digital economy is calculated by the value added categorized by the returns on primary factors, which composed of the compensation on employee, operating surplus and mixed income. For the measurement of the returns on the primary factors within the boundary of digital economy, the compensations of employee are worth 817,197 million baht and 965,951 million baht in 2020 - 2021, respectively, which share 44.42 percent and 46.03 percent of total returns. Operating surpluses and mixed income, which are the return on businesses both corporate and private, increases from 736,893 million baht in 2020 to 805,455 million baht, with digital industries and digital trade account 40.05 percent and 38.38 percent of total primary income (labor and operating & mixed income), accordingly, as a consequence of growing online trading & services businesses.

However, the income from private businesses diminishes as a result of the downward trend of overall economy due to Covid-19, which affects overall purchasing power. Net production taxes and Depreciation maintain their shares of 5.86 and 9.74 of the total income in 2021, respectively.

**Table 4 Returns of the primary factors in the digital economy
2017 - 2021e (million baht)**

Returns on the primary factors	Value (Million baht)					%	
	2017	2018	2019	2020	2021e	2020	2021e
Compensation of employee	737,437	930,824	945,038	817,197	965,951	44.42	46.03
Operating surplus and Mixed income	447,165	570,961	797,466	736,893	805,455	40.05	38.38
Net production taxes	82,170	95,626	108,002	106,332	122,894	5.78	5.86
Depreciation	128,323	147,208	157,321	179,408	204,326	9.75	9.74
Total	1,395,095	1,744,618	2,007,827	1,839,829	2,098,627	100.00	100.00

Considering returns on primary factors by digital sector, categorized by ONDE sector categories, digital industries on hardware, software and ICT services have the highest shares on the compensation of employee in 2020 - 2021 with the value of 403,458 million baht and 460,928 million baht, respectively. This is because hardware employs many positions. Digital trade takes bigger role on employment with the compensation of employee of 249,877 million baht and 315,852 million baht, in 2020 - 2021 from the higher employment in online trade. Business services and other services employ with the compensation worth 54,508 million baht in 2020 and 68,061 million baht in 2021. Financial services are with the wage bills worth 99,741 million baht and 113,012 million baht in 2020 - 2021, respectively.

Digital sectors have the crucial role in operating surplus, where the entrepreneur or business owners obtain earnings. Operating surpluses are worth 508,396 million baht in 2020 and 592,696 million baht in 2021, whilst Mixed incomes, which are the earnings for personal businesses which mostly belongs to the digital trade, are worth 179,714 million baht and 166,457 million baht in 2020 - 2021, respectively.

Figure 5 Income Classified by Sector and Returns on Factors in 2020 (million baht)

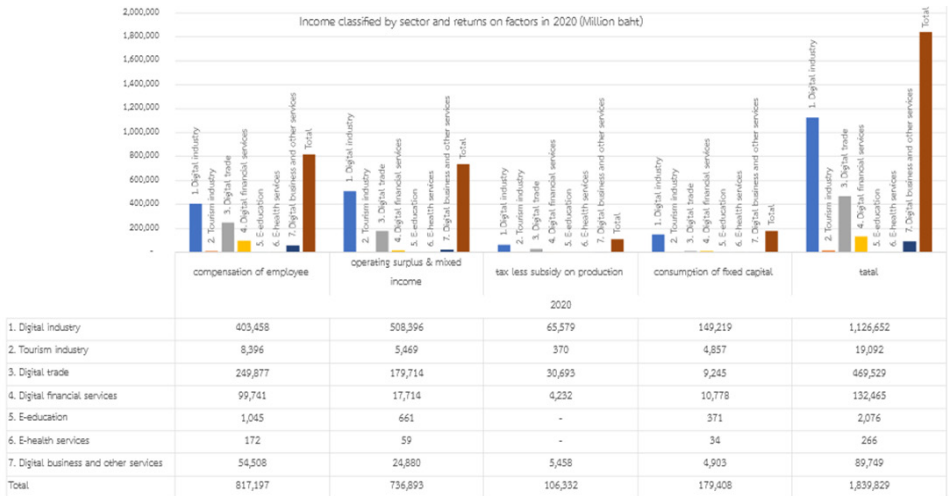
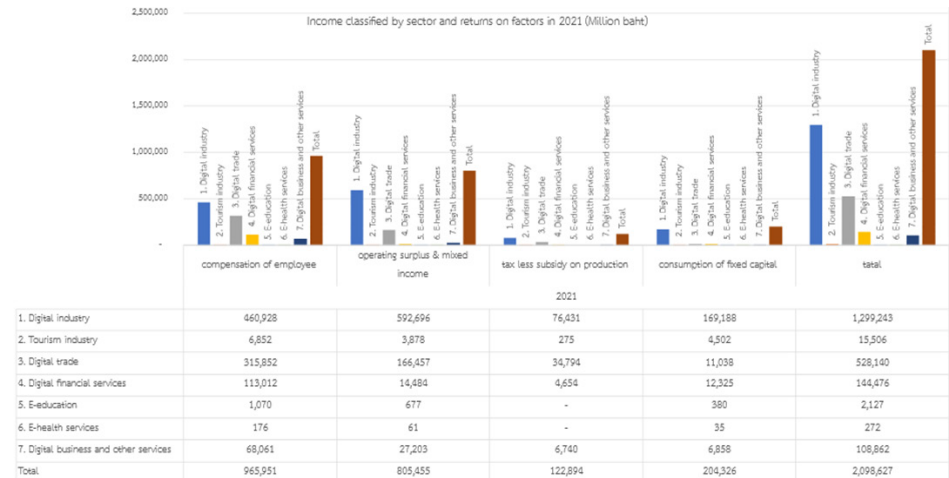


Figure 6 Income Classified by Sector and Returns on Factors in 2021 (million baht)

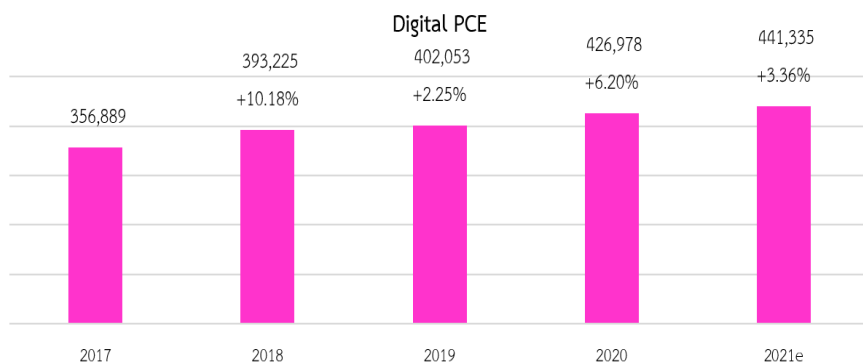


6.3 Expenditure approach

1) Private final consumption expenditure

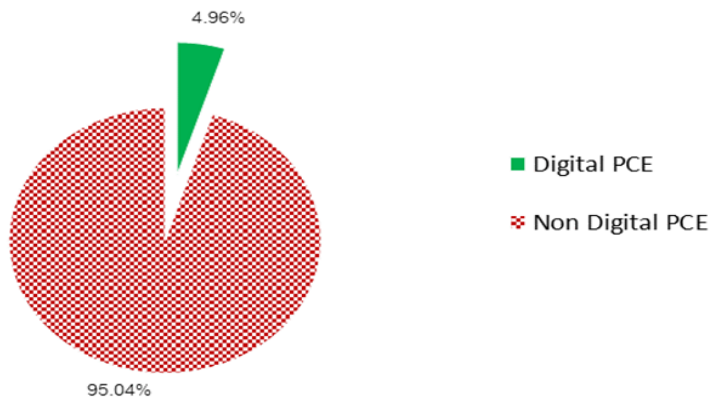
Private final consumption expenditure on digital activities accounts for 426,978 million baht in 2020 and 441,335 million baht in 2021 at current market prices, or the growth of 6.20 percent in 2020 and 3.36 percent in 2021.

Figure 7 Private Final Consumption Expenditure at Current Market Price in 2017-2020e (million baht) with Growth Rates in Percent



In addition, Private final consumption expenditure on digital activities to the total private final consumption expenditure, of which are worth of 8,301,572 million baht and 8,422,639 million baht in 2020 - 2021, are the proportion of 5.14 percent in 2020 and 5.24 percent in 2021, with the average share of 4.96 percent during 2017 - 2021.

