

# Readiness of Thailand Towards the Digital Economy

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*This paper aims to review digital transformation in Thailand. It describes and assesses key policies which have been introduced and modified to enhance the country's digital economy. Digital services and other service sectors involving digital technology such as health and logistics show promising trends. Evidence from surveys reveals some concerns in terms of relatively low investment in the country's digital economy, modest penetration of digital technology in manufacturing and agriculture sectors, and the small proportion of advanced IT-skilled workers. A review of investment promotion certificates showed that investment is more intense in the Eastern Economic Corridor. Other concerns include unequal access to and relatively high prices of digital-related technologies.*

**Keywords:** Digital economy, policy analysis, Thailand, developing Asian countries.

## 1. Introduction

The digital economy is becoming an increasingly important part of the global economy. Different names have been used for the digital economy—Industry 4.0, Industrial Internet of Things (Kiel et al. 2017), Fourth Industrial Revolution (Schwab 2016) and Second Machine Age (Brynjolfsson and McAfee 2014). There is still a lack of a commonly agreed definition of the digital economy (see, for example, OCED 2020, 2012; UNCTAD 2019, 2017; World Bank 2019; IMF 2018; Bukht and Heeks 2017). Despite this, many studies have found that the digital economy has a significant impact on business and society (Porter and Heppelman 2014; Schwab 2016; Klingenberg and Antunese 2017; Bessen et al. 2019; Frey and Osborne 2017; Acemoglu and Restrepo 2019; Jongwanich, Kohpaiboon, and Ayako 2022). Consequently, the transition to a digital economy is a top policy priority for almost all countries.

Thailand puts great policy emphasis on harnessing the advantages of the new and emerging economic opportunity brought about by the digital economy. This has brought about changes in policy responses at both the national level and at other government agencies. For example, in 2018, the Ministry

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of Information and Communication (MICT) and the Ministry of Science and Technology (MOST) codeveloped the Thai Digital Economy and Society Development Plan as a digital blueprint to transform government operations, business practices and people's lifestyles towards the digital economy. Not only have policies directly related to the digital economy (e.g., investment strategy, digital infrastructure, rules and regulations) been launched, strategic investment plans and various decrees have been introduced to induce digital transformation.

This study aims to review digital developments in Thailand and some key policies that have been introduced and changed to promote the digital economy. In addition, this study aims to assess whether such policies have been effective. The paper's organization is as follows. The next section discusses definitions of the digital economy applied in Thailand and presents digital development in the country. The subsequent presents five policy aspects, including those relating to industrial transformation, investment promotion policy, skill transformation, digital plans as well as digital laws. The fourth section evaluates the effectiveness of policies relating to digital plans. Conclusion and policy inferences are provided in the final section.

## 2. Digital Development in Thailand

### 2.1 Definition of Digital Economy

There has been a lack of a commonly agreed definition of the digital economy. However, the progress towards a commonly agreed definition appears to be promising (OECD 2020; UNCTAD 2019). OECD (2020) proposed the comprehensive definition of the digital economy as "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 the government, that are utilizing these digital inputs in their economic activities." Under this definition, three tiers of measures are proposed to cover activities in the digital economy: (1) the core measure, which includes only economic activity from producers of ICT goods and services and digital content; (2) the narrow measure, which includes the core measure and other activities where firms use digital inputs; and (3) the broad measure, which includes (1) and (2) as well as activities noticeably enhancing by applying digital inputs.<sup>1</sup> OECD (2020) also provided an alternative definition of the digital economy, which is "all economic activity that is digitally ordered and/or digitally delivered". This definition considers the nature of the transaction, i.e., the use of digital technology to order and deliver products.

The definition put forward by the OECD (2020) is, to a certain extent, similar to that by UNCTAD (2019) and Bukht and Heeks (2017). The digital economy is defined as all sectors that make extensive and intensive use of digital technologies. Under this definition, a three-tiered approach was proposed:

- Core: Digital (IT/ICT) sector, hardware, software & IT consulting, information services and telecommunications;
- Narrow scope: Digital services and platform economy; and
- Broad scope: Digitalized economy, which includes e-Business, e-Commerce, precision agriculture, algorithmic economy, sharing economy, and the gig economy. Note that both UNCTAD (2019) and Bukht and Heeks (2017) defined the digital economy in terms of production method while the OECD (2020) proposed to incorporate both production and transaction activities in defining the digital economy.

Other organizations, including the World Bank and IMF, provided both narrow and broader definitions of the digital economy. World Bank (2019) defines the digital economy in two ways: (i) narrow sense in terms of the technology sector or the ICT sector (especially fast-growing technology companies); and (ii) broad

sense in terms of the private sector's utilization of digital technologies. The IMF (2018) defines the digital economy in a narrow sense as online platforms and activities that owe their existence to such platforms and in a broader sense as all activities that use digitized data. The broad definitions proposed by the World Bank and IMF are similar to OECD's (2020) definition. A broader definition of the digital economy is also found in other studies such as Global Trend (2013) and UNCTAD (2017).<sup>2</sup> To summarize, although there has been a lack of a commonly agreed definition of the digital economy, many of the definitions proposed by international organizations tend to focus on the use of Internet-based digital technologies.

## 2.2 The Digital Economy in Thailand

There is no official definition of the digital economy in Thailand. However, there are two recent studies on the digital economy in Thailand. The first is the Digital Market Survey and Forecast conducted by the Digital Economy Promotion Agency (DEPA) under the Ministry of Digital Economy and Society (MDES) in partnership with the IMC Institute. The second study, titled The Digital Contribution to GDP, was produced by the Office of the National Digital Economy and Society Commission (ONDE).

*(a) Digital Market Survey and Forecast: Digital Economy Promotion Agency and Ministry of Digital Economy and Society.* In this study, the definition of the digital economy is close to the narrow definition proposed by OECD (2020) and UNCTAD (2019). The survey concentrates on the supply side of digital markets where only firms directly involved in the digital industry are covered, e.g., firms providing system integration and maintenance or ones producing hardware or smart devices, are included in the survey. Other firms which employ/demand digital activities/services, such as firms in automotive setting up IT services, are not included in the survey. In the survey, there are five components, including software, hardware and smart device, digital content, digital services and big data. Table 1 summarizes items included in the digital market survey in Thailand.<sup>3</sup>

From the survey, digital market value increased in 2017–18 after the Thailand 4.0 policy was announced in 2018 (Table 2). Digital services, especially e-Retail and e-Transaction, increased noticeably during this period while software and hardware industries, including smart devices, grew by about 10 per cent. Big Data grew the least, less than 3 per cent in 2018. The performance of digital services was mixed during the COVID-19 period in 2019–20. While the growth of digital services remained positive in 2019, it jumped to almost 45 per cent in 2020. Other components of the digital economy fell sharply, especially the hardware industry, which shrank by more than 10 per cent.

The survey also investigated the development of employment in the labour market. In the 2017–20 period, employment in the digital market in Thailand increased noticeably, particularly those employed in hardware industries (Figure 1). In terms of occupational categories, sales managers accounted for the highest proportion of workers in the hardware industries. Employment in hardware engineering, development and IT project managers was still relatively low. Workers in digital services jumped noticeably in 2018–19, growing as fast as the software industry. Almost 70 per cent of all workers in digital services were IT workers while another 10 per cent were sales managers. In the software industry, almost 30 per cent of the employees were programmers, but the proportion of these workers in the industry declined during 2017–20. The proportion of business analysts, system engineers and sales managers increased, though the share of each of these categories was less than 10 per cent. Not surprisingly, firms that were directly involved with digital activities/services were located mostly in Bangkok and central Thailand (Figure 2).

*(b) The Digital Contribution to GDP: Office of the National Digital Economy and Society Commission.* In the study to estimate the digital contribution to GDP, the system of national account was utilized to measure digital contributions using three approaches, namely, production, income and expenditure. The

TABLE 1  
Components of Digital Market Survey in Thailand

<i>Digital Industry</i>
1. Software <ul style="list-style-type: none"> <li>• System integrator</li> <li>• Software maintenance</li> <li>• Software customizes</li> <li>• Consultation/Training</li> </ul>
2. Hardware and smart devices <ul style="list-style-type: none"> <li>• Peripherals (e.g., keyboard, mouse, control adaptor unit, sound card)</li> <li>• Storage (e.g., floppy disk drives, hard disk drives, tape drives)</li> <li>• Computer (e.g., notebook/laptops, PC, server system)</li> <li>• Printer (e.g., laser printer, inkjet printer)</li> <li>• Smart device (e.g., smart card reader, Bluetooth eyeglass, temperature sensors, drone with (and without) camera, smart watch)</li> </ul>
3. Digital content
4. Digital services <ul style="list-style-type: none"> <li>• e-content</li> <li>• e-entertainment</li> <li>• e-retail</li> <li>• e-advertise</li> <li>• e-transactions</li> <li>• Fintech</li> </ul>
5. Big Data

SOURCE: Author's compilation from the Digital Market Survey and Forecast.

broader definition of OECD was used in this study. When it is measured using the production approach, the digital economy in Thailand grew by around 20 per cent in 2018–19. During the same period, its contribution to GDP increased from 8.5 per cent in 2017 to 11.3 per cent in 2019 (Table 3). Digital industry, e-trading, and IT services contributed significantly to the Thai digital economy. Employment income and profits accounted for around 70 per cent of the digital economy when measured using the income approach.

When the expenditure approach is used to measure the digital economy, trade in digital goods and services made an important contribution to the development of the digital economy in Thailand. This is in line with trade in traditional products where the share of exports and imports in GDP was around 60 and 50 per cent, respectively.<sup>4</sup> The contribution of private consumption was around 12 per cent in 2019 while investment contributed only 4 per cent to the total digital economy supply.<sup>5</sup> The small contribution of digital investment suggests that there is room for further development in Thailand's digital economy. Investment in the digital economy still grew by around 3.5 per cent amidst the pandemic in 2019. In contrast, the growth of investment in traditional products deteriorated to around 2.0 per cent in 2019 and worsened to –8.4 per cent in 2020.<sup>6</sup>

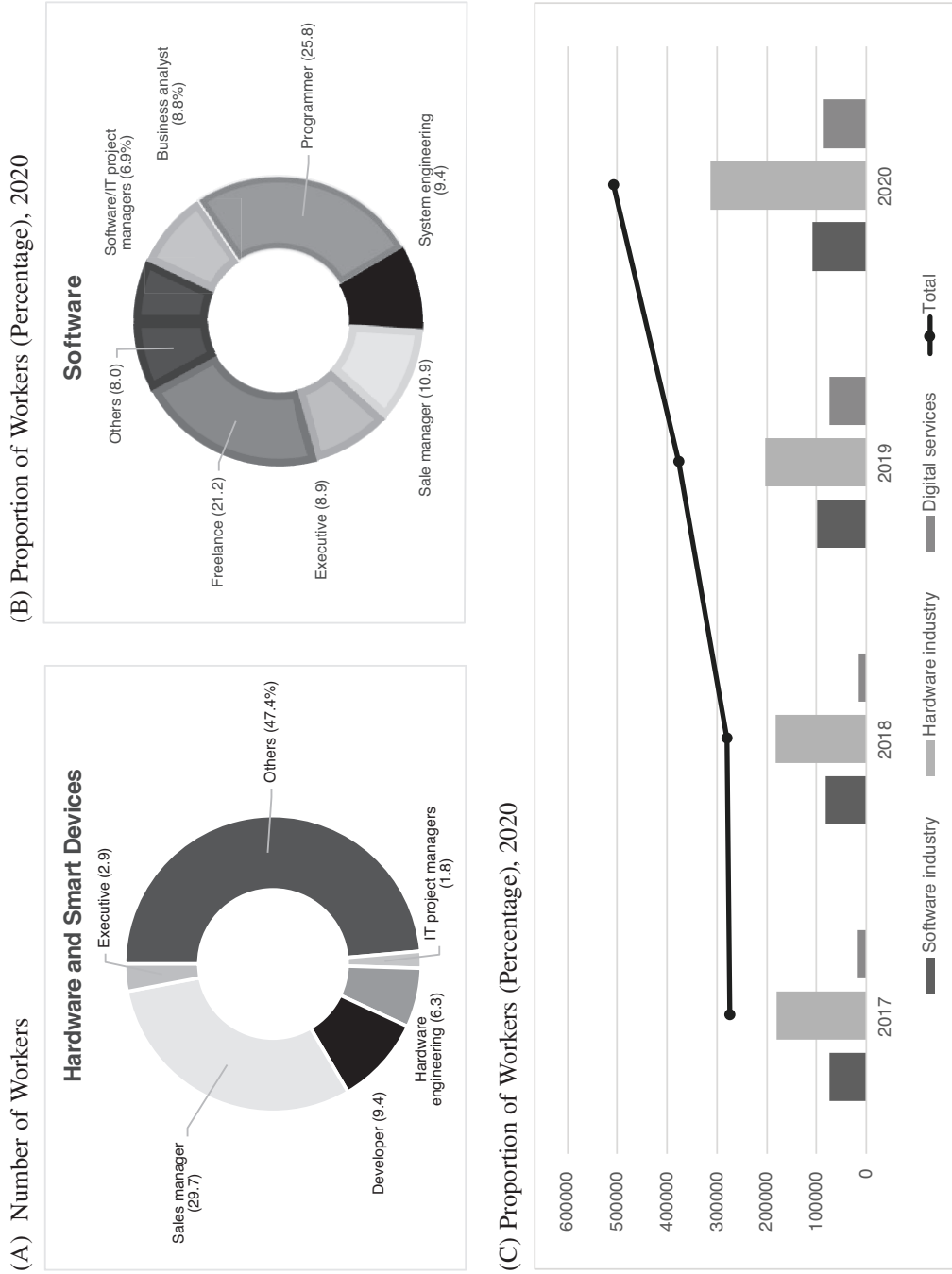
When sectors are examined in detail, digital technology is concentrated in the services sector, e.g., online wholesale and retail trade, mobile phone and Internet services, financial services, web pages/

