THAILAND NATIONAL DIGITAL TALENT DEVELOPMENT

TRANSFORMING THAILAND
INTO ASEAN'S DIGITAL POWERHOUSE

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WHITE PAPER

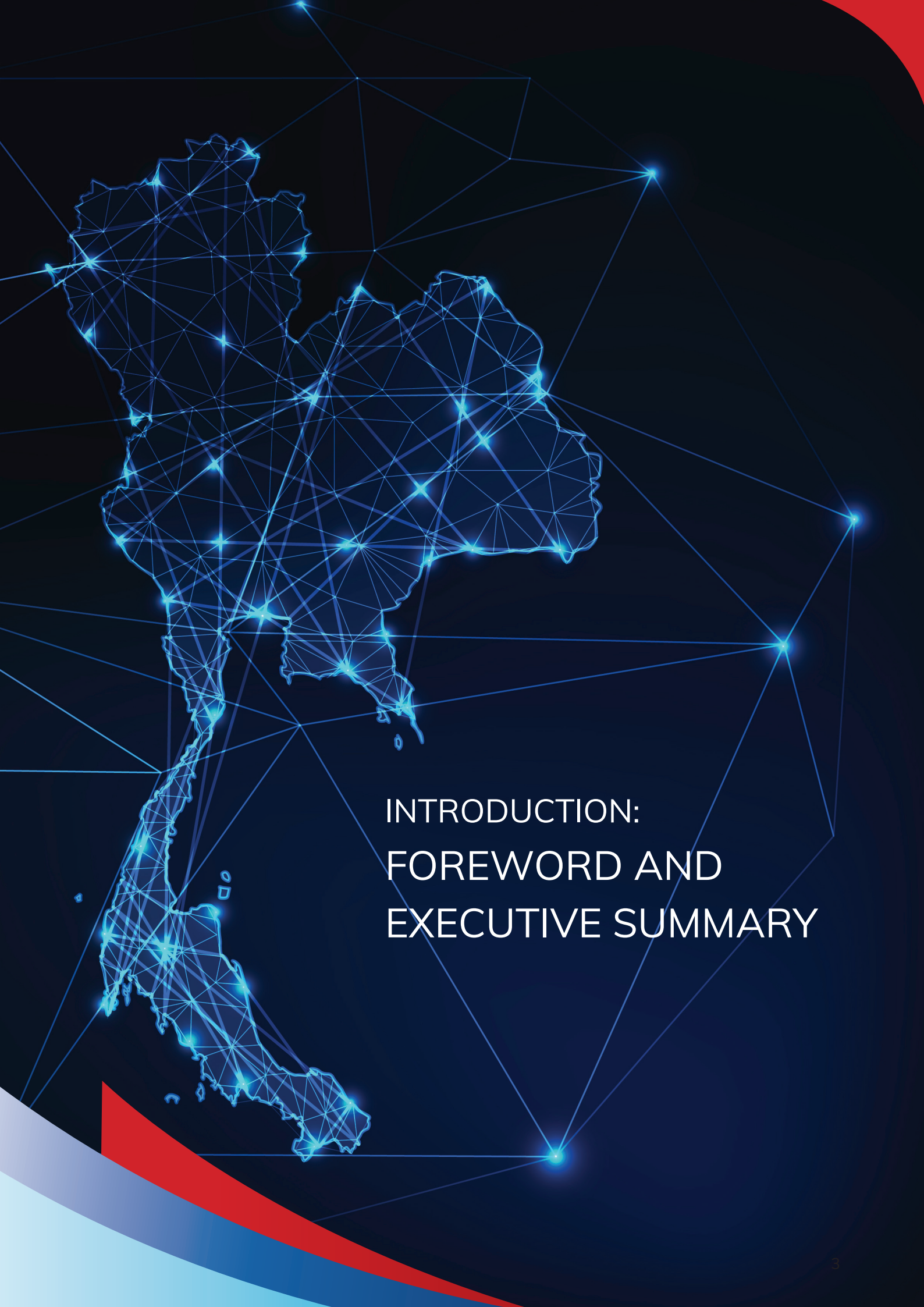OCTOBER 2022

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Foreword

Prof.Dr. Anek Laothamatas

Minister of Higher Education,
Science, Research and Innovation

With the national goal of transitioning Thailand to a developed country surpassing "the middle income trap" by 2037, the Thai economy must encompass science, technology and innovation with value-added products and services in all sectors. In light of this, the Thai government has allocated resources and effort to drive the growth of the industries for the future. Thus, it is vital for the country to upskill and reskill its labor force to support such ambition towards digitalization.

"Digital Talent" development has been at the core of the policy and strategy of Ministry of Higher Education, Science, Research and Innovation to enhance Thailand's competitiveness at the global stage. We have launched multiple initiatives with various stakeholders to revolutionize higher education and foster a sustainable Digital Talent development ecosystem in Thailand to serve the increasing demand for this valuable human resource.

This report will not only raise strong public awareness on the importance of building a future-proof digital workforce, but also provide a holistic perspective that will guide relevant stakeholders to collaborate towards a digitally powered Thailand.

(Prof.Dr. Anek Laothamatas)

Minister
Ministry of Higher Education,
Science, Research and Innovation (MHESI)

Mr. Chaiwut Thanakamanusorn

Minister of Digital Economy and Society

Following the direction of the Thai government, MDES has been devoting a longstanding focus to develop the digital economy and society according to the Thailand Digital Economy and Society Development Plan B.E. 2561 – 2580 (2018–2037) aiming to drive digital inclusiveness, innovative research, and wider data application. Thailand witnessed the unprecedented waves of digital transformation across all industries, leading to an enhanced demand for the digital workforce. We have recognized the growing concern around the Digital Talent gap and established various taskforces and collaborations with public and private partners to address the problem at an early stage. We are on track to embrace the benefits of digital transformation.

This report identifies the current Digital Talent status and highlights the constraints for key stakeholders to jointly resolve and build a sustainable Digital Talent pool. I believe that the framework and initiatives recommended will be a pragmatic development guideline for all stakeholders to successfully transform Thailand into ASEAN's digital powerhouse.

Chaiwut Thanakamanusorn

(Mr. Chaiwut Thanakamanusorn)

Minister
Ministry of Digital Economy and Society (MDES)

Acknowledgments

Appreciation for stakeholders' participation

Government & public sector entities

Ministry of Commerce	Ministry of Digital Economy and Society	Ministry of Education	Ministry of Higher Education, Science, Research and Innovation	Ministry of Labor
DEPA	Digital Gov. Development Agency	Eastern Economic Corridor (EEC)	Electronic Transactions Dev. Agency	Equitable Education Fund (EEF)	National Cybersecurity Agency	National Innovation Agency
National Telecom	NXPO	Thailand Professional Qual. Institute	Global Compact Network Thailand	UNICEF	UNESCO

Thai and global private sector organizations & associations

AIS	SCG	True	Digital Council of Thailand	Thai Startup Association	The Federation of Thai Industries	3BB	Large global tech companies

Leading academia with focus on digital skills

Chiangmai University	Chulalongkorn University	King Mongkut's Institute of Tech. Ladkrabang	King Mongkut's Uni. of Tech. Thonburi	Prince of Songkhla Uni.	Thammasat University	SkillLane	Thai MOOC

... and many more organizations that have kindly contributed to this white paper (names undisclosed upon their request)

Executive summary

Industry 4.0 and COVID-19 have, collaterally, necessitated the need for scaling up the future-readiness of APAC's workforce. The resulting digital revolution is changing the future of the workplace, as well as the skills and capabilities required by the labor force. In Thailand, over 45% of jobs are prone to be automated by digital technologies. The International Labor Organization (ILO) predicts that at least 44% of jobs, approximately 17 million positions, will be replaced by automation within the next two decades.
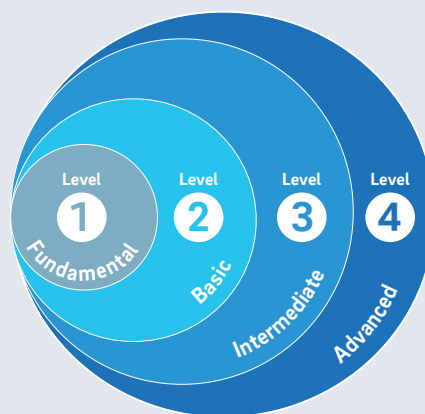
Thailand ranks 78th out of 134 countries on Wiley's Digital Skills Gap Index (2019). This index is constructed around six pillars: Digital Skills Institutions, Digital Responsiveness, Government Support, Supply, Demand & Competitiveness, Data Ethics & Integrity, and Research Intensity. While making incremental progress on various indices, Thailand still has significant opportunities to close its digital skills gap.

The Thailand 4.0 initiative and the Digital Thailand plan has been developed with the aim of shifting the country towards a "value-based" economy. The Thai government has targeted 10 S-Curve industries, focusing on five emerging fields: Automation & Robotics, Aviation & Logistics, Biofuel & Biochemicals, Medical Hub, and Digital Economy. As various industries started embracing digital transformation to improve productivity and develop innovative goods and services, skills required in the workplace have changed to become more digitally-oriented.

The required skills can be distinguished into four levels (Figure A). In the post-pandemic new normal, Thailand observed a fast-growing demand for fundamental and basic digital skills. However, in the next five years, the Digital Talent demand will shift towards intermediate and advanced digital skills to drive the digital era.

Figure A:	Shift in digital skills level from heavy focus on level 1-2 towards level 3-4

	Digital skills level	Definition	Skills example
4	**Advanced** Digital specialists	Able to **create and develop digital solutions** that create new value	**Design & Architecture** (e.g., UI/ UX) **Development** (e.g., AI/ML, big data, IoT, 5G, cloud and app development etc.)
3	**Intermediate** Digitally proficient workforce	Able to use digital tools to **generate meaningful insights** that add value to existing industries	**Digital marketing and basic website development Business intelligence (BI) reporting**
2	**Basic** Digitally literate workforce	Able to **use digital tools** to find, create and communicate information at work	**Productivity tools utilization** (Microsoft Office, email) **Digital workplace skills** (video conferencing)
1	**Fundamental** Workforce with basic digital skills	Able to use digital tools and **participate in digital society in daily life**	**Hardware operations** (basic operation functions, maintenance) **Navigating apps & internet** (basic search engine, social media)

Source: ITU

As a result, in the past years, private and public stakeholders have devoted their focus and resources to cultivating the next generation of the workforce and setting the stage for Thailand's digital era. However, based on the extensive interviews conducted with key stakeholders, including the public and private sectors, there are still multiple challenges to be overcome along the digital employment journey (Figure B).

Figure B: Summary of top challenges to develop Digital Talent along employment journey

Grooming of Digital Talent | Job search for digital roles | Employed | Exit

Upskill/ reskill

Thai citizens

! **Inequality in accessing education and digital knowledge,** especially in non-metropolitan areas
- Digital divide in Thailand
- Limited English proficiency of Thai students

Academia (Supplier)

! **Limited budget to secure the digital expert** locally and internationally
! **Inability to develop digital course** to match in-demand digital skills

Thai workforce

Outcome of the key challenges:
As a result of mis-matched supply and demand, Thai workforce with level 1 and 2 digital skills are facing limited opportunities to secure jobs in the digital era

Private sector (Demanders)

! **Limited talent pool in the market**
! **Inability to compete for Digital Talent**
! **Unable to effectively upskill/ reskill workforce**

Unable to effectively bridge the gap between the supply and demand

Government (Supporter & enabler)

! **Ineffective budget allocation for Digital Talent development initiatives among public entities**
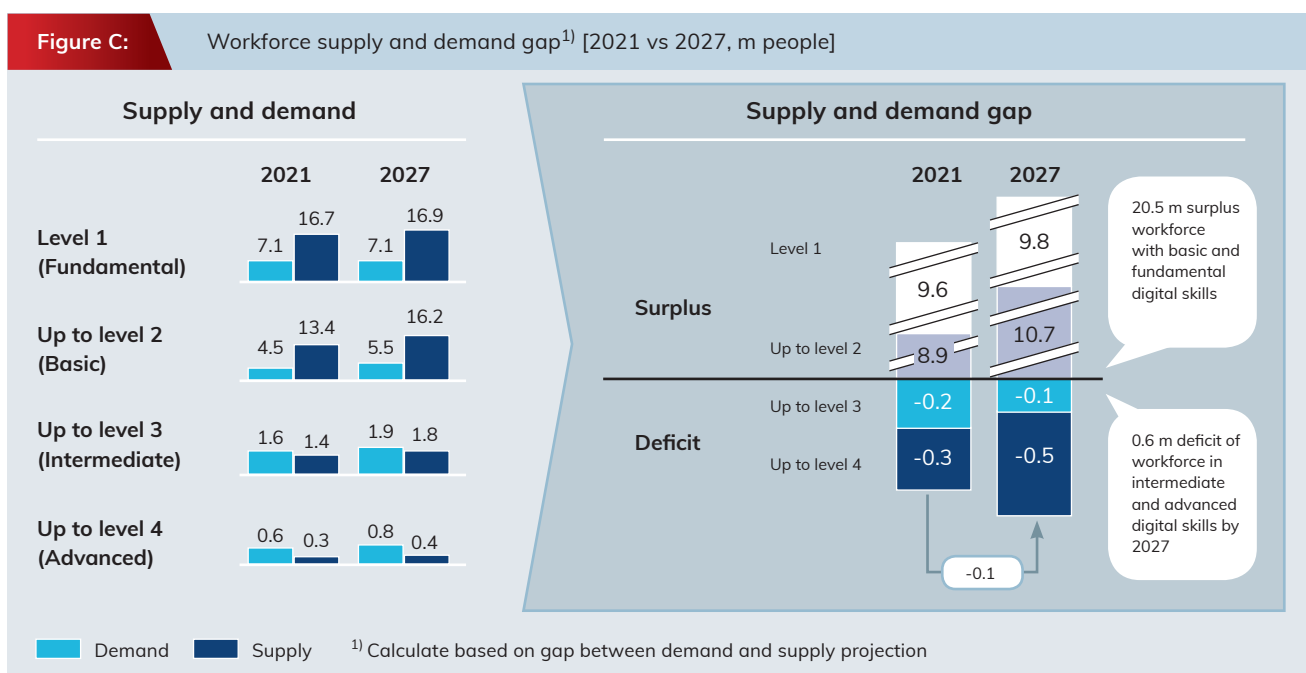! **Lack of comprehensive plan and clear responsibilities to provide support to academia, private sector, and the citizens,** resulting in overlapping initiatives and lack of transparency on initiatives coverage
- Unclear responsibilities among government entities
- Inflexible regulations and bureaucracy
- Inability to measure the effectiveness of initiatives

Source: Digital Talent Assessment interview (2022)

A significant Digital Talent demand and supply gap is still yet to be bridged. The Digital Talent demand is expected to outstrip supply of Digital Talent. By 2027, the Digital Talent gap in Thailand will reach 0.6 m people, with a 0.5 m deficit of advanced digitally skilled.

Figure C: Workforce supply and demand gap[1] [2021 vs 2027, m people]

Supply and demand

	2021		2027	
Level 1 (Fundamental)	7.1	16.7	7.1	16.9
Up to level 2 (Basic)	4.5	13.4	5.5	16.2
Up to level 3 (Intermediate)	1.6	1.4	1.9	1.8
Up to level 4 (Advanced)	0.6	0.3	0.8	0.4

Supply and demand gap

	2021	2027	
Surplus	Level 1	9.6	9.8
	Up to level 2	8.9	10.7
Deficit	Up to level 3	-0.2	-0.1
	Up to level 4	-0.3	-0.5

-0.1

20.5 m surplus workforce with basic and fundamental digital skills

0.6 m deficit of workforce in intermediate and advanced digital skills by 2027

Demand | Supply | [1] Calculate based on gap between demand and supply projection

Source: NSO, BOT, Digital Talent Assessment interview (2022)

To bridge the Digital Talent gap, a holistic set of recommended initiatives with the government playing key role in setting a clear and actionable plan, is discussed in this white paper.

Figure D: Digital Talent development initiatives

A. Skill Development

A1. Digital curriculum for primary, secondary schools and universities

A2. TTT program for professors, run by industry-experts

B. Career/ Job Matching

B1. To define in-demand digital roles, career path, and salary structure

B2. Online 1-on-1 career guidance and job matching platform

E. Funding and Sponsorship

E1. PPP funding scheme / crowdsourcing platform

D. Policy Making, Standardization and Monitoring

D1. Policy to streamline and expedite digital initiative/ project/ curriculum approval process

D2. Incentive for private sector to collaborate with academia

D3. Central monitoring agency to oversee progress and effectiveness of digital initiatives

D4. Revision of salary structure for digital roles at public sector entities

C. Infrastructure Development

C1. Improving overall accessibility and connectivity for citizens

C2. Integrated learning platform

Stakeholders: Government | Private sector | Academia

The initiatives are aimed at achieving the following key objectives:

A Skill Development

- A1 cultivates digital learning in all levels of education to improve digital skills and competencies among the youth
- A2 equips teaching faculty with the latest digital knowledge, teaching methodologies, practical know-how, and reduce the scarcity of subject expert faculty

B Career/ Job Matching

- B1 aims to reduce scattered understanding on digital roles by building a central data bank which collects job roles and corresponding career paths, to raise awareness for students and professionals
- B2 provides a career consultation services to job seekers to support their employment journey

C Infrastructure Development

- C1 promotes digital inclusion among underserved communities, focusing on accessibility and connectivity
- C2 expands access to quality digital education through a hybrid learning model

D	**Policy Making, Standardization and Monitoring**	• D1 and D2 incentivize and expedite the implementation of Digital Talent related initiatives to
		  - encourage innovation in private sector and academia
		  - enable private sector and academia to effectively contribute to Digital Talent development
		• D3 improves effectiveness of Digital Talent initiatives through oversight by a centralized monitoring agency
		• D4 places public sector entities in a better position to attract digital professionals, who are crucial for supporting Thailand's digital transformation ambitions

E	**Funding and Sponsorship**	• E1 addresses the issue of limited budget allocated for Digital Talent development, which, along with other challenges, is hampering the progress of workforce upskilling/reskilling, recruitment of Digital Talent, and other Digital Talent initiatives

For the successful execution of all programs, the initiatives should be prioritized based on urgency as highlighted in the last chapter of this White Paper.

This White Paper has been developed with insights gathered from interviews and surveys with over 36 stakeholders in the government, private and public sectors, and academia. Extensive secondary research, leveraging a wide range of well-established databases, has been performed to synthesize the data-driven findings discussed in this White Paper.

The Thailand Digital Talent Development White Paper provides 3 key takeaways:
1. Detailed scanning of Thailand's Digital Talent landscape and the talent demand-supply dynamics
2. Provide actionable recommendations, based on feedback from multiple stakeholders of Thailand's Digital economy and benchmarking with global practices
3. Propose collaborative framework amongst government, private and public sectors, and academia, to advance Thailand's Digital Talent momentum

CHAPTER 1
DIGITAL TALENT IN APAC
THE EVOLVING LANDSCAPE

THAILAND NATIONAL DIGITAL TALENT DEVELOPMENT
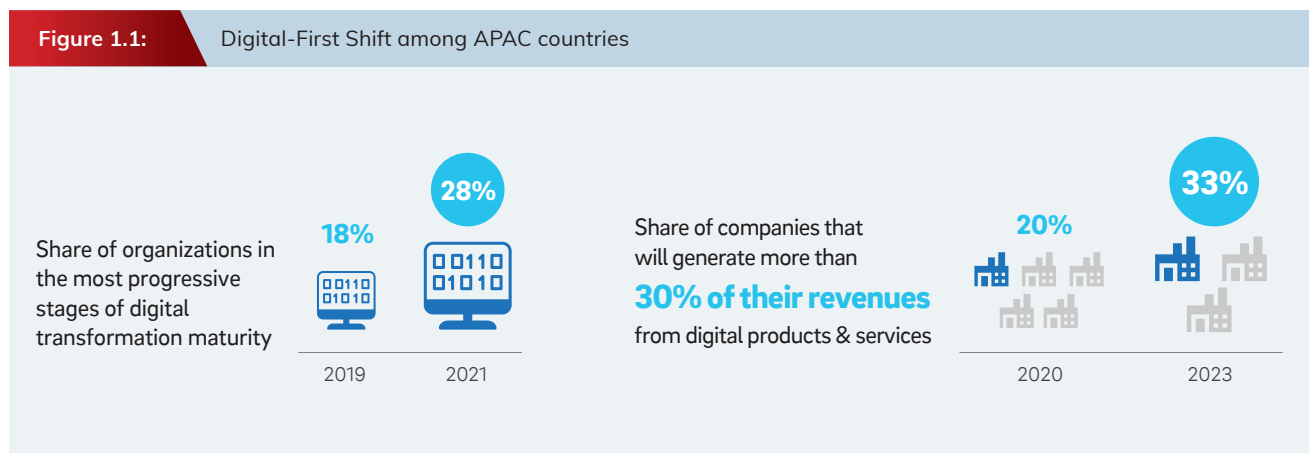
TRANSFORMING THAILAND INTO ASEAN'S DIGITAL POWERHOUSE

Chapter 1.1: Digital Talent in APAC – The Evolving Landscape

Industry 4.0 and COVID-19 have, collaterally, necessitated the need for scaling up the future-readiness of APAC's workforce

APAC countries have undergone significant developments in digital transformation. The region is home to some of the world's fastest growing economies and a leader in digital innovation. Over 50% of the global internet user base is in APAC. According to the International Data Corporation (IDC), APAC countries will continue to outpace other regions in technology adoption. The share of organizations in APAC countries which are in the most progressive stages of digital transformation maturity has grown from 18% in 2019 to 28% in 2021. One in five companies in APAC generated more than 30% of their revenues from digital products and services in 2020. This proportion is poised to rise to one in three companies by 2023 (Figure 1.1). Through the expansion of their digital economy, APAC countries are expected to see digitalized industries contributing over 65% of their GDP. IDC estimates that spending in these digitalized industries is expected to reach USD 1.2 trillion by 2023.

A major digital transformation wave came with the advent of Industry 4.0, which is primarily shaped by new technologies, products and services, and increasingly integrated value chains. The emerging technologies such as Cloud Computing, Big Data, 5G, IoT, and AI are entrenching themselves as key enablers for countries to accelerate their transition to a digital economy.

Figure 1.1: Digital-First Shift among APAC countries

Share of organizations in the most progressive stages of digital transformation maturity

18% 2019 28% 2021

Share of companies that will generate more than **30% of their revenues** from digital products & services

20% 2020 33% 2023

Source: IDC

Cloud computing has been on the forefront of APAC's digital trends in the past few years allowing users to leverage costly and complex computing resources as services. XaaS (Everything/Anything-as-a-Service), the most recent development within the cloud space, makes a virtualized working environment capable of integrating multiple technologies possible. This concept has gained significant adoption throughout APAC. One example is when cloud is combined with technologies such **Big Data, AI, IoT** and biometrics, creating a futuristic use case like Biometric-as-a-Service where biometric data stored in the cloud can be analyzed through embedded AI in real-time. The plethora of opportunities that come from adoption of cloud computing in various industries is spurring a growing demand for cloud-related specializations and specific skills such as cloud application development, cloud security engineering, and cloud architecture.

Another key technology driving the digital economy is **5G, a high speed and low-latency internet connection standard.** It has, in fact, become the backbone of today's interconnected economy where services are offered online in droves. As connectivity technologies gain importance, so does the expertise to manage such infrastructures, in turn increasing the demand for specialized profiles such as mobile core network engineers, 5G software system engineers, and packet core engineers.