Figure 8 Percentage of Digital Private Final Consumption Expenditure at Current Market Price in 2017 - 2020 on Average



Private Final Consumption Expenditure on digital activity in 2020 and 2021 comprises of Communication, the highest rank, brings in 246,220 million baht and 254,915 million baht, or percentage share of 57.67 and 57.76 Entertainment and Culture value 107,397 million baht and 109,290 million baht, or percentage share of 25.15 and 24.76 Decoration, household appliance & maintenance account 12,185 million baht and 16,109 million baht, Commuting & transportation, covering of transport equipment rents & logistic services, cost 7,648 million baht and 6,963 million baht, Education gains 583 million baht and 633 million baht, Health, which comprises of medical services e.g. laboratory and x-ray, exhibits percentage share of 0.03

Figure 9 Private Final Consumption Expenditure at Current Market Price in 2020-2021e Classified by Type of Expense (million baht)

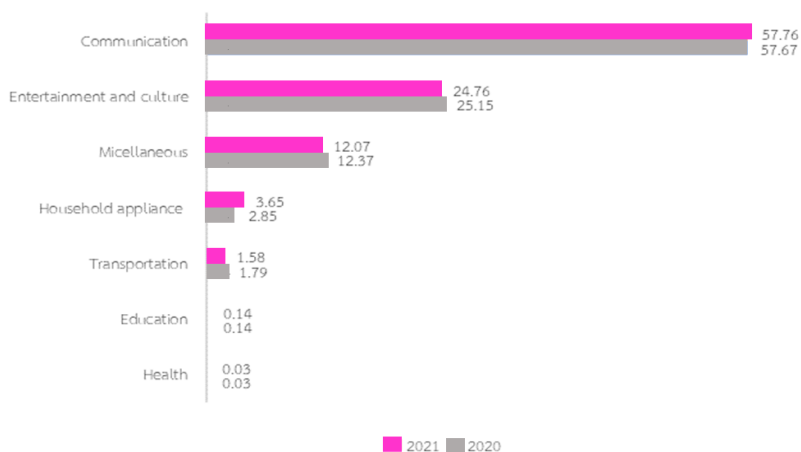


Table 5 Private Final Consumption Expenditure at Current Market Price Categories of COICOP in 2020 – 2021e

COICOP	Categories	Value (million baht)					% share
		2017	2564e	2019	2020	2021e	2021e
05	Furniture, furnishing and routine maintenance	13,084	12,836	13,862	12,185	16,109	3.65
06	Health	125	132	145	140	143	0.03
07	Transportation	6,214	6,942	8,239	7,648	6,963	1.58
08	Communication	191,601	218,890	213,088	246,220	254,915	57.76
09	Entertainment and culture	98,080	103,793	109,013	107,397	109,290	24.76
10	Education	430	431	545	583	633	0.14
12	Miscellaneous	47,354	50,200	57,162	52,804	53,282	12.07
	Total	356,889	393,225	402,053	426,978	441,335	100.00

Private final consumption expenditure on digital commodities and services classified by 7 main categories, it is found that, in 2020 - 2021, Digital industry, the highest rank, gains 368,568 million baht and 384,820 million baht, or percentage share of 86.32 and 87.19 Financial services value 46,093 million baht and 45,289 million baht, or percentage share of 10.80 and 10.26 Digital Tourism gets 11,593 million baht and 10,450 million baht, or percentage share of 2.72 and 2.37 Last two are Digital Education and Digital Health, with Digital Education gains 583 million baht and 633 million baht, whilst Digital Health, cost 140 million baht and 143 million baht.

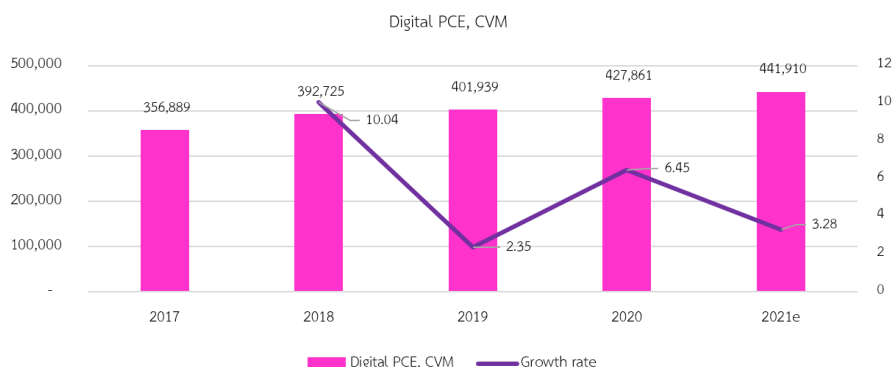
The factor that makes the digital industry having the highest value is that the digital industry covers many sub-sectoral items e.g. Communication, which covers telephone and internet services; the highest digital expense by household. Hardware covers the expense on computer and related parts, including smart devices and digital household appliance, of which television and related smart appliance are included. For Household expense through Digital Platform or e-marketplace, in case that the item could have its commission fee classified and categorized, it could be recorded as household expenses by related sub-items. However, if this expense belongs to the general business services, this would not appear as a record for the household expense.

Table 6 Private Final Consumption Expenditure on Digital Activities by 7 Categories in 2017 - 2021e

Category	Value (thousand baht)					%
	2017	2018	2019	2020	2021e	
1. Digital industry	300,901	331,167	339,166	368,568	384,820	87.2
1.1 Smart devices	23,892	23,146	30,059	22,677	23,987	5.4
1.2 Hardware	44,102	45,604	48,804	50,485	46,351	10.5
1.3 Software	10,237	11,119	11,667	10,994	10,699	2.4
1.4 Digital services e.g. services on digital platform digital order digital delivery	12,640	13,316	13,951	11,330	16,003	3.6
1.5 Communication	189,447	215,160	209,101	242,026	250,480	56.8
1.6 Digital content	20,583	22,822	25,583	31,057	37,300	8.5
2. Digital tourism	17,451	19,230	18,771	11,593	10,450	2.4
3. Digital trade	-	-	-	-	-	-
4. Digital financial services	37,982	42,265	43,426	46,093	45,289	10.3
5. e-education services	430	431	545	583	633	0.1
6. e-health services	125	132	145	140	143	0.0
7. Digital business and other services	-	-	-	-	-	-
Total	356,889	393,225	402,053	426,978	441,335	100.0

Real-term private final consumption expenditure on digital activities (CVM) gain 427,861 million baht and 441,910 million baht in 2020 - 2021, which expands 6.45 percent in 2020 and 3.28 percent in 2021. Higher growth comes from ICT expenditure, which hugely expands to 15.59 percent in 2020, but shrinks 3.55 percent in 2021. Other important items are Entertainment and culture, which diminishes by 1.05 percent in 2020 from Covid-19 impacts, which makes household aware of income and saving. However, the expense rises by 1.90 percent in 2021. This is similar to miscellaneous item which drops by 6.94 percent in 2020 but adjust with small amount of 0.18 percent in 2021.

Figure 10 Real Term and Real Growth of Private Final Consumption Expenditure on Digital Activities (CVM) in 2017 - 2021e (percentage)



2) Government final consumption expenditure: GFCE

Government final consumption expenditure on digital activities at current market prices accounts 16,162 million baht and 16,029 million baht in 2020 – 2021, respectively. This includes material costs, which comprise computer repairs and electronic devices, website development services, banking fee and computer parts, for 10,137 million baht and 10,325 million baht in 2020 and 2021. Public services, which comprise telephone bill and internet expense, account 6,025 million baht and 5,704 million baht in 2020 and 2021, or percentage shares of 64.41 % and 35.59%, respectively.

Computer and electronic devices repair are the outstanding item. This computer repair shares 28.66%, whilst computer components share 27.16% of the total GFCE In 2021. For public utility services, the important items are internet service and telephone services with the share of 25.45% and 7.36% of total GFCE in 2021.

Figure 11 Structure of the Government Final Consumption Expenditure on Digital Activities Classified by Type of Expenditure, Current Market Prices, in 2020 and 2021

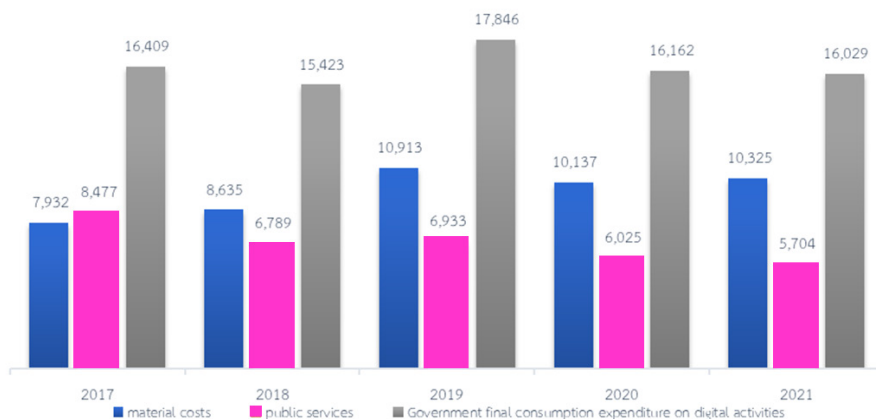


Table 7 Government Final Consumption Expenditure on Digital Activities Classified by Type of Expenditure, Current Market Prices, in 2017 - 2021e