TABLE 2  
Digital Market Value, 2017–20 (THB million)

Digital industry	Value (million baht)						Growth (%)				
	2017	2018	2019	2020	2021e	2022e	2018	2019	2020	2021e	2022e
<b>Software industry</b>	<b>110,007</b>	<b>118,918</b>	<b>134,816</b>	<b>131,297</b>	<b>134,494</b>	<b>140,021</b>	<b>8.10</b>	<b>13.34</b>	<b>-2.61</b>	<b>2.44</b>	<b>6.84</b>
<b>Hardware industry</b>	<b>303,168</b>	<b>325,262</b>	<b>299,343</b>	<b>274,381</b>	<b>286,448</b>	<b>281,921</b>	<b>7.29</b>	<b>-7.97</b>	<b>-8.34</b>	<b>4.40</b>	<b>1.10</b>
- Hardware	222,410	236,396	217,294	194,159			6.29	-8.08	-10.65		
- Smart device	80,758	88,866	82,049	80,222			10.04	-7.67	-2.23		
<b>Digital services</b>	<b>123,615</b>	<b>153,497</b>	<b>169,536</b>	<b>244,836</b>	<b>306,360</b>	<b>363,270</b>	<b>24.17</b>	<b>10.45</b>	<b>44.42</b>	<b>25.13</b>	<b>7.86</b>
- e-Retail	11,602	21,217	25,264	45,340			82.87	19.07	79.46		
- e-Transaction	23,931	35,680	49,521	75,865			49.10	38.79	53.20		
- e-Logistic				68,174							
- e-Tourism				7,691							
- online-media				100,529							
- e-Content	57,333	61,478	78,647				7.23	2.50	59.53		
- e-Entertainment	14,955	16,887	63,015				12.92	-7.43	87.71		
- e-Advertise	1,602	1,790	1,815	3,407			11.74	1.40	28.93		
- FinTech	14,192	16,445	14,289	18,423			15.88	-13.11			
- HealthTech				314							
- EdTech				958							
<b>Digital Content</b>	<b>25,040</b>	<b>27,872</b>	<b>31,080</b>				<b>11.31</b>				
<b>Big Data</b>	<b>11,839</b>	<b>12,129</b>	<b>13,177</b>				<b>2.45</b>				
<b>Total</b>	<b>573,221</b>	<b>637,678</b>	<b>603,695</b>	<b>650,514</b>	<b>727,302</b>	<b>785,212</b>	<b>11.24</b>	<b>-5.33</b>	<b>7.76</b>	<b>11.80</b>	<b>7.96</b>

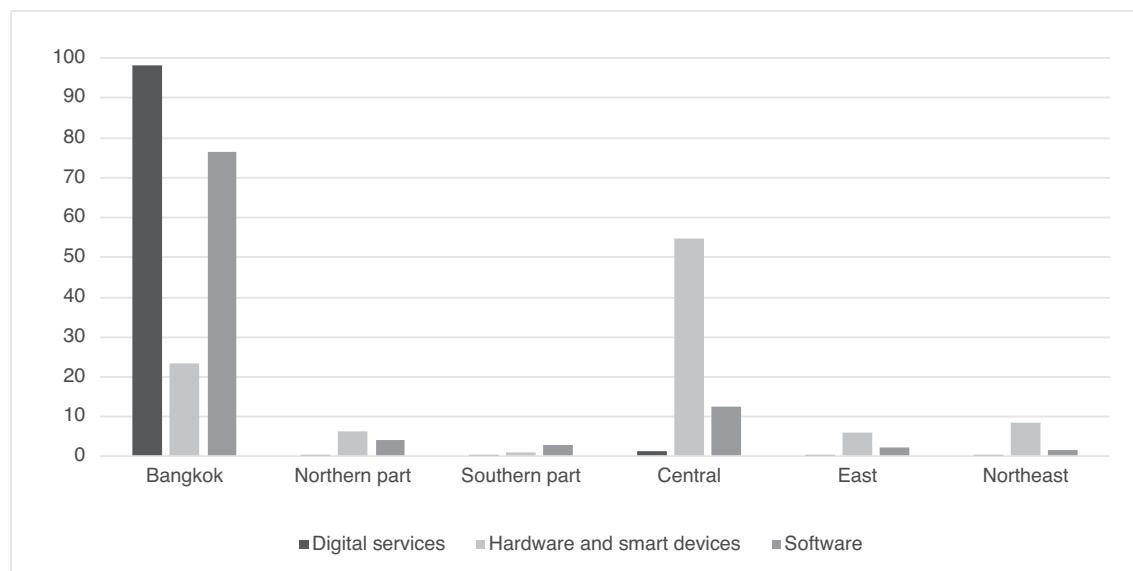
SOURCES: The Digital Economy Promotion Agency (DEPA) under the Ministry of Digital Economy and Society (MDES) and the IMC Institute.

FIGURE 1  
Employment in Digital Market Survey



SOURCES: The Digital Economy Promotion Agency (DEPA) under the Ministry of Digital Economy and Society (MDES) and the IMC Institute.

FIGURE 2  
Employment in Digital Market Survey by Region (2020)



SOURCES: The Digital Economy Promotion Agency (DEPA) under the Ministry of Digital Economy and Society (MDES) and the IMC Institute.

programmes, and consultants on hardware and software (Figure 3). The utilization of digital technology in the manufacturing and agriculture sectors has been rather limited. This could probably be due to the narrower coverage of digital activities arising from the approach used to measure the digital economy. As shown in Table 3, attempts to measure the contribution of the digital economy to GDP only began in 2017. The estimates were based on the OECD's broader definition of the digital economy. At this early stage of development, the unsettled definition of the digital economy could have led to the possible exclusion of various types of digital-related activities. In addition, the demand for and supply of digital technology in these sectors could be underdeveloped during this time. Several factors such as high costs, difficulty in accessing technology, as well as unreadiness of workers, could partly explain the relatively low deployment of such technology in the manufacturing and agriculture sectors.<sup>7</sup> Figure 4 shows that robots, ICT and e-commerce were unevenly utilized. For robots, for example, usage was concentrated in three sectors, namely automotive, plastics and rubber, and electronic sectors. ICT usage was more evenly distributed among sectors though there was greater utilization in the chemical and pharmaceutical, and paper industries.

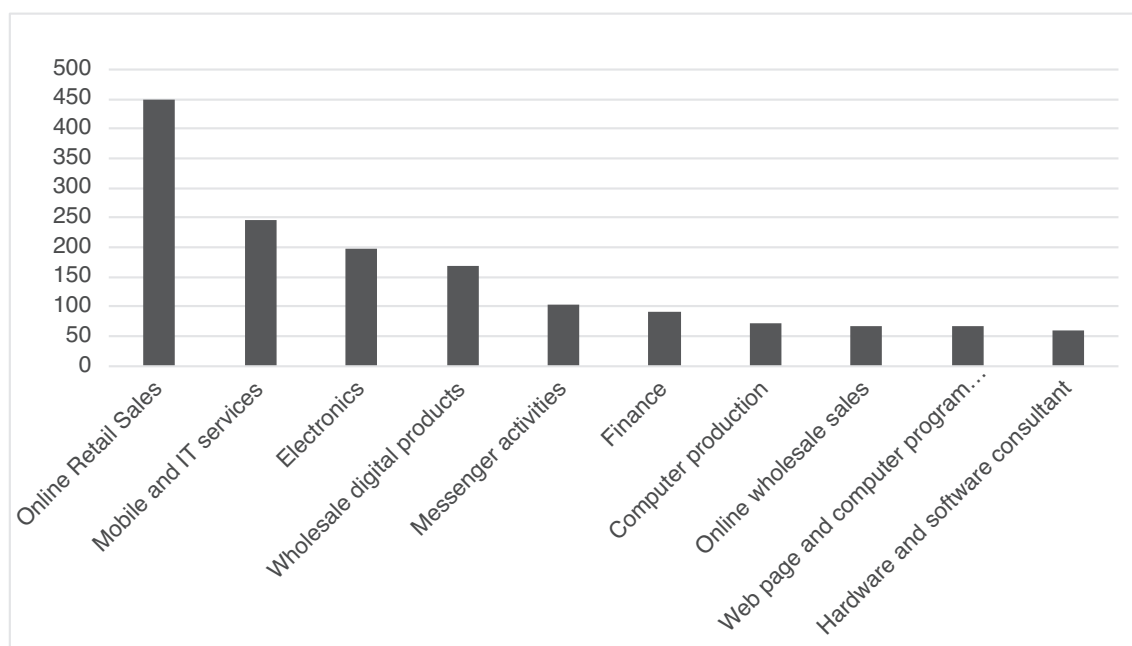
Investment is crucial in promoting the digital economy in Thailand. Investment information from the Board of Investment (BOI) can be used to examine the development of investment in Thailand's digital economy. From Table 4, based on BOI's investment promotion certificates, it seems that investment, based on a number of projects, was concentrated in biofuels and biochemicals, followed by digital industries, agriculture and biotechnology, food for future and new generation automotive sectors. Interestingly, when the value of investment funds is considered, investment in digital industries tends to be small, especially compared to biofuels and biochemicals, agriculture and biotechnology, smart electronics and new-generation automotive. Foreign investors played a more crucial role in digital investments during

TABLE 3  
The Digital Economy (Measured in Terms of GDP)

	Value-added (million baht)			% changes	
	2017	2018	2019	2018	2019
Digital Economy (Total value added)	1,322,061	1,619,448	1,902,652	22.49	17.49
Digital industry	729,707	857,393	853,322	17.50	-0.47
Tourism industry (e.g., car leasing, sports)	53,917	55,275	54,427	2.52	-1.53
E-trading (e.g., wholesale, retail trade)	291,111	450,909	685,990	54.89	52.13
IT services (e.g., internet, platform)	212,326	217,361	203,245	2.37	-6.49
Others (e.g., health, education, logistics)	35,000	38,511	105,668	10.03	174.38
Gross Domestic Products (Value-added)	15,488,664	16,368,711	16,898,086	5.68	3.23
Digital Contribution to GDP	8.54	9.89	11.26	15.91	13.81

SOURCE: Office of the National Digital Economy and Society Commission.