COVID-19 has undeniably accelerated the digitalization of companies at an unprecedented pace. During this extraordinary period, customer behavior has dramatically shifted towards the use of online channels with companies responding to this trend. In addition, the COVID-19 pandemic has disrupted the way people work and triggered a meteoric rise in remote work, which inevitably relies on new technologies.

Both Industry 4.0 and COVID-19 have driven drastic changes in the APAC workforce. Developments such as new job roles and changes in the way people work have remodeled overall talent requirements. The Asian Development Bank (ADB) estimates that around 65 million new jobs will be created by 2025. The emergence of the new post-pandemic normal and new technologies is expected to perpetuate the upsurge in demand for Digital Talent.
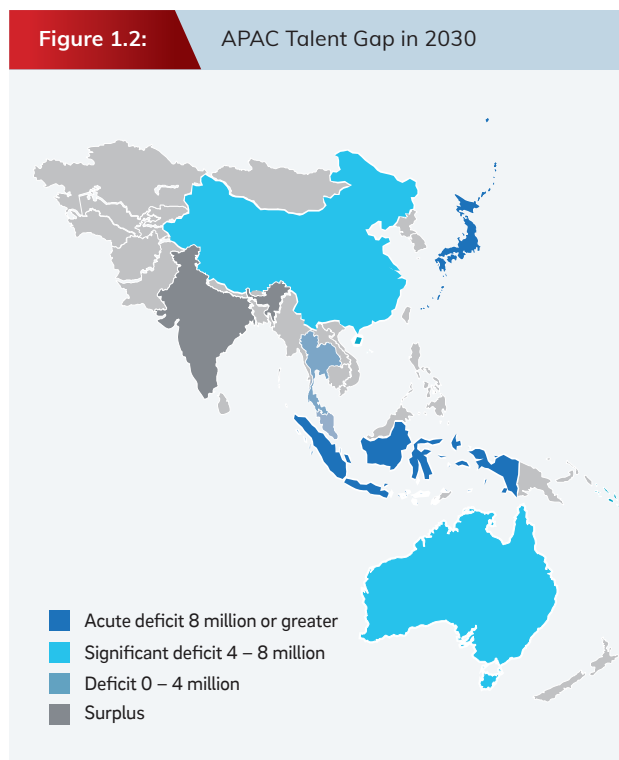
To meet industry demands for Digital Talent, the need for talent development through re- and up-skilling is undoubtedly crucial.

Despite the growth in Digital Talent development, the progress within APAC is mixed

The demand for digitally skilled workers across APAC countries is forecasted to grow by a staggering 550% by 2025, according to Amazon Web Services (AWS) estimations, 149 million workers in APAC apply digital skills today. Digital skills underpin an overwhelming majority of sectors in APAC, but technology advancements are only possible with the talent being well-equipped to harness the technologies.
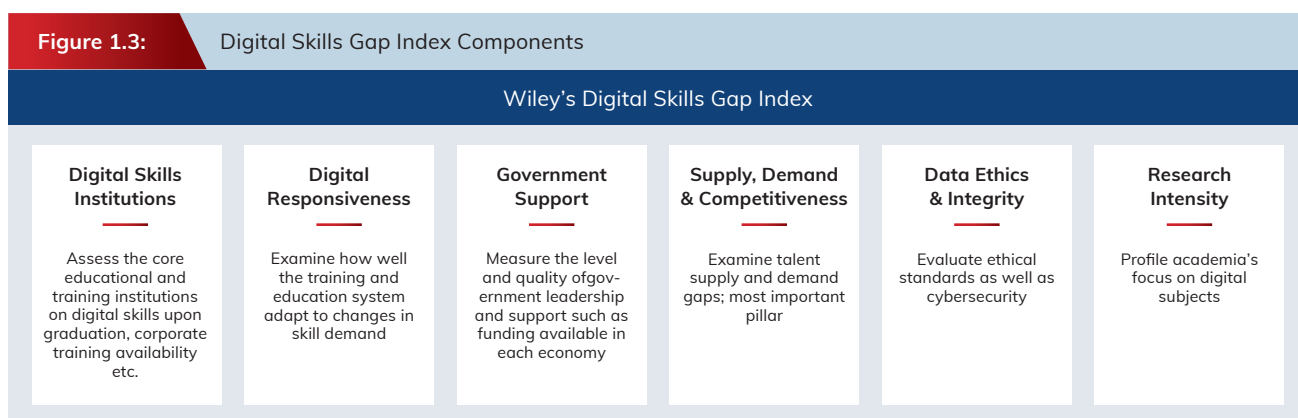
Talent gaps are already evident and Korn Ferry forecasts that **all major economies in the APAC region will face a shortage of talent by 2030,** with the exception of India (Figure 1.2). Overall, the APAC region is expected to face a shortage of over 47 million workers. Indonesia is projected to face the largest Digital Talent deficit while countries such as Thailand are projected to face a shortage of 0.5 million Digital Talent by 2030 if no proactive action is taken.

In order to keep pace with emerging technologies and close the Digital Talent deficits, the average worker in the region will need to acquire new digital skills. However, the disparity between the maturity of nations' digital workforces in APAC countries is apparent, with countries such as Thailand and Vietnam clearly lagging their peers.

Figure 1.2: APAC Talent Gap in 2030

- Acute deficit 8 million or greater
- Significant deficit 4 – 8 million
- Deficit 0 – 4 million
- Surplus

Source: Korn Ferry

The different initiatives and efforts made by each APAC country are reflected in Wiley's Digital Skills Gap Index. This index is constructed around six different pillars: Digital Skills Institutions, Digital Responsiveness, Government Support, Supply, Demand & Competitiveness, Data Ethics & Integrity, and Research Intensity (Figure 1.3).

Figure 1.3: Digital Skills Gap Index Components

Wiley's Digital Skills Gap Index

Digital Skills Institutions	Digital Responsiveness	Government Support	Supply, Demand & Competitiveness	Data Ethics & Integrity	Research Intensity
Assess the core educational and training institutions on digital skills upon graduation, corporate training availability etc.	Examine how well the training and education system adapt to changes in skill demand	Measure the level and quality of government leadership and support such as funding available in each economy	Examine talent supply and demand gaps; most important pillar	Evaluate ethical standards as well as cybersecurity	Profile academia's focus on digital subjects

Source: Wiley

Singapore ranked 1st with an overall score of 7.8 while Thailand ranked 78**th** with an overall score of 4.5 (Figure 1.4), leaving Thailand significant opportunities to close its digital skills gap with regional peers.

A fundamental building block for Digital Talent development is digital inclusion, categorized by factors such as digital access, affordability, ability, and attitude. All of these play a role in shaping digital skills.

In terms of digital inclusion, the APAC region is distinctly trailing behind Europe and North America. Asia Pacific (excluding Southeast Asia) and Southeast Asia ranked 3rd and 6th with scores of 68 and 63 in the digital inclusion index (Figure 1.5).

Across the APAC countries, **Singapore is dominantly leading the list,** ranking 1st across all 82 countries examined in the report (Figure 1.6). Other countries in the region such as **Thailand, Vietnam and Indonesia are struggling to keep pace,** ranking in the lower half globally, corroborating the clear gap between regional digital leaders and followers.

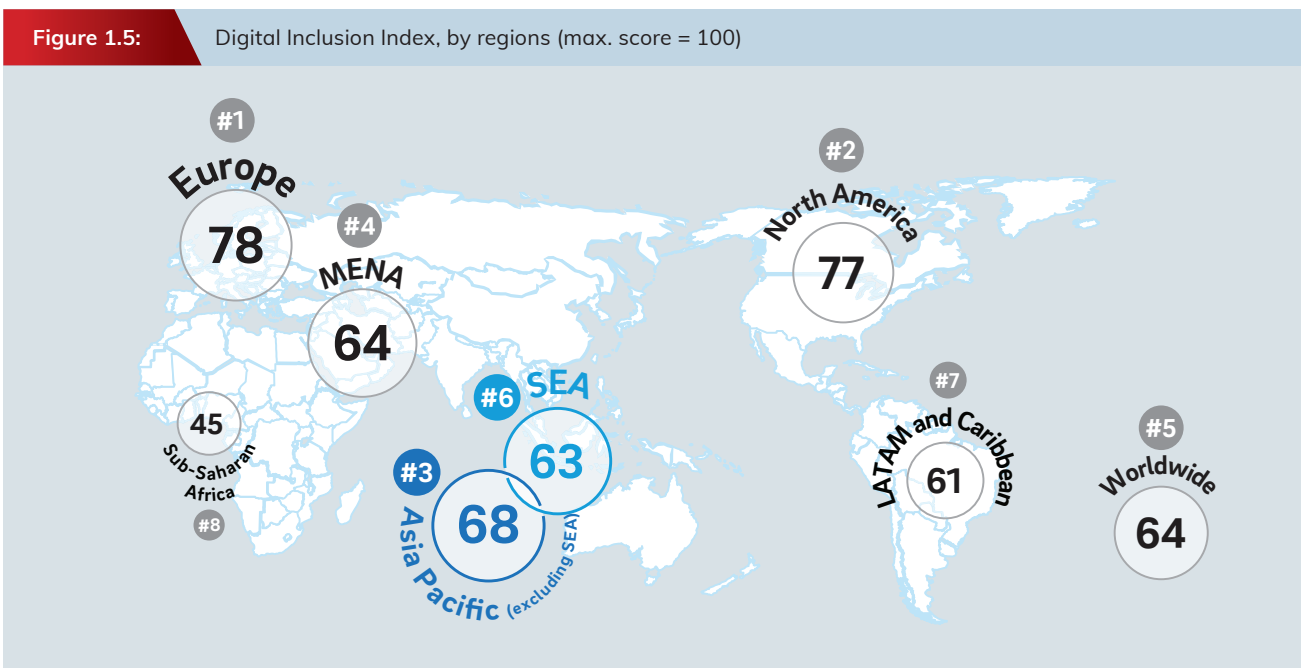| Figure 1.4:	Digital Skills Gap Index 2021	
Rank	**Countries**	**Score**
1st	Singapore	7.8
10th	Malaysia	7.2
15th	South Korea	7.0
18th	China	6.7
36th	Japan	5.9
47th	Indonesia	5.2
53rd	Vietnam	5.0
78th	**Thailand**	**4.5**

Source: Wiley, Roland Berger

Figure 1.6:	Digital Inclusion Index 2020	
Rank	**Countries**	**Score**
1st	Singapore	86
7th	South Korea	84
13th	Japan	81
21st	Malaysia	76
32nd	China	72
42nd	**Thailand**	**64**
44th	Vietnam	64
49th	Indonesia	61

Source: Roland Berger

Figure 1.5:	Digital Inclusion Index, by regions (max. score = 100)

#1 Europe 78
#4 MENA 64
45 Sub-Saharan Africa #8
#3 Asia Pacific (excluding SEA) 68
#6 SEA 63
#2 North America 77
#7 LATAM and Caribbean 61
#5 Worldwide 64

Source: Roland Berger

Chapter 1.2: Key Stakeholders in the Digital Talent Ecosystem

Digital Talent development is at the top of the agenda of government & public sector entities, private sector & associations, as well as academia in APAC

Driven by the digital growth and demand for Digital Talent, a multitude of Digital Talent development initiatives are ongoing in APAC countries. Several APAC countries have made remarkable efforts in government and private sector collaborations to upgrade the digital workforce quality.

The key stakeholders involved in shaping the country's Digital Talent development are the government, academia & public sector entities, and private sector & associations (Figure 1.7). Collaboration between these three stakeholders is of paramount importance for achieving the country's Digital Talent development ambitions.

Figure 1.7: Stakeholder's involvement
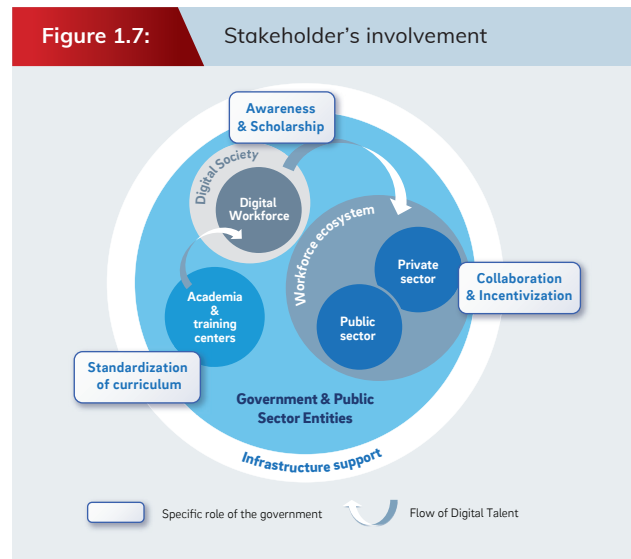
Each stakeholder group comprises of different actors with varying roles.

Government & public sector agencies

The government & public sector entities in the Digital Talent ecosystem comprises of ministries like Labor, Commerce, and Digital, and their associated entities.

The government & public sector entities play a facilitator role in building the Digital Talent ecosystem in the country. This includes conceptualizing and enacting policies that advances the development and adoption of next generation technologies such as Cloud Computing, Big Data, 5G, IoT, and AI, and launching funding to incentivize digital upskilling and reskilling by both the private and public sector.

The government is also pivotal in improving the enabling environment that will advance the digital skill and future readiness of the workforce by enabling research, reforming education, and making life-long learning accessible. As the facilitator of the Digital Talent ecosystem, the government and its entities collectively are at the core of promoting open data initiatives to facilitate innovative approaches for the development of technologies and its associated training for the workforce.

Academia

Academia in the Digital Talent ecosystem comprises of conventional higher education institutions such as universities and vocational schools, and the emerging education platforms such as massive open online courses for acquiring new skills.

The academia plays the key role of not only imparting digital knowledge and skills on the workforce, but also preparing the workforce to thrive in the digital era by spearheading experiential learning and instilling mindset and capabilities complementary to digital skills.

Private sector and associations

The private sector and associations stakeholder in the Digital Talent ecosystem includes both foreign and local for-profit companies, as well as trade associations formed by the industries.

The private sector and associations stakeholder plays the role to embed experiential learning into everyday work, enabling the continuous reskilling and upskilling to maintain momentum with technological advancements. As such, the private sector and associations are central to understanding the evolving needs of the digital skills in the workforce, and in turn engage in ecosystem play in close collaboration with the government & public sector entities and the academia in developing a future-ready digital workforce.

Chapter 1.3: Stakeholder Initiatives to promote Digital Talent

Stakeholders have launched a variety of initiatives across Southeast Asia to promote the development of Digital Talent

In each sector, various stakeholders have launched different initiatives to address various facets of the Digital Talent environment.

1 | **Governments are enacting policies and formulating initiatives to address the Digital Talent gap in their countries.** Initiatives such as providing online and offline training, digital adoption programs, and job matching platforms have been rolled out with the aim to close the Digital Talent gaps. The Singaporean government has initiated a combination of over 40 policies, initiatives, and Public-Private Partnerships (PPP), investing 8% of its government expenditure in Digital Talent development.

2 | **Several tech companies are also at the forefront of driving development of Digital Talent in APAC.** Tech companies are actively generating thought leaderships on Digital Talent topics. For example, Huawei's 2022 Asia Pacific Digital Talent Insights lays out the digital skills framework and talent development portfolio to build a robust Digital Talent ecosystem. Other studies[1] shed light on digital skills of the future, highlighting the importance of connecting talents to future agile organizations, and mapping out the possible career paths for digital roles in a digital economy.

Companies are also actively playing their role in developing local Digital Talent. Microsoft launched the "Accelerating Thailand" program in 2020, a digital upskilling program for Thai workers in collaboration with partners from public and private sectors. In less than 2 years, the "Accelerating Thailand" program has enhanced the digital skills of 280,000 Thais through offline and online channels. Huawei has also launched the OpenLabs program, a series of open innovation hubs across several countries. The OpenLab Bangkok provides one-stop ICT infrastructure support for enterprises as well as facilitate the Thailand's digital transformation drive with ICT training, ICT Career Certification, and Proof Concept testing services.

3 | **Academia is curating curricula and programs to improve the quality of training in digital skills,** with the aim to enhance employability of the digital workforce. Organizations such as 42 Bangkok offer free coding classes with peer-to-peer learning that equip workers with coding skills needed in the future workforce. **42 Bangkok** is founded by Prof. Dr. Suchatvee Suwansawat, President of King Mongkut's Institute of Technology Ladkrabang (KMITL), in 2019 and situated on the KMITL campus. Courses offered by organizations such as 42 Bangkok have provided new ways of learning, making coding accessible for everyone, across all digital literacy backgrounds.

[1] Amazon Web Services' Unlocking APAC's Digital Potential: Changing Digital Skill Needs and Policy Approaches; AON's Digitalization Begins at Home: Talent Transformation Study APAC and ME

APAC countries' commitment to ongoing Digital Talent development initiatives is a testament to their unequivocal need and ambition for building a future-ready digital workforce. Not scaling up the future-readiness of the digital workforce would be detrimental to a country's growth. According to World Economic Forum (WEF) in 2021, upskilling could boost global GDP by up to USD 6.5 trillion in 2030. Digital Talent development will remain at the top of the agenda for APAC countries as they navigate the paradigm shift towards a digital economy.

Huawei's 2022 Digital Talent Insight white paper has analyzed the Digital Talent hiring landscape trends in Asia Pacific to highlight the skills employers demand, and provided a call to action for wide-scale digital upskilling through cooperation between stakeholders in the Digital Talent development ecosystem. This white paper will focus on Thailand's Digital Talent development, and its pivotal role in accelerating Thailand's transformation into ASEAN's digital powerhouse.

CHAPTER 2
THAILAND 4.0 – THAILAND'S DIGITAL TRANSFORMATION AMBITIONS

THAILAND NATIONAL Digital Talent DEVELOPMENT

TRANSFORMING THAILAND INTO ASEAN'S DIGITAL POWERHOUSE

Chapter 2.1: Government's digital transformation plans and policies

Thailand envisions transforming the nation into a high-tech and value-based economy, and has developed strategies centered on focus industries to achieve its ambition

Thailand aims to shift towards a high-tech driven economy to boost economic growth. In order to achieve these ambitions, the government has launched the **Thailand 4.0 initiative and Digital Thailand plan** in 2016. For the transformation, **the government has identified 10 target industries (First S-Curve and New S-Curve) as priorities.** In parallel, the national Digital Economy Plan lays out **6 strategies for developing Thailand's digital economy** including driving the S-curve industries and building digital-era workforce. Initiatives for the **national digital plan are built upon five key pillars** including infrastructures and digital society promotion. In addition to government initiatives, Thai government has designed incentives to attract the private sector.

The Thailand 4.0 initiative and Digital Thailand plan aims to shift the country towards a "value-based" economy

The Thailand 4.0 initiative and Digital Thailand plan is a 20-year strategy that aims to liberate the country from the "middle-income trap" and develop a "value-based" economy driven by innovation, technology, and creativity, and in turn create economic prosperity, social well-being, human development, and environmental protection (Figure 2.1).

1 | **Economic Prosperity**
Thailand aims to increase government expenditure in **Research and Development** to 4% of GDP, **economic growth** to its full potential of approximately 5-6%, and **national income per capita** from USD 5,470 in 2014 to USD 15,000 by 2032.

2 | **Social Well-Being**
Aiming to create a **forward and inclusive society** realizing the full potential of all members of society, Thailand is targeting to reduce **social disparity** from 0.465 in 2013 to 0.36 in 2032. In addition, it aims to completely transform the **social welfare** system within 20 years and develop 20,000 **"Smart Farmers"** within 5 years through physical and virtual job training centers, aiming to build a **digitally ready workforce** equipped with knowledge especially on digital domains such as **IoT and AI.** Given accessibility challenge among the citizens living in the remote parts of Thailand, Massive Open Online Courses (MOOC) platforms and **remote labs** can be leveraged to reach more of the population.

3 | **Human Development**
The country plans to transform the people of Thailand into **"Thais 4.0".** This transformation aims to raise Thailand's Human Development Index (HDI) from 0.722 to 0.8 within 10 years and uplift the world ranking of the 5 Thai universities to amongst the world's top 100 higher education institutions within 20 years. Another part of human development is the **upskilling of citizens to be ready for a digital-driven workforce.**

4 | **Environmental Protection**
The Thai government also aims to create a livable society with an economic system that has the capabilities to address **climate change** and carbon reduction. The plan focuses on developing at least 10 **Thai cities with high environmental quality** and rated on The Economist's list of "World's Most Livable cities".

Figure 2.1: Thailand 4.0 initiative and Digital Thailand plan – Thailand's 20-year digital transformation strategy (Non-exhaustive)
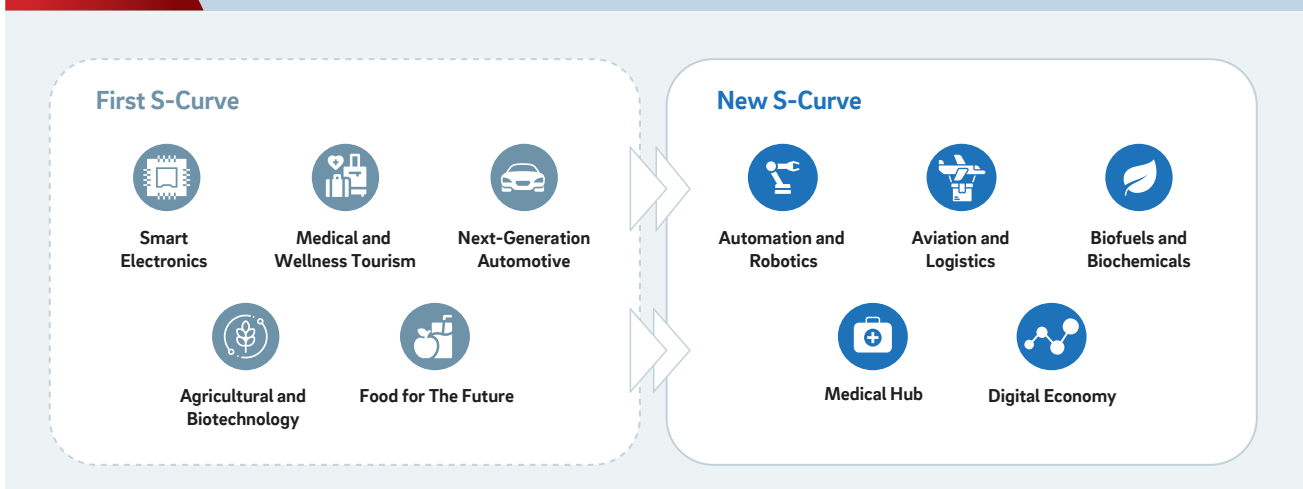
Economic Prosperity

GDP

4% → **6%**

Income per capita

5,470 USD 2014 → **15,000 USD** 2032

Social Well-Being

Forward & inclusive society with digitally ready workforce

Human Development

Thais 4.0 and digital upskilling

Environmental Protection

Thai cities with high environmental quality

Source: ITU

The Thai government has set 10 target S-Curve industries, particularly focusing on the 5 new, emerging industries

The government has identified several target industries as critical to the transformation of the country and these related sectors have attracted tremendous support from foreign investments. The Ministry of Industry has set **10 target industries** which are divided into the **First S-Curve** and the **New S-Curve** (Figure 2.2). The First S-Curve industries were introduced to enhance the country's competitiveness through technology and innovation. On the other hand, the New S-Curve industries were added to accelerate the growth of the new industrial base. With Thailand 4.0, the government has established these 5 New S-Curve industries that will focus on **technology trends such as Internet of Things (IoT) and Artificial Intelligence (AI).** The industries designated as the New S-Curve include Automation & Robotics, Aviation & Logistics, Biofuel & Biochemicals, Medical Hub, and Digital Economy.