Expenditure items	Value (million baht)					%share
	2017	2018	2019	2020	2021e	2021e
1. material costs	7,932	8,635	10,913	10,138	10,325	64.41
1.1 Repair and maintenance	3,882	4,115	4,530	4,549	4,594	28.66
1.2 System maintenance	358	342	1,778	815	804	5.02
1.3 Banking fee	37	42	379	376	382	2.39
1.4 Computer components	3,392	3,871	3,818	4,157	4,354	27.16
1.5 Other ICT expenses	157	143	159	132	102	0.63
1.6 Other expenses	106	121	250	109	89	0.55
2. public services	8,477	6,789	6,933	6,025	5,704	35.59
2.1 Telephone services	1,497	1,385	1,377	1,384	1,180	7.36
2.2 Internet services	6,809	4,583	5,208	4,222	4,080	25.45
2.3 Satellite communication services expenses, cable TV	37	43	40	41	43	0.27
2.4 Internet network expenses	89	286	95	84	93	0.58
2.5 Others	46	491	212	294	308	1.92
Total	16,409	15,423	17,846	16,162	16,029	100.00

Considering the Government final consumption expenditure on digital activities by 7 major sectors, it could be seen that GFCE was spent mostly in digital industry and the sector that has GFCE the highest is communication, worth of 6,023 million baht in 2020 and 5,693 million baht in 2021, as percentage share of 37.26% and 35.52%, respectively. The important item is telephone calling service and internet service. Second ranking is digital service sector, with about 4,571.47 million baht and 4,157 million baht for 2020 and 2021, respectively. For the hardware, it covers the related items for computer components with about 4,157 million baht and 4,354 million baht for 2020 and 2021, respectively.

Real-term Government final consumption expenditure on digital activities (CVM) declines in 2020 with the value of 16,175 million baht (a decrease of 9.01% from 2019) as a consequence of the drop in material costs and public services expenses of 6.41 percent and 13.10 percent, respectively, as following the decline in telephone and internet services expenses. In 2021, the real-term Government final consumption expenditure is worth 16,013 million baht, continuously contracts with an adjust to drop only 1.01 percent from the expansion of material costs, importantly on computer and fixing expenses with 1.52 percent growth, while public services drop continuously at 5.26 percent.

Figure 12 Government Final Consumption Expenditure, Digital Activities Classified by Digital Sectors, 2017 - 2021e

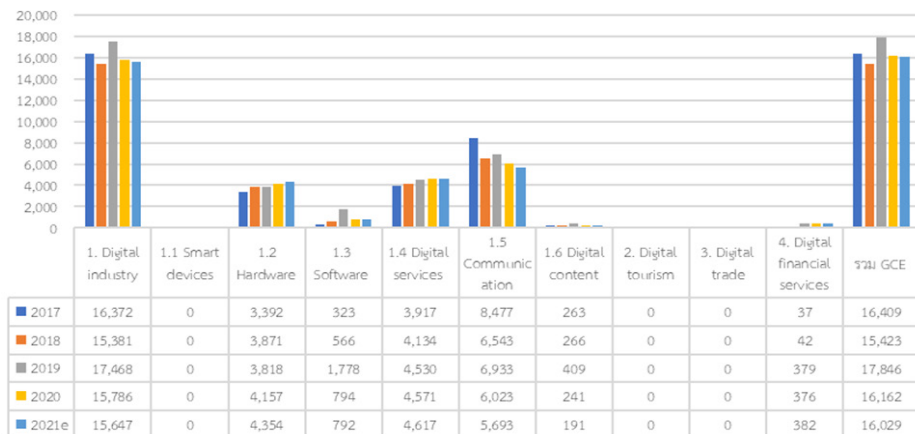
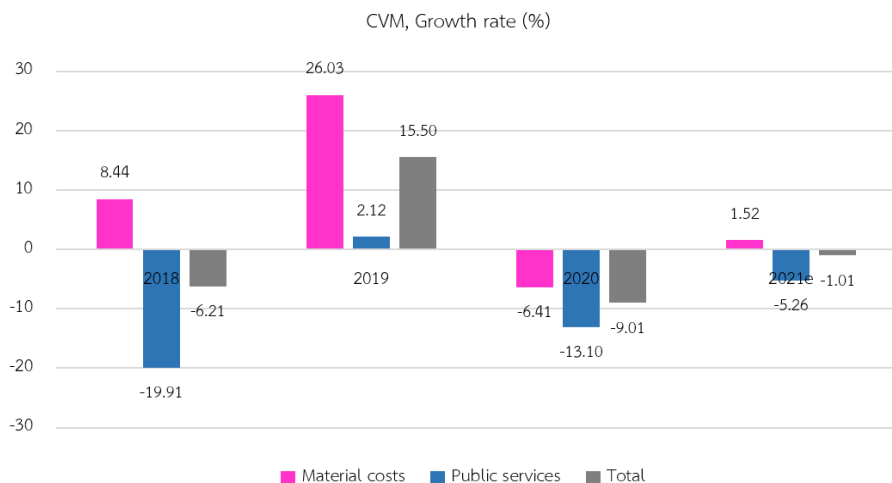


Figure 13 Real-term Government Final Consumption Expenditure on Digital Activities (CVM) Year 2018 - 2021e





3) Gross fixed capital formation: GFCF

Gross fixed capital formation means the expenditure that the economic agent pays to obtain the fixed capital (assets) with the lifetime period over one year and uses them for producing commodities and services in the economy. For this study, the Gross fixed capital formation of the digital activity in the economy is worth 251,056 million baht in 2020 and increases to 266,283 million baht in 2021. The GFCF in term of digital products is worth 139,614 million baht in 2020 and increases to 170,740 million baht in 2021.

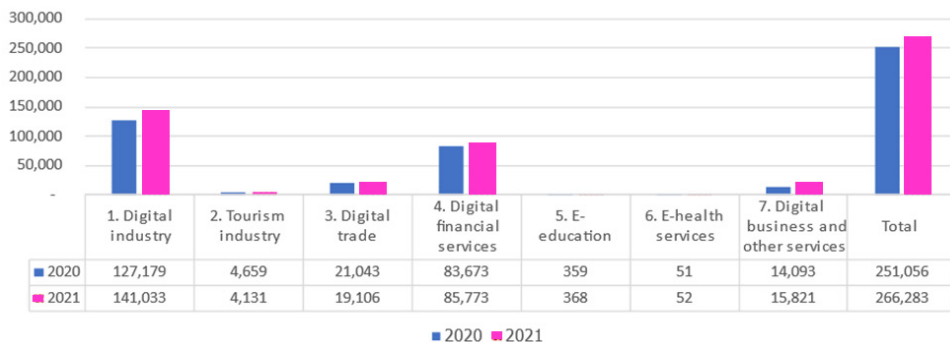
Considering by types of fixed capital, in 2020 the capital investment on Machinery and tools is worth 164,813 million baht and 170,729 million baht in 2020 - 2021 or the share of 66.72 percent and 64.12 percent of the total fixed capital formation in digital activity. Lower ranking is Building and Construction, which accounts 34,339 million baht and 38,410 million baht or a share of 13.68 percent and 14.42 percent in 2020 - 2021, respectively. Investment in High-value Software and Applications, as the main capital enabler of digital economy, brings in 3,887 million baht and 4,040 million baht, or a share of 1.55 percent and 1.52 percent of the total capital formation in the digital activity in 2020 - 2021, respectively.

Table 8 Gross Fixed Capital Formation of Digital Economy at Current Market Price in 2017 - 2021e

Year	Land	Building & Construction	Machinery and tools	Software	Investment in High-value Software and Applications	Other assets	Total
Value at current market price (million baht)							
2017	22,760	36,403	166,099	8,251	3,027	18,999	255,539
2018	24,028	38,021	186,338	9,437	3,520	19,605	280,949
2019	23,636	40,443	190,967	9,535	4,916	19,342	279,771
2020	20,825	34,339	164,813	8,605	3,887	18,587	251,056
2021e	21,740	38,410	170,729	9,045	4,040	22,319	266,283
% Share							
2017	8.91	14.25	65.00	3.23	1.18	7.43	100.00
2018	8.55	13.53	66.32	3.36	1.25	6.98	100.00
2019	8.45	14.46	68.26	3.41	1.76	6.91	100.00
2020	8.30	13.68	65.65	3.43	1.55	7.40	100.00
2021e	8.16	14.42	64.12	3.40	1.52	8.38	100.00

Considering investment classified by digital sectors (following ONDE), the digital industry which composes of hardware, software, and telecommunication gain the highest value of investment in gross fixed capital formation comparing to others, with the investment of 127,179 million baht and 141,033 million baht in 2020 and 2021, respectively. The second digital activity with high capital formation is the financial service, worth 83,673 million baht and 85,773 million baht and the digital trade, including trade of digital goods and previously high growth of E-commerce, with a slight drop in 2021 as shown from the value of 21,043 million baht in 2020 to 19,106 million baht in 2021. Others are the business services, e-education, e-health. Digital tourism is, in contrast, clearly found with the contraction of the gross fixed capital formation. All is shown as following:

Figure 14 Gross Fixed Capital Formation Classified by Digital Sectors in 2020 - 2021e (million baht)



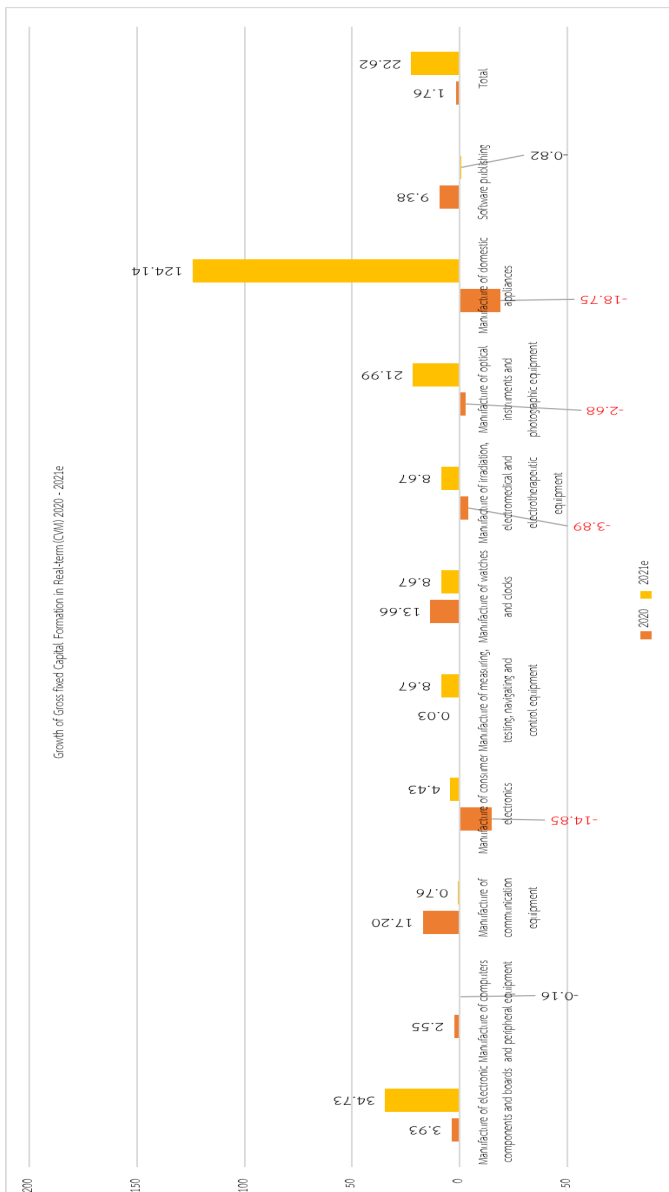
When categorizing by Central product classification (CPC), Gross fixed capital formation in Computer and parts, software, and smart devices are worth 139,614 million baht and 170,740 million baht in 2020 - 2021 with the growing direction resulting from smart devices which increase from 27,709 million baht in 2020 to 36,973 million baht in 2021 which gives the rise of the percentage share from 19.85 to 21.65 percent of the overall digital gross fixed capital formation in 2021. Hardware accounts from 102,182 million baht in 2020 to 124,073 million baht in 2021, whilst Software shows diminishing direction from 9,724 million baht or percentage share of 6.96 of the total gross fixed capital formation in 2020 to 9,694 million baht or with a share of 5.68 percent in 2021, as following.

Table 9 Gross Fixed Capital Formation Classified by Digital Commodities, 2017 - 2021e

	2017	2018	2019	2020	2021e
Value at current market price (thousand baht)					
1. Smart devices	24,786	28,167	30,195	27,709	36,973
2. Hardware	100,826	102,838	98,822	102,182	124,073
3. Software	7,402	8,400	8,848	9,724	9,694
Total	133,014	139,405	137,865	139,614	170,740
Share (%)					
1. Smart devices	18.63	20.21	21.90	19.85	21.65
2. Hardware	75.80	73.77	71.68	73.19	72.67
3. Software	5.56	6.03	6.42	6.96	5.68
Total	100.00	100.00	100.00	100.00	100.00

The real-term digital gross fixed capital formation (CVM: Reference year of 2017) shows the value of 141,661 million baht in 2020 and 173,704 million baht in 2021, which increase 1.76 percent, as a growth of the hardware products, especially computers and parts, telephone and parts, television/radio and parts, sonar and control equipment, and watch production equipment. For 2021, the real-term increase 22.62 percent from the high growth in digital hardware such as electronics and computer parts and medical electronics equipment, smart devices, sonar and control equipment, watches, radioactive equipment, except software, which slightly decline by 0.82 percent in 2021.

Figure 15 Growth of Gross fixed Capital Formation in Real-term (CVM) 2020 – 2021e





4) Imports and Exports of digital goods and services

Exports of digital commodities and services at current market prices (FOB) value 2,030,530 million baht, and 2,270,808 million baht for 2020 - 2021, respectively, with the rising trend. Of that amount, exports of digital commodities account 1,484,604 million baht and 1,776,171 million baht, which share 73.11 percent and 78.22 percent in 2020 - 2021. However, there is the decline of the digital services from 545,926 million baht in 2020 to 494,637 million baht in 2021, which share 26.89 percent and 21.78 percent, respectively.

Imports of digital commodities and services give rise from 1,727,856 million baht to 2,060,287 million baht in 2020 - 2021. Of that amount, imports of digital commodities account 1,294,420 million baht and 1,604,053 million baht, which share 74.91 percent and 77.86 percent in 2020-2021. There is a rise of the import of digital services from 433,437 million baht in 2020 to 456,234 million baht in 2021, which share 25.09 percent and 22.14 percent, respectively.

**Table 10 Imports and Exports of digital goods and services in 2017-2021e
(million baht)**

	2560	2561	2562	2563	2564e
FOB at current market prices					
Export of goods & services	2,381,293	2,377,962	2,283,258	2,030,530	2,270,808
Goods	1,576,390	1,564,163	1,462,798	1,484,604	1,776,171
Services	804,903	813,800	820,460	545,926	494,637
Import of goods & services	1,868,856	1,986,468	1,898,947	1,727,856	2,060,287
Goods	1,383,059	1,434,718	1,332,079	1,294,420	1,604,053
Services	485,797	551,749	566,868	433,437	456,234
% share					
Export of goods & services	100.00	100.00	100.00	100.00	100.00
Goods	66.20	65.78	64.07	73.11	78.22
Services	33.80	34.22	35.93	26.89	21.78
Import of goods & services	100.00	100.00	100.00	100.00	100.00
Goods	74.01	72.22	70.15	74.91	77.86
Services	25.99	27.78	29.85	25.09	22.14

Exports of digital commodities/services, concerning first five ranking, comprise of: Computer and computer parts, with the highest gain of 507,200 million baht, and 614,721 million baht for 2020 - 2021. The second rank is the sub-category of electronic parts, of which get 230,420 million baht and 274,753 million baht in 2020-2021. International telecommunication services are worth 250,281 million baht and 239,004 million baht. Telecommunication devices and radio/television signal operator get 151,994 million baht and 180,329 million baht. Electronic devices obtain 157,733 million baht and 179,927 million baht in 2020 - 2021, respectively.

Figure 16 Value of Exports of Digital Goods/Services by Top 5 ranking in 2020-2021 (million baht)

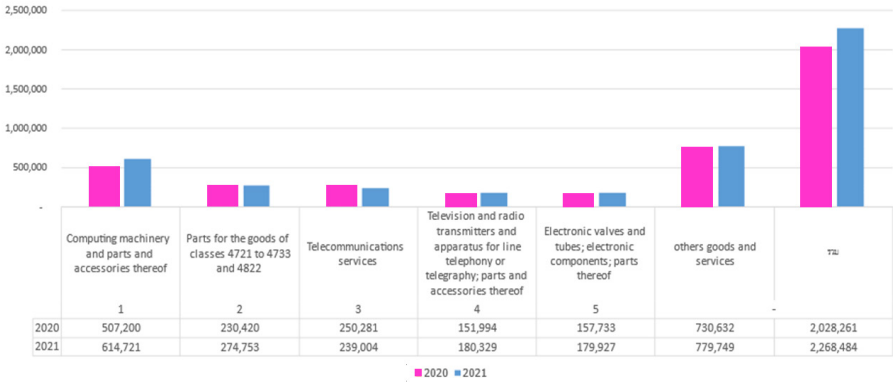
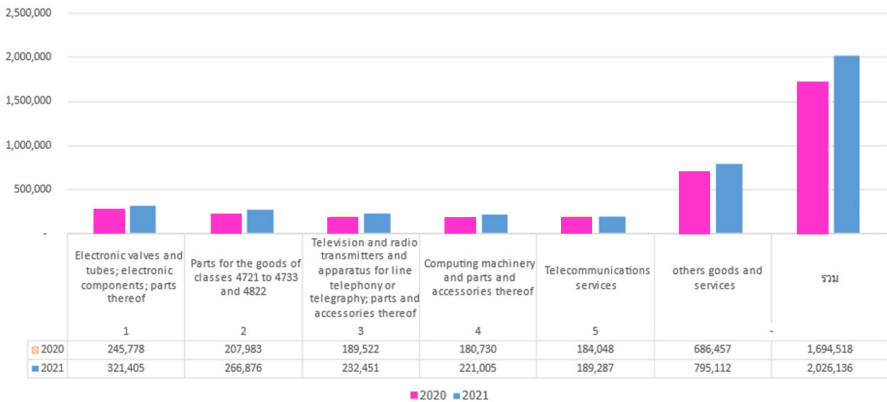