FIGURE 3  
The Size of Thailand's Digital Economy by Sector, 2019

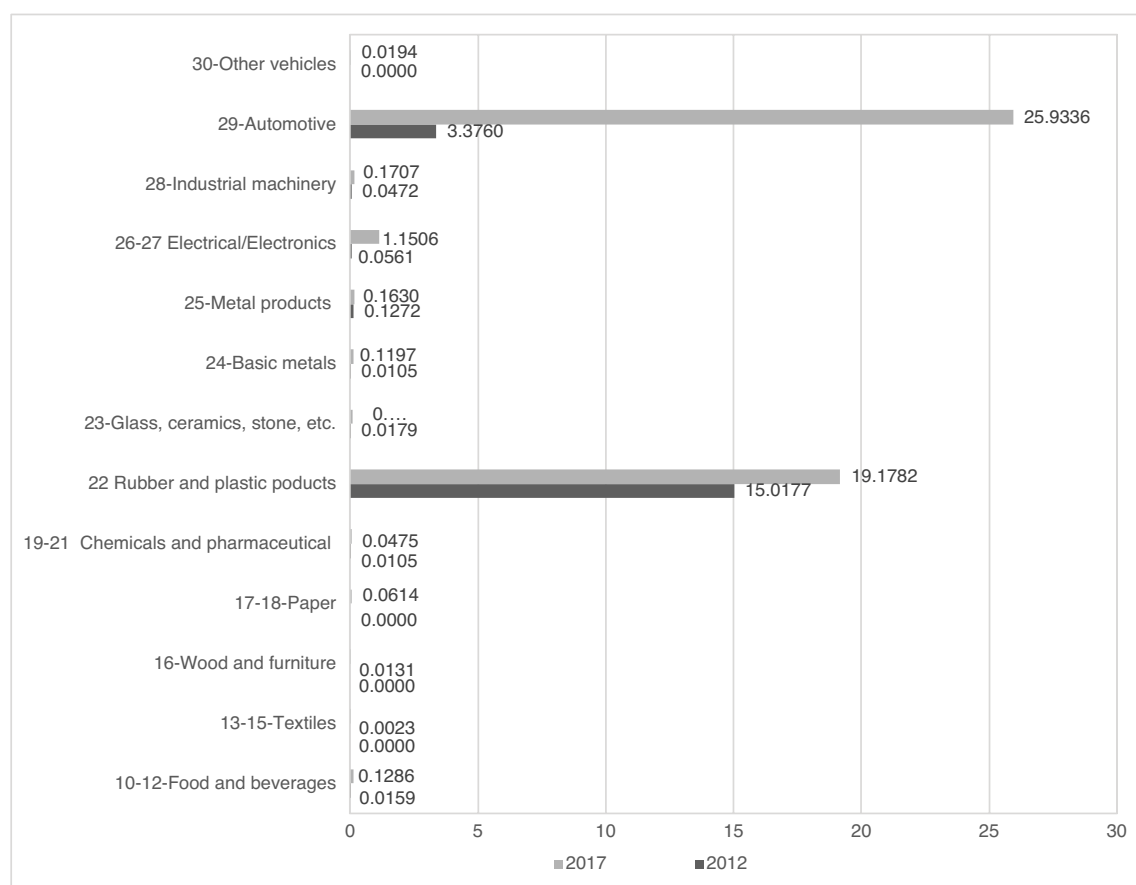
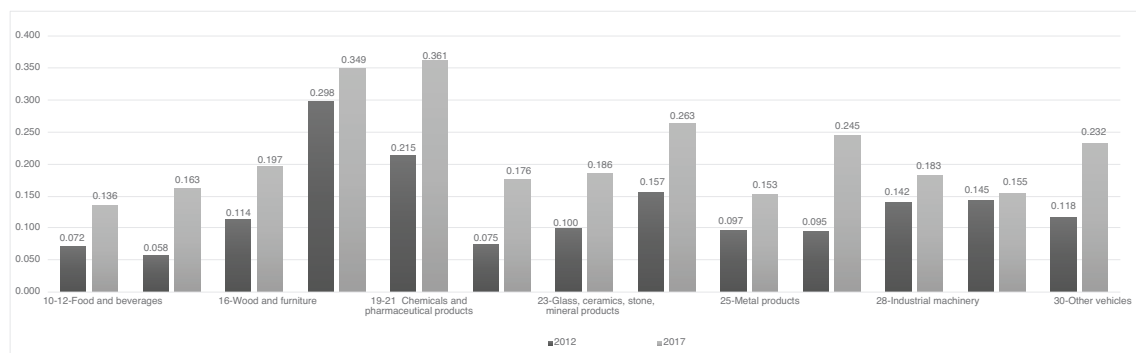


SOURCE: Office of the National Digital Economy and Society Commission.

2018–21 as reflected by the higher proportion of foreign registered capital in total registered capital. Their share grew from 39 per cent in 2018 to about 81 per cent in 2021 (January–September). In terms of location, investment tends to be more concentrated in the Eastern Economic Corridor (EEC) area, i.e., in Chonburi, Rayong and Chachoengsao.



FIGURE 4  
ICT and Robot Usage by Sector, 2012–17



NOTE: The use of ICT is measured by computer use per 1,000 workers. The intensity of robot usage is measured by the operational stock of robots per 1,000 workers.

SOURCES: National Statistical Office (NSO), International Federation of Robotics (IFR), UNIDO INDSTAT data and National Statistical Office (NSO), Thailand.

TABLE 4  
Investment Promotion Certificates from the Board of Investment, Thailand

	Number of Projects				Investment fund (million baht)			
	2018	2019	2020	2021 (Jan - Sep)	2018	2019	2020	2021 (Jan-Sep)
1. New generation automotive		1	146	4		18	45,066	540
2. Smart electronics	19	22	24	28	6,430	27,306	51,020	31,776
3. Affluent, medical and wellness tourism	4	5	4	6	1,223	1,475	2,544	929
4. Agriculture and biotechnology	27	30	88	65	6,783	11,207	28,353	66,669
5. Food for Future	80	95	86	54	11,980	21,664	21,716	8,577
6. Manufacturing of robotics	61	67	57	28	7,827	10,947	2,973	5,608
7. Medical hub	9	2	3	4	901	48	95	241
8. Aviation and logistics	209	15	10	24	50,492	12,149	1,578	7,656
9. Biofuels and biochemicals	303	347	368	457	552,902	186,449	180,512	213,625
10. Digital industries	187	174	155	132	10,339	2,092	2,769	7,184
Total activities	1626	1624	1717	1273	901,772	755,864	481,149	520,678

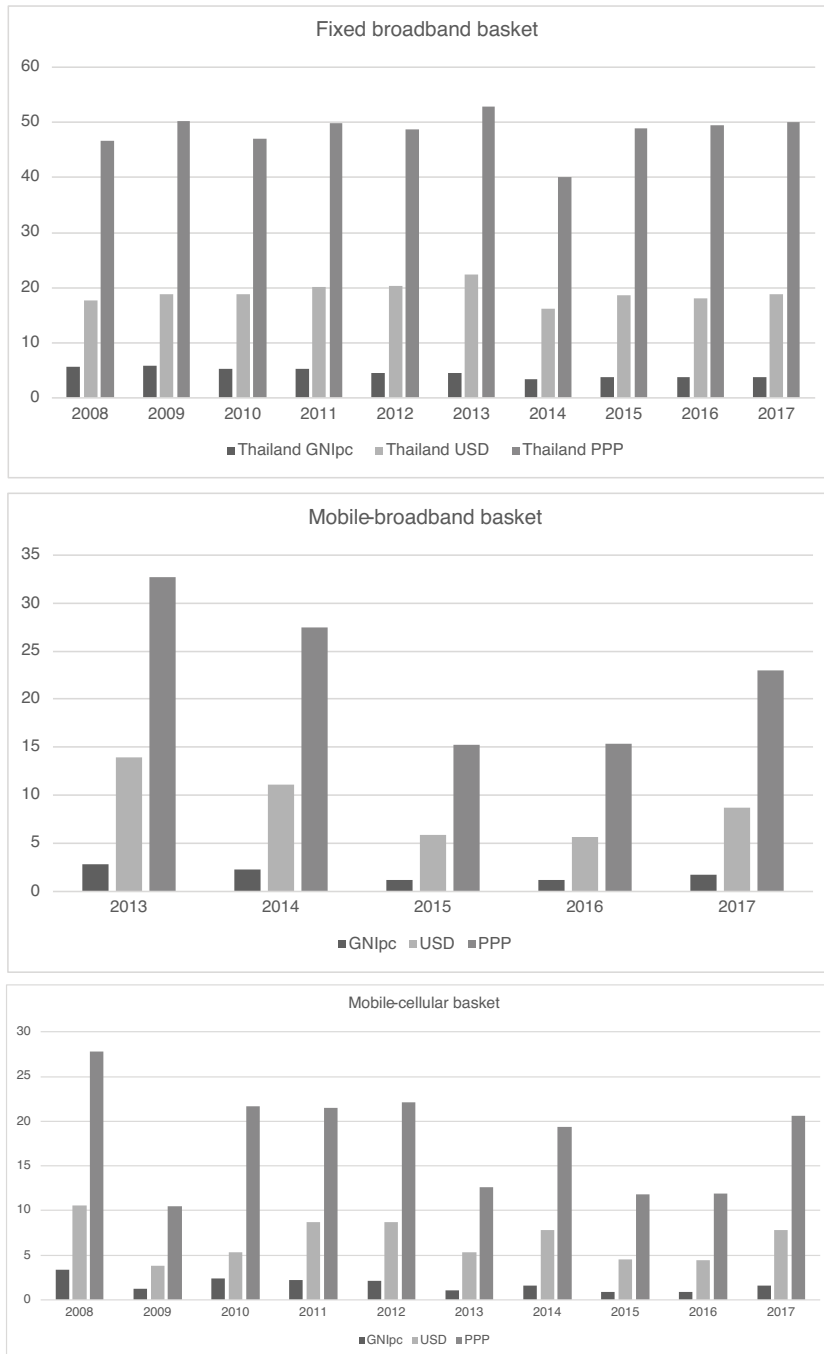
SOURCE: The Board of Investment of Thailand, <https://ipstat.boi.go.th/pubrpt/index.php>

### 2.3 Digital Economy Infrastructure

Thailand has been developing its digital infrastructure, both in terms of hard and soft infrastructure. Various plans have been introduced, starting with the twenty-year National Master Plan for Digital Development (2018–37) and followed by the Thailand Strategic Digital Plan for Economic and Social Development, MDES (2020–24). In 2018, the government launched the countrywide village broadband network called “Connected Netpacharat”, which aimed to offer affordable high-speed Internet to poor households in more than 24,000 villages. The government also established a Digital Park in Chonburi province, which is supported by a submarine cable system, cable landing station and data centre. In May 2020, a national 5G committee was formed to develop a roadmap for 5G adoption and enhance cooperation among relevant agencies.

Various infrastructure and accessibility indicators show that Thailand’s digital infrastructure has improved over the past decade. About 99 per cent of the population was covered by mobile cellular networks with 98 per cent enjoying access to at least a 4G mobile. The fixed broadband subscriptions per 100 inhabitants increased significantly after 2014 while active mobile broadband subscriptions showed an improving trend. However, Thailand still lags behind other countries in Asia such as China, Singapore, Malaysia and Vietnam—particularly in terms of unequal access, prices and ICT skills. In 2020, based on ITU statistics, the percentage of households with a computer at home was only 19 per cent. The percentage of households with Internet access at home in rural areas was only 69 per cent, while in urban areas, it reached 81 per cent. In terms of ICT skills, only 1 per cent of the population could be classified as having advanced ICT skills, while around 20 per cent had basic skills for ICT. The prices of fixed broadband, mobile broadband and mobile cellular services (measured as a percentage of gross national income) have declined noticeably in Thailand over the past decade (Figure 5). However, when the prices of these services are measured after considering purchasing power parity (PPP) (i.e., by considering the prices of other products), it seems that ICT prices in Thailand, especially in terms of fixed broadband services, have not yet declined as expected. Compared to selected countries in Asia, the prices of broadband and mobile services in Thailand are higher. This could be due to the method of spectrum allocation, which leads to higher prices than in most countries.<sup>8</sup> All in all, although infrastructure and accessibility indicators in the country have improved, unequal access, relatively higher prices, and low ICT skills remain key obstacles.

FIGURE 5  
Prices of Fixed Broadband, Mobile Broadband and Mobile Cellular in Thailand



SOURCE: Author's compilation from ITU, <https://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx>

TABLE 5  
Prices of Fixed Broadband, Mobile Broadband and Mobile Cellular in Selected Countries, 2020

	Currency Applied	Fixed Broadband 5GB	Mobile Broadband Data only 1.5 GB	Mobile Data and Voice High Usage
China	as % of GNIpc	0.51	0.51	1.08
	PPP	7.18	7.18	15.23
	USD	4.28	4.28	9.08
Indonesia	as % of GNIpc	10.93	1.33	2.43
	PPP	99.64	12.14	22.16
	USD	34.81	4.24	7.74
Malaysia	as % of GNIpc	2.19	0.91	1.19
	PPP	49.8	20.81	27.06
	USD	19.64	8.21	10.67
Philippines	as % of GNIpc	7.85	1.36	2.9
	PPP	64.8	11.22	23.94
	USD	26.14	4.53	9.66
Singapore	as % of GNIpc	0.74	0.37	0.37
	PPP	47.69	23.89	23.89
	USD	35.81	17.94	17.94
Thailand	as % of GNIpc	3.29	1.18	2.66
	PPP	49.43	17.66	39.85
	USD	20.26	7.24	16.33
Vietnam	as % of GNIpc	3.92	1.04	1.87
	PPP	23.72	6.28	11.3
	USD	8.13	2.15	3.87

SOURCE: Author's compilation from ITU, <https://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx>

### 3. Policies towards the Digital Economy in Thailand

This section reviews key policies relevant to the digital economy in Thailand. Five major policies are reviewed, namely industrial transformation, investment promotion policy, digital plans, rules and regulations for digital activities and skill reformation policies.<sup>9</sup>

#### 3.1 Industrial Transformation

The Thai government has been active in promoting Industry 4.0 since 2014. The Thailand 4.0 Policy was launched in 2018 with the goal of transforming Thailand into a value-based economy. In the plan, ten industries were selected as new engines of growth (including digital industries).<sup>10</sup> The Eastern Economic Corridor (EEC), the newest special economic zone, was established under the General Prayuth Administration. The EEC straddles three eastern provinces of Thailand—Chonburi, Rayong and Chachoengsao—and is located off the coast of the Gulf of Thailand and spans a total of 13,285 square kilometres. The government hopes to turn this region into a hub for technological manufacturing and services with strong connectivity to its ASEAN neighbours by land, sea and air routes.

The law for trade and investment in the Eastern Economic Corridor (EEC) was approved by the Thai parliament on 1 February 2018 and published in the Government Gazette on 14 May 2018. Chaired by the Prime Minister, the EEC Policy Committee (EEPC) was established to implement and enforce the EEC. Three EEC Offices (EECOs) were set up as one-stop service centres in Bangkok, Laem Chabang Industrial Estate and Map Ta Phut Industrial Estate in Rayong to handle applications for permissions and licenses necessary for business operations in the SEPZ. Several legal authorities to approve licence applications under several laws (i.e., building control law, factory law, etc.) were transferred to the EEPC to simplify legal restrictions on foreign investment. The EECO also established an e-permission and privilege system to facilitate applications and approvals online.