Figure 2.2: Thailand New S-Curve and First S-Curve industries

First S-Curve

Smart Electronics

Medical and Wellness Tourism

Next-Generation Automotive

Agricultural and Biotechnology

Food for The Future

New S-Curve

Automation and Robotics

Aviation and Logistics

Biofuels and Biochemicals

Medical Hub

Digital Economy

Source: Ministry of Information and Communication Technology

Automation and Robotics

The Automation and Robotics industry in Thailand has been developing rapidly especially in the manufacturing sector. Automation enables industries to lower operating costs and increase overall productivity. In order to stay competitive in the global digitalized manufacturing landscape, most manufacturers are investing heavily in machinery and systems. According to the International Federation of Robotics (IFR), Thailand had the highest number of industrial robots among ASEAN countries in 2019. 50% of Thai manufacturers are forecasted to be automating their systems within the next few years. This shift would create demand for talent with automation-related skills and experience with innovative use cases for robotics technology.

Aviation and Logistics

Within the Aviation and logistics industry Thailand targets to be a leading logistics hub in the ASEAN region. The government is focusing on developing comprehensive and efficient routes between ports, airports, and industrial clusters throughout the country. This is made possible through **technology integration (IoT, blockchain etc.) in carriers.** Prior to the COVID-19 pandemic, passenger traffic at Thailand's Suvarnabhumi airport was exceeding its annual 45 million passenger capacity. With COVID-19 cases in decline, the Thai government aims to develop high-speed railways that will connect the three main airports in Thailand: U-Tapao, Don Mueang and Suvarnabhumi. In addition, the Airport of Thailand (AOT) forecasted that all three major airports will recover their passenger traffic to 2019 levels by 2025.

Biofuels and biochemicals

The Biofuel and biochemicals industry in Thailand has been growing and the country has become one of the world's leading exporters in the industry. Thailand aims to generate 30% of its power from renewables such as biofuels by 2036. It plans to utilize sugarcane and cassava in order to produce biofuel, as well as biochemical and biopharmaceutical products. In addition, the demand for exporting bioplastic products is forecasted to increase in the next few years, which increases the importance of adopting biochemical technology to produce biomaterials.

Medical Hub

Positioning Thailand as a **Medical hub** is part of the government efforts to develop the country's medical industry as the place-to-be for medical centers in the ASEAN region. According to the BOI, there has been a significant increase in the number of international and Thai companies that invested in the medical sector during the COVID-19 pandemic. In addition, the country is at an early stage of integrating **robotics, IoT and AI** in several hospitals. The rising market demand for advanced treatments has prompted hospitals to invest in developing **healthcare technologies and human resource capabilities.**
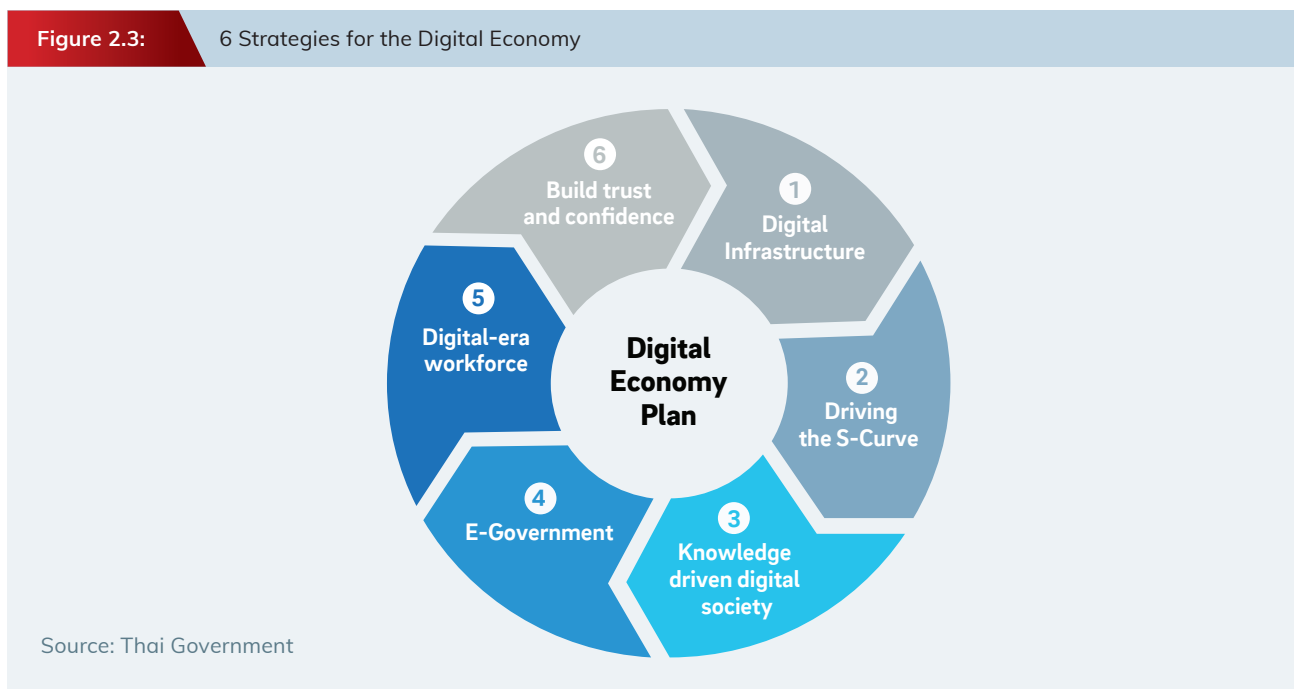
Digital Economy

A Digital economy is a centerpiece of the Thai government's digital transformation plan. Compared to other ASEAN countries, Thailand has become one of the **fastest growing IoT markets,** predicted to reach a staggering USD 2.19 billion by 2030, which represents a CAGR of 27%[1]. The country has also implemented a national plan for digital economy development. Both the public and private sector in the targeted industries are leveraging innovative technologies to create new business models, products, or services.

[1] Thailand Investment Review Vol.30, February 2020, BOI

Strategies for developing the Digital Economy have been conceptualized

The government of Thailand has established six different strategies within their national Digital Economy Plan (Figure 2.3):

Figure 2.3: 6 Strategies for the Digital Economy

Source: Thai Government

1 | Establishing a country-wide **digital infrastructure** ensuring accessibility, availability, and affordability

2 | Boost the economy through use of **digital technology** by driving the **"New S-Curve"**, raising competitiveness, and building new value-added businesses

3 | Create a **knowledge-driven digital society** that is inclusive and equal

4 | Transition towards a digital or **e-government** that simplifies access for people and businesses

5 | Develop the **workforce for the digital era** by providing skills and building strength from within

6 | Build **trust and confidence in the use of digital techno -logy** by updating laws and regulations to encourage investments

Anchoring on these six strategies, the Thai government developed the economic development initiative – **Eastern Economic Corridor (EEC).** In order to increase Thailand's competitiveness, the EEC includes various initiatives such as the development of fundamental infrastructure, digital infrastructure, livable smart cities and financial centers; the support for targeted industries utilizing advanced technology; and the promotion of tourism, human resources, education, research & technology. The EEC further includes 3 main activities:

A | Upgrade the transport and logistics infrastructure to provide a solid connectivity platform to link the EEC region with the wider APAC market

B | Establish investment areas in the EEC such as EECi for innovation or EECd for digital economy

C | Create a sustainable eco- nomic & social development area by using environmen- tally-friendly technologies to enhance quality of life

To establish a flourishing national digital economy, initiatives are built upon 5 key pillars

In order to develop Thailand's digital economy, the Thai government aims to create a comprehensive approach to address all aspects. The National Digital Economy Masterplan will focus on 5 key pillars to drive Thailand's digital economy. These pillars are hard infrastructure, service infrastructure, soft infrastructure, digital economy promotion, and digital society promotion (Figure 2.4).

Figure 2.4:	Five pillars of Thailand's Digital Economy Initiative

Hard Infrastructure	Soft Infrastructure	Service Infrastructure	Digital Economy Promotion	Digital Society Promotion
National Broadband	e-Trade Facilitation	Digital-government	Digital Commerce	Lifelong Learning
Data Centers	CERT Readiness	Service platforms	Digital Entrepreneurs	Digital Archive & Library
International Gateways	Laws	E-Logistics	Digital Innovation	Media &Information Literacy
National Broadcast	E-Commerce Directory	Data Service Innovation	Digital Contents	Universal Healthcare
Satellite				
Radio Frequency Management				

Source: Ministry of Information and Communication Technology

Hard Infrastructure

The government will focus on collaborating with the private sectors to build suitable hard infrastructures to support Thailand's digital economy. Hard infrastructure includes information technology, high-capacity broadband internet, digital gateways, and various data centers.

One major initiative by the Thai government is the National Broadband Network (NBN) under which the country is building a telecommunication infrastructure to provide high-speed internet services to all Thais. The NBN aims to provide nationwide coverage and broadband service quality while remaining affordable. It is constructed by integrating existing network infrastructure from the private sector with new network. This initiative also integrates the **Village Broadband Internet** project, known as **Net Pracharat,** which aims to bring high-speed broadband internet to every village. This further exemplifies the collaboration between multiple sectors, in order to generate positive and sustainable economic and social impact.

Another initiative is the establishment of Thailand's first 5G innovation center and laboratory, the Digital Park Thailand. The Digital Park Thailand in the EEC is spearheading the country's adoption of 5G as Thailand aims to be the first country in Southeast Asia to fully harness this technology. The project is a collaboration between the public and private sector – telecom operator AIS and the Digital Economy Promotion Agency (DEPA) have established partnerships to build 5G technology in Thailand. The Digital Park Thailand will consist of five buildings on an area of 4,500 square meters. In order to develop the capabilities necessary to create an extensive 5G network, AIS has also established partnerships with globally leading companies such as Singtel, NCS Telco+ and Siemens. This project will enable and accelerate digital transformation of businesses in Thailand, particularly e-commerce and related logistics services.

Soft Infrastructure focuses on building the confidence of both business owners and consumers in online transactions, such as through implementing identity verification systems and cybersecurity tools. This focus on soft infrastructure is also creating new opportunities for digital-focused investments. In addition, regulators have reviewed regulations such as the Personal Data Protection Act (PDPA) and the Cybersecurity Act (CSA).

The Personal Data Protection Act (PDPA) is Thailand's pioneer domestic law to govern data protection, passed on June 1, 2022. The law encloses the requirements for data controllers and data processor for both public and private companies.

The law also provides guidance on how to receive consent from data subjects prior to processing, collecting, or disclosing of data. With the digitalization of countries' economies, more businesses and consumers are storing personal data online. The PDPA serves to protect businesses and consumers against data breaches.

The second regulatory initiative is the Cybersecurity Act (CSA) which came into force in 2019. As digitalization grows, so does the cyber risks that could compromise computer system and user data. CSA aims to govern cybersecurity activities in order to prevent and combat digital threats.

In addition to the laws and regulations governing the flow of online transactions from various sources like E-Commerce, the focus is also on regulatory standards to protect and facilitate the exchange of information shared on the internet.

Service Infrastructure

The Service Infrastructure will be propelled by the Electronic Transactions Development Agency's plan to introduce e-documents, offering efficient services in government-run offices such as digitized document search. This venture will create connectivity between offices. The government will set up a centralized system to provide accurate and complete information for every party involved in digital businesses and online transactions.

The Thai government has launched an e-government initiative in form of a central information portal. This portal, developed by the Digital Government Development Agency (DGA), aggregates public services and information provided by government agencies under one system. It will act as a one-stop services to provide businesses and citizens with services such as e-tax services or online business registration. This initiative aims to increase both quality and efficiency of public services, in turn driving digital adoption in the public and private sector.

Another initiative is the creation of Open Data platforms in Thailand. These platforms aims to improve data access for businesses and citizens as the government would facilitate data exchange across government agencies. Currently, Thailand has a platform called "data.go.th" that provides datasets covering official statistics, as well as economic and industry-specific information. The government aims to improve the platform by launching a data exchange platform called the Government Data Exchange (GDX). This platform will enable the government to digitalize its operations acting as the backbone of Thailand's service infrastructure.

Digital Economy Promotion

The Digital Economy Promotion program focuses on developing digital skills to improve efficiency for entrepreneurs. It will utilize digital tools to support the business growth in sectors such as banking, services and manufacturing and IT to support small and medium-sized enterprises. Both the government and private companies have collaborated to initiate digital literacy programs.

The Saphan Digital initiative by the Ministry of Commerce and Google Thailand, alongside other business partners provided free online instructions for SMEs, non-profit organizations and other interested citizens. Saphan Digital allows participants to learn basic skills such as digital tooling techniques to grow their online business.

A further initiative is the Smart Business Transformation Program aiming to help Thai SMEs with digital development. This program was born from the partnerships between the Digital Economy Promotion Agency (DEPA), United Overseas Bank (UOB), and FinLab. Through the program, SMEs will be able to gain insights and receive guidance provided by industry experts, mentors, and technology leaders.

The government aims to develop digital capabilities within various sectors to help Thai SMEs to successfully complete their digital transformation.

Digital Society Promotion

The Digital Society and Knowledge Resource sector will provide universal access to lifelong learning for the Thai population. This involves upskilling both current and future workers in the Thai workforce. Several government entities have partnered up with private companies and developed multiple upskilling initiatives.

The Ministry of Labor collaborated with Microsoft on digital initiatives to improve the workforce quality. This partnership aims to **upskill 4 million Thai workers** in order to improve their employment opportunities and to build a sustainable economy. Microsoft will offer the **digital skill courses** and participants can choose which skills match their interests. This partnership is part of Microsoft's commitment to enhance digital skills education and close the digital divide.

Another initiative is the **collaboration between the Thai government and Huawei for the Digital Talent Development Program.** The Eastern Economic Corridor Office (EECO) and Huawei have signed a Memorandum of Understanding (MoU) for the development of an EEC Branch of Huawei's ASEAN Academy. This initiative will provide training programs to train 30,000 **ICT talents** between 2021 and 2024. The academy will provide trainees with cutting-edge ICT technologies and industry best practices that will cover key technology domains including **5G, Cloud, IoT, Big Data, AI, Cybersecurity, and Digital Leadership.** This program will be available for young IT students, industry professionals, and the general public.

Source of Image: https://www.depa.or.th/

In addition to government initiatives, the Thai government has designed incentives to attract the private sector

Recognizing the importance of collaborations with the private sector to achieve Thailand's digital transformation ambitions, the Thai government has implemented targeted incentives to attract players from the private sector.

These incentives are particularly interesting for the digital sector, as they offer strong benefits for investments in R&D as well as training opportunities for students and staff, both of which are highly needed in the digital sector. In addition, producers and vendors of digital hardware also benefit from multiple targeted exemptions.

These incentives are grouped into six categories depending on several key factors including level of technology and the role they play in the supply chain (Figure 2.5). There is a series of investments and expenses that the BOI targets to encourage by offering tax and non-tax incentives to companies. Under these categories, companies will get a merit (such as on expenses incurred for training of workers in advanced technologies) which can increase their investment cap, and thus their tax deductibles, by a percentage of the expenses incurred (200% in the aforementioned case). The incentives range from purely merit related incentives to 8 years of CIT exemption in addition to the merit incentives without a cap on the maximum amount (although the exemption from CIT can be obtained for a maximum of 13 years). Even though the B1 and B2 categories do not receive CIT exemptions, they receive other incentives such as exemptions from import duties.

| Figure 2.5: | Government policy, tax incentives, and non-tax incentives |

Incentive category		CIT exemption	Import duty exemption on machinery	Import duty exemption on raw materials for export	Non-tax incentives
A1	Knowledge-based activities focusing on R&D and design to enhance the country's competitiveness	8 years + Merit no cap	✔	✔	✔
A2	Infrastructure activities for the country's development, activities using technology to create value-added, with no or very existing investments in Thailand	8 years + Merit	✔	✔	✔
A3	High technology activities which are important to the develop-ment of the country, with a few investments already existing in Thailand	5 years + Merit	✔	✔	✔
A4	Activities with lower technology than A1-A3 but which add value to domestic resources and strengthen the supply chain	3 years + Merit	✔	✔	✔
B1	Supporting industry that does not use high technology, but is still important to the value chain	Merit	✔	✔	✔
B2	Supporting industry that does not use high technology, but is still important to the value chain	Merit	✘	✔	✔

8 years — CIT Exemption — 0 years

Source: BOI, PwC

While the initiatives launched are laying foundation for Thailand's digital transformation, an adequately skilled workforce is needed to harness the potential from the digital economy

The initiatives in building digital infrastructures and incentivizing private sector investments in S-curve industries are improving the enabling environment to drive Thailand's digital transformation. However, the shift towards a "value-based" economy in the digital era inherently changes the skills required in Thailand's workforce.

Unless the country can develop sufficient highly digital skilled workers, the risk of a talent crunch could threaten the rosy forecasts for technological progress and its accompanying economic growth.

To fully harness the potential of its digital transformation, Thailand needs to build a ready pool of adequately trained workers. In the next sub-chapter, this paper will discuss the new roles and skills in demand as digital transformation accelerates in the private sector.

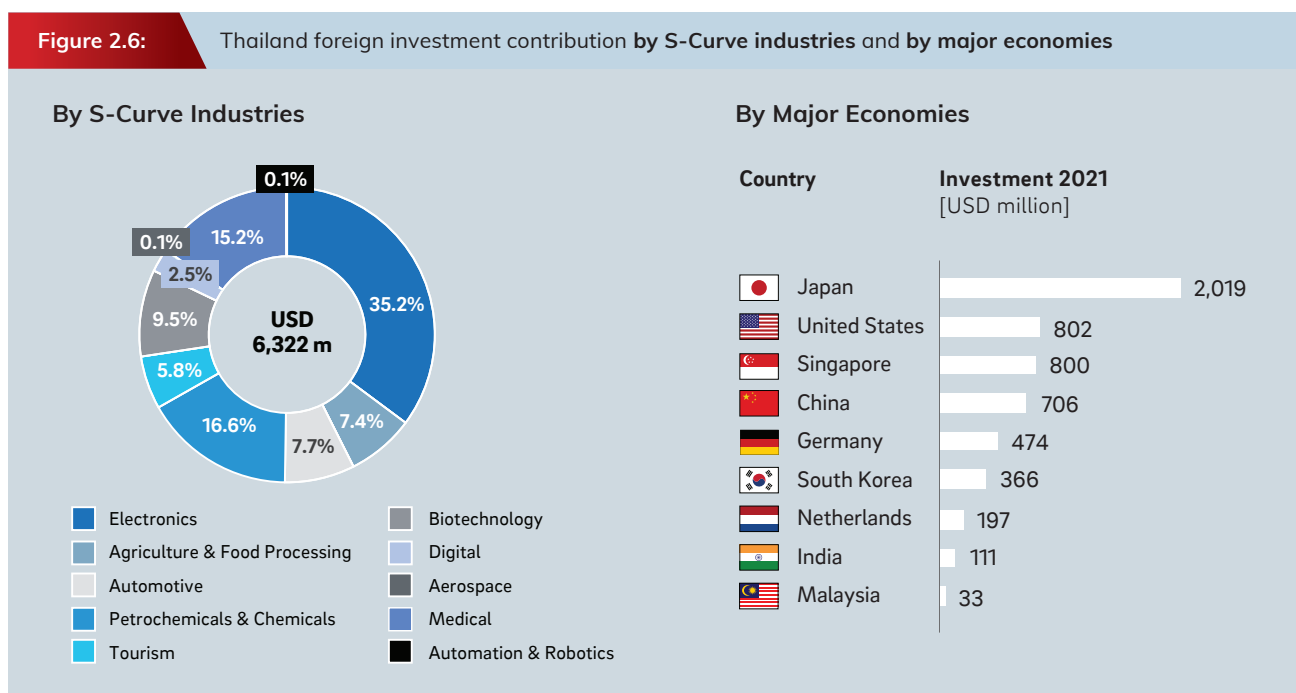## Chapter 2.2: Digital transformations in private sector

As digital transformation in private sector gains traction, new roles and skills are in demand especially in fast-growing technology domains integral to Thailand's S-Curve industries

The Thai government's digital transformation plans and policies outlined in Chapter 2.1 have catalyzed the pace of digital transformation in the private sector.

The private sector plays an important role in Thailand's digital economy as the digital trend-setter and the largest source of the country's tech talent demand. The role of private sector in high-tech innovations and digital product and services developments cannot be overlooked.

This sub-chapter will discuss key developments in the digital transformations in the Thai private sector, including foreign investments in Thailand's digital focused S-curve industries, business environments for tech startups and unicorns, as well as initiatives which the startups and tech firms are implementing to support the country's digital transformation ambition and talent development.

FDI in Thailand has been concentrated in the S-Curve industries, in which most digital transformations are taking place

Figure 2.6: Thailand foreign investment contribution **by S-Curve industries** and **by major economies**

By S-Curve Industries

USD 6,322 m

- 35.2%
- 7.4%
- 7.7%
- 16.6%
- 5.8%
- 9.5%
- 2.5%
- 0.1%
- 15.2%
- 0.1%

Legend:
- Electronics
- Agriculture & Food Processing
- Automotive
- Petrochemicals & Chemicals
- Tourism
- Biotechnology
- Digital
- Aerospace
- Medical
- Automation & Robotics

By Major Economies

| Country	Investment 2021 [USD million]
Japan	2,019
United States	802
Singapore	800
China	706
Germany	474
South Korea	366
Netherlands	197
India	111
Malaysia	33

Source: BOI

Foreign direct investment (FDI) is an important source of capital for Thailand's economic development. Thailand has been a popular destination for foreign investments as the country offers not only lower cost, skilled, and diverse workforce, but also government policies focusing on attracting investments and improving ease of doing business.

FDI into Thailand reached a total of USD 11.4 billion in 2021, of which USD 6.3 billion for S-curve industries. A majority of the investments are coming from Japan, which contributed more than USD 2 billion. Two-thirds or 67% of FDI in Thailand went to electronics, petrochemicals & chemicals, and medical industries (Figure 2.6). Regardless of the receiving industries, FDIs support the development of a digital economy, as they bring large, innovative companies to Thailand accompanied by both foreign talent and opportunities for domestic talent.

On top of the rising foreign investments, there is vibrant growth in the tech startups scene in Thailand

Since 2010, approximately 1,000 tech startups have been launched in Thailand, where the startup scene is mostly comprised of business service companies. Opportunities exist for collaboration between established Thai tech firms and tech startups to drive the development of innovative digital products and services in Thailand.

With the recent surge in the tech startups, Thailand is in a position to catch up with comparable countries in the region such as Indonesia, Singapore, Malaysia and Vietnam, to produce more local unicorn companies (Figure 2.7).