Figure 17 Value of Imports of Digital Goods/Services by Top 5 ranking in 2020-2021 (million baht)



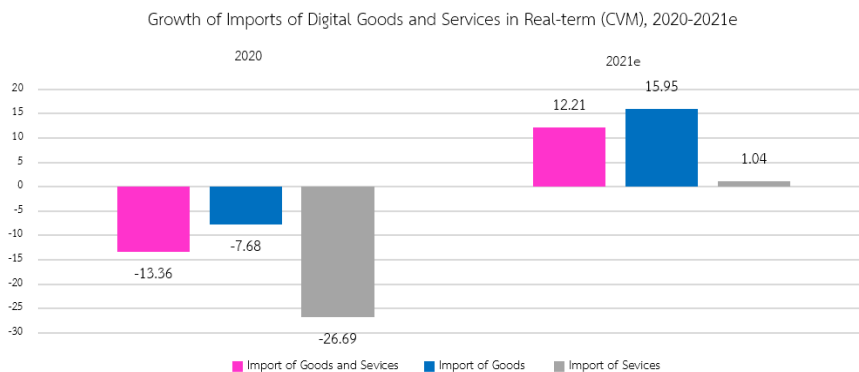
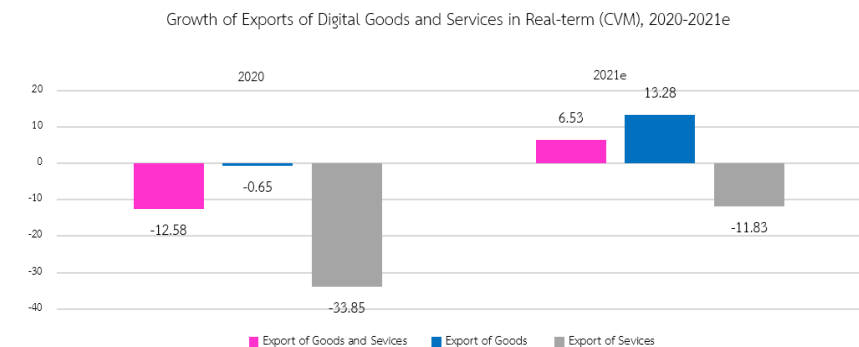
Exports and Imports of Digital Goods and Services in Real-term (CVM)

The real-term of exports of digital goods and services (CVM: Reference year of 2017) shows the value of 1,903,097 million baht in 2020 and 2,027,351 million baht in 2021. The 2020 real-term decline of 12.58 percent was a consequence of the Covid-19 impacts on the overall economy, which caused a contraction of the exports of the digital goods and services, especially the digital services, which was devastated by 33.85 percent. For 2021, the overall covid-19 impacts subside, which make the real-term expansion of 6.53 percent, specifically from the growth in digital goods of 13.28 percent, though there is a continuous contraction in the exports of digital services.

The imports of digital goods and services in real-term (CVM) exhibits the value of 1,522,261 million baht in 2020 and 1,708,105 million baht in 2021, respectively. The 2020 real-term deterioration of 13.36 percent caused by the Covid-19 impacts, which distressed international trade, similar to what happened to exports. For 2021, with the lessening impacts from covid-19, the real-term imports of digital goods and services expand to 12.21 percent, from the growth of digital goods imports of 15.65 percent, while there is a slight expansion of 1.04 percent in the imports of digital services.



Figure 18 Growth of Exports & Imports of Digital Goods and Services in Real-term (CVM), 2020 – 2021e



5) Summary on calculation of digital contribution to GDP on expenditure approach

Considering at current prices, the digital contribution to GDP on Expenditure approach is worth 885,428 million baht in 2020 and declines to 838,625 million baht in 2021, as a consequence of the Global Covid-19 pandemic, which dwindles the overall economy.

Structurally, the digital contribution to GDP on Expenditure side has the continuous rise of the Private Final Consumption Expenditure from the percentage share of 48.22 in 2020 to 52.63 in 2021, which shows the crucial role as the main economic driver for the country. Gross Fixed Capital Formation, secondly, consecutively shares higher percentage from 15.77 in 2020 to 20.36 in 2021, while Government Final Consumption Expenditure maintains moderate share about 1.83 in 2020 but with a slight increase to 1.91 in 2021 of the total digital contribution to expenditure. Exports and Imports of the digital goods and services still gain a vital role as the major contribution of the economy since Thailand is the key export production hub for hardware e.g. computer parts and components and some other electronic parts with high export ratios. Nonetheless, in 2020, this portion drops from the Covid-19 impacts on international trade, though with a slight increase in 2021 when the adverse situation subsides. In addition, as Thailand has been depending on high-valued capital goods from abroad, both hardware and software, the share becomes higher for the imports of digital goods and services in 2021.

The net trade balance (x-m), is lower but still positive during 2020-21 due to the fact that the situation on exports of digital goods and services still could not maintain the competitiveness as it should be. Details could be seen from the table as following :

Table 11 Overview of the digital contribution to GDP, expenditure approach (million baht)

Composition	Value, current market price (million baht)					Share (%)	
	2017	2018	2019	2020	2021e	2020	2021e
Private final consumption expenditure	356,889	393,225	402,053	426,978	441,335	48.22	52.63
General government final consumption expenditure	16,409	15,423	17,846	16,162	16,029	1.83	1.91
Gross fixed capital formation (digital goods)	133,014	139,405	137,865	139,614	170,740	15.77	20.36
Plus : Exports of goods and services	2,379,439	2,375,812	2,280,744	2,028,261	2,268,484	229.33	270.78
Less : Imports of goods and services	1,834,397	1,950,303	1,858,256	1,694,515	2,026,133	201.57	245.67
Net export of goods and services	545,042	425,509	422,488	333,746	242,351	34.18	25.10
Expenditure on Gross domestic products (Digital GDP Expenditure)	1,051,354	973,562	980,252	916,500	870,455	100.00	100.00



7. Statistical Usage and Applications

The main objective of the statistical measurement for the digital economy is based on the same principle and framework of the National Income Accounting of the System of the National Accounts and belongs as the crucial part to the Macroeconomic statistics. Thus, it is appropriate to apply for various economic analyses on macroeconomic measurement of the economy both for the direct valuation of the digital economy and for the analyses with the national income accounting for the overall economy. With this kind of dataset, it is the main basic determinant for policy planning and further policy decision making from the appropriate and logical strategic planning. This kind of the statistical usage and applications could be clearly identified in some points as follow:

7.1 Situation and economic behavioral pattern monitoring

1) Some concluding remark e.g. the percentage shares of the digital contribution to GDP are the mainstream macroeconomic statistics with statistical specification popular to analysts, policy makers, scholars, journalists, businesses and private sector. Statistics, which give the overall movement of the changing behavioral patterns, could be used to assess the economy and, for this reason, it could be informed if the policy implementation, by either public or private, is successful or with failure.

2) Statistical datasets in this project cover important economic activities e.g. production, household consumption, government spending, investment, export, import, etc. This could monitor the economic movement both value and quantity change. Moreover, more information regarding some indicators from balancing method and percentage share from accounting framework e.g. budget surplus or deficit, earning share, investment share of each economic group and trade balance, etc. In addition, datasets in the form of National Income Accounts could be the basic base data to support the measurement of the movement of the short-term economic indicators, for example, monthly production indicators; the data usage for production or manufacturer/consumer could be applied to assess and monitor the changes in the behavioral pattern, which could crucially be better or worse, to, at least, present and report as the annual datasets even if it is difficult to have the accounting and statistics more frequently than once a year.

7.2 Macro-economic Analysis

1) Digital economic datasets could, overall, be used to investigate causal and mechanism within the economic system. Such analyses could be performed in terms of parameter estimation of the relationship among different economic variables by constructing the economic model, which bases on the time series of the datasets, both in terms of value and quantity, under the National Income Accounting framework similar to the macroeconomic analyses for the country. The types of the macroeconomic model might be different regarding the school of economic theory and the purpose of the studies. However, the digital economic datasets, which follow National Income Accounting framework, are flexible enough to be applicable for various kinds of economic theories or models, on condition that the basic concept of the economic composition of the economy e.g. production, consumption, earning, etc. is generally acceptable.