The Board of Investment No. 6/2561 (2018) Investment Promotion Measures in the Eastern Economic Corridor (EEC) was launched to promote zones for specific industries. These included the following:

- (1) The EEC-A (Airport City), located near U-Tapao International Airport, Rayong province focused on activities related to an aviation training centre, freight centre and free trade zone;
- (2) The EEC-D (Digital Park) in Sriracha, Chonburi province was built to support digital business innovators;<sup>11</sup>
- (3) The EEC-I (Corridor of Innovation) in Wangchan Valley, Rayong province was constructed to help develop industrial technological innovation;
- (4) The EEC-MD (Medical Hub) in Bang Lamung District, Chonburi province, and EEC-H (High-Speed Rail) was designed to connect Don Mueang, Suvarnabhumi and U-Tapao International Airports; and
- (5) The EEC zone located at Burapha University (Bang Saen) was specified as a newly promoted zone focusing on genomics.<sup>12</sup>

Aside from the industrial estate mentioned above, there are also twenty-one promoted economic zones within existing industrial estates.

The COVID-19 pandemic prompted the General Prayuth Administration to rethink the ten targeted industries. More specifically, the Bio-Circular-Green Economy (BCG) Model was emphasized instead of all ten targeted industries. The four strategic areas emphasized for the BCG model are: (1) food and agriculture; (2) medical and wellness; (3) energy, material, and biochemicals; and (4) tourism and creative economy. It is claimed that, by focusing on these areas, Thailand would achieve comprehensive security in food, health, energy, employment and sustainable natural resources and the environment.<sup>13</sup> Two BCG committees have been established, namely, the BCG Policy Board of Directors, chaired by the Prime Minister, and the BCG Model Implementation Committee, chaired by the Minister of Higher Education, Science, Research and Innovation. The BCG has been adopted as part of Thailand's national agenda since January 2021.

The Thai government has invested heavily in infrastructure to enhance the connectivity of these three provinces with the world. There are 168 infrastructure projects that have been planned with a total budget of THB988 billion. Five infrastructure projects were initiated in 2020 by the Eastern Economic Corridor Policy Committee (EECPC): the high-speed train route linking Suvarnabhumi, Don Mueang and U-Tapao airports; the third phase of Map Ta Phut port; the third phase of Laem Chabang port; and a centre to handle the maintenance, repair and overhaul of planes.<sup>14</sup> Other projects include the double-track railway and the expansion of the inter-city motorway. The Office of Transport and Traffic Policy and Planning (OTP) has claimed that sixty-nine infrastructure projects, which account for 41 per cent of all infrastructure projects in the EEC were completed by 2021.<sup>15</sup> Another sixty-five projects (or 39 per cent) are still under construction, including the five key infrastructure projects mentioned earlier.<sup>16</sup>

### *3.2 Investment Promotion Policy*

The Board of Investment was established in 1966 as an independent office to encourage foreign investment. The agency decides which firms receive promotion privileges.<sup>17</sup> Investment promotion measures included both tax-based incentives (such as tax concessions on imported machinery, equipment, and raw materials inputs) as well as non-tax-based incentives (including permission to recruit skilled personnel and experts to work in promoted activities as well as permission to own land). The Investment Promotion Act was amended in 1999 to abolish the privileges granted to promote export-oriented activities in accordance with

the WTO commitment to trade-related investment measures (TRIMs) agreement. It was further amended in 2009 when a corporate income tax (CIT) exemption was introduced and granted to skill formation, technological upgrading and innovation activities.

A major change took place in 2017 in the wake of an amendment included in the BOI investment promotion plan (2015–21). The main purpose of the amendment was to promote activities enhancing national competitiveness through research and development (R&D) and innovation. Additional incentives were granted to support the new policy package known as Thailand 4.0. In addition, ten newly targeted industries were selected to serve as new and more sustainable growth engines, along with the establishment of the Eastern Economic Corridor (EEC). The incentives provided by the BOI for the newly targeted industries also comprise a combination of two sub-incentive schemes; one involves activity-based incentives and the other merit-based. However, the activities in each category are different (Table 6). The list of activities is divided into seven categories (A\*, A1–A4 and B1–B2) according to their involvement in technology and innovation. The A\* category covers activities that are classified as support-targeted technology such as nanotech, biotech, advanced material and digital technologies. The A1 category includes knowledge-based activities focusing on R&D and design, and the A2 category covers incentives for infrastructure activities using advanced technology to create value-added benefits. For the merit-based incentives, additional incentives are stipulated for activities that generate added value for the economy in three areas, namely competitiveness enhancements, decentralization and industrial area developments. Incentives for investors take the form of corporate income tax (CIT) exemption (up to a maximum of thirteen years),<sup>18</sup> exemption of import duties on machinery and raw materials used in R&D and/or exports, and non-tax incentives, such as access to long-term land leases and work visas. The adjusted incentive package provided by the Thai BOI tends to be one of the most generous in Southeast Asia (Jongwanich 2022).

All activities eligible for promotion are shown in Table 7. Except for “Technology and Innovation Development” (Section 8), most of the eligible activities receive privileges under A3 and A4 levels, comprising around 50 per cent of total activities in the corresponding section. For the eligible activities in Section 8, all receive privileges at the A\* level, while those in Section 7 (about 30 per cent of all activities), obtain promotion at A1. Interestingly, although the country includes agriculture and biotechnology, food for the future, smart electronics, and biofuels and biochemicals in the ten newly targeted industries, the proportion of eligible activities in Sections 1, 4, 5, and 6 compared to privileges at A\* and A1 is noticeably small (Table 7). This casts doubts on the ultimate effectiveness of such incentives in promoting the targeted industries.<sup>19</sup>

### 3.3 Digital Plans under the Ministry of Digital Economy and Society (MDES)

The Thai government has emphasized the importance of digital development (especially ICT) since the mid-1990s as a means to enhance productivity and promote long-term growth. The country’s first plan at the national level, the Thailand National IT Policy (1996–2000), was introduced in the mid-1990s. Since then, several national-level plans have been launched:

- Thailand Information and Communication Technology (ICT) Policy Framework (2001–10);
- Thailand Information and Communication Technology (ICT) Master Plan (2002–6);<sup>20</sup>
- National Broadband Policy (2010);
- Information and Communication Technology Policy Framework (2011–20);
- Universal Service Obligation (USO) Master Plan for Provision of Basic Telecommunication Services (2012–14);

TABLE 6  
Privileges from BOI for Activities Classified under Groups A and B, 2017 Onwards

	Activity-Based Incentives			Merit-Based Incentives			
	Exemption of Corporate Income Tax	Exemption of Import Duty from Machines	Exemption of Import Duty on Raw Materials*	Non-Tax Incentives**	Competitiveness Enhancement***	Decentralization****	Industrial Area Development*****
A1*	✓	✓	✓	✓	1-3 years	3 years	1 year
A1	✓	✓	✓	✓	1-3 years	-	-
A2	✓	✓	✓	✓	1-3 years	-	-
A3	✓	✓	✓	✓	1-3 years	3 years	1 year
A4	✓	✓	✓	✓	1-3 years	3 years	1 year
B1	✓	✓	✓	✓	1-3 years	3 years	-
B2	X	✓	✓	✓	-	-	-

NOTE: \*This is applied for activities relating to R&D and exports; \*\* Non-tax incentives include permits to own land, to transfer money out of Thailand and permission to import foreign workers. \*\*\* Additional cap as a percentage of investment or expenses increases up to 300 per cent and additional corporate income tax exemption is provided, i.e., 1 per cent or less than THB200 million, investors receive 1 year additional, 2 per cent or less than THB400 million, they receive 2 years additional, 3 per cent or less than THB600 million, they receive 3 years additional. \*\*\*\* The 20 provinces with the lowest per capita income, e.g., Kalasin, Chaiyaphum, Nakhon Phanom, Nan, Bueng Kan, Phrae, Maha Sarakham, Mukdahan, Mae Hong Son. SOURCE: Board of Investment, Thailand.

TABLE 7  
Eligible Activities for BOI Promotion, 2017 Onwards

Section	Proportion of Eligible Activities (Percentage of Total Eligible Activities)					
	A1*	A1	A2	A3	A4	B1, B2
Section 1: Agriculture and Agricultural Products	0.00	4.00	24.00	40.00	24.00	8.00
Section 2: Mining, Ceramics and Basic Metals	0.00	0.00	17.86	28.57	17.86	35.71
Section 3: Light Industry	0.00	4.17	8.33	12.50	37.50	37.50
Section 4: Metal Products, Machinery and Transport Equipment	0.00	3.23	35.48	22.58	19.35	19.35
Section 5: Electronic Industry and Electric Appliances	2.13	6.38	12.77	34.04	31.91	12.77
Section 6: Chemicals, Paper and Plastics	0.00	0.00	23.81	33.33	23.81	19.05
Section 7: Services and Public Utilities	7.81	28.13	10.94	31.25	4.69	17.19
Section 8: Technology and Innovation Development	100.00	0.00	0.00	0.00	0.00	0.00
Total	4.10	9.84	17.21	29.10	20.08	19.67

SOURCE: Author's calculations based on information provided by the Board of Investment, Thailand.

- National Master Plan for Digital Development (2018–37);
- Thailand Strategic Digital Plan for Economic and Social Development, MDES (2020–24); and
- Thailand Digital Plan DEPA (2018–22).

The more recent of the above plans are in line with several national development strategies, namely: (1) the twenty-year National Strategy (2018–37), the country's first national long-term strategy development pursuant to the constitution; (2) the National Strategy on Competitiveness Enhancement; and (3) the Twelfth National Economic and Social Development Plan (2017–21).<sup>21</sup>

The Ministry of Information and Communication Technology (MICT) was established in 2002 as the sole ministry responsible for implementing all relevant plans and measures with jurisdiction over all related government agencies. The ministry was renamed the Ministry of Digital Economy and Society (MDES) in 2016 in line with its broader scope. There are three government agencies under MICT, namely, the National Statistical Office, the Meteorological Department and the Post Office. All state-owned enterprises and public organizations related to ICT services are under MDES's jurisdiction. These include the Telephone Organization of Thailand (TOT), the Communications Authority of Thailand (CAT), the Electronic Government Agency (Public Organization) (EGA), and the Electronic Transactions Development Agency (Public Organization) (ETDA). More importantly, the Software Industry Promotion Agency (SIPA) has been replaced by the Digital Economy Promotion Agency (DEPA), which has become the workhorse to promote and support the development of digital industry and innovation as well as the adoption of digital technology.<sup>22</sup>

The twenty-year National Master Plan for Digital Development (2018–37) has four goals: (1) increasing the country's competitiveness; (2) equalizing opportunities for all Thais in terms of access to broadband Internet as a basic utility; (3) human capital—by ensuring that all Thais will be digitally literate; and (4) government reform. There are four phases in the plan, beginning with the building of a



digital foundation in Phase I which covers the first one and a half years. This is followed by the next five years of Phase II (the inclusion phase), in which all citizens will reap the benefits of digital technology. This will be followed by Phase III which covers another ten years during which the economy will enter the full digital transformation phase, i.e., the economy will be driven by digital, technology and innovation (by 2028). Finally, Thailand plans to be a global digital leader in Phase IV lasting twenty years (Figure 6).

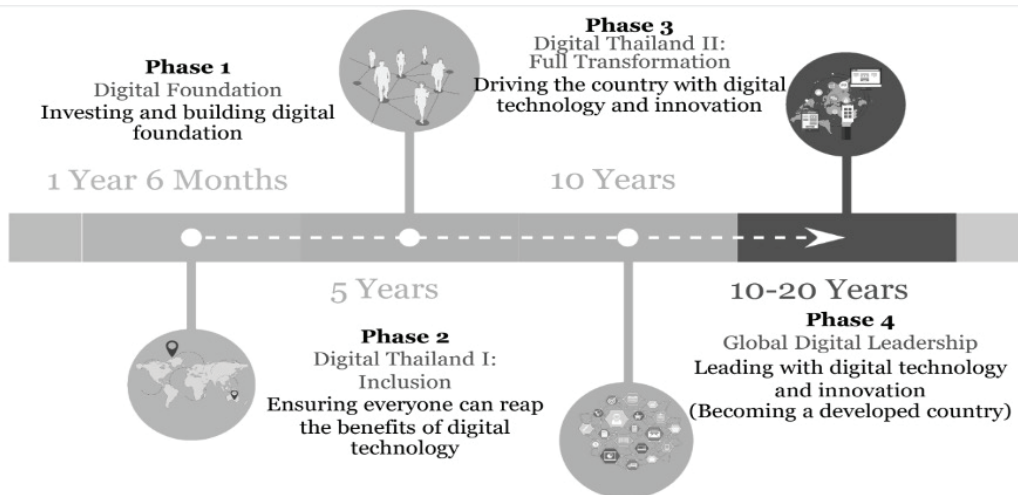
There are six strategies to reach the goals of the four phases:

- (1) Building the country's digital infrastructure with affordable prices;
- (2) Driving the economy with digital technology, especially the new s-curve;
- (3) Building a quality and equitable society through digital technology;
- (4) Transforming the economy by using digital government;
- (5) Developing a workforce for the digital era; and
- (6) Building trust and confidence in the use of digital technology.