**Figure 2.7:** Local unicorns across APAC countries
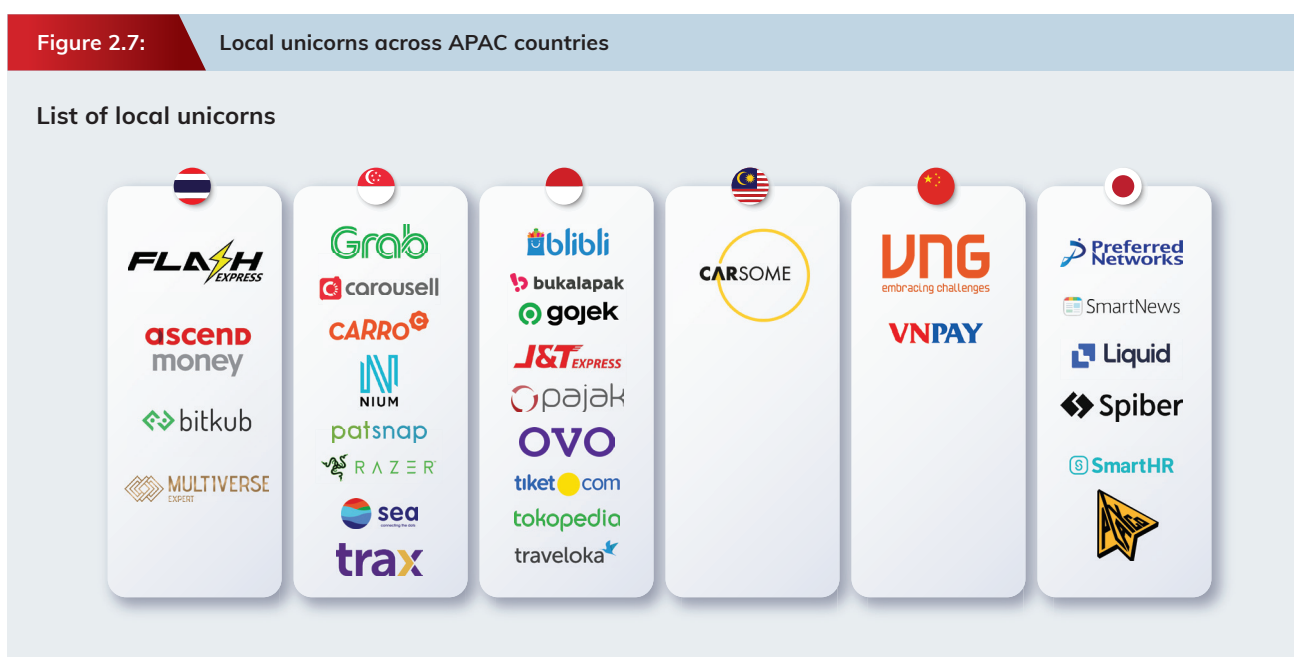
Source: Desktop research

The new president of Thai Startup Trade Association recently shared the vision and two-year plan to transform Thailand into a "technology maker" instead "technology user". This vision will necessitate collaborations between startups, private companies, and public sector partners to create new technologies and value-adding services.

As digital transformation in the private sector continues to gain traction in Thailand, new roles and skills requirements are emerging especially in the focused industries. Fast-growing technology domains like **Cloud Computing, Big Data, 5G, IoT,** and **AI** have now become an integral part of Thailand's S-Curve industries, changing employees' job description, the way jobs are executed, and the skills required. Ensuring that the workforce is competent to fill these newly created or evolved roles is of paramount importance in Thailand's transition to a high-tech and value-based economy.

Startups and tech firms have implemented initiatives supporting Thailand's digital transformation ambition and talent development

Figure 2.8: Examples of private sector participation in Thailand's digital transformation (non-exhaustive)
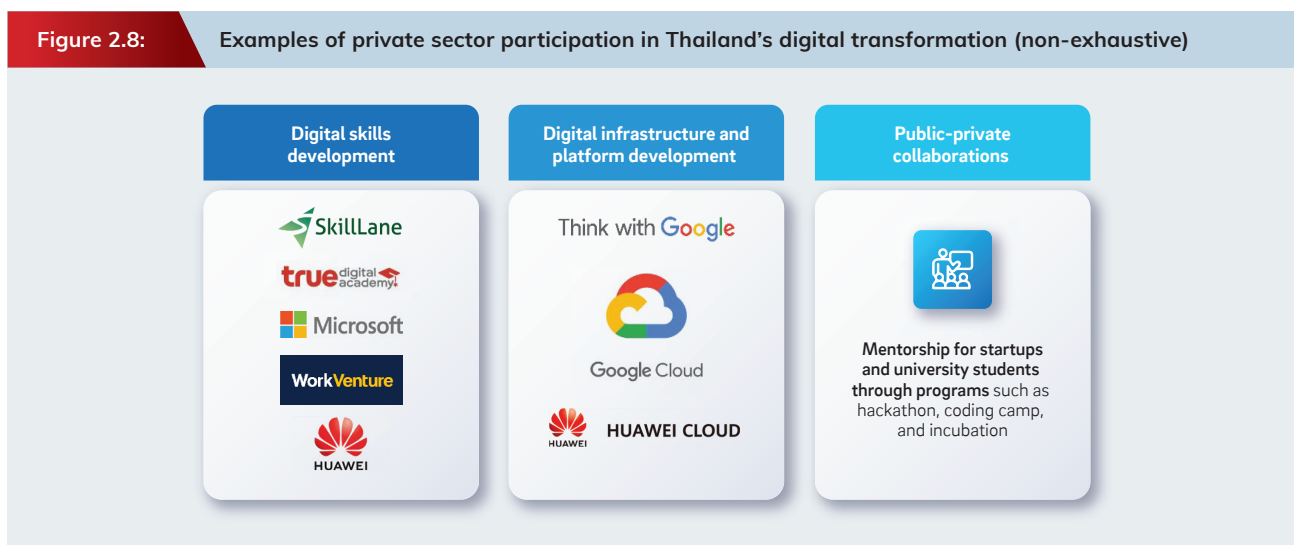
Source: Companies report

Private sector participation in Thailand's digital transformation primarily revolves around three aspects (Figure 2.8). The first aspect is digital skills development, that is the up- and reskilling of digital capabilities among the wider population. The second aspect is digital infrastructure and platform development to support digital transformation of companies in Thailand. The third aspect is public-private collaborations on building digital transformation enablers.

Digital Skills Development

An example is the **Thai startup SkillLane,** which provides a platform allowing experts from any profession to create online courses and offer the courses to the public. SkillLane offers self-paced courses that range from completely free to THB 35,000 in 17 categories including software development, languages, marketing, entrepreneurship and data analytics. These courses are tailored for young professionals who wish to learn new skills but do not have the time for a full-time course. Another tech startup example is **WorkVenture** which offers recruitment and job matching process, connecting jobseekers and employers through its own AI algorithm.

More established tech companies are also playing their role in Thailand Digital Talent development. **Microsoft Thailand** collaborated with both the public and private sectors including UNESCO, DEPA and JobsDB to create the **"Accelerating Thailand"** program aiming to enhance the digital capabilities of 280,000 Thais within one year. Starting in 2022, the target of the program is to reduce the unemployment rate through the creation of 180,000 new jobs.

Another example is the **True Digital Academy,** a training initiative which focuses on enhancing digital competencies for employees across business functions to meet changing demands in the digital era.

Currently, the True Digital Academy is focusing on upskilling and reskilling across seven different digital functions including **data analytics, technology solutions, digital marketing, product management, user experience design, cybersecurity** and **business innovation.** The aim of the training courses is to create **'Digital Champions'** where users have analytic capabilities that allow them to leverage data insights to maximize their job functions.

Google is playing an active role in Thailand's Digital Talent development via the **Google Academy** in Bangkok, which is also **Asia's first** and the **world's second digital incubation center.** The **Google Academy** in Bangkok aims to enhance digital capabilities and embed digital innovation among startups and entrepreneurs through collaborative trainings, workshops and networking activities. On top of that, the center offers training programs for graduate students to improve their digital literacy and competencies.

Huawei has launched the **OpenLab Bangkok** in Thailand to offer one-stop ICT infrastructure support for enterprises as well as facilitate the development of Thailand's Digital Talent with ICT training, ICT Career Certification, and Proof Concept testing services. In addition, the **Huawei ASEAN Academy** is working with The Eastern Economic Corridor Office (EECO) in Thailand to provide training programs for SMEs in the EEC region, aimed at further strengthening the economic potential of Thailand's EEC initiative.

Digital Infrastructure and Platform Development

Google is also playing an active role in digital transformation ambitions via the **Google Cloud** and **"Think with Google"** which enable businesses to adopt data-driven tools for their operations. These initiatives are estimated to have helped **Thai businesses to realize up to THB 144.5 billion in annual benefits and support over 63,000 jobs.**

Public-private Collaborations

While private and public sector players are both launching initiatives to play their roles in the digital transformation and talent development in Thailand, they are also **collaborating to offer mentorship** for startups and university students through programs such as hackathon, coding camp, and incubation. These public-private collaborations will be discussed in further detail in Chapter 3 of this white paper.

Digital Talent development is undeniably one of the key success factors for Thailand's digital transformation. According to Outsource Asia, 16.9 million unskilled Thai employees are at risk of job loss due to a lack of technological skills. This accentuates the pressing need for **building a future -ready workforce in order to achieve the goals of transitioning Thailand to a high-tech and value-based economy.**

Chapter 2.3 Implications on digital skills required

To scale up and future-proof the Thai digital workforce, upskilling and reskilling across the four levels of digital skills and the complementary capabilities is key

The government's commitment to achieving Thailand's digital transformation ambition is evidenced by the multitude of digital transformation plans and policies as discussed in Chapter 2.1. These plans and policies have catalyzed the pace of digital transformation in the private sector, where players are increasingly participating in various digital transformation initiatives and engagements outlined in Chapter 2.2. The result is a vibrant growing digital landscape which is seeing increased demand for emerging roles related to digital, especially in technology domains such as Cloud Computing, 5G, Big Data, IoT and AI.
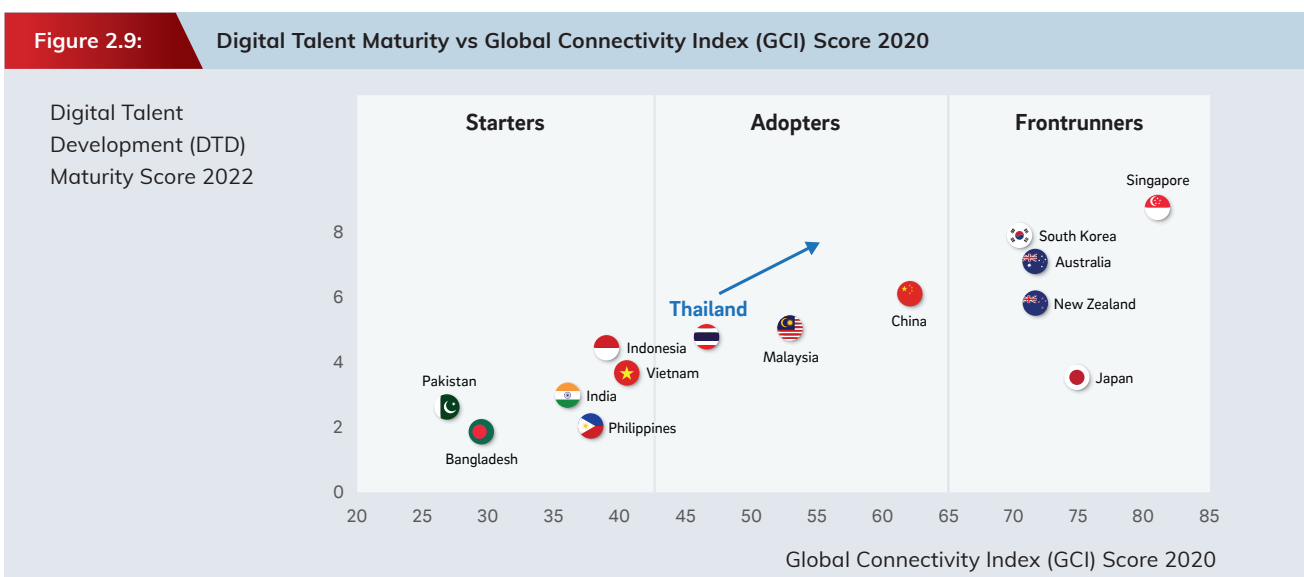
Currently in its early digital adoption stage, Thailand has significant opportunity to close gaps with digital leaders by scaling up and future-proofing its digital workforce through up- and reskilling across four levels of digital skills and the complementary capabilities.

2.3.1 Thailand Digital Talent as-is situation

Thailand is in the early digital adoption stage and in a position to catch up with regional and global leaders

Having made initial progress in developing its Digital Talent workforce, Thailand is in a position to catch up with regional and global leaders. Under the 20-year strategy for Thailand 4.0, the country is striving to establish itself as a globally leading digital economy. Thailand has yet to fully realize its development potential, according to the Institute for Management Development's (IMD) annual Digital Competitiveness and Talent Rankings, in which Thailand made incremental progress. ICT infrastructures and the availability of skilled and qualified talent were identified by the Organization for Economic Co-operation and Development (OECD) as key improvement areas that would be pivotal for driving Thailand's economic development.

As one of the first countries in the region to place emphasis on developing digital infrastructures, Thailand is well-positioned to leapfrog its neighbors and close the gap with regional and global leaders. With the Thailand 4.0 strategic focus on building ICT infrastructures, Thailand is ahead of countries like Indonesia, Vietnam and India on Huawei's global connectivity and Digital Talent development maturity scores, but trails behind regional peers such as Singapore and Malaysia (Figure 2.9).

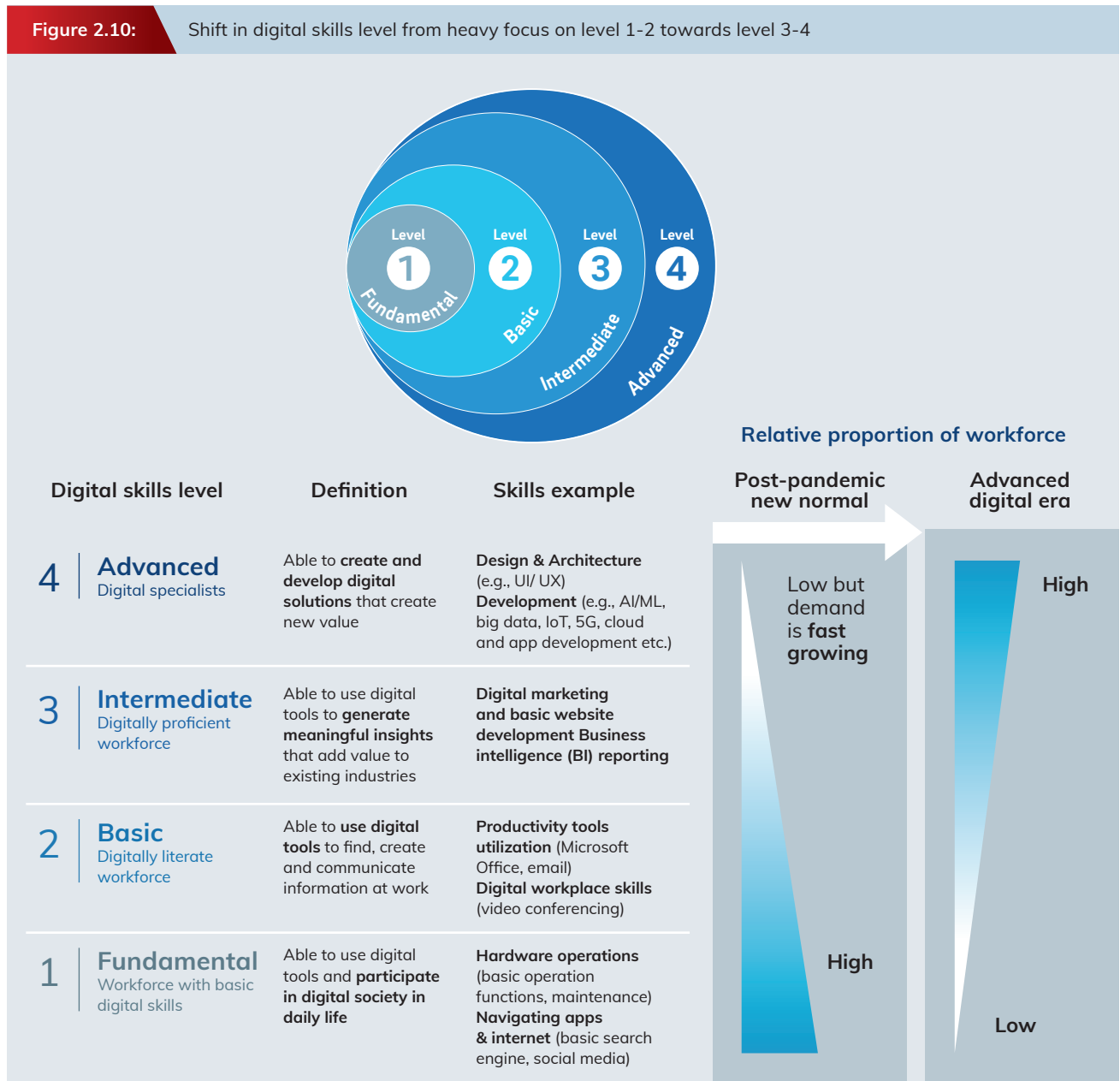**Figure 2.9:** Digital Talent Maturity vs Global Connectivity Index (GCI) Score 2020

Source: Huawei

Thailand, however, is catching up with Malaysia in closing the Digital Talent gap, scoring similar as Malaysia on the Digital Talent development (DTD) maturing score in 2022. Thailand, in its early digital adoption stage today, is in a position to propel its talent development maturity to levels of regional leaders such as Singapore, South Korea and Australia.

Digital skills can be categorized into four levels ranging from fundamental to advanced, which influence how the workforce interact with technology – from participate to use and create

Figure 2.10: Shift in digital skills level from heavy focus on level 1-2 towards level 3-4

Digital skills level		Definition	Skills example
4	**Advanced** Digital specialists	Able to **create and develop digital solutions** that create new value	**Design & Architecture** (e.g., UI/ UX) **Development** (e.g., AI/ML, big data, IoT, 5G, cloud and app development etc.)
3	**Intermediate** Digitally proficient workforce	Able to use digital tools to **generate meaningful insights** that add value to existing industries	**Digital marketing and basic website development Business intelligence (BI) reporting**
2	**Basic** Digitally literate workforce	Able to **use digital tools** to find, create and communicate information at work	**Productivity tools utilization** (Microsoft Office, email) **Digital workplace skills** (video conferencing)
1	**Fundamental** Workforce with basic digital skills	Able to use digital tools and **participate in digital society in daily life**	**Hardware operations** (basic operation functions, maintenance) **Navigating apps & internet** (basic search engine, social media)

Relative proportion of workforce

Post-pandemic new normal → **Advanced digital era**

Low but demand is **fast growing** / High (Post-pandemic new normal)

High / Low (Advanced digital era)

Source: ITU

Digital skills can be categorized into four levels: fundamental, basic, intermediate and advanced. Fundamental and basic digital skills constitute the minimum requirement for many job roles in the post-pandemic new normal, while intermediate and advanced digital skills refer to more cutting-edge skills that are most in-demand by specific roles in the workplace of the future (Figure 2.10). The four digital skill levels could be understood as layers of digital skills. The skill levels build on one another such that workers with level 3 digital skills also possess level 1 and 2 digital skills, and that level 4 digital skills are more rigorous than level 3.

Level 1: Fundamental digital skills

At level 1, the individual possesses fundamental digital skills referring to the **ability of using basic digital tools in their daily lives.** Individuals with fundamental digital skills are capable of basic hardware operations like turning a smartphone or computer on and off, charging devices.

Level 1 digital skills form the foundation of operating in a digital society. For an individual to be digitally included, they need to be at least at this skill level. The level 1 digital skills are required for members of a digital society such that they could operate digital functions such as navigating the Internet and apps like Facebook, LINE, and Grab, as well as online services like online banking, e-commerce and online government services. Even low cognitive-intense occupations such as general labor workers like construction workers, field farmers and shop staff, require these level 1 digital skills to operate in a digital society. Without these digital skills, the individuals will remain virtually cut off from the rest of society.

Level 2: Basic digital skills

Individuals with level 2 digital skills are considered **digitally literate and capable of using digital tools to find, evaluate, create and communicate information at work.** At this level, workers are able to use systems such as the Microsoft Office Suite, video conferencing applications like Zoom and Microsoft Teams, and search engines to access online resources and conduct research.

Being equipped with sufficient discernment to use a selection of software for the right purpose, individuals with level 2 basic digital skills understand how to use company-approved applications for tasks such as file transfers or cybersecurity management, leveraging digital tools to enable greater efficiency at the workplace.

In the workplace, **level 2 digital skills will form the minimum requirements for many roles, especially white-collar office workers.** Workers in these roles may find most of their work performed via a laptop or desktop and requires one to be regularly connected to the Internet. As observed in other developed countries, these basic digital skills will become mandatory for workers in environments with digital touchpoints.

Level 3: Intermediate digital skills

Individuals with level 3 digital skills are considered **digitally proficient and capable of harnessing digital solutions to generate meaningful insights.** They are able to perform more challenging digital tasks such as data analytics or utilizing job-specific tools such as customer relationship management (CRM) systems like Salesforce or Microsoft Dynamics 365 in order to gain valuable information that add value within organizations.

Level 3 digital skills are wide-ranging depending on the industry and job function, and focus on specialist aspects of the job.
In the Robotics and Automation industry, job functions that involve new and emerging technologies would require skills in human-machine interaction such as using digital machine interfaces or monitoring systems. More advanced systems can include IoT solutions which require a minimum level of digital skills to operate.

In the Biofuel and Biochemical industry, job functions that manage production would require data analysis and knowledge management skills that generate business insights. Other functions such as in workplace safety or inventory management would require digital skills to operate new facility management or inventory management systems that are housed on digital platforms.

In the Aviation and Logistics industry, job functions that involve some degree of technology management would require skills such as integrated system application and human-robot collaboration. Digital skills may also be required in supply chain management, to execute efficient routing, SAP deployment or inventory control and audit.

In the Digital industry, client-facing job functions would require customer data analysis skills and the usage of customer relationship management (CRM) systems.

With more and more workplace activities outsourced to XaaS providers, employees across all industries, especially in startups and SMEs, need to be able to use cloud-based tools to effectively contribute to their organizations.

Individuals who are equipped with Level 3 digital skills are often in PMET (Professionals, Managers, Executives & Technicians) roles. Examples of such roles are machine operators who adjust and troubleshoot IoT connected production lines, account executives who track sales pipelines and performance on CRM tools, or process systems engineers who analyze factory operational efficiency through smart monitoring systems. These roles typically entail interactions with industry-specific platforms, which require digital proficiency.

Level 4:
Advanced digital skills

Individuals with level 4 digital skills are considered digital specialists who have acquired advanced skills through education or training, or honed these skills through years of practical experience. These individuals are capable of developing digital solutions that generate value and contribute to driving Thailand's digital economy forward. Workforce with level 4 digital skills have strong IT foundation such as programming languages, web technologies, database management, and system architecture. This enables them to adapt and keep up with trending technology domains like **Cloud, 5G, AI, IoT and Big Data.**

As of now, **level 4 digital skills are predominantly required in ICT roles.** Within IT design and architecture, a Solution Architect would have skills in embedded systems integration, cloud security engineering, and user interface and experience design. In digital product development and implementation, a Product Developer would hone skills such as app development, DevOps, and blockchain. Roles related to big data and analytics are of growing importance exemplified by the rise of Data Scientist as one of the most desired role across various industries.

In the fast-changing digital era, a workforce with advanced digital skills would not only possess up-to-date digital skills but also the ability to continuously self-learn new skills and contribute to the digital economy.