2. Short-term policy making can be determined upon the basic assessment on the behavior of economic agents and current economic situation, including the views or expectations on the future development trend from the analyses of the digital economic datasets reported by periods. Short-term expectation, in general, uses the macro-econometric model that can explain future situation, whilst mid-term or long-term may consider from the time-series statistics. To establish the economic policy planning, it is also to determine the context of the economic strategies for the related activities or sectors. The datasets of the project could be applied for the structure, the source, and the important composition of the digital economic activities and the changing trend of the period of interests to set the benchmark and appropriate indicators for the successful assessment of policy planning by all economic agents.

3. Policy making and decision taking happen in every level of the institutions, both public and private, companies, corporations e.g. transnational corporations. Such institutions are able to construct the macroeconomic model, with flexibility according to their own purposes. There are demands for such datasets, which follow the framework of the System of the National Accounts, to support the institution's investment policy to be in line with the country's long-term economic development.

Moreover, there are some specialists in the agencies where the macroeconomic forecasts are required to give views on the country's economic vibes for the customers in order to obtain fee, such agencies demand such datasets in details.

7.3 International comparison

For international comparison, it is a requirement to report the international digital economic information in terms of the National Income Accounting, which follows the international standard of concepts, definitions, and acceptable categories such as the GDP or the percentage share to GDP, including the comparison of structural statistics e.g. ratios of taxes or investment to GDP. Such comparisons are used by the economists, journalists or policy analysts to assess and monitor the economic situations among countries alike. Such economic datasets also politically support the success or the popularity of the direction of policy agenda for economic development in various term. Mostly, it contains the SNA's style datasets, for comparison, with the time-series and cross-sectional formats in support for various kinds of economic model to give the full macro-economic picture.

8. Notes for consideration

For the report on the measurement for Digital contribution to GDP for this phase, even if there have been several efforts to further develop, in variety of issues concerning the measurement methodology, from phase I and II, there are still many limitations both in terms of definition and scope for the digital activities, those this project refers the OECD's measurement framework and the in-process guidelines. For example, the practice on the categorization of digital and non-digital for broad measure, or the statistical limitations in support of the three-approach SNA measurement.

Most importantly, some kinds of activities could be directly measured, but others are not and they need to use the indirect method or imputation or ratio estimation from related indicators. Moreover, some items are required to adjust for the data continuity and data consistency, especially for Production and Expenditure approaches. This measurement report for 2021, thus, still is incomplete e.g. in term of categorization of financial services and digital services, estimation of exports and imports of international digital services, measurement on production of the public digital services by public authorities, valuation of the inventories for digital goods and services, which are parts of expenditure approach.

Nonetheless, the measurement in this project could be able to echo the size of the digital economy and its vital components, those are the national engine of growth other than traditional economic drivers. Entities and interested parties are contented to apply this report of statistical indicators, yet to ponder the inadequacies as aforementioned.

Statistical table

Table 12 Value Added of Digital Economy Classified by Digital Sector at Current Market Prices in 2017 - 2021e
(million baht)

	Value Added					% Share		Growth rate	
	2017	2018	2019	2020	2021e	2020	2021e	2020	2021e
1. Digital industry	793,959	925,646	980,678	1,126,652	1,299,243	61.24	61.91	14.88	15.32
1.1 Smart devices	52,406	78,677	87,059	88,719	129,232	4.82	6.16	1.91	45.66
1.2 Hardware	354,427	345,592	311,323	500,226	606,492	27.19	28.90	60.68	21.24
1.3 Software	66,509	69,554	75,994	51,451	52,442	2.80	2.50	-32.30	1.92
1.4 Digital services such as digital platform digital order digital delivery	63,074	73,433	88,178	61,957	64,937	3.37	3.09	-29.74	4.81
1.5 Communication	192,007	292,668	355,203	379,792	397,035	20.64	18.92	6.92	4.54
1.6 Digital content	65,536	65,722	62,921	44,507	49,105	2.42	2.34	-29.27	10.33
2. Tourism industry	35,893	42,029	35,963	19,092	15,506	1.04	0.74	-46.91	-18.78
2.3 Transport equipment rental	8,318	10,553	12,459	8,363	7,490	0.45	0.36	-32.87	-10.44
2.4 Travel agencies and other reservation services	25,237	28,359	19,401	6,995	3,461	0.38	0.16	-63.95	-50.52
2.5 Cultural activity	29	58	17	38	54	0.00	0.00	124.23	42.65
2.6 Sport and recreation activity	2,309	3,059	4,086	3,696	4,501	0.20	0.21	-9.55	21.78

Table 12 Value Added of Digital Economy Classified by Digital Sector at Current Market Prices in 2017 - 2021e
(million baht)

	Value Added					% Share		Growth rate	
	2017	2018	2019	2020	2021e	2020	2021e	2020	2021e
3. Digital trade	317,597	533,152	685,162	469,529	528,140	25.52	25.17	-31.47	12.48
3.1 Trade on digital goods	144,714	151,903	234,305	201,344	240,415	10.94	11.46	-14.07	19.40
3.2 Online trade	172,883	381,249	450,857	268,185	287,726	14.58	13.71	-40.52	7.29
4. Digital financial services	136,891	140,939	140,782	132,465	144,476	7.20	6.88	-5.91	9.07
4.1 Digital banking services	95,353	96,870	95,225	90,432	88,737	4.92	4.23	-5.03	-1.87
4.2 Other financial services	41,538	44,069	45,556	42,033	55,738	2.28	2.66	-7.73	32.61
5. E-education services	2,290	1,093	1,468	2,076	2,127	0.11	0.10	41.47	2.42
5.1 E-education services	2,290	1,093	1,468	2,076	2,127	0.11	0.10	41.47	2.42
6. E-health services	197	206	229	266	272	0.01	0.01	16.08	2.44
6.1 E-health services	197	206	229	266	272	0.01	0.01	16.08	2.44
7. Digital business and other services	108,268	101,554	163,546	89,749	108,862	4.88	5.19	-45.12	21.30
7.1 Postal and courier services	86,455	79,262	139,383	73,585	82,780	4.00	3.94	-47.21	12.50
7.2 Other digital business services	21,813	22,292	24,163	16,164	26,082	0.88	1.24	-33.10	61.36
Total	1,395,095	1,744,618	2,007,827	1,839,829	2,098,627	100.00	100.00	-8.37	14.07

Note : data not available in some categories

Table 13 Income from Digital Economy Activities Classified by Digital Sector in Year 2020 - 2021e

Million baht	2020				2021e					
	Compensation of employee	Operating surplus and mixed income	Tax less subsidy on production	Consumption of fixed capital	Total	Compensation of employee	Operating surplus and mixed income	Tax less subsidy on production	Consumption of fixed capital	Total
1. Digital industry	403,458	508,396	65,579	149,219	1,126,652	460,928	592,696	76,431	169,188	1,299,243
2. Tourism industry	8,396	5,469	370	4,857	19,092	6,852	3,878	275	4,502	15,506
3. Digital trade	249,877	179,714	30,693	9,245	469,529	315,852	166,457	34,794	11,038	528,140
4. Digital financial services	99,741	17,714	4,232	10,778	132,465	113,012	14,484	4,654	12,325	144,476
5. E-education services	1,045	661	-	371	2,076	1,070	677	-	380	2,127
6. E-health services	172	59	-	34	266	176	61	-	35	272
7. Digital business and other services	54,508	24,880	5,458	4,903	89,749	68,061	27,203	6,740	6,858	108,862
Total	817,197	736,893	106,332	179,408	1,839,829	965,951	805,455	122,894	204,326	2,098,627
% share										
1. Digital industry	49.37	68.99	61.67	83.17	61.24	47.72	73.59	62.19	82.80	61.91
2. Tourism industry	1.03	0.74	0.35	2.71	1.04	0.71	0.48	0.22	2.20	0.74
3. Digital trade	30.58	24.39	28.87	5.15	25.52	32.70	20.67	28.31	5.40	25.17
4. Digital financial services	12.21	2.40	3.98	6.01	7.20	11.70	1.80	3.79	6.03	6.88
5. E-education services	0.13	0.09	-	0.21	0.11	0.11	0.08	-	0.19	0.10
6. E-health services	0.02	0.01	-	0.02	0.01	0.02	0.01	-	0.02	0.01
7. Digital business and other services	6.67	3.38	5.13	2.73	4.88	7.05	3.38	5.48	3.36	5.19
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Table 14 Private Final Consumption Expenditure Classified by Digital Sector at Current Market Prices in Year 2017 - 2021e