The government has set several key goals for the next ten years. These are to ensure that: (1) Thailand is in the list of top fifteen most developed countries as ranked by the World Competitiveness Scoreboard; (2) digital industries contribute 25 per cent of GDP; (3) every citizen has access to broadband as a public utility; (4) Thailand is ranked one of the forty most developed countries by the ICT Development Index (IDI); (5) every citizen is aware of and knowledgeable in digital literacy; and (6) Thailand is ranked one of the fifty most developed countries in terms of e-government by the UN E-Government Survey.

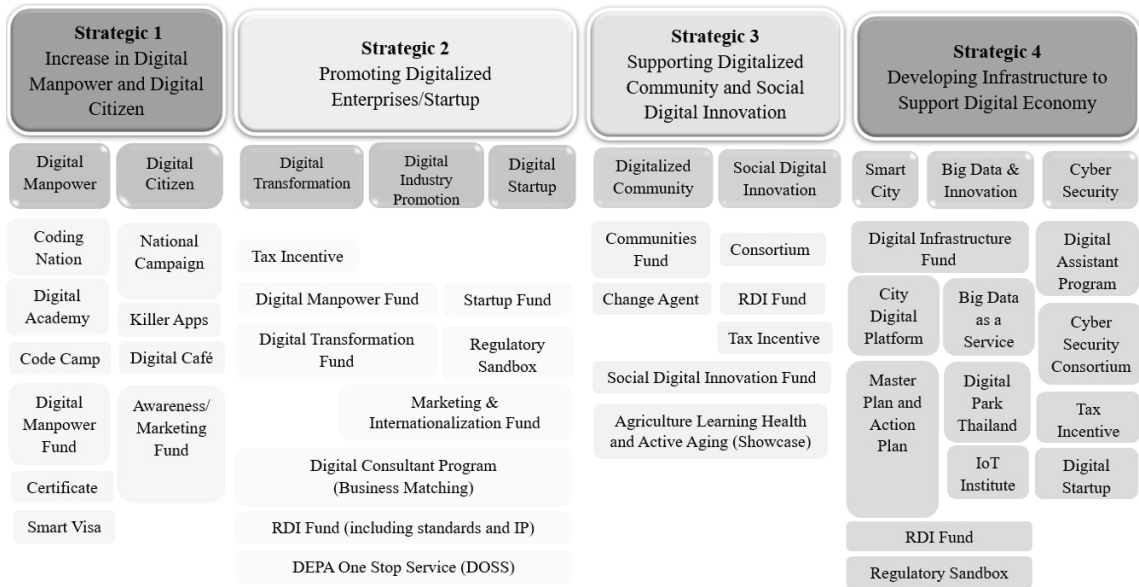
In terms of implementation, various units in the government are responsible for setting up their plans in line with the twenty-year National Master Plan for Digital Development (Figure 7). For example, the Ministry of Digital Economy and Society (MDES) has set up the Strategic Digital Plan for Economic and Social Development for 2018–21 and 2020–24. The Office of the Permanent Secretary launched the

FIGURE 6  
Twenty Year-National Master Plan for Digital Development (2018–37)



SOURCE: Ministry of Digital Economy and Society.

FIGURE 7  
Thailand’s Key Digital Development Plans



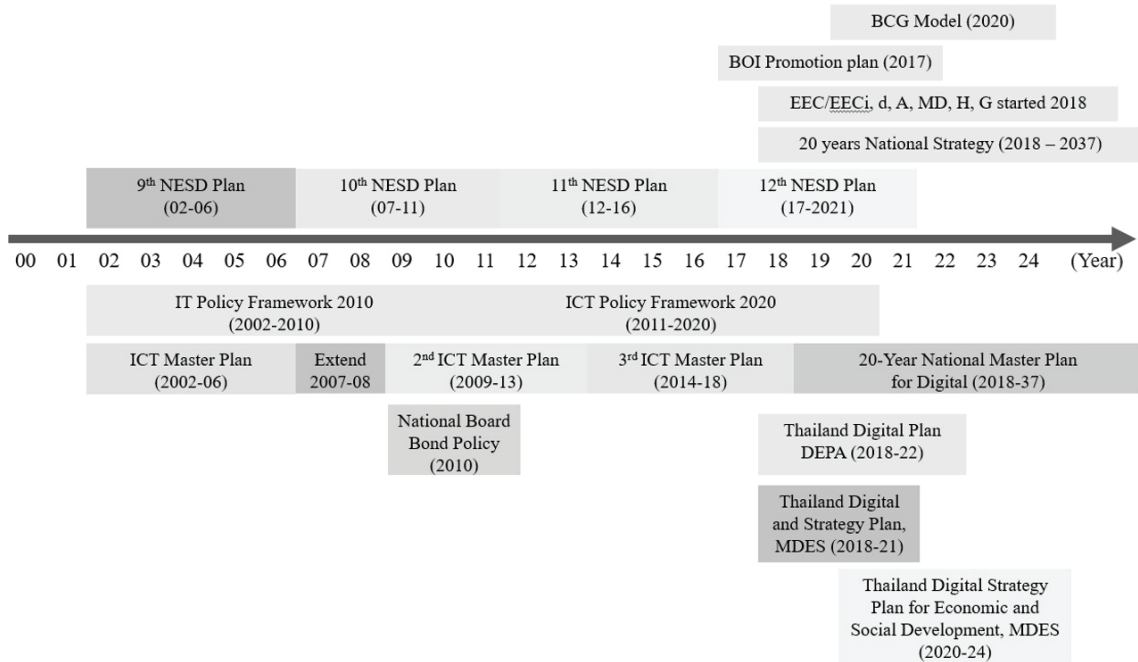
SOURCE: Author’s compilation.

Strategic Plan for 2020–24 while the Digital Economy Promotion Agency (DEPA) launched the Thailand Digital Plan for 2018–22.

In the case of MDES’s Strategic Digital Plan for 2018–21, only four strategies, which are sub-set of the twenty-year National Master Plan, were adopted. They are: (1) developing a digital foundation; (2) increasing competitiveness and improving quality of life; (3) encouraging digital services; and (4) improving the accuracy of weather/earthquake forecasts/warnings using digital technologies and innovation. For MDES’s Strategic Digital Plan 2020–24, all six strategies in the twenty-year plan are included. Interestingly, although these two plans have strategies and time overlap, indicators to measure accomplishments are different. For instance, to develop the digital foundation, the 2018–22 plan uses the Network Readiness Index, which was expected to improve by two ranks every year (from sixtieth to fifty-second in 2021). The 2020–24 plan has a different set of indicators and applies the index of the World Competitiveness IMD to measure accomplishment.

Four key strategies in the DEPA’s Digital Plan (2018–22) were launched in 2018.<sup>23</sup> These four strategies are also sub-strategies in the twenty-year National Master Plan for Digital Development. They are: (1) increase in digital human resources and digital citizens; (2) promoting digitalized enterprises/start-ups; (3) supporting digitalized community and social digital innovation; and (4) developing infrastructure to support the digital economy. There are ten programmes in the plan. Each plan’s achievements are measured by a set of indicators, such as digital manpower, digital citizens, digital transformation, digital industry promotion, and digital start-up (Figure 8). The indicators are to some extent different from those set by MDES and the Office of the Permanent Secretary. For example, under the 2018–22 plan under DEPA, indicators of Strategy 2 are: (1) the annual value of the digital industry (hardware, software, digital services, communication, digital content) should be 10 per cent of GDP; and (2) a total of 1,000

FIGURE 8  
Digital Plan Developed by the Digital Economy Promotion Agency (DEPA)



SOURCE: DEPA.

digital SMEs and digital start-ups should be added into a market during 2018–22. For the 2018–21 and 2020–24 plans of MDES, the indicators relating to the promotion of the digital economy are: (1) the value of e-commerce (measured in terms of total sales) to be 2 per cent of total sales in 2018–21 and the percentage growth of 10 per cent per year in 2020–24; and (2) and digital start-ups to increase annually by 300 firms in 2018–21 and 2020–24.

### 3.4 Rules and Regulations for Digital Activities

Rules and regulations relating to the digital economy have been put in place in Thailand and they are in line with those existing in other Asian countries. They are also consistent with international practices such as the United Nations Convention on the Use of Electronic Communications in International Contracts (UNCITRAL), the recommendations of the Council concerning Guidelines governing the Protection of Privacy and Transborder Flows of Personal Data by OECD, the APEC Privacy Framework and the EU's General Data Protection Regulation (GDPR), among others.

Digital laws in Thailand can be divided into three groups, namely: (1) laws relating to digital infrastructure and trade facilitation such as electronic transaction law, digital ID and the Penal Code; (2) laws relating to consumer protection and business trust such as Consumer Protection Act, Copy Right Act, the Direct Sales and Direct Marketing Act, and Unfair Contract Terms Act; and (3) laws relating to securing the digital ecosystem such as the Personal Data Protection Act and the Cyber Security Act.

For the first group, Thailand introduced The Electronic Transactions Act of B.E. 2544 (2001) in 2001. This Act provides legal acknowledgement of electronic transactions as having the same legal status as transactions conducted by traditional paper means. The Act aims to promote the reliability of electronic commerce by recognizing that data messages are the same as messages in writing and by recognizing the use of electronic signatures. The Electronic Transactions Act was amended in 2019 [the Electronic Transactions Act (No. 3) B.E. 2562 (A.D. 2019)] by strengthening the evidence relating to electronic transactions and by providing conditions to ensure a legal consequence when no signature is signed in a digital document.<sup>24</sup> In addition, the Digital ID Bill was in principle approved by the Cabinet in 2018. The Bill supports a digital ID system aimed at facilitating and expediting the processes of identity verification via online platforms. The system is intended to eliminate the need for repeatedly undertaking traditional Know-Your-Customer (KYC) of end-users held by other members of the systems.<sup>25</sup> The Royal Decree of B.E.2551(2008) was enacted in 2008 to monitor the business operation of electronic payment services. The Penal Code B.E.2547 (2004) was also legislated to cover electronic card payment including having provisions on e-card forgery.

Regarding the second group, various Acts have been enacted to protect consumers and create business trust. The Consumer Protection Act of B.E. 2522 (1979) was introduced in 1979 and amended in 2019 [The Consumer Protection Act (No. 4) B.E. 2562 (2019)]. This Act protects consumers against false, misleading and unfair advertising of goods and services. It guarantees that consumers shall have the same rights regardless of whether the transaction is carried out electronically or by traditional means. The amended Consumer Act in 2019 strengthened consumer protection in terms of product/service safety. The Goods and Services Safety Committee was established with powers to examine the safety of enterprises' goods and services. The maximum amount of fines for violations was increased in the new Act.<sup>26</sup>

As electronic transactions can be used for direct marketing, the Direct Selling and Direct Marketing Act of B.E. 2545 (2002) is relevant to sellers or providers offering goods and services through this channel. Under the law, customers shall have the right to terminate a contract within an agreed period and sellers are also obligated to provide statements in Thai for e-transaction customers. The Copyright Act 2558 (2015) amendment, which supersedes the Copyright Act B.E. 2537 (1994), is another relevant legislation for the digital economy.<sup>27</sup> Under the new Act, a stricter notice and take-down scheme were introduced. A copyright owner can send a notice to the service provider to remove violated copyright works from computer systems. The online service provider must without any delay remove all such materials. However, the online service provider is also entitled to lodge a swift counter-notification.

It is noteworthy that, in 2021, Thailand's online dispute resolution platform (Talk DD), which is a cooperation between the Department of Intellectual Property (DIP) and the Thailand Arbitration Centre (THAC), was introduced to support and facilitate out-of-court dispute resolutions. The platform can be used for cases relating to copyright, patents and trademark contraventions. Four procedures are introduced in the platform, including filing claims, negotiation, mediation and arbitration. The EU and US also have an online dispute resolution (ODR) platform. While the former has direct supportive laws, namely ADR 2003/11/EU and ODR regulation 2015, the latter does not have direct supporting laws but relies instead on the Electronic Act. The EU has the ODR platform centre while the US allows enterprises to set up the ODR platform.

Another noteworthy point is that, on 15 July 2021, the MDES (Ministry of Digital Economy and Society) and the ETDA (Electronic Transactions Development Agency) held the second public hearing on the draft of the Royal Decree on Digital Platform Service Businesses (DPSB Law), which is planned to be enacted under the Electronic Transactions Act. The objectives of this decree are to protect consumers and enhance digital platforms' credibility. In the current version of the draft law, a digital platform services provider located outside Thailand but provides services to Thai consumers, is subject to the DPSB law

and is required to appoint a local representative in Thailand. In addition, the ETDA has the power to determine the terms and conditions of services for large-scale digital platform service providers. These terms and conditions include the system of consumer feedback and dispute resolution and the exclusion of SMEs with fewer than five employees with an annual turnover of not more than THB1.8 million.