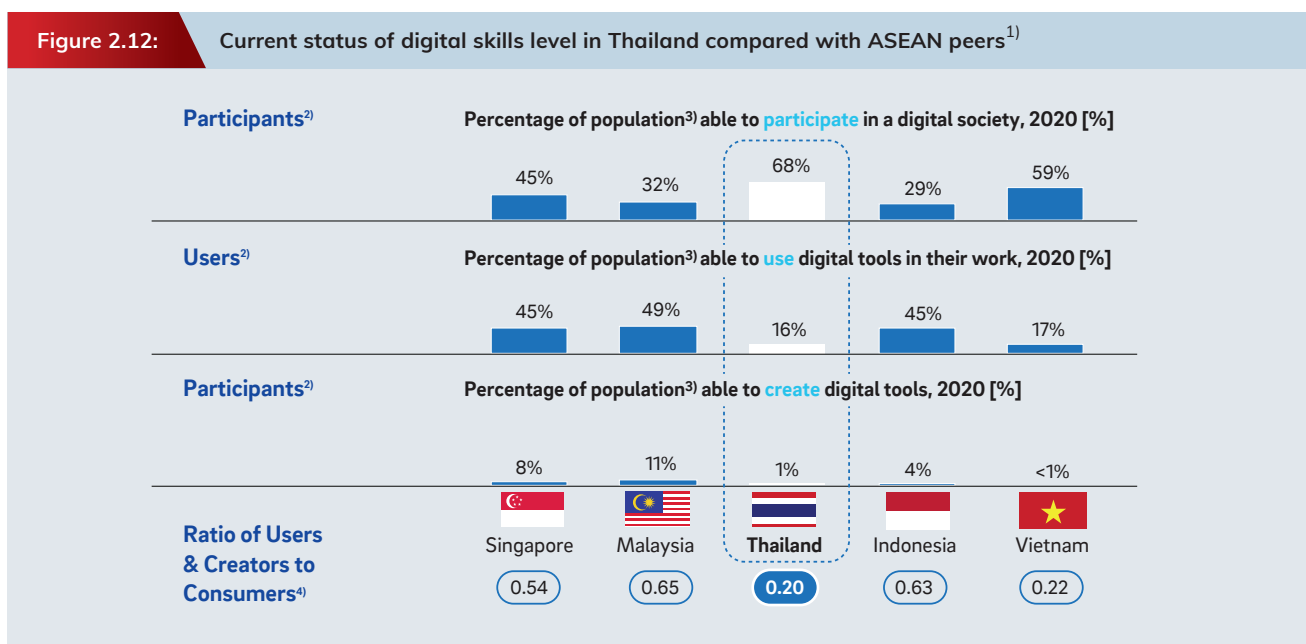## Alternative differentiation of digital skill levels

From a broader societal point of view, the population can be grouped by how their digital skill levels allow them to interact with technology. In this distinction, this paper discern between three groups: **Participants** in a digital society, **Users** who handle digital tools in their work, and **Creators** of digital tools. Individuals with level 2 and level 3 digital skills make up the Users group. This distinction is helpful when examining the way people interact with technology, and what their learning and work should focus on.

Creators tend to focus their training on becoming better at creating technology, such as by deepening AI development skills or by learning a new coding language like Java for IoT applications. In contrast, Users would focus on expanding their knowledge either horizontally to use new technology such as SAP and AWS, or vertically to create the digital products they use.

In the existing Thai workforce, digital skills for using and creating technology have an opportunity for growth when compared to regional peers

Across ASEAN, Thailand's population of **User and Creator of digital technology is comparable with Vietnam but falls behind Singapore, Malaysia and Indonesia** (Figure 2.12).

Technology consumption in Thailand is among the highest in the region, but technology creation is lowest. For every technology consumer in Thailand, the country has only 0.2 technology creators and users. The current situation in Thailand highlights the readiness of citizens in embracing digital services however it also shows that the country lacks in-house development capabilities. In comparison, Malaysia, Indonesia and Singapore have more than 0.5 technology creators and users for each technology consumer. This represents significant opportunity to fill the gap for technology creation as the Thai society is considerably ready for digital adoption. Thailand has opportunity to accelerate development of intermediate and advanced digital skills in its people. Unlocking the potential of its workforce and driving the growth of its S-curve industries will place Thailand in a favorable position to achieve economic growth and exceed regional peers.

Figure 2.12:	Current status of digital skills level in Thailand compared with ASEAN peers[1]

Participants[2] Percentage of population[3] able to participate in a digital society, 2020 [%]

			68%		59%
	45%	32%		29%	

Users[2] Percentage of population[3] able to use digital tools in their work, 2020 [%]

	45%	49%		45%	
			16%		17%

Participants[2] Percentage of population[3] able to create digital tools, 2020 [%]

	8%	11%	1%	4%	<1%

Ratio of Users & Creators to Consumers[4]	Singapore	Malaysia	**Thailand**	Indonesia	Vietnam
	0.54	0.65	0.20	0.63	0.22

Source: ITU, National Statistics Office, DCT

[1] Numbers are cumulative, *Participants* defined as population with internet access excluding *Users* and *Creators*
[2] Participants refers to individuals with level 1 digital skills, *Users* refers to individuals with level 2 and/or 3 digital skills, and *Creators* refers to individuals with level 4 digital skills. The breakdown for Thailand specifically can be found in Chapter 4.
[3] Based on a survey of the general population in the respective countries (ITU data)
[4] Ratio of Users & Creators to Consumers = % Users & creators / % Consumers, where Consumers are defined as sum of *Participants*, *Users*, and *Creators*

Malaysia could be a benchmark for Thailand in terms of Digital Talent development, due to their similar demographics, economic performance as well as digital transformation ambitions and target industries. Malaysia outscores Thailand in all aspects of digital skills and digital competitiveness in both the Wiley's Digital Skills Gap Index (DSGI) and IMD's Digital Competitiveness Index in 2021 (Figure 2.13). This extends to the digital skill levels of the population, and thus the workforce, in the two countries, with Malaysia's share of population equipped with higher level digital skills being significantly larger.

Figure 2.13:	Digital skills and digital competitiveness ranking, 2021

		Malaysia	Thailand
WILEY	Digital Skills Gap Index (DSGI)	10th	78th
IMD	Digital Competitiveness Index	27th	38th
IMD	World Talent Ranking	28th	43th

Source: Wiley, IMD

Malaysia appears on track to maintaining that gap. It significantly outranks Thailand in IMD's World Talent Ranking of 2021. The ranking measures, among other factors, the extent to which a country develops, attracts and retains talent. Thailand has potential to improve in the category "Investment & Development" where it ranks 51st out of 64 countries (compared to Malaysia's 33rd ranking).

The most glaring contrast is with regards to Talent Development and Education, which is a major component of IMD's Digital Competitiveness Index. In this metric, Thailand ranks 56th out of 64 countries, its lowest ranking among the 9 major categories of the Digital Competitiveness Index. Malaysia, in comparison, ranks a stellar 9th, its highest ranking among the 9 major categories. This result is mirrored across other reports, such as Wiley's 2021 DSGI report, where Malaysia outscores Thailand significantly in all education and training related categories, such as staff training in which Thailand ranks 47th out of 134 worldwide and digital skills upon graduation in which Thailand ranks 13th out of 21 in the APAC region. In contrast, Malaysia comes in 8th and 2nd respectively. The gap between the demand and supply of Digital Talent will be discussed in detail in Chapter 4.

Out of the total employees surveyed in Thailand

58%

indicated that they felt well equipped with the workplace skills that they will need in the future.

Workers self-perceived skill levels, however, do not seem to match reality. In a recent Digital Skills Index published by Salesforce in January 2022 which surveyed 23,000 employees across 19 countries with regards to how well prepared they are for the future of work, Thailand ranked third outscoring countries such as Germany, South Korea and Singapore (Figure 2.14). Of the employees surveyed in Thailand, a total of 58% indicated that they felt well equipped with the workplace skills that they will need in the future. Thailand is also the only country other than Argentina, whose population rated itself better prepared for the workplace in 5 years than for the workplace right now. This stands in stark contrast to our findings and the findings of multiple other external reports on Thailand's digital readiness. There is a bright side however: Thailand ranks very highly in terms of percentage of workers that are actively learning/training on digital skills, coming in 4th, outscored only by India, Mexico and Brazil.
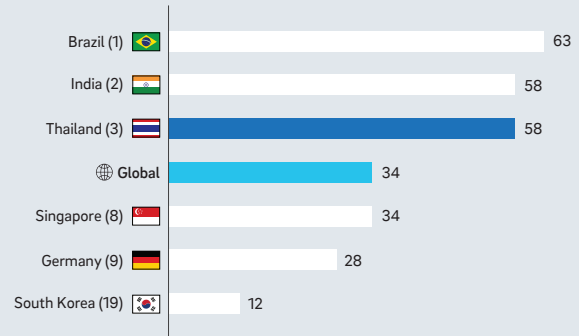
The comparison against the benchmark reveals the breadth of the chasm Thailand needs to cross in order to catch up with leaders in the region. Simply building up hard ICT infrastructure and luring in foreign investments through favorable legislation will not suffice in creating strong and lasting economic prosperity through a digital transformation. It is important for Thailand to invest in human capital and build up a strong, future-ready workforce that is well equipped with the digital skills needed to spawn a digital transformation of the nation's economy.

Thailand has potential to equip more of its workforce with level 2, 3 and 4 digital skills, that is Users and Creators, in order to build a digitally ready workforce comparable to Singapore, Malaysia and Indonesia. An exemplary situation demonstrating demand for Digital Talent in Thailand is the Eastern Economic Corridor project. The EEC Office is projecting a demand of 475,000 employees across 10 targeted S-Curve industries, 60% of which should be filled by qualified but low-skilled vocational workers. With Thailand's present shortage of digitally skilled workforce, especially amongst vocational workers, Digital Talent development is imperative to avoid jeopardizing future development plans and timeline of the Thailand 4.0 project.

Figure 2.14: Percentage of surveyed population that feels very prepared with workplace digital skills required in the next 5 years [%]

Brazil (1)	63
India (2)	58
Thailand (3)	58
🌐 Global	34
Singapore (8)	34
Germany (9)	28
South Korea (19)	12

Source: Salesforce

As such, it is imperative for Thailand to focus and expand on its efforts for building a strong Digital Talent development ecosystem

2.3.2 Digital skills of the future

Thailand needs to close gaps especially in the intermediate and advanced digital skill levels to build a future-ready workforce for supporting growth in the S-curve industries

As discussed in Chapter 2.3.1, a future-ready digital workforce is vital for Thailand to realize its digital transformation ambition. Workers with level 3 or 4 digital skills play a particularly significant role, due to the positive scale effects of value added in the workplace enabled by higher levels of digital skills.

With each higher level of digital skill attained, the individual is empowered to complete higher value tasks by leveraging digital technology. An employee with level 3 digital skills can perform more complex tasks that produce data-rich insights which can then inform higher level business decisions compared to an employee with level 2 skills (Figure 2.15). Similarly, compared to level 3 skills, an employee with level 4 skills can wield technology in a manner that can create innovative digital solutions and products.

The development and growth of s-curve industries provide opportunities for, and require workers with, higher levels digital skills. Workers who are equipped with higher level digital skills hold a valuable, transferrable skill set that can be employed in functions across multiple S-curve industries.

A data scientist for example can leverage data to optimize supply chain routes or analyze vast amounts of patient data to develop or evaluate new cancer treatments.
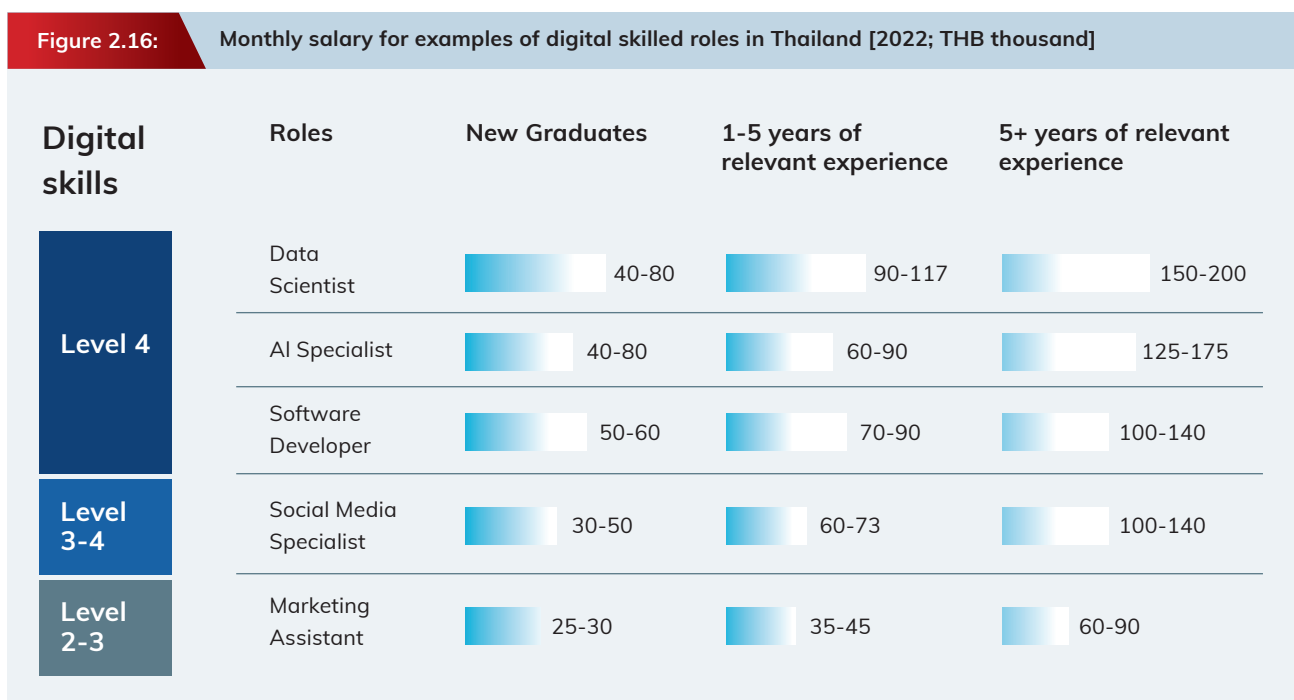
A digital marketing expert can develop online marketing strategies for new digital products or for a wellness hotel. UI/UX designers can develop new interfaces for manufacturing robots or for consumer mobile apps.

Figure 2.15:	Examples of occupations and capabilities by industry by digital skill levels			
S-Curve Industry	**Level 1** Fundamental digital skills	**Level 2** Basic digital skills	**Level 3** Intermediate digital skills	**Level 4** Advanced digital skills
Automation and Robotics	**Individuals able to use computer/ electronic devices** to participate in daily life e.g., social media, LINE, YouTube, e-commerce, web browsing	Factory operator controls machines using applications	Analyst improves productivity by reviewing operation efficiency data through BI dashboard	**Robotics application specialist** develops human-robot interfaces and design automated functions
Aviation and Logistics		Airport personnel use digital flight tracking tools	Supply chain specialist identifies route optimization opportunities from analytics report	**Machine learning specialist** develops new routing algorithms and programs AI functions using Python
Medical Hub		Hospital staff utilizes a simulation software to manage floor planning and bed occupancy	Doctor draws insights from an AI-based application to plan treatments	**Data scientist** create data lakes to store medical records and analyze data through analytics tool
Digital Economy		Salesperson manages client contacts and sales transactions in CRM	Marketer develops digital marketing campaigns for new products	**Software developer** builds a new SaaS application in the financial services industry

Source: Roland Berger

A digital marketing expert can develop online marketing strategies for new digital products or for a wellness hotel. UI/UX designers can develop new interfaces for manufacturing robots or for consumer mobile apps.

Additionally, the ability to use digital tools is an important adroitness for employees across a variety of functions. Basic and intermediate digital skills are required to effectively utilize these digital tools, such as online videoconferencing, Microsoft office suite, inventory control or file management, all of which are common in the workplace today.

Job roles which require level 4 digital skills are in particularly high demand by Thai companies. In an employer survey carried out by the World Economic Forum in 2020, the five job roles in highest demand by Thai employers were: 1) data analysts and scientists, 2) digital marketing and strategy specialists, 3) big data specialists, 4) AI and machine learning specialists, and 5) software and applications developers. These high demand roles particularly require level 3 to 4 digital skills. A divergence between demand and supply of these digital specialists and digitally proficient workers could potentially darkens the outlook for future growth. In Chapter 4, we will discuss Thailand's Digital Talent demand and supply dynamics and analyze the potential talent gap.

The high demand of certain roles also has wider social and economic implications, particularly through the increased income of digitally enabled workers. Individuals with level 4 digital skills tend to command higher salaries because adequately qualified Digital Talent is highly limited yet high in demand due to the growth of the digital industry. Compared to roles requiring level 2-3 digital skills, digitally skilled positions requiring level 3 and above digital skills are paid up to 2.7 times higher salaries (Figure 2.16).

Figure 2.16:	Monthly salary for examples of digital skilled roles in Thailand [2022; THB thousand]		
Digital skills	**Roles**	**New Graduates**	**1-5 years of relevant experience**	**5+ years of relevant experience**
Level 4	Data Scientist	40-80	90-117	150-200
	AI Specialist	40-80	60-90	125-175
	Software Developer	50-60	70-90	100-140
Level 3-4	Social Media Specialist	30-50	60-73	100-140
Level 2-3	Marketing Assistant	25-30	35-45	60-90

Source: Salary Explorer

The average salary of a marketing assistant is between THB 25,000 and THB 90,000, whereas for ICT roles of level 4 skills, salaries range anywhere form THB 30,000 to THB 200,000, depending on experience and role.
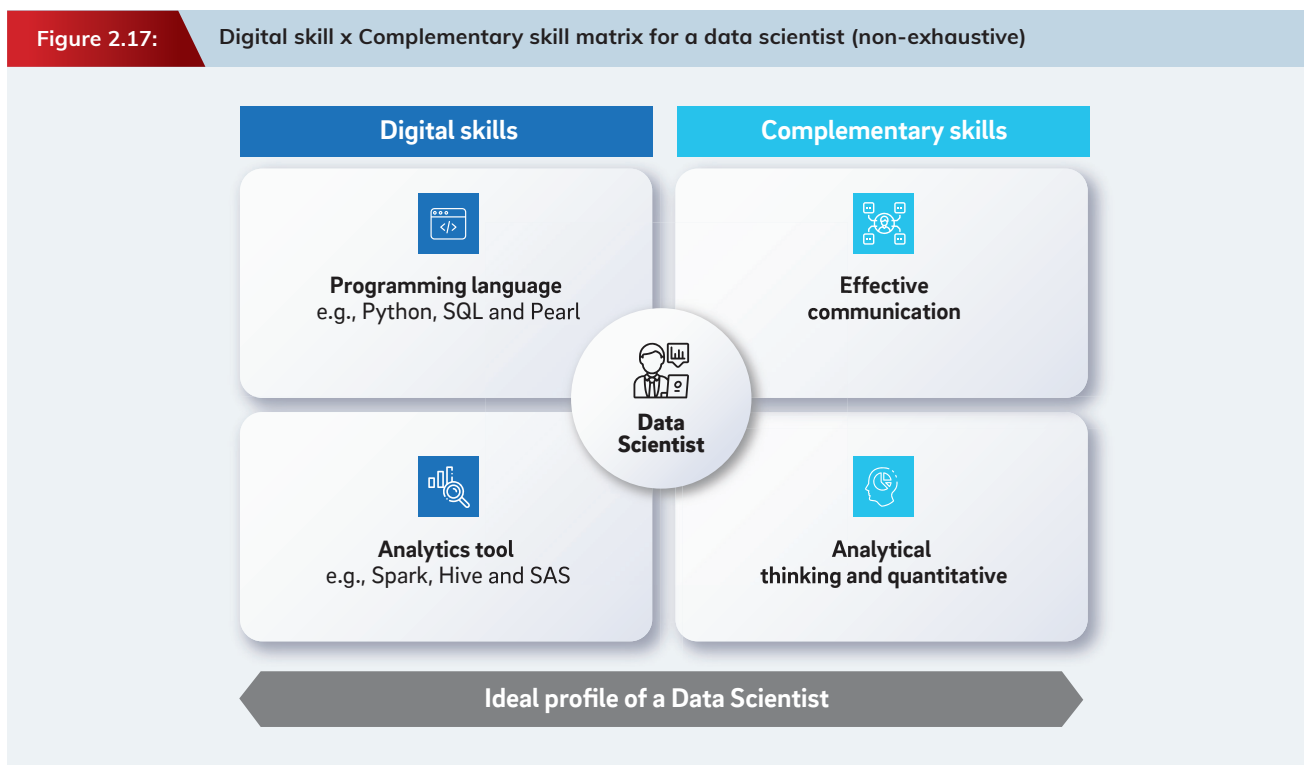
Higher salaries of digitally skilled workers will in turn positively affect economic growth. By increasing the national and average income of households, their spending power increases which in turn leads to more domestic spending and investments, boosting the economy. Furthermore, an increase in income is also positively correlated with an increase in life expectancy and spending on children's education. The increased salaries can thus launch a virtuous cycle for both the economy and society. The strong demand for workers with higher digital skill levels is likely to reduce unemployment risks and create ease of switching jobs and companies to match career goals, both of which further underscore the positive societal benefits of digital upskilling.

Digital skills alone do not suffice – complementary capabilities are essential for a holistically future-ready digital workforce

While digital skills are essential prerequisite for success in the workplace of the future on an individual level and economic growth on the macro level, they alone do not suffice. To be a future-ready workforce that is holistically competent to meet the evolving workforce demands and continue driving Thailand's digital transformation, the digital skills need to be accompanied by an additional set of soft skills. These complementary capabilities are essential to ensure a successful and impactful application of the digital hard skills in the workplace. Soft skills are functional and transferrable across different industries and roles. In an age where industry cross-migration is becoming prevalent, complementary capabilities are of paramount importance. A data scientist should not only possess strong programming skills or the ability to extract data through analytical tools but are also required to be able to analyze the results, uncover insights and present findings in an effective manner to stakeholders (Figure 2.17). Such combination of skills are expected in various other digital roles.

Figure 2.17:	Digital skill x Complementary skill matrix for a data scientist (non-exhaustive)

Digital skills

Programming language
e.g., Python, SQL and Pearl

Analytics tool
e.g., Spark, Hive and SAS

Complementary skills

Effective communication

Analytical thinking and quantitative

Data Scientist

Ideal profile of a Data Scientist

Source: Roland Berger

The four key groups of complementary skills are

1 | Quantitative, Mathematical, and Analytical Thinking

2 | Communication Skills and English Proficiency

3 | Leadership and Social Influence

4 | Creative Thinking and Ideation

1. Analytical Thinking and Quantitative

Analytical thinking and quantitative refers to numeracy skills to process data, apply logic and problem solve uncertainties. This is an essential capability to complement digital skills in a digital economy highly driven by data collected in massive volume. The ability to draw insights from these data, and in turn leverage these insights to build a competitive advantage is a necessary capability to thrive in a digitalizing economy.

2. Communication Skills and English Proficiency

The ability to convey information and intention has been the foundation of collaboration. For a workforce to collaborate effectively and efficiently, communication skills are crucial. Furthermore, English serves as the international language for business and is used widely in leading companies in Thailand. However, according to the EF English Proficiency Index 2019, Thailand was ranked 74th out of 100 non-native English-speaking countries representing an area for improvement to keep up with today's increasingly competitive labor market. Based on a survey result, companies in Thailand are emphasizing communication skills as one of the most desired skills from new graduates.

3. Leadership and Social Influence

Leadership and social influence skills are important for PMET roles which are often positions where individuals need to assume greater ownership of their work, create value and understand big picture ideas. Leadership and social influence enable PMET's to work more independently, increasing productivity.

4. Creative Thinking and Ideation

With the rapid advancements of technology, the opportunities for innovation are seemingly endless. In order to capitalize on these opportunities, a culture of experimentation without the fear of failure is highly encouraged. This creative thinking and ideation capability is important for the future workforce as the advancement of a business or even an entire field could be catalyzed by daring and creative strives towards a new frontier.