Industry	2017	2018	2019	2020	2021e	2020	2021e	2020	2021e
	1. Digital industry	300,901,005	331,166,651	339,166,489	368,568,303	384,819,829	86.32	87.19	8.67
1.1 Smart devices	23,892,167	23,146,003	30,059,382	22,677,400	23,987,067	5.31	5.44	-24.56	5.78
1.2 Hardware	44,102,069	45,603,860	48,804,410	50,484,831	46,351,000	11.82	10.50	3.44	-8.19
1.3 Software	10,236,672	11,119,124	11,667,197	10,993,605	10,699,097	2.57	2.42	-5.77	-2.68
1.4 Digital services such as digital platform digital order digital delivery	12,639,524	13,315,977	13,951,463	11,329,545	16,002,822	2.65	3.63	-18.79	41.25
1.5 Communication	189,447,214	215,159,645	209,100,938	242,025,575	250,479,820	56.68	56.75	15.75	3.49
1.6 Digital content	20,583,360	22,822,043	25,583,098	31,057,347	37,300,023	7.27	8.45	21.40	20.10
2.Tourism industry	17,451,162	19,229,931	18,770,733	11,593,326	10,450,143	2.72	2.37	-38.24	-9.86
3. Digital trade									
4. Digital financial services	37,981,970	42,265,357	43,425,933	46,092,953	45,288,541	10.80	10.26	6.14	-1.75
5. E-education services	429,656	430,966	545,047	583,080	633,383	0.14	0.14	6.98	8.63
6. E-health services	125,390	131,770	144,826	139,937	143,352	0.03	0.03	-3.38	2.44
7. Digital business and other services									
Total	356,889,184	393,224,675	402,053,027	426,977,600	441,355,248	100.00	100.00	6.20	3.36

Table 15 Gross Fixed Capital Expenditure Classified by type of Assets and Digital Sector at Current Market Prices in 2020 (million baht)

	Land	Building and other structure	Machinery and Equipment	Package software	Hiring on Computer software	Other assets	Total
1. Digital industry	6,167	16,900	82,755	4,043	2,452	14,862	127,179
2. Tourism industry	28	216	4,366	4	1	44	4,659
3. Digital trade	1,763	2,745	15,149	1,015	87	284	21,043
4. Digital financial services	12,751	11,985	52,178	3,403	384	2,971	83,673
5. E-education services	4	153	199	0	-	3	359
6. E-health services	0	27	23	0	-	0	51
7. Digital business and other services	112	2,312	10,144	139	964	422	14,093
Total	20,825	34,339	164,813	8,605	3,887	18,587	251,056
% share	4.85	13.29	65.07	3.18	1.93	11.69	100.00
1. Digital industry	0.60	4.64	93.71	0.09	0.02	0.94	100.00
2. Tourism industry	8.38	13.04	71.99	4.82	0.41	1.35	100.00
3. Digital trade	15.24	14.32	62.36	4.07	0.46	3.55	100.00
4. Digital financial services	1.11	42.62	55.43	0.00	-	0.84	100.00
5. E-education services	0.00	52.94	45.10	0.00	-	0.00	100.00
6. E-health services	0.79	16.41	71.98	0.99	6.84	2.99	100.00
7. Digital business and other services	8.29	13.68	65.65	3.43	1.55	7.40	100.00
Total	4.85	13.29	65.07	3.18	1.93	11.69	100.00

Table 16 Gross Fixed Capital Expenditure Classified by type of Assets and Digital Sector at Current Market Prices in 2021e (million baht)

	Land	Building and other structure	Machinery and Equipment	Package software	Hiring on Computer software	Other assets	Total
1. Digital industry	6,493	19,333	89,991	4,290	2,583	18,343	141,033
2. Tourism industry	14	138	3,934	3	1	40	4,131
3. Digital trade	1,998	3,369	12,195	1,099	96	349	19,106
4. Digital financial services	13,065	12,279	53,448	3,512	428	3,040	85,773
5. E-education services	4	157	204	0	-	3	368
6. E-health services	0	28	23	0	-	0	52
7. Digital business and other services	166	3,106	10,934	140	932	543	15,821
Total	21,740	38,410	170,729	9,045	4,040	22,319	266,283
% share							
1. Digital industry	4.60	13.71	63.81	3.04	1.83	13.01	100.00
2. Tourism industry	0.35	3.35	95.24	0.08	0.01	0.97	100.00
3. Digital trade	10.46	17.63	63.83	5.75	0.50	1.82	100.00
4. Digital financial services	15.23	14.32	62.31	4.09	0.50	3.54	100.00
5. E-education services	1.00	42.67	55.44	0.04	0.00	0.85	100.00
6. E-health services	0.13	53.87	44.70	0.52	0.00	0.78	100.00
7. Digital business and other services	1.05	19.63	69.11	0.88	5.89	3.43	100.00
Total	8.16	14.42	64.12	3.40	1.52	8.38	100.00

Table 17 Export of Goods and Services Classified by Central Products Classification : CPC in 2017 - 2021e
(million baht)

CPC	Export categories	2017	2018	2019	2020	2021e
384	Sports goods	17,936,498	17,607,171	16,781,078	15,489,233	19,885,112
385	Games and toys	6,945,937	7,315,971	7,760,633	7,217,578	8,078,797
448	Domestic appliances and parts thereof	135,454,755	124,358,166	114,423,468	128,957,500	148,168,999
451	Office and accounting machinery, and parts and accessories thereof	7,676,169	6,675,022	6,989,673	5,727,584	3,958,894
452	Computing machinery and parts and accessories thereof	568,152,446	571,689,974	509,150,488	507,200,256	614,721,226
463	Insulated wire and cable; optical fiber cables	37,228,320	39,192,169	39,034,759	36,628,601	56,246,011
471	Electronic valves and tubes; electronic components; parts thereof	144,331,264	136,601,636	130,304,563	157,733,047	179,927,068
472	Television and radio transmitters and apparatus for line telephony or telegraphy; parts and accessories thereof	156,989,336	158,611,351	133,086,055	151,994,184	180,329,135
473	Radio broadcast and television receivers; apparatus for sound and video recording and reproducing; microphones, loudspeakers, amplifier	88,729,965	83,205,153	81,168,846	63,585,080	79,436,496
474	Parts for the goods of classes 4721 to 4733 and 4822	193,223,400	202,945,727	208,554,861	230,419,829	274,753,296
475	Disks, tapes, solid-state non-volatile storage devices and other media, not recorded	6,125,105	12,074,638	12,115,306	10,552,255	20,698,177
478	Packaged software	-	-	-	-	-

Table 17 Export of Goods and Services Classified by Central Products Classification : CPC in 2017 - 2021e
(million baht)

CPC	Export categories	2017	2018	2019	2020	2021e
481	Medical and surgical equipment and optical appliances	21,906,505	22,458,046	22,678,851	23,793,404	28,040,028
482	Instruments and appliances for measuring, checking, testing, navigating and other purposes, except optical instruments; industrial	50,471,682	55,530,734	52,221,819	43,885,842	56,253,645
483	Optical instruments and photographic equipment, and parts and accessories thereof	120,685,901	101,928,054	95,519,263	81,856,005	80,186,838
484	Watches and clocks, and parts thereof	18,679,004	21,818,858	30,494,274	17,294,333	23,163,296
61142	Wholesale trade services, except on a fee or contract basis, of radio and television equipment and recorded audio and video disks and tapes	-	-	-	-	-
61184	Wholesale trade services, except on a fee or contract basis, of computers and packaged software	-	-	-	-	-
61185	Wholesale trade services, except on a fee or contract basis, of electronic and telecommunications equipment and parts	-	-	-	-	-
62184	Wholesale trade services, except on a fee or contract basis, of computers and packaged software	-	-	-	-	-
62185	Wholesale trade services, except on a fee or contract basis, of electronic and telecommunications equipment and parts	-	-	-	-	-
623	Mail order retail trade services	-	-	-	-	-

Table 17 Export of Goods and Services Classified by Central Products Classification : CPC in 2017 - 2021e
(million baht)

CPC	Export categories	2017	2018	2019	2020	2021e
624	Other non-store retail trade services	-	-	-	-	-
678	Travel agency, tour operator and tourist guide services	92,613,516	94,428,975	96,137,794	23,283,206	10,432,263
679	Auxiliary and other supporting transport services	98,095,339	99,985,622	101,679,375	42,889,960	31,460,374
680	Postal and courier services	983,083	1,349,605	1,132,493	531,966	403,221
711	Financial intermediation services, except investment banking, insurance services and pension services	17,244,746	16,958,761	16,949,485	17,228,862	14,840,821
712	Investment banking services	4,056,512	4,210,147	3,250,127	3,252,727	3,196,052
713d	Insurance and pension services (excluding reinsurance services), except compulsory social security services	560,147	560,147	560,147	560,147	560,147
715	Services auxiliary to financial intermediation other than to insurance and pensions	4,253,502	4,385,852	5,355,148	5,073,172	7,517,888
731	Leasing or rental services concerning machinery and equipment without operator	7,155,988	7,094,510	6,901,982	8,155,087	8,202,387
732	Leasing or rental services concerning other goods	52,719,631	-	-	-	-
733	Licensing the right to use intangible assets	255,622	298,619	190,445	149,476	160,186
831	Management consulting and management services; information technology services	74,354,989	70,721,535	73,262,797	75,922,272	73,655,669
836	Advertising services and provision of advertising space or time	30,362,760	25,408,454	24,866,932	25,593,725	24,379,749
838	Photographic services and photography processing services	553,737	425,708	395,498	351,952	599,154