The third group of laws focuses on building a secure digital ecosystem. The Personal Data Protection Act B.E. 2562 (2019) (PDPA) and Cyber Security Act B.E. 2562 (CSA) were introduced in addition to the Computer Crime Act of B.E. 2550 (2007) which was amended in 2017. The Computer Crime Act specifies measures to prevent and suppress computer-related criminal acts, especially those related to computer systems, computer data and tools used in committing computer crime, as well as to enforce obligations of Internet service providers such as storing computer traffic data and keeping the necessary information of the service users. The Computer Crimes Act was amended in 2017 to address the issue of spam emails. The Act also established the Settlement Committee, which has the power to settle a case via the payment of fines for infringements involving the transfer of false information into a computer. The Computer Data Screening Committee was also established with the power to block or destroy any data through a court order.

However, the amended Computer Crime Act did not provide sufficient coverage of national security relating to cyberspace and personal data protection. Although Thailand has some laws relating to data protection, such as the Credit Information Business Act B.E. 2545 (2002), these laws are only relevant to certain products. For example, the Credit Information Business Act B.E. 2545 (2002) imposes measures to protect only credit information.<sup>28</sup> The Cyber Security Act B.E. 2562 (CSA) was enacted and became effective on 28 May 2019. This act aims to provide national security for cyberspace and the safety of the underlying infrastructure relevant to the digital economy.<sup>29</sup> Under the Act,<sup>30</sup> infrastructure service providers must comply with four key obligations, including: (1) regularly (at least once a year) conducting cyber security risk assessments; (2) creating and implementing sector-specific mechanisms, procedures and code of conduct to monitor and solve cyber security threats; (3) notifying the Office of the National Cyber Security Committee (ONCSC) the names and contact information of owners, processors of the computers and administrators; and (4) reporting cyber security threats to the ONCSC.

The Personal Data Protection Act B.E. 2562 (PDPA) was established in 2019. Several of the principles in the Act are drawn from the EU's General Data Protection Regulation 2016/679 (GDPR). The PDPA applies to: (1) controllers and processors located in Thailand regardless of how personal data<sup>31</sup> are sourced; and (2) controllers and processors located outside Thailand in which their data subjects involving goods and services are offered and monitored in Thailand. Under the PDPA, consent for the collection, usage and disclosure of the personal data from data subject is required, with some exceptions (e.g., (1) when data collection, usage and disclosure lead to prevention/suppression of danger to personal life or health, (2) when data are used for statistics or research provided appropriate measures have been put in place to protect such data information). A privacy notice must also be provided prior to personal data being collected and valid consent must be obtained using the set of criteria developed in the PDPA such as providing a clear purpose for the data collection, use or disclosure; an easily accessible and intelligible form of the request for consent. According to the Act, a data controller has an obligation to keep personal data secure, particularly in ensuring that personal data are destroyed once the maintenance period expires. Regarding cross-border data transfer, a data controller can transfer personal data to a foreign country only when the foreign country has adequate data protection standards. However, the guideline regarding this issue is yet to be established in Thailand. It is noteworthy that, in 2019, the first digital government law, the Digitalization of Public Administration and Service Delivery Act, B.E. 2562 (2019), was enacted. The Act focuses on three key areas, including: digitalizing working processes and services; integrating government agencies for providing comprehensive digital services; and establishing e-government data for reusing and creating innovations.

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### 3.5 Skill Reformation Policies

Thailand has implemented policies related to skill reformation as well as assistance to firms to install automation with the goal of moving Thailand towards enhancing its digital economy. The Department of Skill Development (DSD) under the Ministry of Labour is the prime government agency in charge of these policies. The key policy of the DSD is to train fresh graduates for the labour market as well as to improve the skills of existing workers. In addition, the DSD also provides financial support to establishments to enhance their workers' skills.

In addition, there have been several policies that are freshly introduced to support Industry 4.0. For example, the Vocational Education Commission (VEC) under the Ministry of Education launched skill manpower plans to upskill local workers through the Co-operative Education Programme. The Programme provides students with the experience of working in factories and experiences are credited to their graduation. The Sattahip Model is a clear illustration of the Co-operative Education Programme of VEC. Many agencies in the Ministry of Industry (including the Office of Industrial Economics (OIE), Department of Industrial Promotion (DIP), National Innovation Agency (NIA), and Thailand Productivity Institute (TPI)) launched policy measures that cover both the re-training of workers and the installing of automation. Other government agencies involved are the National Science Technology and Innovation Policy Office (NSTIP) and the Ministry of Higher Education, Science, Research, and Innovation. These agencies offer opportunities for upscaling science-based skills and assistance for firms in installing automation.

The existing policies and measures across the various government agencies overlap each other to a large extent. In this circumstance, it is unlikely for Thailand to create an innovation-based institution where firms are recognized as the prime agency in charge and are able to seek assistance. The DSD's activities cover such activities for around 500,000 workers (dominated by workers already in the market (60 per cent)). It accounts for around 1.3 per cent of the total workforce. The types of occupational skills the DSD offers include electricians, plumbers, constructors, and service-related. The purpose of the DSD programmes does not seem to be the promotion of establishment productivity. Instead, such programmes are only helpful to workers when they are dismissed from their current jobs. The problem is worse when we look at the financial support to the establishments. From 2009 to 2013, the support was similar to the R&D expenditure tax deductible. It turns out that few firms applied for support. The expense per worker spent was unusually small, which implies that there were any fruitful improvements in the skills of workers. For example, the expense per worker was THB848 (US\$25) in 2011 and this dropped to THB350 (US\$15) in 2013. From 2014 onwards, the DSD altered the programme by providing financial loans with a ceiling of THB1 million a year. The application process for these loans, which involves a lot of documents and screening processes, was primarily designed to prevent any opportunistic behaviour. It turns out to be unattractive for firms with potential and needs. Struggling firms applied for the fund and were unable to repay the debt. Note that recently there were changes in the training activities observed on the DSD website (6 March 2019) to place firms in a better position to harness the Industry 4.0 revolution. There are many activities designed to enhance firms' productivity, especially in the area of automation skills. These activities include the adoption of programmable logic controllers (PLC) in manufacturing, computer coding for machines, the installation of the Internet-of-things (IoT) technology within agriculture plantations and embedding system design for industry and 3D animation. At this point, it is difficult to assess the relative effectiveness of such initiatives.

## 4. Policy Evaluation

The digital economy has played an important role in Thailand and the country's digital infrastructure has also improved noticeably over the past decade. However, there are some concerns regarding digital

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development in Thailand in terms of the relatively low investments in digital and digital-related industries, unequal access and insufficient infrastructure, as well as the lack of ICT skills. All these concerns are related to policies established in the country.

The deteriorated business environment in the country, especially after COVID-19, explains the relatively low levels of investment. The BOI incentives placed too much emphasis on particular locations, especially in the Eastern Economic Corridor (EEC). They ignored existing development clusters involved in producing key digital products. These include the electronic sector clusters in Pathum Thani, Phra Nakhon Si Ayutthaya and Samut Prakan; the automotive sector (auto parts) clusters in Samut Prakan, Prachinburi, Phra Nakhon Si Ayutthaya and Chachoengsao. In addition, delayed infrastructure development, especially those linking the EEC with other parts of Thailand, could have imposed additional burdens on the sustainable development path towards the digital economy. Jongwanich (2021) shows evidence that the unattractiveness of new BOI incentives for existing firms, especially those in electronics/electrical appliances and machinery and equipment, in expanding production at their established locations outside of the EEC limited the potential windfalls available as a side effect of the US-China trade war in 2018 compared to other Asian countries.

In addition, creating uncertainty for (foreign) investors, particularly those involved in the targeted industries, could jeopardize the investment climate and lessen the overall investment level. As mentioned earlier, the government has begun to pay attention to the Bio-Circular-Green Economy (BCG) Model, which emphasizes four strategic areas (including food and agriculture; medical and wellness; energy, material, and biochemicals; and tourism and creative economy)<sup>32</sup> instead of the ten targeted S-curve and new S-curve industries. The attempts to pick up winners beyond the country's existing comparative advantage space could lead to economic inefficiency and policy uncertainties (for investors).

The budget allocations have an unclear target(s) and those budget allocations for the Ministry of Digital Economy and Society have been relatively small compared to other Ministries. The allocation for MDES declined from THB20,173 million in 2017 or 0.7 per cent of the total budget in 2017 to THB6,825 million or 0.2 per cent of the total budget in 2022 (see Appendix 1). In addition, the budget allocations for the Ministry of Education and Ministry of Higher Education, Science, Research and Technology<sup>33</sup> also declined during this period, from around 20 per cent in 2017 to about 15 per cent in 2022. The deficiency in the budget allocated and inefficient use of the allocated budget are the key obstacles to building hard and soft digital infrastructure and promoting the digital industry.

Regarding digital plans, there are various concerns related to plan setting and enforcement to transform the economy. First, there is a lack of continuity in the policy framework over the various plans. This results in difficulties in following up on the progress of the country's digital development. For example, in the 2010 ICT policy framework (2001–10), enhancing Thailand's ranking in the Technology Achievement Index (TAI) and increasing the total workforce of ICT workers to 30 per cent of the workforce by 2010 were set as priority goals. In the 2020 ICT policy framework (2011–20), the goals of achieving better TAI were abandoned while the quality of human resources was set in terms of information literacy of the population (75 per cent of the population) instead of setting indicators by using the proportion of ICT workers in the total workforce. In addition, the 2010 ICT policy framework set a target for knowledge-based industry to be 50 per cent of GDP while in the 2020 ICT policy framework, there was no target regarding the knowledge-based industry. It was replaced by a target for the ICT industry set at 18 per cent of GDP.

Second, the strategies and measurements set in various organizations, which are crucial drivers for digital transformation, are inconsistent. For example, in the twenty-year National Master Plan for Digital (2018–37), the World Competitiveness Scoreboard (set to be one of the fifteen most developed countries in 2028) and the ICT Development Index (one of the forty most developed countries for creating equal opportunity regarding ICT) are used as measurements while the MDES's Strategic Digital Plans (2018–21

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and 2020–24) paid attention to achieving improvements in Network Readiness Index (two ranks every year from sixtieth for 2018–21) and the Global Data Index (improve ranking from thirty-six to twenty-eight in 2018–21). The Strategic Digital Plan of MDES (2020–24) has paid attention to confidence in using the Internet (developed by the CIGHpsos Global Survey) and has also set a less ambitious plan to reach a better position on World Competitiveness Scoreboard compared to the National Master Plan (i.e., to be ranked twenty-ninth in 2024). Plans established by the Office of the Permanent Secretary and DEPA have not included these indicators.

In addition, the lack of cooperation among government agencies has led to inefficient budget utilization and possibly delays in development outcomes. For example, various government agencies have introduced policies to improve labour skills for serving Industry 4.0, including the Vocational Education Commission (VEC), Ministry of Education as well as the various agencies in the Ministry of Industry (including the Office of Industrial Economics (OIE), Department of Industrial Promotion (DIP), National Innovation Agency (NIA), and Thailand Productivity Institute (TPI), National Science Technology and Innovation Policy Office (NSTIP), Ministry of Higher Education, Science, Research and Innovation, as well as DEPA, working together with the Department of Skill Development (DSD), Ministry of Labour). The measures across several government agencies overlap to a large extent. In addition, there is the possibility of inefficient budget utilization. Under these circumstances, it is unlikely for Thailand to create innovation-based institutions that recognize firms/investors as the prime agency in charge of seeking public assistance.

Third, the measures and targets in the various plans have been too simple and easy to complete. This is possibly due to the risk and uncertainty involved in achieving the targets. Metrics such as the number of policies launched, training programmes, and information dissemination schemes are set as the top priorities of some government agencies. For example, the Office of the Permanent Secretary emphasizes the number of policies for the digital economy as well as the number of illegal websites detected. In this case, the number of policies for the digital economy (and cybersecurity) should be at least two policies per year while policies relating to communication cooperation should be at least one policy per year. The target for the number of illegal websites detected is five every year while the staff should receive at least five training sessions per year. The setting of too simple and easy-to-complete measures could make strategic plans worthless and slow down the development path towards the digital economy. In addition, introducing too many policies could impose more burdens on enterprises and jeopardize the business environment, which eventually creates an adverse impact on digital transformation in the country.

According to the UNCTAD Global Cyberlaw Tracker, digital laws developed so far in Thailand have been in line with International Standards, broadly covering e-transaction, consumer protection, privacy and data protection and cybercrime laws. Although Thailand has made progress in developing digital laws, there are still some aspects that could be improved to serve the rapid pace of digitalization in the country. For example, although the procedure for applying for Thailand's online dispute resolution (ODR) platform has been established, there has been no clear regulatory framework for resolving disputes. Impartiality, independence, confidentiality/security, as well as affordability are still concerns when applying for an ODR in Thailand. A clear regulatory framework for online dispute resolution should be established beyond domestic dispute settlement as the volume of cross-border online transactions is increasing rapidly. Establishing a trademark scheme could also help enhance online services' credibility as well as assist the dispute resolution process. In addition, the ODR established in Thailand tends to follow the standards set by UNCITRAL and ADR under the EU. It covers consumers dealing in Business to Consumer (B2C) and Business-to-Business (B2B) transactions but not consumers dealing in Consumer-to-Consumer (C2C) transactions.