Only by complementing the digital hard skills with these soft skills does it become possible to drive a digital transformation that leads to long-run economic growth and prosperity. Equipping the workforce with these complementary capabilities in addition to the aforementioned digital hard skills would enable the Thai workforce to fully leverage their digital skills to achieve success in the digital economy. Thailand would, in turn, be well-positioned to realize the full potential of its digital transformation ambition.

To build a future ready workforce competitive with regional and global leaders, Thailand needs to set ambitious targets to equip the workforce with relevant digital skills and complementary capabilities

Thailand has the opportunity to set its long-term target to be among the region's leading digitally competitive countries. On the back of the Thai government's commitment to Thailand's digital transformation ambition and the vibrant private sector digital transformation landscape, Thailand is poised to close gaps with regional peers in terms of Digital Talent development.

Maintaining status-quo with the existing capabilities of its workforce, Thailand risks seeing its economic growth lag global and regional peers. The Digital Talent gap in Thailand, if left unchecked, could widen and potentially perpetuate a downward spiral leading to obsolescence of the workforce. Especially for the group of 40 million individuals with level 1 digital skills, upskilling to at least level 2 digital skills becomes imperative in order to utilize digital tools effectively in the daily work in a digital economy.

To enable growth in the S-Curve's focus industries, Thailand needs to build a future-ready digital workforce. The S-Curve's focus industries require a digitally skilled workforce even more than the rest of the economy, as they are high technology industries with digital components. In addition to fulfilling the minimum requirements of level 2 digital skills that will be needed by a vast majority of job roles, further steps need to be taken to ensure the workforce is future ready.

Thailand should strive to upskill the majority of its digitally skilled workforce from level 2 to level 3 digital skills, as well as equipping the workforce with complementary capabilities. Moving into the advanced digital era, workers with level 3 and 4 digital skills are the key drivers for the economy of the future. Having a large mass of workforce with level 3 and 4 digital skills is crucial for filling the high value-adding job roles that is growing in demand and giving economies the competitive edge to outpace competitors.

A variety of stakeholders have worked in tandem to drive the digital transformation of Thailand forward. There remains significant opportunity for Thailand to catch up with the global and regional leaders in Digital Talent development. To fully unlock the potential of its digital workforce, Thailand needs to form strong partnerships with and between the different stakeholders. Chapter 3 will discuss Thailand's Digital Talent ecosystem including the key challenges for Digital Talent development and the roles of its stakeholders. The demand and supply gap for Digital Talent, as well as top in-demand job roles and their career path development will be discussed in Chapter 4.

CHAPTER 3
THE DIGITAL TALENT ECOSYSTEM OF THAILAND

THAILAND NATIONAL DIGITAL TALENT DEVELOPMENT
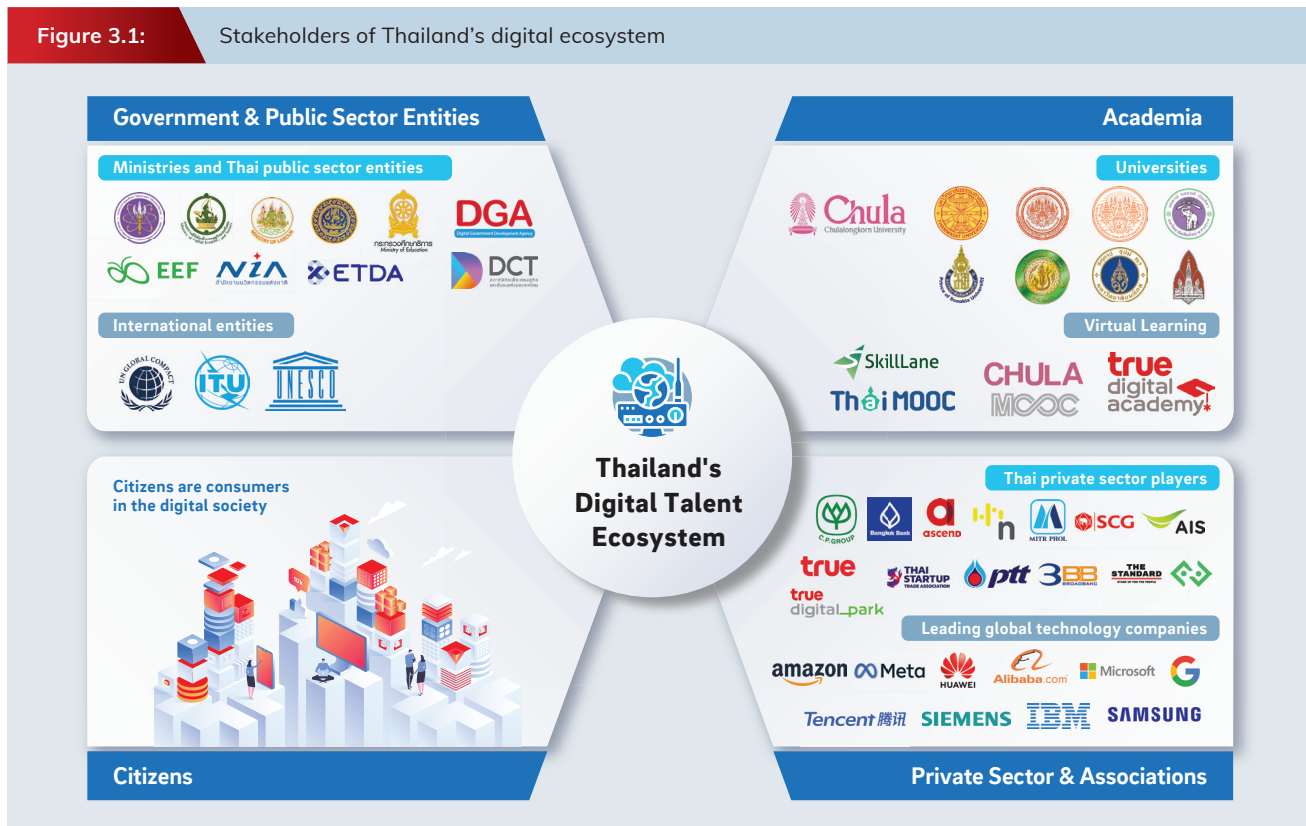TRANSFORMING THAILAND INTO ASEAN'S DIGITAL POWERHOUSE

Chapter 3.1 Key stakeholders in Thailand's Digital Talent ecosystem

Three stakeholder groups play key roles in Thailand's Digital Talent ecosystem

Figure 3.1: Stakeholders of Thailand's digital ecosystem

Source: Roland Berger

As mentioned in Chapter 2, the progress of Thailand's digital transformation has increased the need for more Digital Talent in the workforce. In building Thailand's Digital Talent ecosystem, the key stakeholders need to work coherently in leveraging their expertise and resources to develop the digital workforce.

Thailand's Digital Talent ecosystem is driven by three key stakeholder groups (Figure 3.1).

1 | **Government & public sector entities** - The government promotes, facilitates and incentivizes companies and academia to adopt digital technologies and develop Digital Talent. A focal point of the governments activities is the building of digital and ICT infrastructure. Furthermore, the government provides funding or investments in technologies, enacting of policies and regulations to lower barriers to digital adoption, and digitally transforming the core government services (E-Government) (Figure 3.2).
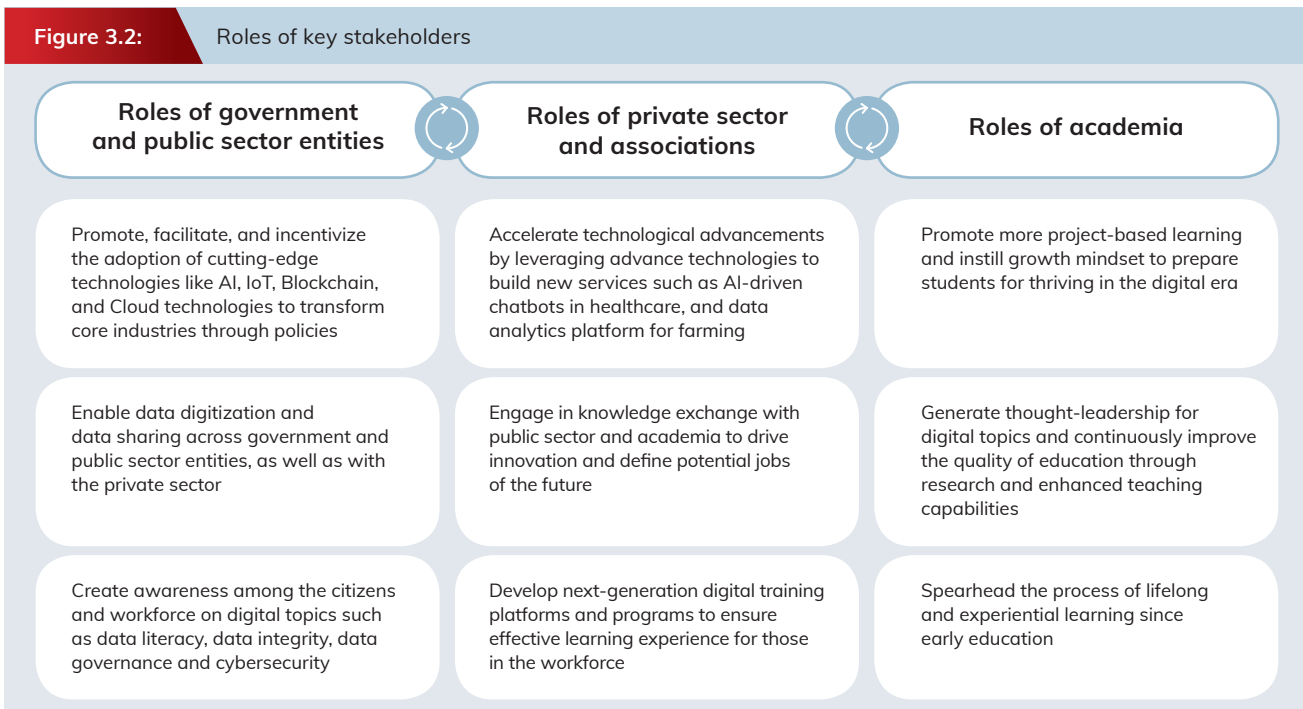
Public sector entities complement the government's role by translating the nation's digital development ambitions into action plans and facilitate the collaboration between public and private entities. Initiatives in these action plans include promoting an agile data-driven government, creating a data community through open data platform, providing digital skills training to public sector workers of all levels and educating the citizens on the digital-related concepts such as data governance and cybersecurity.

2 | **Private sector and associations** play the role of accelerating technological advancements by developing new digital product and services, and embedding experiential learning into everyday work to equip the workforce with in-demand digital skills. The private sector and associations could leverage their expertise and understanding of digital skills in demand to support the Digital Talent ecosystem in shaping the digital reskilling and upskilling programs and enabling next-generation digital training platforms to improve effectiveness and accessibility of learning digital skills.

3 | **Academia**[1] plays the crucial role of imparting digital knowledge and skills to the workforce and preparing the workforce for thriving in the digital era by instilling mindset and capabilities complementary to digital skills. The role of academia comprises of training the upcoming generations (secondary and universities), as well as upskilling and reskilling of the current work-force. The goal of academia is to produce high quality talents with advance digital and complementary skills matching the demand of the industries.

Figure 3.2: Roles of key stakeholders

Roles of government and public sector entities	Roles of private sector and associations	Roles of academia
Promote, facilitate, and incentivize the adoption of cutting-edge technologies like AI, IoT, Blockchain, and Cloud technologies to transform core industries through policies	Accelerate technological advancements by leveraging advance technologies to build new services such as AI-driven chatbots in healthcare, and data analytics platform for farming	Promote more project-based learning and instill growth mindset to prepare students for thriving in the digital era
Enable data digitization and data sharing across government and public sector entities, as well as with the private sector	Engage in knowledge exchange with public sector and academia to drive innovation and define potential jobs of the future	Generate thought-leadership for digital topics and continuously improve the quality of education through research and enhanced teaching capabilities
Create awareness among the citizens and workforce on digital topics such as data literacy, data integrity, data governance and cybersecurity	Develop next-generation digital training platforms and programs to ensure effective learning experience for those in the workforce	Spearhead the process of lifelong and experiential learning since early education

Source: DGA, NT, Chiangmai University, Roland Berger

While the three stakeholders have their respective roles to play in Thailand's Digital Talent development journey, they are also interdependent. The government and public sector entities and the academia need to work closely with the private sector and associations to ensure that the national talent development plan and digital curriculums respectively are aligned with industry demands. In turn, the private sector and associations leverage government support in terms of digital training incentives and subsidies. At the same time, all three stakeholders are competing to recruit Digital Talent.

The Digital Talent development strategy therefore needs to be holistic covering needs of all three stakeholders and coherent in execution by the three stakeholders.

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[1] In this paper, the academia refers to universities, vocational schools and online training platform providers.

Chapter 3.2 Efforts in promoting skills development

Key stakeholders have initiated several initiatives aimed at promoting digital skills development

Figure 3.3:	Type of initiatives currently implemented by each stakeholder group		
Initiative type	**Government & public sector entities**	**Private sector**	**Academia**
A Skills Development	✔	✔	✔
B Career/ Job Matching	✔	✔	✖
C Infrastructure Development	✔	✔	✔
D Policy Making, Standardization, and Monitoring	✔	✖	✖
E Funding and Sponsorship	✔	✔	✔

Source: Roland Berger

Chapter 3.2.1: Government and public sector entities initiatives

Initiatives by the government and public sector entities focus on improving the enabling environment for Digital Talent development

The government set national level goals and is pivotal in improving the enabling environment for Digital Talent development. Different government entities have different roles in the Digital Talent development ecosystem in Thailand (Figure 3.4).

One of the role of the government is to strengthen job creation in the digital ecosystem by enacting policies and facilitating partnerships between the private sector and academia to support the promotion of digital skills development. The government also provides incentives and enacts policies to attract leading companies to Thailand. These tailored incentives and targeted policies aim to create a favorable environment for multinational organizations to set up business in Thailand, and in turn increase demand for Digital Talent locally.

Figure 3.4:	Roles of Thai government and public sector entities

Ministry of Education
Promote digital literacy among students attending schools, universities and vocational institutions, focuses on wider education landscape

Ministry of Labour
Ensure that workers have the required skills now and in the future

MHESI
Focuses on higher education and ensures that students are equipped with required skills before entering the workforce – including digital skills required for Thailand 4.0

Ministry of Digital Economy and Society
Lead and drive the use of technology and digital innovation to drive Thailand towards Thailand 4.0

BOI
Launch incentives to attract private sector to invest in digital competency training to drive forward Thai's government digital economy ambitions

Source: Roland Berger

Together with the government, public sector entities have been working towards building a strong Digital Talent ecosystem to support the Thailand 4.0 initiative. One government agency, DEPA has launched a digital master plan in 2018 and a second master plan, which focuses on digital workforce development, is upcoming. DEPA aims to address the potential Digital Talent gap in Thailand, where it estimated a shortage of 80,000 Digital Talent per year in the workforce. Along with MHESI, the Ministry of Labor, and the Ministry of Industrial, **DEPA has launched schemes to promote Digital Talent development to equip the workforce** with skills required to use digital tools in the relevant businesses. The goal is to produce a total of 500,000 additional Digital Talent within 4 years.

Overall, the government and public sector entities are actively implementing initiatives related to skill development, funding and sponsorship, laws and regulations, and career/ job matching.

> *We want to develop the skills of public sector staff [...]*
> *to build an agile and data-driven government. There are*
> *different programs for leaders, middle management,*
> *IT staff and the non-IT workforce to equip them with*
> *appropriate tech knowledge...*
>
> Dr. Supot Tiarawut (President & CEO)

Figure 3.5: Overview of private sector initiatives driven by respective initiative owners

Category		Initiative owner	Initiatives
A	Skills development	Ministry of Education	Coding programs for primary school children, training both teachers and students • Teachers are trained at the IPTST[1]
		MHESI	**U2Tambon,** a digital literacy program for the general population across Thailand
B	Career/ job matching	MHESI	**Future Skills x New Career Thailand,** a platform that aims to train and connect talents with jobs in the private sector • In collaboration with 19 universities, the program aims to offer over 800 online and offline courses
C	Infrastructure development	Kasetsart University, Ministry of Digital Economy & Society, DEPA	**Digital Academy Thailand,** a short-term training center to provide upskilling resources for the current • Building soft and hard infrastructure to strengthen learning spaces • Courses are focused on Big Data, AI, and IoT to support the EEC program
D	Regulations and monitoring	Ministry of Labor	**Digital Nomad visa,** a new 10-year visa program to entice ICT experts and tech workers to move to Thailand • The visa offers incentives such as a reduced income tax (17% instead of 35%) • Eligibility is judged based on employer, wealth, expertise, and subject experience • Talent visa global benchmark available in the appendix section
E	Funding and scholarships	Thai government	THB 50 billion budget meant to support rural schools and make education more equitable • The initiative aims to strengthen the education in Thailand by hiring a large number of foreign teachers, especially for teaching English

Source: MOE, MHESI, MDES, DEPA, MOL, Thai Government

[1] Institute for the Promotion of Teaching Science and Technology

Chapter 3.2.2: Private sector and association initiatives

Initiatives by the private sector and associations center around experiential learning for in-demand digital skills

The private sector and associations play a key role in embedding experiential learning into everyday work and school to equip the workforce and students with in-demand digital skills.

The private sector not only develop talents for their own company but also act as thought-leaders in advancing the overall digital workforce of Thailand. Impacted by digital technologies, some companies adapt their business model and become digital service providers by adopting trending technologies like AI, Cloud, IoT, 5G and Big Data. In the healthcare sector, hospitals and clinics are focusing on telemedicine and remote care due to the growing demand for safety and convenience, which was only made possible with robust network, cloud infrastructure, and wearable devices. With the adoption of such technologies, not only does the business model change but also the working process and human resource requirements.

Companies today are finding themselves competing to recruit skilled Digital Talent. For many companies, the proportion of their workforce that possesses intermediate to advance digital skills fall short by 10-20%. The major challenge cited by many companies points at outdated HR and salary structure. **The need to increase pay schemes for Digital Talent to keep up with the growing market is inevitable,** yet many companies do not have a customized pay structure tailored for digital roles.

Company image also plays a significant role in attracting top Digital Talent. The younger Thai generation aspiring to work for companies such as Google, Microsoft, Meta or True Corporation, are proactively acquiring digital skills.

Limited training budgets, lack of internal training resources, and limited support from the government have also slowed down the progress of Digital Talent development in some private sector organizations. The lack of training opportunities is evident in the more advanced skills such as data analytics, cybersecurity, AI, blockchain and IoT. Industry leaders highlight that less than 10% of their employees receive such trainings.

In order to keep up with the fast-changing digital skills in-demand, the private sector and associations need to work closely among themselves and with other stakeholders to foster a strong Digital Talent ecosystem.

Several initiatives related to upskilling, pipeline creation and infrastructure development have been taking shape.

Overview of private sector initiatives driven by respective initiative owners

Category		Initiative owner	Initiatives
A	Skills development	Microsoft, Ministry of Labor	Digital skill training and train-the-trainer program • The program aims to upskill 4 million workers across Thailand
		Mercer, MHESI	**Life Skill Thai Labor Project** aims to adapt the Thai education system to the digital era • The initiative aims to identify, resolve and implement solutions for obstacles to a digital education system
		Huawei, Ministry of Labor	**Mobile App Development Course** aims to develop over 200 Digital Talent • Huawei and the Ministry of Labor signed a 3-year MoU for learning opportunities in the digital landscape
B	Career/ job matching	Google, True Digital Park	**Academy Bangkok,** a venue to facilitate training and upskilling courses • The venue can accommodate up to 150 students at a time to facilitate digital upskilling and training programs
		Huawei, Academic Institutions	A variety of projects have been launched to strengthen academia • 5-year collaboration with Chiang Mai University to build a 5G learning infrastructure • ASEAN Academy offers students the opportunity to interact with cutting edge ICT technologies
C	Infrastructure development	WorkVenture	A career market platform to connect jobseekers and employers • Using AI, WorkVenture processes jobseekers data to help employers make the right hiring decisions
E	Funding and scholarships	KBank	KBank offers 8 graduate scholarships to support outstanding students in studying the most sought-after fields including data analytics and FinTech at national and international institutions

Source: Microsoft, MOL, MHESI, Huawei, Google, WorkVenture, Kasikorn Bank

...DCT has experts within our organization and is more than willing to partner with academia to contribute to Digital Talent development. In DCT view, skill mismatch is the key concern observed in today's workforce hence we have launched DCT Digital University which aims to upskill/ reskill employees and students alike...
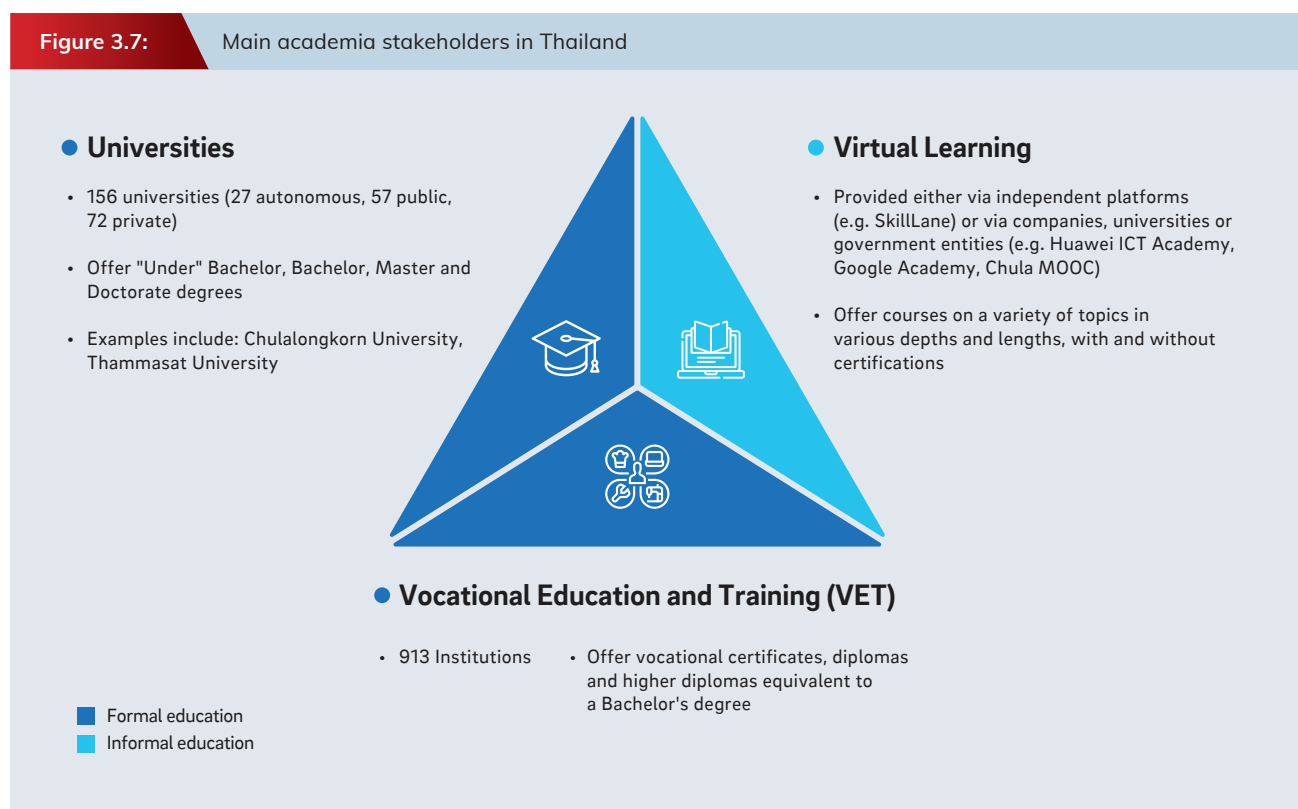
Dr. Veera Veerakool (Vice President)

Chapter 3.2.3: Academia initiatives

Initiatives implemented by the Academia form the backbone of Thailand's education and learning ecosystem

The academia[1] stakeholders for digital skills development comprises of three core education groups: Universities, Vocational Education and Training (VET), and Virtual Learning. Both universities and vocational training are governed by the Thai government. Universities by the Ministry of Higher Education, Science, Research and Innovation (MHESI), created in May 2019. Vocational education is mostly offered by the Office of the Vocational Education Commission (OVEC), which covered around 429 public and 484 private colleges with almost 1 million students in 2019. MOOCs on the other hand are offered by a variety of providers, including universities (e.g. ChulaMOOC offered by Chulalongkorn University) and companies (such as Huawei's ASEAN Academy or Google's Digital Garage). Additionally, there also exists a range of platforms, such as SkillLane, which allows users to create and upload custom courses on a variety of topics, including, but not limited to, digital skills.