Table 17 Export of Goods and Services Classified by Central Products Classification : CPC in 2017 - 2021e
(million baht)

CPC	Export categories	2017	2018	2019	2020	2021e
841	Telecommunications services	226,841,425	246,978,460	243,953,258	250,281,429	239,004,405
842	On-line access services	-	-	-	-	-
843	On-line information provision services	22,688,806	23,161,581	23,606,585	4,634,087	1,287,496
844	News agency services	383,724	122,244	285,276	80,022	76,226
846	Broadcasting, programming and programmer distribution services	1,044,087	1,065,843	1,086,321	213,250	59,248
851	Employment agency services and supply of personnel services	10,989,384	8,887,231	8,171,615	7,559,229	12,868,656
855	Travel arrangement, tour operator and related services	7,156,517	6,395,067	6,102,600	3,537,360	1,608,126
859	Other support services	4,694,024	5,255,409	5,024,208	5,691,826	6,685,484
871	Maintenance and repair services of fabricated metal products, machinery and equipment	-	-	-	-	-
873	Installation services (other than construction)	19,672,894	18,820,095	23,972,995	20,925,706	19,932,161
929	Other education and training services	110,345	112,508	114,544	27,741	12,430
931	Human health services	39,685,880	40,512,828	41,291,202	8,105,663	2,252,010
935	Other social services without accommodation	29,883,658	22,670,267	20,051,280	14,060,394	23,936,088
961	Audiovisual and related services	-	-	-	-	-
962	Performing arts and other live entertainment event presentation and promotion services	17,019,833	20,752,398	24,403,248	4,684,754	1,700,071

Table 17 Export of Goods and Services Classified by Central Products Classification : CPC in 2017 - 2021e
(million baht)

CPC	Export categories	2017	2018	2019	2020	2021e
969	Other amusement and recreational services	41,523,029	38,986,153	36,460,757	8,196,095	2,716,950
979	Other miscellaneous services	-	54,251,700	55,254,142	14,936,317	7,089,756
	Total	2,379,439,465	2,375,812,386	2,280,744,191	2,028,261,156	2,268,484,033

Table 18 Import of Goods and Services Classified by Central Products Classification : CPC in 2017 - 2021e
(million baht)

CPC	Import categories	2017	2018	2019	2020	2021e
384	Sports goods	6,516,193	7,256,950	6,377,511	6,446,303	8,064,225
385	Games and toys	4,462,708	5,441,206	5,469,748	4,185,007	4,877,218
448	Domestic appliances and parts thereof	23,371,128	25,049,163	25,463,695	29,956,043	35,028,605
451	Office and accounting machinery, and parts and accessories thereof	6,284,096	4,237,564	4,821,335	4,681,122	2,756,992
452	Computing machinery and parts and accessories thereof	204,771,428	226,722,121	204,050,499	180,729,872	221,005,193
463	Insulated wire and cable; optical fibre cables	55,910,445	60,887,576	57,413,472	53,343,191	71,705,749
471	Electronic valves and tubes; electronic components; parts thereof	244,586,430	258,003,210	232,376,522	245,777,930	321,405,020
472	Television and radio transmitters and apparatus for line telephony or telegraphy; parts and accessories thereof	231,353,260	217,950,853	199,319,416	189,521,989	232,450,909
473	Radio broadcast and television receivers; apparatus for sound and video recording and reproducing; microphones, loudspeakers, amp	46,790,561	49,317,846	47,320,351	43,119,207	55,881,136
474	Parts for the goods of classes 4721 to 4733 and 4822	227,735,907	228,299,009	196,961,357	207,983,200	266,876,038
475	Disks, tapes, solid-state non-volatile storage devices and other media, not recorded	77,162,088	87,721,330	81,279,506	98,060,762	114,963,718
478	Packaged software	-	-	-	-	-

Table 18 Import of Goods and Services Classified by Central Products Classification : CPC in 2017 - 2021e
(million baht)

CPC	Import categories	2017	2018	2019	2020	2021e
481	Medical and surgical equipment and orthopedic appliances	34,974,410	36,466,911	39,692,212	38,795,938	44,512,286
482	Instruments and appliances for measuring, checking, testing, navigating and other purposes, except optical instruments; industrial	112,274,972	116,155,347	122,198,342	103,917,857	123,468,802
483	Optical instruments and photographic equipment, and parts and accessories thereof	50,078,373	49,943,388	44,901,079	36,410,114	44,125,273
484	Watches and clocks, and parts thereof	22,327,628	25,100,848	23,743,019	18,150,134	22,778,147
61142	Wholesale trade services, except on a fee or contract basis, of radio and television equipment and recorded audio and video disks and tapes	-	-	-	-	-
61184	Wholesale trade services, except on a fee or contract basis, of computers and packaged software	-	-	-	-	-
61185	Wholesale trade services, except on a fee or contract basis, of electronic and telecommunications equipment and parts	-	-	-	-	-
62184	Wholesale trade services, except on a fee or contract basis, of computers and packaged software	-	-	-	-	-
62185	Wholesale trade services, except on a fee or contract basis, of electronic and telecommunications equipment and parts	-	-	-	-	-

Table 18 Import of Goods and Services Classified by Central Products Classification : CPC in 2017 - 2021e
(million baht)

CPC	Import categories	2017	2018	2019	2020	2021e
623	Mail order retail trade services	-	-	-	-	-
624	Other non-store retail trade services	-	-	-	-	-
678	Travel agency, tour operator and tourist guide services	15,871,555	17,076,882	16,722,787	6,432,598	4,924,649
679	Auxiliary and other supporting transport services	77,245,819	82,833,430	90,727,354	52,967,229	57,796,528
680	Postal and courier services	774,135	1,118,085	1,010,510	656,955	740,766
711	Financial intermediation services, except investment banking, insurance services and pension services	22,516,856	22,267,875	26,140,901	25,834,042	23,202,881
712	Investment banking services	5,296,680	5,528,177	5,012,616	4,877,343	4,996,867
713d	Insurance and pension services (excluding reinsurance services), except compulsory social security services	3,148,679	3,808,349	3,644,727	3,886,250	5,065,251
715	Services auxiliary to financial intermediation other than to insurance and pensions	5,553,894	5,758,888	8,259,153	7,607,034	11,753,842
731	Leasing or rental services concerning machinery and equipment without operator	4,887,746	5,706,065	5,601,463	5,996,967	6,496,134
732	Leasing or rental services concerning other goods	23,612,038	2,254,499	2,310,753	1,958,494	2,002,545
733	Licensing the right to use intangible assets	174,597	240,177	154,560	109,919	126,865
831	Management consulting and management services; information technology services	50,786,599	56,880,837	59,458,111	55,830,594	58,333,881
836	Advertising services and provision of advertising space or time	20,738,640	20,435,842	20,181,331	18,820,734	19,308,294

Table 18 Import of Goods and Services Classified by Central Products Classification : CPC in 2017 - 2021e
(million baht)

CPC	Import categories	2017	2018	2019	2020	2021e
838	Photographic services and photography processing services	378,218	342,394	320,975	258,813	474,519
841	Telecommunications services	154,939,229	198,643,053	197,985,885	184,048,245	189,286,915
842	On-line access services	-	-	-	-	-
843	On-line information provision services	22,357,735	24,555,168	23,948,618	7,035,935	4,918,480
844	News agency services	262,095	98,320	231,523	58,845	60,370
846	Broadcasting, programming and programmer distribution services	4,031	4,427	4,318	1,269	887
851	Employment agency services and supply of personnel services	7,506,066	7,147,938	6,631,862	5,558,794	10,191,729
855	Travel arrangement, tour operator and related services	4,888,108	5,143,508	4,952,706	2,601,251	1,273,605
859	Other support services	3,206,153	4,226,889	4,077,512	4,185,571	5,294,775
871	Maintenance and repair services of fabricated metal products, machinery and equipment	257,259	307,564	315,954	310,104	216,718
873	Installation services (other than construction)	13,437,153	15,136,871	19,455,836	15,388,035	15,785,890
929	Other education and training services	47,350	50,946	49,890	19,191	14,692
931	Human health services	22,373,663	24,572,663	23,965,680	7,040,948	4,921,984
935	Other social services without accommodation	20,411,399	18,233,538	16,273,078	10,339,524	18,956,924
961	Audiovisual and related services	-	-	-	-	-

Table 18 Import of Goods and Services Classified by Central Products Classification : CPC in 2017 - 2021e
(million baht)

CPC	Import categories	2017	2018	2019	2020	2021e
962	Performing arts and other live entertainment event presentation and promotion services	948,589	1,245,711	1,422,115	490,633	448,600
969	Other amusement and recreational services	2,314,259	2,340,236	2,124,774	858,374	716,925
979	Other miscellaneous services	1,858,429	25,791,149	25,882,905	10,262,920	8,922,629
	Total	1,834,396,601	1,950,302,800	1,858,255,962	1,694,515,278	2,026,133,454

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