Second, there are concerns among service providers in terms of uncertainty about the new requirements and unreasonable burdens arising from the cybersecurity and personal data protection laws enacted in



2019. These laws provide greater government authority to demand confidential and sensitive information from IT service providers potentially. The government needs to achieve a good balance between providing a secure environment and creating a conducive business environment for promoting the digital economy. Regarding data localization requirement (DLR), Thailand has not implemented any specific policies to require (foreign) service providers to localize their data, turnover source code, as well as provide access to scrutiny. Foreign investors are also not required to use domestic content in technology, but are encouraged to do so in government procurement.

Nevertheless, such laws raise concerns about DLR and economic burdens to investors. In addition, imposing DLR contradicts some Free Trade Agreements' clauses such as the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP) framework, which bans the imposition of DLR. Thus, DLR should be introduced with caution.<sup>34</sup>

Another area of concern relates to the cross-border data transfer rule established in the Personal Data Protection Act B.E. 2562 (PDPA) which allows a data controller to transfer personal data to only a foreign country in which adequate data protection standards are established. However, the guideline for a case where the foreign country has no data protection standards has not been established. The establishment of such guidelines should be considered to help facilitate and effectively secure cross-border data transfer.

Established rules and regulations need to be monitored and modernized in line with the rapid pace of digitalization in the economy. Four regulatory issues, including online consumer protection, cross-border data flow restrictions, competition policy and tax on digital services, need to be strengthened. There is no clear rule in the country's competition policy on how to deal with the adverse effects of digital MNEs' anti-competition practices on indigenous firms. The laws on consumer protection and cross-border data flow should be strengthened and modernized, particularly in areas such as electronic data interchange, electronic fund transfer, electronic commerce criminal code and computer-related crime. In terms of taxes on cross-border e-commerce, a 7 per cent VAT on electronic services has been imposed on overseas electronic service providers and online platforms according to the Act Amending Revenue Code No. 53 that was announced on 10 February 2021.<sup>35</sup> The introduction of the VAT on electronic services was partly due to concerns about government revenue shortages and the rise in government debt during the COVID-19 pandemic. However, the government should closely monitor the consequences of the VAT imposition, especially in terms of whether the VAT costs were transferred to consumers and whether there was an adverse impact on the business environment.

## **5. Conclusion and Policy Implications**

This study aims to review the development of Thailand's digital economy. It describes and analyses the key policies and laws that have been introduced or modified to support the digital economy. Five key policies are reviewed in this study, including industrial transformation, investment promotion policy, digital plans, rules and regulations for digital activities and skill reformation policies.

Thailand measures the digital economy using two definitions. The first is a narrow definition proposed by OECD (2020) and UNCTAD (2019), which considers only the supply side of digital market value. The Digital Economy Promotion Agency (DEPA) under the Ministry of Digital Economy and Society (MDES), in partnership with the IMC Institute, applies the narrow definition to conducting Digital Market Surveys and Forecasts. The second definition is based on the broader definition proposed by the OECD (2020), which defines the digital economy as all economic activity reliant on, or significantly enhanced by using digital inputs. The Office of the National Digital Economy and Society Commission (ONDE) measures the digital contribution to GDP by employing the broader definition. Regardless of the definitions used, both surveys found that the trends in the digital industry in Thailand are promising, particularly in digital services and other service sectors involving digital technology such as health and logistics. However,

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both surveys reveal some interesting trends, namely, the relatively low levels of investment in the digital economy, the modest penetration of digital technology in the manufacturing and agriculture sectors and the small proportion of advanced IT-skilled workers.

Various infrastructure and accessibility indicators show that digital infrastructure has improved in Thailand over the past decade. However, unequal access to ICT, relatively higher prices of digital-related technologies and low ICT skills are still the key obstacles to moving the country forward. In addition, the BOI investment promotion certificates focus on investments in Eastern Economic Corridor (EEC) area, i.e., Chonburi, Rayong, and Chachoengsao. This raises concerns about whether digital infrastructure and related matters in the digital industries are sufficient and evenly distributed in the rest of the country. It is argued in this study that these concerns could perhaps be related to policies that have been established in the country so far. These concerns include the concentration of investments in the Eastern Economic Corridor (EEC), new Board of Investment (BOI) incentives and the delayed infrastructure development linking the EEC with other parts of the economy. Budget deficiency (and inefficient budget utilization) could become another key obstacle in building hard and soft digital infrastructure in the economy. A lack of policy framework continuity, overlapping policies and coordination failures among government agencies have partly caused inefficient budget utilization, which could delay digital development.

Four key policy recommendations are proposed to support the transformation of Thailand's digital economy. First, due to the nature of digital technology, which tends to be boundless and an enabler of fundamental innovation and disruption, technological-based incentives should be more emphasized than locational-based ones. Excess emphasis is being placed on BOI incentives for a particular location, i.e., the Eastern Economic Corridor (EEC). At the same time, less attention is paid to the original development clusters involved in producing digital-related activities such as electronics/electrical appliances and automotive sectors. This could potentially lower the country's productivity improvements, worsen income inequality and eventually result in unsustainable progress in transforming the economy towards the digital era. In the digital age, clusters of digital-related activities should be located in various areas of the country and should be linked to each other through efficient logistical systems. Infrastructure development should be sped up to ensure efficient logistical systems as well as affordable and reliable digital technologies.

Second, Thailand's digital transformation plans need to be strengthened. The continuity of policy framework as well as clear policy coordination among government agencies should be prioritized. The Ministry of Digital Economy and Society (MDES) could play a key and active role in coordinating digital transformation plans across institutions to possibly avoid unnecessary policy overlaps as well as failures in policy coordination and enforcement. Adequate budget allocations for building hard and soft digital infrastructure as well as the promotion of the digital industry should also be considered.

Third, human capital needs to be further developed to support digital transformation. The Thai government has plans to improve human capital development, but overlapping policies and coordination failures across institutions are still the key obstacles in pushing Thailand forward. The government should have a clear evaluation criterion for each project/policy and should ensure an effective whole-of-government approach, particularly in establishing coordination processes and communication channels across institutions. In addition, public-private partnerships in enhancing human capital development should be continued, especially by encouraging large companies to support medium and small enterprises to develop workers' skills.

Fourth, with the rapid pace of digitalization in the economy, established rules and regulations (e.g., data security, privacy, consumer protection, competition policy, cross-border data flows restrictions and DLR) need to be monitored and modernized to address public concerns. Deepening regional cooperation in terms of compatible regulations should also be encouraged to facilitate business in the region as well as to protect consumers from both privacy and security concerns. As possible negative effects of digital transformation could arise (Jongwanich, Kohpaiboon and Ayako 2022; Jongwanich 2022), especially in

traditional sectors, the Thai government should develop a systematic evaluation process—for employment generation, potential job and business losses, technology adoption and transfer—to monitor and mitigate the potential negative economic and social effects of digital transformation in the country.

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APPENDIX 1  
Government Budget, 2017–22

Agency	Fiscal year											
	2017		2018		2019		2020		2021		2022	
	Budget (Million Bath)	%	Budget (Million Bath)	%	Budget (Million Bath)	%	Budget (Million Bath)	%	Budget (Million Bath)	%	Budget (Million Bath)	%
1. Central Budget	455,382.50	16.4	420,183.20	13.8	468,032.00	15.6	518,770.90	16.5	614,616.20	19.2	587,409.30	19.6
2. Office of the Prime Minister	36,001.30	1.3	34,256.50	1.1	41,216.20	1.4	39,108.90	1.2	39,290.90	1.2	33,742.10	1.1
3. Ministry of Defence	206,461.30	7.4	218,503.10	7.2	227,671.40	7.6	233,353.40	7.4	214,530.60	6.7	199,937.20	6.7
4. Ministry of Finance	199,174.10	7.2	238,246.90	7.8	242,846.00	8.1	249,676.90	7.9	268,440.20	8.4	273,602.80	9.1
5. Ministry of Foreign Affairs	8,015.10	0.3	8,761.50	0.3	9,241.80	0.3	8,922.60	0.3	8,156.40	0.3	7,406.50	0.2
6. Ministry of Tourism and Sports	7,136.80	0.2	6,729.20	0.2	6,413.90	0.2	6,071.30	0.2	6,092.70	0.2	5,092.90	0.2
7. Ministry of Social Development and Human Security	10,078.20	0.4	13,717.50	0.4	12,863.50	0.4	21,281.50	0.7	22,341.80	0.7	24,624.90	0.8
8. Ministry of Agriculture and Cooperatives	86,403.70	3.1	122,572.80	4	108,539.30	3.6	109,833.60	3.5	110,731.10	3.5	109,852.60	3.7
9. Ministry of Transport	136,101.30	4.9	168,768.00	5.5	183,732.50	6.1	178,840	5.7	189,959	5.9	173,164	5.8
10. Ministry of Digital Economy and Society	20,172.80	0.7	5,133.50	0.2	5,461.40	0.2	6,897.80	0.2	8,301.70	0.3	6,825.20	0.2
11. Ministry of Natural Resources and Environment	35,877.90	1.3	33,716.70	1.1	31,586.10	1.1	30,370	1	29,336	0.9	28,111	0.9
12. Ministry of Energy	2,006.50	0.1	2,221.10	0.1	2,318.90	0.1	2,157.90	0.1	2,279.20	0.1	2,707.40	0.1
13. Ministry of Commerce	7,192.60	0.3	7,332.20	0.2	6,911.90	0.2	7,551.10	0.2	6,825.50	0.2	6,345.10	0.2
14. Ministry of Interior	341,820.80	12.3	386,179.30	12.7	373,519.70	12.5	353,007.40	11.2	333,671.60	10.4	315,513.10	10.5
15. Ministry of Justice	23,163.20	0.8	24,480.80	0.8	24,993.20	0.8	26,949	0.9	26,828	0.8	24,194	0.8
16. Ministry of Labour	39,832.70	1.2	51,679.70	1.7	52,641.20	1.8	60,878.30	1.9	69,720.30	2.2	49,701.90	1.7
17. Ministry of Culture	7,742.30	0.3	8,170.40	0.3	8,209.40	0.3	8,569.70	0.3	7,962.90	0.2	6,993.50	0.2
18. Ministry of Science and Technology (note that in 2020, it was renamed to Ministry of Higher Education, Science, Research and Innovation)	9,725.70	0.3	14,275.40	0.5	14,885.40	0.5	140,444.50	4.5	128,127.00	4.0	123,446.60	4.1
19. Ministry of Education	517,076.70	18.6	599,003.70	16.7	489,798.60	16.3	368,660.30	11.7	356,449.70	11.1	330,426.60	11.0
20. Ministry of Public Health	123,542.10	4.5	134,894.00	4.4	135,827.60	4.5	138,735.30	4.4	138,278.60	4.9	133,888.70	5.1
21. Ministry of Industry	5,965.40	0.2	5,653.70	0.2	5,063.70	0.2	5,363.80	0.2	4,659.20	0.1	4,341.10	0.1
22. State Agency not affiliated with Ministry or Office of the Prime Minister	120,024.10	4.3	125,612.20	4.1	130,432.20	4.3	132,230.90	4.2	130,774.40	4.1	122,624.70	4.1
23. Agency of National Assembly	4,753.70	0.2	6,203.40	0.2	10,418.40	0.3	8,684.60	0.3	9,666.30	0.3	8,088.30	0.3
24. Agency of Court	20,821.70	0.8	21,719.00	0.7	22,656.40	0.8	20,234.90	0.6	23,988.90	0.7	22,940.80	0.8
25. Agency of Office of Attorney General and Independent Organization	14,140.40	0.5	15,974.70	0.5	22,210.30	0.7	16,495.50	0.5	17,764.30	0.6	18,459.00	0.6
26. Province	24,680.00	0.9	31,765.40	1	27,981.60	0.9	24,000	0.8	23,110	0.7	17,441	0.6
27. State-owned enterprise	143,804.80	5.2	154,650.80	5.1	134,911.80	4.5	156,292	5	153,692	4.8	127,866	4.3
28. Bureau of the Royal Household	5,222.30	0.2	6,391.40	0.2	6,800.00	0.2	7,685.20	0.2	8,980.90	0.3	8,761.40	0.3
29. Thai Red Cross Society			8,333.30	0.3	10,303.90	0.3	10,651.10	0.3	8,871.60	0.3	8,265.40	0.3
30. Other State Agency			-	-	270.6	0	598.7	0	563.2	0.0	477.9	0.0
31. Fund and Working Capital	147,874.70	5.3	215,235.70	7.1	182,241.10	6.1	189,714	6	223,025	7.0	195,370	6.5
32. Expenditure for Recoup Treasury Balance	21,875.10	0.8	49,641.90	1.6	-	-	62,709.40	2	-	-	596.70	0.0
<b>Total</b>	<b>2,776,000.00</b>	<b>100</b>	<b>3,050,000.00</b>	<b>100</b>	<b>3,000,000.00</b>	<b>100</b>	<b>3,144,747.50</b>	<b>100</b>	<b>3,206,274.20</b>	<b>100</b>	<b>2,998,138.70</b>	<b>100</b>

NOTE: In 2020, Higher Education under the Ministry of Education was integrated with the Ministry of Science and Technology. The latter was renamed the Ministry of Higher Education, Science, Research and Innovation.