While virtual learning can be used to build digital skills across all levels, from basic usage of Microsoft office to advanced Machine Learning or AI development concepts, the education that formal institutions such as universities or vocational colleges provide is more focused on the individual skill levels (Figure 3.5).

Figure 3.7: Main academia stakeholders in Thailand

Universities
- 156 universities (27 autonomous, 57 public, 72 private)
- Offer "Under" Bachelor, Bachelor, Master and Doctorate degrees
- Examples include: Chulalongkorn University, Thammasat University

Virtual Learning
- Provided either via independent platforms (e.g. SkillLane) or via companies, universities or government entities (e.g. Huawei ICT Academy, Google Academy, Chula MOOC)
- Offer courses on a variety of topics in various depths and lengths, with and without certifications

Vocational Education and Training (VET)
- 913 Institutions
- Offer vocational certificates, diplomas and higher diplomas equivalent to a Bachelor's degree

■ Formal education
■ Informal education

Source: MHESI, OVEC, Roland Berger

The formal Thai education consists of 9 years of mandatory schooling, 6 years in primary and 3 years in lower secondary school, with an optional additional 3 years of upper secondary schooling (Figure 3.6). According to the OECD, about 35% of students choose the vocational track. Students from both, the general track and the vocational track are eligible to sit for the competitive national university entrance examination.

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[1] For the purpose of this paper, academia is considered to include both secondary & tertiary education institutions as well as online learning programs.

Supply of Digital Talent from VET is comparatively lower than universities, stemming from inferior digital curricula at VET
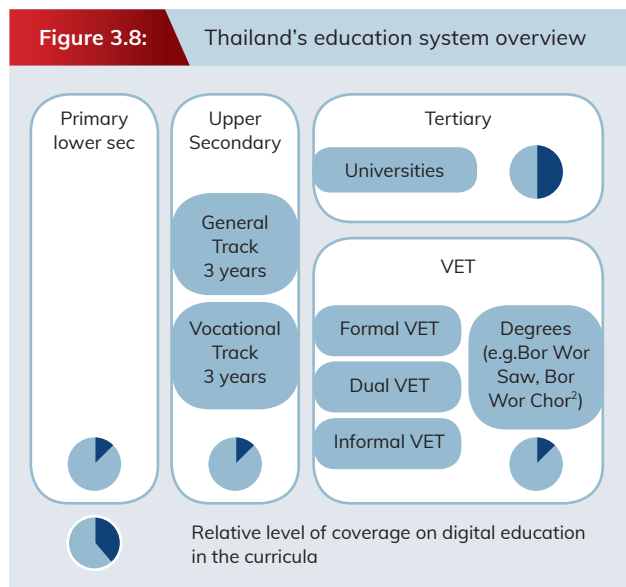
Vocational Education and Training (VET)

Vocationally trained workers with digital skills are in short supply, partly due to the insufficient digital skills portion of their training. VET in Thailand produces a vital group of workers but often do not equip students with a future-ready digital skillset. The digital curricula of VET institutions is also lagging behind that of universities, beyond the natural gap. Additionally, the quality of education provided by VET institutions can vary, especially with smaller institutions in rural or remote areas.

Many vocational schools in Thailand lack a comprehensive digital curriculum. Most programs in vocational schools train workers for analog roles in the primary and secondary sector of the economy and for non-digital roles in the tertiary sector[1]. While many vocational workers do not require skills such as software development, it is essential, in the digital era, to ensure that vocational workers are able to work with the technology that surrounds them. Further, increasingly more digital tools are used in the primary and secondary sector of the economy, such as digital machine interfaces in manufacturing.

Only 35% of students opt for the vocational track during their upper secondary years despite the labor market requiring a significantly larger share of vocational workers. As illustrated in chapter 2, 60% of the workers needed in the 10 S-curve industries would need to be vocational workers. Part of the reason for lower intake at VET is the perceived lower status of vocational training compared to tertiary education. Students tend to opt for university qualifications simply due to the perceived status, rather than the actual employability of their degree. It has been suggested, for example by the OECD, that Thai employers are biased towards candidates with degrees from higher education institutions.

Despite not being at the same level as university degree programs, VET is still an important source for talent to complement the workforce, including Digital Talent.

In order to drive vocational education management, OVEC has released a list of seven strategies to improve Thailand's vocational system (Figure 3.9). Specifically strategies 2-4 are directly or indirectly geared towards developing a digital-ready workforce, by either directly promoting necessary skills in line with Thailand 4.0 needs or by improving the upskilling potential of students.

Figure 3.8: Thailand's education system overview

Source: Roland Berger

Figure 3.9: OVEC strategies for improving VET
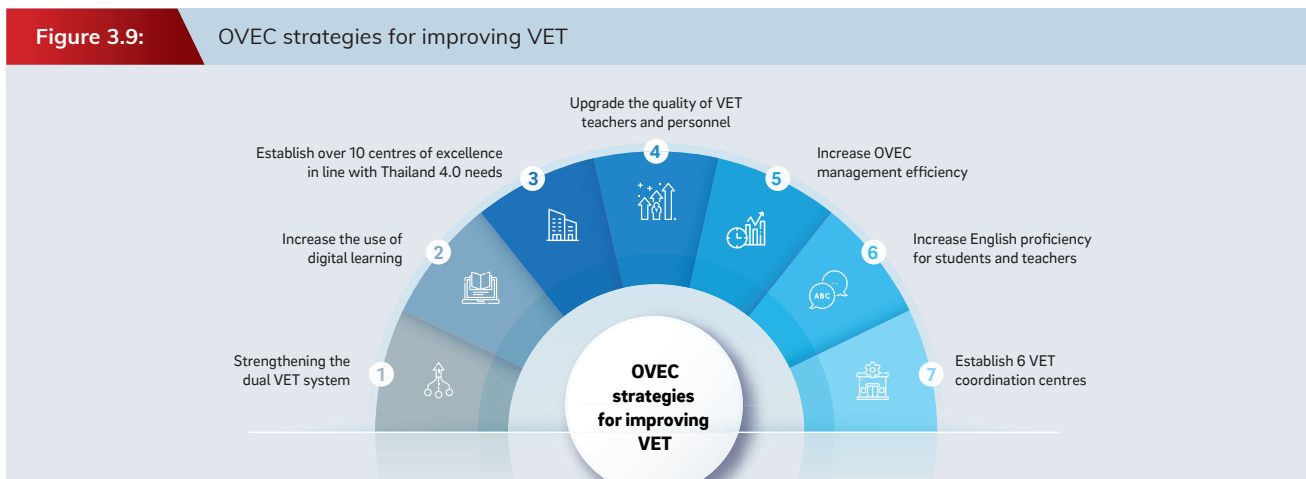
Source: OVEC

[1] Primary sector refers to agriculture, secondary to manufacturing and tertiary to service

[2] These refer to the different degrees obtainable

Universities train vital level 3 and 4 digital skills but often have high entry barriers

Universities

The major source of formally trained talent in Thailand are the universities which are designed to equip students with intermediate and advanced digital skills during their program. While these institutions provide students with advanced tertiary education in the form of Bachelor, Masters and Doctorate degrees, their curriculum often does not overlap with the requirements in the job market. OECD estimates that around 90% of yearly ICT graduates lack the basic qualifications to begin job-specific training within companies.

University programs are less accessible and available to students due to the high demand and competitive entry requirements. In order to be admitted for a place at one of the prestigious public universities in Thailand, students need to score well in the national university entrance exam. This exam is however, skewed towards students from more urban regions in the country due to their superior schooling equipment and infrastructure. Additionally, the high tuition costs, which can reach into the hundreds of thousands of baht, often pose a significant challenge to students from weaker socioeconomic backgrounds.

Despite the good ranking of some Thailand universities in certain subjects, universities still do not have enough capacity to fulfill the market demand. Currently, digital, computer and ICT related subjects have a capacity for 30 – 130 students a year per university on average. The current acceptance rates of 10% or less underline the capacity constraints universities face. The seemingly small capacity in contrast to the high interest levels of prospective students is in large parts due to space and personnel constraints. Many institutions simply do not have enough physical space to admit and teach more students. That, combined with the insufficient equipment of many universities, especially outside of the big or international institutions exacerbate the challenge to adequately train a sufficient number of workers with higher digital skills.

Hiring qualified faculty is another significant challenge for higher education institutions. In order to develop courses that are in line with industry demands, universities need qualified staff with expertise in the new subjects that are able to teach these courses. Beyond the challenges of sourcing qualified staff to expand the capacity of courses in the current portfolio, this shortage is particularly pressing for new, cutting-edge topics. The ICT industry is a very fast moving one with rapidly developing technologies and changing demands. In order to create courses that teach students certain topics, such as cybersecurity or blockchain, universities need to find experts in these fields to teach the courses. Due to the high pace of the industry and the inherent inertia of the academic world, this is often difficult to do.

Nevertheless, some academia are starting to spearhead active engagement with the private sector to overcome this challenge.

> *...Thammasat University is planning to become a platform where the private sector and academia come together and share their knowledge in classrooms to cultivate the next generation of Digital Talent...*
>
> Dr. Surat Teerakapibal
> (Vice Rector for Administration (Tha Prachan)
> and International Affairs)

In addition to formal education institutions, virtual learning offers an alternative way to skill, upskill and reskill the workforce. In contrasting to formal education avenues such as universities or VET, online courses offer a more independent, less structured way of acquiring new skills.

There are two types of online programs in Thailand today. One is the curated programs created by universities, government institutions or private companies, while the other are courses uploaded by individuals to a platform such as SkillLane or Udemy (Figure 3.10).

Virtual learning is able to significantly drive upskilling by making knowledge more accessible. Many platforms offer holistic programs that do not only prepare users to work in specific digital roles, but also offer career consultation and hiring opportunities and platforms to connect upskilled workers with potential employers.

These benefits, however, come with a series of drawbacks, namely visibility, accessibility, quality and usability.

There exists a plethora of courses on all kinds of topics and varying depths, from beginner courses on how to write an email to advanced courses on machine learning algorithms. People need to be aware of these offers and their benefit to decide on the courses to take. With the wide range of course offerings, it is often not easy to tell for individuals, which programs or courses are of high quality and most applicable for their roles or aspirations.

Finally, the lack of a coherent curriculum also often pose a challenge to users. Courses often teach certain skills, such as the basics of Python or pivot tables in Excel, but it is left to the user to identify which courses give them an actual advantage in the workplace.

Figure 3.10:	Main approaches to virtual learning	
	Curated programs	**Open platforms**
Pros	• Comprehensive curriculum • Easier to ensure quality • Takes the burden of choosing the right courses away from the learners	• Larger variety • Practitioners as teachers ensures the workplace applicability of the skills • Able to cover even the most niche topics
Cons	• Higher administrative effort • Need to be consistently adjusted to industry needs • Can cover a smaller range of topics due to the complexity associated with creating a course	• Difficult to ensure the quality and comprehensiveness of courses • Places burden of navigating skill trees on learners, which often do not know which course to take
Examples	true digital academy CHULA MOOC	SkillLane Udemy

Source: Roland Berger

Overall, the three academia stakeholders play varying roles in developing Digital Talent in the current ecosystem, but are all burdened by challenges that need to be overcome (Figure 3.11). The avenues of upskilling that produce the most sought-after talent with higher level digital skills are currently the most unavailable due to limited capacity and high entry barriers from students. These challenges need to be addressed in order to build a future-ready digital workforce to successfully drive the country's digital transformation. **Progress have been made so far in terms of initiatives (Figure 3.12)** however, further efforts can be harnessed to strengthen the quality of Thai education system.

Examples of Skills taught

Examples of Skills taught	Universities	Vocational Education and Training	Virtual Learning
Basic			
Hardware Operations		✓	✓
Navigation of web/mobile apps		✓	✓
Productivity tools (e.g. Microsoft Office)		✓	✓
Intermediate			
Digital marketing tools	✓		✓
Data Visualization	✓		✓
Enterprise software skills	✓		✓
Advanced			
Cloud Infrastructure	✓		✓
Machine Learning	✓		✓
Big Data	✓		✓
5G network design	✓		✓
IoT Computing	✓		✓
Blockchain	✓		✓
Availability[3]	Low	Mid	High
Teaching methods	• In-person lessons • Laboratories • Online teaching • Internships	• In-person lessons • In-company sessions	• Self-paced video lessons • Live online sessions
Capacity	100-3000 per public university	500K - 1 million nation-wide	unlimited

Access barriers for students

Language

English language
- Most courses, especially by international providers such as Google Digital Garage, Coursera, etc.
- The basis for most modern digital systems, from Excel to Python, is English

Access	Image	Information Gap
• Highly competitive entrance exams for universities • Skill prerequisites	• Fear of status • Lower future income prospects	• Decision which course to take is left to user • Mostly lack of coherent curriculum

Costs
- High tuition fees
- Required equipment to participate (e.g. a laptop)
- No income during studies

Source: Roland Berger

[3] Availability refers to how available these paths are for prospective students, i.e. how easy it is to enter these learning institutions

Figure 3.12:	Overview of academia initiatives driven by respective initiative owners

Category	Initiative owner	Initiatives
A Skills development	Chiangmai University (CMU)	In collaboration with the private sector, universities are developing new degree programs for in-demand skills • The CMU program aims to teach students essential skills in cybersecurity architecture, threat assessment and neutralization • Key challenge is the sourcing of skilled professors
	True Digital Academy	Online academy that aims to enhance talent competencies for highly in-demand skills by • partnering with General Assembly • providing courses for both individuals and enterprises who are seeking to accelerate their digital transformation journey • covering core skills like Data Analytics, Digital Marketing, UX/UI, and Cybersecurity etc.
	SkillLane	Platform that offers self-paced courses for young professionals and covers subjects ranging from non-digital to digital • Users with expertise in a certain subject create and upload the courses to teach • Qualifications of the teachers are difficult for students to assess and verify • Difficult to navigate due to vast number of courses
	42 Bangkok	Program that aims to teach programming and computer sciences to a selected group of students mainly via peer-to-peer learning • Open 24/7 and free of charge • Strong focus on teamwork • Students gain Experience Points after completing projects
C Infrastructure development	OVEC	Comprehensive dual training programs (DVET) that allows students to benefit from on-the-job training and be better prepared to thrive in digital era work environment • Target to reduce digital skill mismatch
	MHESI	Centralization of all higher education responsibilities under the newly created Ministry of Higher Education, Science, Research and Innovation (MHESI) with the goal to • build the necessary education infrastructures, both in terms of equipment and certified trainers and teachers • build the workforce for the digital era through digital literacy and skill development programs
E Funding and scholarships	Chulalongkorn University	Chulalongkorn University offers a series of scholarships for outstanding students to study science and technology subjects, including high-tech subjects such as programming, at leading international institutions such as • Tokyo University of Science • Meji University • Kansai University

Source: CMU, True, SkillLane, KMITL, OVEC, MHESI, Chulalongkorn University

While the Digital Talent ecosystem in Thailand are developing thanks to the multitude of initiatives by key stakeholders, there is more to be done as the demand for Digital Talent is outstripping supply

With a wide range of individual and collaborative efforts from the key stakeholders, the Digital Talent ecosystem in Thailand are developing. Through digital skills and infrastructures developments, funding in combination with favorable regulations, as well as career matching initiatives, the three key stakeholder groups in the Digital Talent ecosystem in Thailand have made a variety of digital upskilling and reskilling opportunities accessible for individuals with the aptitude to acquire higher level digital skills.

However, the variety of initiatives have yet to fully address the individual's motivation and willingness upskill or reskill. The impact of the initiatives would be low if few take up the courses. Incentives for motivating the workforce to proactively elevate their current digital skills in line with future job trends could potentially have magnified effects in scaling up the digital workforce in Thailand.

The gap in Digital Talent, both in the size and the quality of digital workforce, remains. The upcoming chapter dives deeper into this gap and explores the underlying causes for these imbalances.

CHAPTER 4
DIGITAL TALENT DEMAND AND SUPPLY DYNAMICS: ANALYZING THE TALENT GAP

THAILAND NATIONAL DIGITAL TALENT DEVELOPMENT

TRANSFORMING THAILAND INTO ASEAN'S DIGITAL POWERHOUSE

Chapter 4.1: Demand for Digital Talent of the Future

Industries are pursuing tech-transformation, accelerating Digital Talent demand to a new level

Market dynamics, accelerated by COVID-19, have shifted organizations' focus to harness digital technology. Digital Talent is becoming one of the most important factors to steer the country forward. This section discuss 5 key drivers for Digital Talent demand in Thailand.

Figure 4.1: Key drivers for Digital Talent demand

The rise in demand for Digital Talent

COVID19-pandemic

Growing digital citizens

Emerging technologies

Shrinking workforce due to ageing population

Government-led initiatives
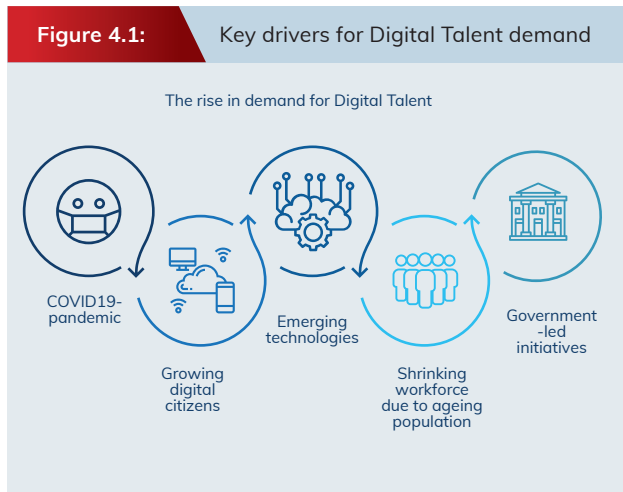
1. COVID-19 pandemic

Based on JobsDB research, over 52% of the businesses surveyed have encouraged their employees to work from home. Therefore, the importance of the workforce being familiar with digital tools has become crucial. This includes work communication tools such as video conference tools, project management platforms, cloud computer storage. The pivot in work culture has resulted in companies becoming more vulnerable to cyber attacks. As a result, there is an increase in the demand for information security professionals as organizations place greater importance on strengthening their security standards.

2. Growing digital citizens

Thais have become accustomed to the new way of living – **the shift in consumer behavior towards online channels are likely to stay for the long term.** Thai citizens now find social commerce, e-commerce marketplaces, and delivery apps attractive for ordering goods and services online from the convenience of their homes.

Moreover, over 86% of mid-income Thai households have preference toward smart devices, which calls for businesses to invest more in home innovations and IoT devices.

The increasing complexity of consumer preferences for goods and services will further push for innovative solutions and personalized marketing strategies. Companies adopt more data use cases and analytics, including AI, ML, and big data, to derive meaningful consumer insights and invent new products. Thus, the strong demand for Digital Talent, especially the intermediate and advanced digital skill levels, will sustain as firms invest more in emerging digital technologies and introduce more digital roles within the company.

… Data utilization is the key to transform ourself from a telco company to a tech company…

Nuttawut Kietchaiyakorn,
HR Director (Acting)

true

3. Emerging technologies

Growth of emerging technologies such as Artificial Intelligence, Robotic Process Automation (RPA), Big Data, Cloud, Fintech act as key drivers of digital transformation amongst businesses. Therefore, an increase in advanced skill level IT personnel are required to manage and enhance digitall use-case in the workplace.

For example, proportion of Thai companies using the cloud has increased from 59% in 2020 to 78% in 2021 with expected increase to 87% by 2030. According to Thailand Development Research Institute (TDRI), AI systems will replace over 70% of semi- and un-skilled jobs in Thailand, whilst giving rise to more positions to manage AI systems. Moreover, automation technologies and use of robots will rise in the manufacturing sector, shifting demand from labor-intensive to high-skilled jobs (Figure 4.2).

Figure 4.2: Job risks assessment based on productivity and future demand of the Thai workforce[1]

High labor productivity [1]

Survivor

Unemployed in mfg. sector (0.1m, 17)

Unemployed in service sector (0.21m, 16)

Unemployed in tourism sector (0.12m, 12)

Labor employed in other sectors and at risk of automation[3] (13m, 12)

New Grad Business (0.19m, <24)

New Grad STEM (0.07m, <27)

STEM[2] (1.3m, 27)

High-skilled Foreign Worker (0.2m, 48.4)

New Graduate Vocational (0.4m, <13)

Farmer Age >50 (6.0m, 6.9)

Farmer Age <50 (6.4m, 8.4)

Public Worker (0.57m, 9)

Low-skilled Foreign Worker (2.3m, 9)

Vulnerable

Higher future demand

Level of unemployment risk in the digital era: ● High ● Medium ● Low

(xx,xxx) = (Workforce, average salary per month ['000 THB])

Note: [1] Estimated based on percentage of industry and skill level;
[2] Science, technology, engineering, mathematics;
[3] Include workforce employed in manufacturing, services, etc.

Source: Office of Estern Economic Corridor (EEC), Bank of Thailand

4. Shrinking workforce due to ageing population

Thailand is shifting rapidly into a completely-aged society; over 33% of the population will be above 60 years old by 2040. **The workforce aged between 15-59 will decrease from 64% of the population in 2022 to 56% in 2040.** The trend for lower birthrate is also seen in Thailand with 9.904 births per 1,000 people in 2021, a 1.84% decline from 2020. To counter increasing workforce scarcity today and in the future, companies are adapting fast to embrace technologies and improve labor productivity. As a result, pushing for stronger demand of digitally fluent workforce in all levels.