SOURCE: Author's compilation

## NOTES

1. OECD (2020) proposed the definition of the Digital Economy to include possible other activities, which have zero priced digital services and termed this as the Digital society.
2. Global Trend (2013) terms the digital economy to include social and economic activities that demonstrate the following characteristics: are enabled by Internet/mobile technology platforms and ubiquitous sensors; offer an information-rich environment; are built on global, instant/real-time information flows; provide access and support multiple, virtual, connected networks. UNCTAD (2017) defines the digital economy as the application of Internet-based digital technologies to the production and trade of goods and services.
3. Digital firms in the survey refer to those directly involved with digital services (both Thai and foreign ownership) and those indirectly involved with digital services (firms generating 10 per cent of income from digital usage, mostly e-commerce).
4. During the COVID-19 pandemic, the share of exports and imports in GDP dropped to around 51 per cent and 45 per cent, respectively, in 2020 before reviving in the second quarter of 2022.
5. In terms of GDP, digital investment accounted for between 1 and 3 per cent of total investment.
6. Note that according to APO Productivity Yearbook 2021, both economic growth and share of investment in the GDP of Thailand were lower than those of other ASEAN countries during 2010–19. However, the share of IT capital and R&D in investment tended to be higher than other ASEAN countries, except Malaysia and Singapore, partly reflecting the fact that Thailand is one of the key production bases in electronics and electrical appliances and the growing importance of IT in service sector. As measured by the stock concept, the ratio of IT hardware to the basic-price GDP in 2019 was greater than other ASEAN countries. Nevertheless, this ratio needs to be treated with caution because, in 2019, Thailand's GDP declined more than most of other ASEAN countries and this could cause a significant rise in ratio of IT hardware. Although IT hardware seems to contribute more to investment and GDP than other ASEAN countries, for the country to move forward, contribution of R&D and IT software tend to be more vital. The ratio of these two items (in terms of stock) in Thai GDP is far lower than high-income countries like Korea, Japan, the US and Singapore.
7. Note that the value of e-commerce in Thailand increased from THB2.76 trillion in 2017 to THB4.01 trillion in 2021 (expected data) or grew at an average rate about 10 per cent per year during this period. The value of e-commerce declined by around 6 per cent in 2020 amid the pandemic, from THB4.05 trillion in 2019 to THB3.78 trillion in 2020. B2C dominates the e-commerce value, accounting for 51 per cent, followed by B2B (27 per cent) and B2G (around 22 per cent). Consumer-to-consumer (C2C) transactions tend to be increasing in Thailand (reflected by monthly web visits in leading C2C e-commerce sites in Thailand jumping from 49.6 million in 2020Q2 visits to 90 million visits in 2021Q2 and 103 million visits in 2021Q3) (Statista and EDTA: <https://www.eta.or.th/th/Useful-Resource/publications/Value-of-e-Commerce-Survey-in-Thailand-2021-Slides.aspx>).
8. For more information, see, "How the Spectrum Price Affects 5G Development in Thailand?", Thailand Business News, 24 September 2019, <https://www.thailand-business-news.com/economics/76028-how-the-spectrum-price-affects-5g-development-in-thailand>
9. It is crucial to note that industrial policy includes a wider range of protection policy tools, including not only both tariff/non-tariff protection and investment promotion measures, but also other complementary measures, such as monopoly rights of production, exchange rate intervention, appropriate rules and regulations, as well as active intervention in research and development (R&D). Naudé (2010), for example, provides seven objectives for implementing industrial policy (e.g., Economic Signals and Incentives; Scientific and Technological Innovation; Selective Industry Support; Improving Productivity of Firms and Entrepreneurs) and their possible associated instruments (such as exchange rate, tax breaks, intellectual property right for Economic Signals and Incentives, and setting up special economic zone, providing export subsidies and credit for Selective Industry Support objective) (see also Perez and Primi 2009; Cimoli et al. 2006). Nevertheless, the effectiveness of industrial policy—non-neutral inter-industry (and sometimes inter-firm) incentives, which has regained policy attention in the last two decades as many countries have been disappointed with pursuing the conventional economic policies known as the Washington Consensus (Pack and Saggi 2006; Cimoli, Dosi and Stiglitz 2009; Chang and Andreoni 2016) in enhancing firms' and industry's productivity and supporting industrial development remains debatable. This is beyond the scope of this study.
10. Note that ten industries are divided into two segments, five S-curved and five new S-curved industries. The five S-curved industries include new-generation automotive, smart electronics, affluent, medical and wellness tourism, agriculture and biotechnology, and food for the future. The five new S-curved industries, consisting of manufacturing robotics, medical hub, aviation and logistics, biofuels and biochemicals and digital industries, are nascent high-tech industries slated to become significant long-term growth drivers.

11. Regarding the Digital Park (EEC-D) aimed to be established as Thailand's innovation hub and destination for digital global players and digital biz innovators, the key participants in the park include hardware and software producers/service providers such as Cloud Computing, Intelligent System, Pervasive Software, Cognitive Platform IoT Platform Machine Learning; digital content providers such as Data Center, Big Data Analytic, Streaming Content, Content Delivery Platform, VR Movie, Hologram, Immersive Animation; Digital Tech Startup. The EEC-D is equipped with ultra-high-speed broadband infrastructure, including but not limited to, an international submarine cable station, satellite earth station, and data management centre. It is also crucial to note that in ASEAN, there are another two digital parks, namely Hoa Lac Hi-Tech Park of Vietnam and Punggol Digital District of Singapore, which are likely to compete in attracting foreign investors in this area. In particular, the Punggol Digital District would bring together global digital players, investors, innovators, start-ups and professional researchers. The new campus of Singapore Institute of Technology (SIT), which is planned to include the entire education system relating to digital technology, is set up in this district.
  12. Genomics is an interdisciplinary field of biology focusing on the structure, function, evolution, mapping and editing of genomes.
  13. See more information at <https://thaiembdc.org/2021/05/21/thailand-activates-the-bcg-model-for-a-sustainable-recovery-from-covid-19/>, Ministry of Foreign Affairs, Thailand.
  14. The total cost of EEC development is expected to be around US\$60 billion (THB1.7 trillion). One-third of the funds will be spent on five key infrastructure projects. See *Techwire Asia*, 14 January 2021, <https://techwireasia.com/2021/01/thailands-eec-closes-in-on-becoming-seas-5g-logistics-hub/>
  15. See *The Nations*, 15 September 2021, <https://www.nationthailand.com/in-focus/40006063>
  16. Among the five project, high-speed train connecting three airports is prioritized and has been expected to be completed by the end of 2021. U-Tapao Airport in which the BBS Joint Venture Group won the bid, is expected to begin in 2021 and start operation in 2023. For Rayong's Map Ta Phut deep seaport third-phase, Gulf and PTT Group jointly, which set up Gulf MTP LNG Terminal Co, won a bid for the project. The contract between the Industrial Estate Authority of Thailand (IEAT) and the investor is expected to take place in 2022. The construction is expected to start in 2024 while the operation is anticipated to begin in 2026. Regarding Laem Chabang Port Development Project Phase 3, in June 2021, CNNC Joint Venture, consisting of NTL Marine, a subsidiary of Prima Marine, Nathalin and China-based Zhonggang Construction Group, signed a construction contract with the Port Authority of Thailand (PAT). The construction and operation are expected to start in 2022 and 2024, respectively.
  17. It is noteworthy that the BOI started its operation in 1959 and began to promote selected industries in 1962 (Akira 1996) under the amended Industrial Investment Promotion Act B.E. 2503 (1960). In 1962, 123 industries were promoted, and most were classified as capital intensive industries and modern industries. In other words, most industrial investment during the 1960s involved import-substitution type industries (Akira 1996).
  18. Note that, under the Competitiveness Enhancement Act, section 24, CIT exemption for targeted industry could be extended to fifteen years, based on the judgment of the Board of Investment.
  19. Note that the promoted projects located in the EEC receive an additional 50 per cent reduction from the normal rate of corporate income tax on the net profits derived from the promoted activities for a period of five years from the expiring date of the corporate income tax exemption, special deductions for research and development in certain areas, as well as an income tax cap of 17 per cent. In addition, exemption of import duties relating to machine, raw materials for production and R&D is provided, along with special tax deductions granted for R&D on technology and innovation expense. Foreign skilled labours, executives and specialists working for businesses in the SEPZ can work in Thailand without a work permit upon receiving a permit from the Secretary General of EECO. Foreign entities can own land and properties for both their business operation and residential purpose.
  20. First ICT Master Plan was extended to cover 2007–8.
  21. It is noted that Thailand is preparing the Thirteenth National Economic and Social Development Plan for 2022 to 2026. On 15 February 2021, the National Economic and Social Development Council (NESDC) approved a development framework, which focuses into four main areas, namely (1) to promote industries towards a knowledge-based or high value-added economy that is environmentally friendly; (2) to narrow income disparity and to build more security, both in terms of income and well-being; (3) to support community-based business and small and medium-sized enterprises; and (4) to develop high-quality workforce and improve government to facilitate investors and public services. See *Bangkok Post*, 23 April 2021, <https://www.bangkokpost.com/business/2104323/development-plan-targets-adding-value>
  22. The exception is that the National Disaster Warning Center, which was formerly under MICT, is to be transferred to the Interior Ministry. In addition, MDES set up a cybersecurity agency and hacker training centre.
  23. Note that one major policy effort by DEPA is to launch various DEPA-funds as shown in Figure 7. Fund size
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- ranged from THB50,000 to THB250 million per firm. For example, Digital Startup fund; Digital Transformation fund; Digital R&D and Innovation fund; and Digital Event and Marketing fund.
24. For example, a transaction is required to be made in writing, evidenced by writing, supported by documents or to bear legal consequence; a person is entitled to operate an electronic transaction business and a royal decree can be issued to require electronic transaction businesses to be notified, registered or licensed, and to make a legal consequence of e-documents without a signature, a method whereby the identity and intention of the owner of the signature can be identified in relation to the electronic data.
  25. Under the digital ID legislation, an organization applying the National Digital Identification (NDID) will develop an “NDID Platform”, which will issue licences to identify digital IDs and verify the citizens’ digital IDs. However, it’s not mandatory and other means for checking individuals’ identities will still be in use in Thailand.
  26. Business operators who fail to comply with the consumer protection measures can be subject to imprisonment of up to ten years, a fine of up to THB2,000,000 or both plus a daily fine of up to THB20,000 per day.
  27. The new ACT is similar to some sections in the US’s Digital Millennium Copyright Act (DMCA), which is implemented under the World Intellectual Property Organization (WIPO), EU Directive 2000/31/EC and the Australian Copyright Law.
  28. For instance, a credit company is prohibited from gathering and recording other information relating to credit and credit providers shall prepare a security system to ensure the confidentiality and safety of clients’ information.
  29. The underlying infrastructure includes but is not limited to the provision of information infrastructure services in the following sectors: banking, IT/telecoms, energy and public utilities, transportation/logistics, and public health. For more information, see <https://www.lawplusltd.com/2018/02/draft-amendment-copyright-act-thailand/>.
  30. The CSA establishes a number of bodies which discharge the duties under this law. In particular, the National Cyber Security Committee (NCSC), the Cyber Security Governance Committee (NSGC), the Executive Committee of the Office of the Cyber Security Committee and the Office of the National Cyber Security Committee (ONCSC).
  31. Personal Data in the PDPA is defined as any information relating to a person and can identify such person directly or indirectly. Section 26 requires that explicit consent must be obtained for the collection of “personal data pertaining to racial, ethnic origin, political opinions, cult, religious or philosophical beliefs, sexual behaviour, criminal records, health data, disability, trade union information, genetic data, biometric data, or of any data which may affect the data subject in the same manner”, as prescribed by the PDPC. See more information at <https://www.cookiepro.com/blog/data-protection-in-thailand-pdpa/>
  32. Note that creative economy refers to activities relating to creativity and ideas. The creative economy encompasses careers in photography, graphic design, fashion design, filmmaking, architecture, publishing, video games, etc.
  33. It is noteworthy that in 2020, Higher Education under the Ministry of Education, was moved to be integrated with the Ministry of Science and Technology. The latter was renamed the Ministry of Higher Education, Science, Research and Innovation.
  34. South Korea has imposed DLR, but the government provides other incentives for foreign investors along with such requirements such as incentives for land access and incentive to establish facilities to localize their data.
  35. Note that the following countries have imposed tax relating to electronic services as follows: in Singapore, foreign digital service providers are obligated to register and pay 7 per cent goods and services tax; in Malaysia, 6 per cent digital service tax was imposed on foreign tech companies; a 10 per cent VAT from e-commerce services was introduced in Indonesia; while in the Philippines, 12 per cent VAT on the supplies of electronic services was imposed on various activities, including e-books, e-journals, music apps, films, streaming games as well as Internet services.

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