A key lever under the "Thailand 4.0" National Development Plan includes promotion of innovations and adoption of higher technologies amongst SMEs, manufacturing companies, and the service sector. The government has implemented multiple initiatives, including introducing new policies and implementing tax and non-tax incentives, to push for digital technology embracement. Additionally, as the government embrace the New S-curve industries, the pressure on the labor market to supply more intermediate and advanced digitally skilled workforce has been escalated. This national drive toward a digital economy would bring in investments, create new opportunities across the nation and underpin a strong demand for Digital Talent, skilled labor, and specific digital functions.

depa

… THB 600 m budget allocated in 2023 to drive digital economy: THB 50 m to support startups, THB 60 m to develop data platform, and the remainder will be used to build Digital Talent capability"

Nuttapon Nimmanphatcharin
President

Exponential growth in Digital Talent demand expected within the next 5 years, especially Level 4 digital skills for creating and developing digital solutions

Figure 4.3: Digital Talent demand projection[1] [No. of workforce, mn people]

CAGR '21-27

	'21	'22	'23	'24	'25	'26	'27	CAGR '21-27
Total	13.8	14.0	14.3	14.6	14.8	15.1	15.4	
Level 1	7.1	7.2	6.8	6.9	7.0	7.0	7.1	0.1%
Level 2	13.9	13.9	14.4	14.9	15.3	15.7	16.2	3.3%
Level 3	1.4	1.4	1.5	1.6	1.6	1.7	1.8	3.1%
Level 4	0.6	0.6	0.7	0.8	0.8	0.8	0.8	6.0%
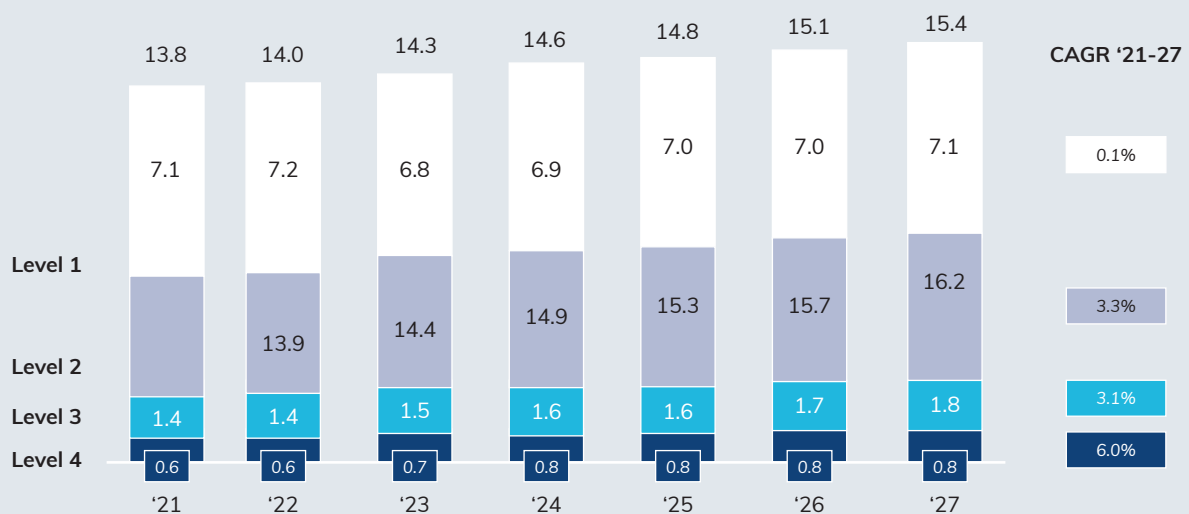
Note: [1] Level 1 (fundamental) includes ability to use digital tools in daily lives, Level 2 (basic) includes ability to use digital tools to find, create, and communicate information at work, Level 3 (intermediate) includes ability to use digital tools to generate meaningful insights, Level 4 (advanced) includes the ability to create and develop digital solutions; Demand projection does not include demand for workforce that does not require digital skill

Source: NSO, Digital Talent Assessment interview (2022)

Digital skills required by the digital era workforce cover a wide range of abilities – including fundamental skills such as the ability to use digital tools to specialized programming and software development skills. Due to the aforementioned drivers, Digital Talent demand is expected to grow by 3-6% over the 5 years. As Thai industries are still in the early-mid stage of digitalization, majority of the digital workforce remains in Level 2 skills. However, t**he shift of digital skill expectations by the industries is observed – from basic and intermediate levels to advanced digital skill levels in the next five years.** Thai companies are expected to increase advanced technology adoption, thereby increasing the demand for Level 4 talent. **As a result, a sharp increase in demand for a workforce with Level 4 skills is forecasted.** Additionally, according to the Bangkok Post release, adoption of advanced technologies, including cloud, IoT and mobile applications in businesses has risen by over 19%, 16%, and 15% respectively in 2022 compared to 2020. Driven by technology, telecommunication, media, and healthcare sectors which are heavily impacted by the pandemic.

Figure 4.4: Demand projection methodology

Workforce demand by level of education/ degree

Expected digital skill levels of workforce by education/ degree today

Expected digital skill levels of workforce by education/ degree within the next 5 years

Demand of digital workforce

Source: Roland Berger

Figure 4.5: Technology adoption in 2025 by Thai companies [% of surveyed companies]

Question: What is the likeliness that your company will adopt the stated technology as part of the growth strategy in 2025?

98% Cloud computing

95% IoT

90% Encryption and cyber security

87% E-commerce

85% Big data analytics

80% AI/ ML

67% Robots & industrial automation

59% Distributed ledger technology (e.g. Blockchain)

xx% % of companies that will adopt the technologies
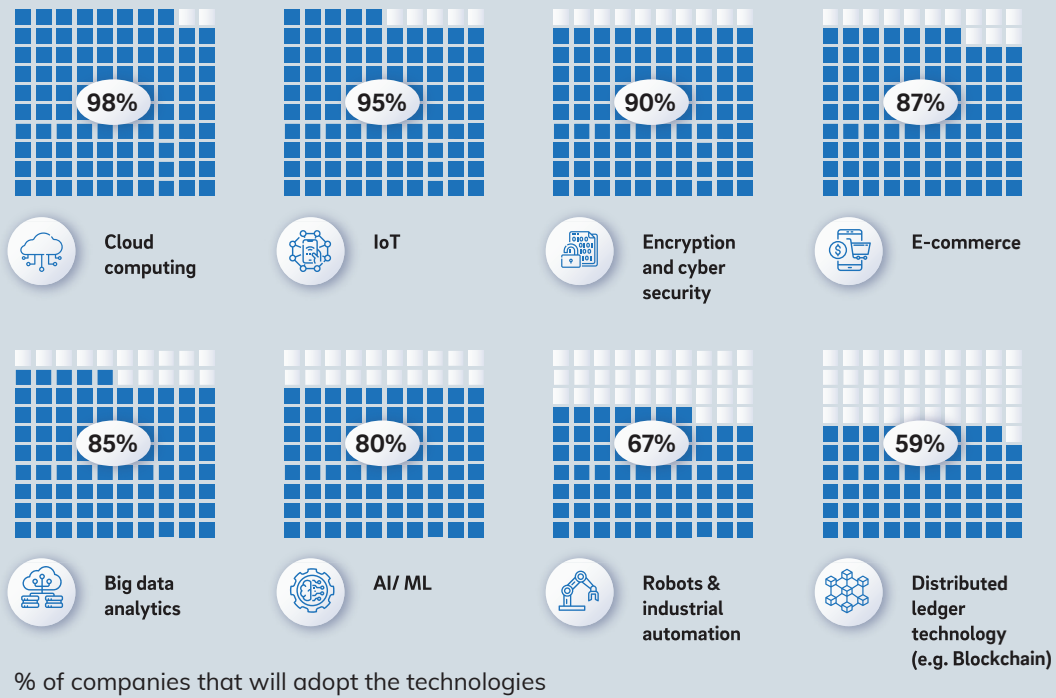
Source: World Economic Forum

Figure 4.6: Share of tasks performed by humans vs machines, 2020 and 2025 (expected)

- Information and data processing
- Administering
- Performing physical and manual work activities
- Communicating and interacting
- Reasoning and decision-making
- Coordinating, developing, managing and advising

0 20 40 60 80 100

- Machine 2020
- Human 2020
- Machine 2025
- Human 2025
- Human-machine frontier 2025
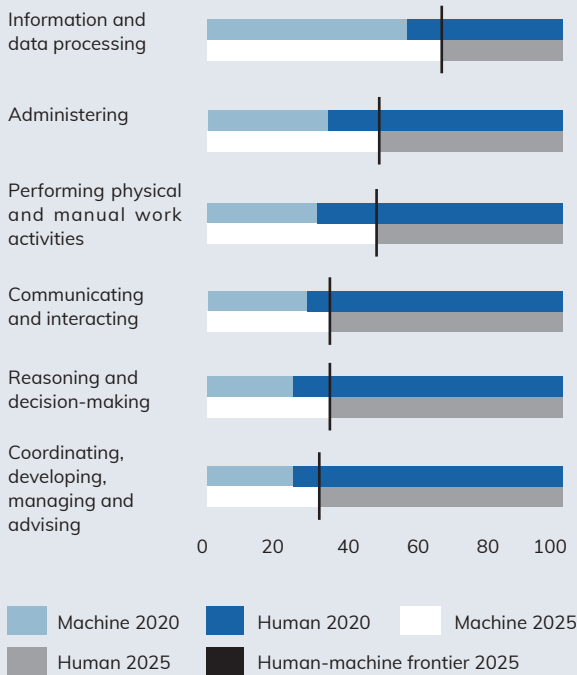
Source: World Economic Forum

As companies push for more advanced technology adoption, demand for Digital Talent in the respective domain will continue to rise in the foreseeable future.

At the same time, companies will look to rearrange the composition of their workforce – including downsizing the total workforce pool, shifting focus to intermediate -advanced digital skills, and expanding the use of contractors for specialized digital work. Enterprises will slowly transform the work process, reallocating tasks from human to digital machines/ software. Machines will focus more on data processing, administration, and manual labor, while human will remain responsible for managing, interacting, reasoning, and decision making.

The rate of task reallocation may differ depending on the level of skill complexity required. **However, as technology advances, low-skill jobs will certainly become obsolete while giving rise to new jobs.**

Emerging jobs in Thailand require mid-to-high level of digital knowledge while labor intensive jobs are progressively replaced

Figure 4.7: Top declining and emerging job roles in Thailand (2020)

Top declining roles

Relative rate of decreasing demand

1. Data entry clerks
2. Administrative and executive secretaries
3. Accounting, bookkeeping, payroll clerks
4. Assembly and factories workers
5. Construction laborers

High

Low

Top emerging roles

Relative rate of increasing demand

1. Data analysts and scientist
2. Digital marketing & strategy specialists
3. Big data specialists
4. AI and Machine learning specialists
5. Software and applications developers

High

Low

● Required up to basic digital skill levels   ● Required up to advanced digital skill levels

Source: World Economic Forum

The pressure from the technology advancement era will lead to the replacement of the current workforce. Over 45% of the jobs in Thailand are to be automated and routine tasks are prone to be replaced by technologies and smart machines. The International Labor Organization (ILO) predicted that at least 44% of jobs, approximately 17 million positions, will be replaced by automation in the next two decades. Sectors with the highest risk of being replaced include services and the agriculture sector.

On the other hand, Dell Technologies predicted that over 85% of the jobs in 2030 have yet to be invented. Whether or not the prediction will become true, it has highlighted the impact of job development in Thailand. **The World Economic Forum (2020) suggested that most emerging job roles will require at least an intermediate to high digital skill level.** The top 5 jobs portray the same future for Thai industries – data and use of applications will be the norm in the years to come.

Among the emerging job roles, the top demanded positions cited in interviews with Executives from large corporate are Data analysts, Digital marketing, AI/ML engineer, Software developer, Cloud developer and Cybersecurity analyst. These digital roles promise attractive career and skills path development but also reinforce the importance of upskilling even for those already in digital roles (Figure 4.8). Additional illustrations of career paths are available in the appendix section.

> *...as Thailand already have the coverage for 5G, we believe that it will be the major engine to boost innovation within the country... , both the private sector and the government are focusing to prepare our workforce to leverage 5G in all digital roles...*

Dr. Chinawut Chinaprayun
(Executive Vice President)

depa

Position and responsibilities: Data analysts

	Monthly salary ['000 THB]	Skills path

Data analyst (0-5 years of experience)
- Building and managing databases and data systems
- Performing data mining and data wrangling
- Visualize data and create reports describing trends, patterns, and forecasts

30-50

- Microsoft excel
- Basic programing
- Basic data visualization

Senior data analyst (3-10 years of experience)
- Handling / mining of large and diverse data sets; managing large scale data projects
- Building sophisticated dashboards
- Communicating findings/ insights to support key decision making

70-100

- Advance data mgmt. skill
- Advance programming SQL, Python, etc.

Big data specialists (>10-15 years of experience)
- Design and develop novel algorithms and ML algorithms
- Own and manage knowledge sharing within a community/ company
- Support/ create data management system of the company

80-150

- Machine learning, AI
- Cybersecurity

Chief data officer (>10-15 years of experience)
- Leading data architecture and infrastructure design
- Create data management system
- Implement measures for data protections

180-200

- Advance in data and business skills
- Strong leadership skill

Position and responsibilities: Digital marketing

	Monthly salary ['000 THB]	Skills path

Digital AE/ marketing specialist (0-5 years of experience)
- Handle client accounts, ensuring all parties are equipped with necessary data
- Develop digital marketing strategies and promote business across digital media platform
- Support account manager in analyzing the effectiveness of digital marketing strategies

20-30

- Productivity tools
- Social media/ marketing tools
- CRM and other enterprise software

Digital account manager (3-10 years of experience)
- Plan and manage digital strategies for multiple and large clients
- Recommend, design and oversee digital marketing projects
- Analyze effectiveness of digital marketing strategies

40-70

- Strong business sense
- Strategic thinking
- Analytics tool

Digital director (4-6 years of experience)
- Monitor and interpret analytics related to marketing initiatives
- Manage project staff, timelines, and budget
- Ensure efficiency and optimization of digital ecosystem

70-80

- Strong understanding of digital channels, analysis tool, and business
- Project management

Chief data officer (>10 years of experience)
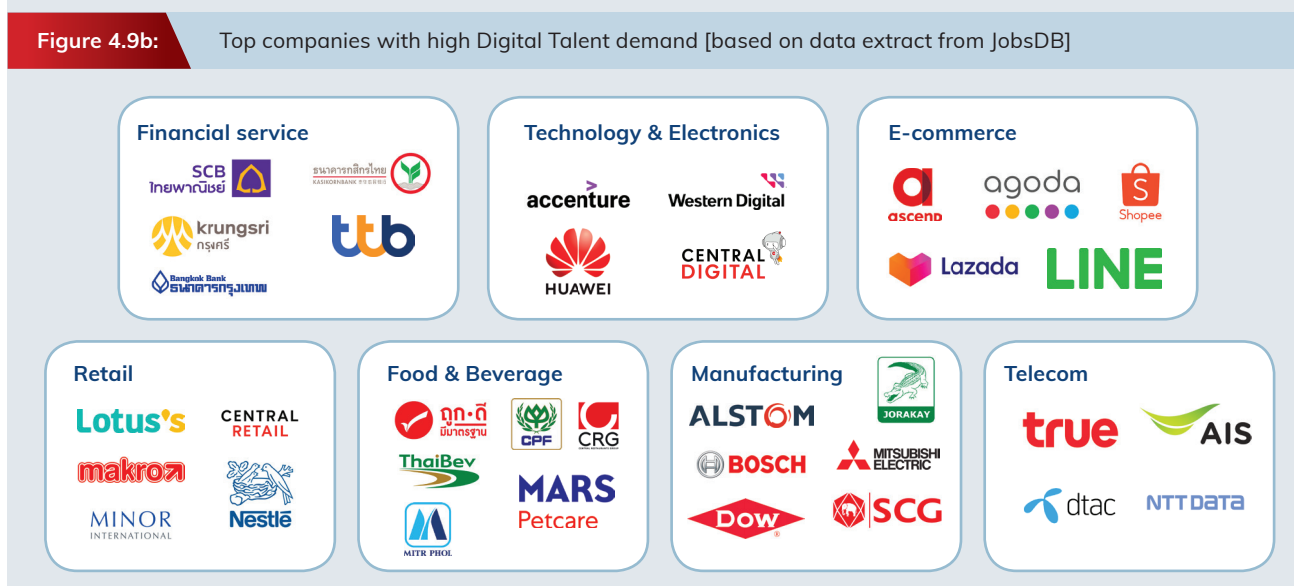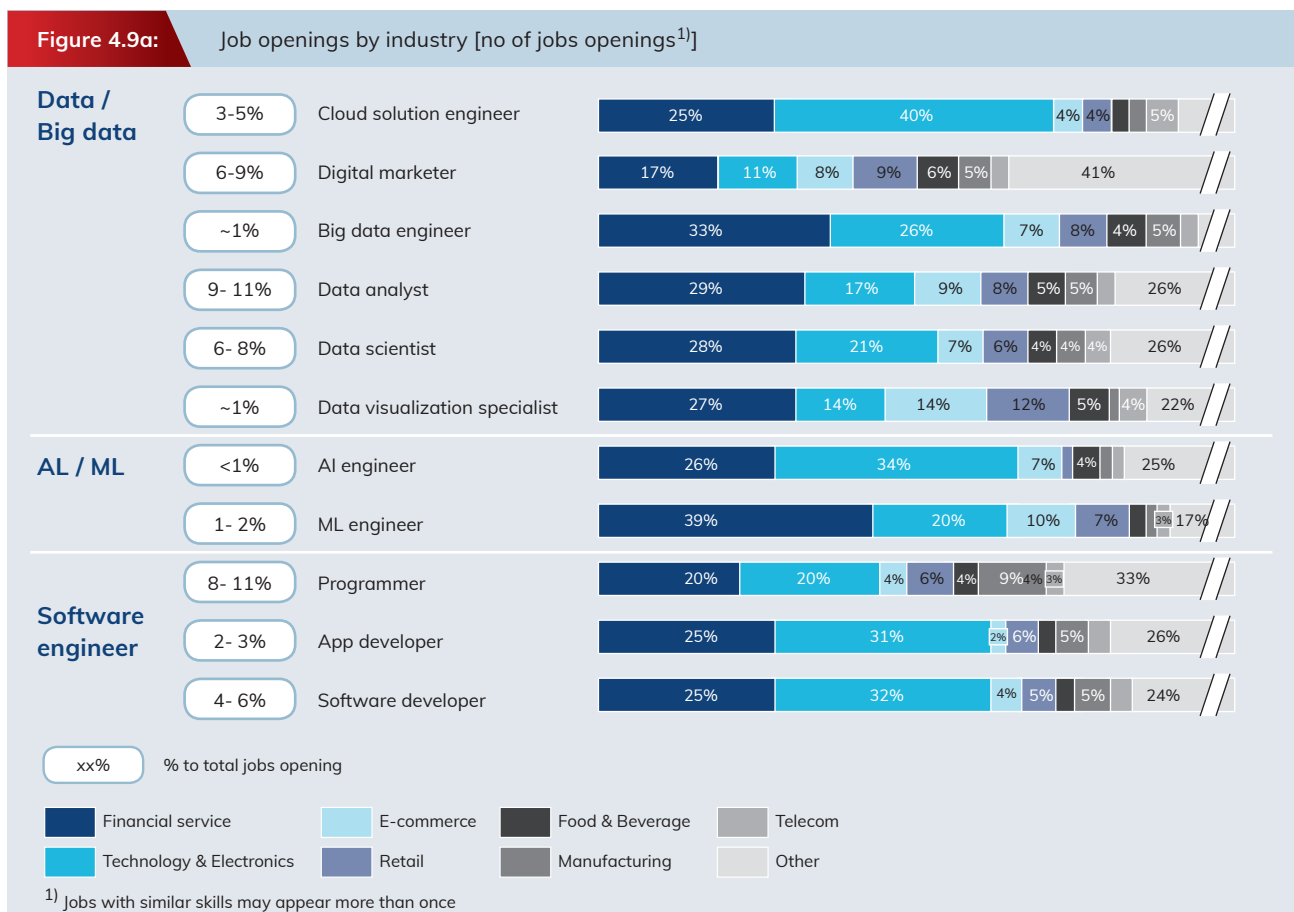- Oversee the planning, development, and execution of company's marketing initiatives

180-250

- Advance in data and business skills
- Strong leadership skill

Source: World Economic Forum, Digital Talent Assessment interview (2022), Desktop research

Up to ~10% of jobs openings in Thailand today require at least intermediate digital skills, reflecting the demand for Digital Talent

As a sample, job openings listed on JobsDB, one of Thailand's largest job searching platforms, were extracted to identify the current demand for digital-related skills. The result shows that in-demand job roles are concentrated in 3 domains: data/big data, software engineering, and machine learning & artificial intelligence. Data-related use cases cover multiple functions in the business, ranging from customer analytics to marketing strategy, and process improvements. Programming will be useful for developing automation within the business process, inventing new products, and launching digital channels to connect to customers.

Figure 4.9a: Job openings by industry [no of jobs openings[1]]

Domain	% to total	Role	Financial service	Technology & Electronics	E-commerce	Retail	Food & Beverage	Manufacturing	Telecom	Other
Data / Big data	3-5%	Cloud solution engineer	25%	40%			4%	4%		5%
	6-9%	Digital marketer	17%	11%	8%	9%	6%	5%		41%
	~1%	Big data engineer	33%	26%	7%	8%	4%			5%
	9-11%	Data analyst	29%	17%	9%	8%	5%	5%		26%
	6-8%	Data scientist	28%	21%	7%	6%	4%	4%	4%	26%
	~1%	Data visualization specialist	27%	14%	14%	12%	5%	4%		22%
AL / ML	<1%	AI engineer	26%	34%	7%	4%				25%
	1-2%	ML engineer	39%	20%	10%	7%	3%			17%
Software engineer	8-11%	Programmer	20%	20%	4%	6%	4%	9%	4% 3%	33%
	2-3%	App developer	25%	31%	2%	6%	5%			26%
	4-6%	Software developer	25%	32%	4%	5%	5%			24%

xx% % to total jobs opening

- Financial service
- Technology & Electronics
- E-commerce
- Retail
- Food & Beverage
- Manufacturing
- Telecom
- Other

[1] Jobs with similar skills may appear more than once

Figure 4.9b: Top companies with high Digital Talent demand [based on data extract from JobsDB]

Financial service
SCB ไทยพาณิชย์, ธนาคารกสิกรไทย KASIKORNBANK, krungsri กรุงศรี, ttb, Bangkok Bank ธนาคารกรุงเทพ

Technology & Electronics
accenture, Western Digital, HUAWEI, CENTRAL DIGITAL

E-commerce
ascend, agoda, Shopee, Lazada, LINE

Retail
Lotus's, CENTRAL RETAIL, makro, MINOR INTERNATIONAL, Nestlé

Food & Beverage
ถูก·ดี มีมาตรฐาน, CPF, CRG, ThaiBev, MARS Petcare, MITR PHOL

Manufacturing
ALSTOM, JORAKAY, BOSCH, MITSUBISHI ELECTRIC, Dow, SCG

Telecom
true, AIS, dtac, NTT DATA

The top three open positions, including data analysts, programmers, and digital marketers, are the prerequisite positions required for the first step of digital transformation within the organization. While data scientists, software developers, and cloud solution engineers follow, as the positions require higher technology adoption, compensation, and subject expertise.

Figure 4.11 breaks down the job openings by industry: financial service, technology, and e-commerce industries as the main demand drivers. On the other hand, digital marketing is embraced by various industries. This is due to the rising number of digital users in Thailand and e-commerce popularity. Companies are moving fast to gain digital footprints to attract online consumers.

> *IT jobs recorded growth of 10% in 2021*
> *... including AI developer, blockchain and crypto consultant, machine learning engineers, elastic search engineers, as well as roles for experts in PDPA...*
>
> Country Managing director

Digital transformation has brought extraordinary changes to business organizations, especially in the talent arrangements. However, the fast digital adoption in Thailand is creating a developmental gap for digital workforce. While the companies are demanding Digital Talent to embrace digital economy, the country is faced with talent shortfalls. The next chapter will discuss development of Digital Talent supply and growth projection.

Chapter 4.2: Availability (supply) of Digital Talent

Thailand has made incremental progress in growing the Digital Talent pool – accelerating the momentum is key to catch up with demand

In recent years, the supply-demand gap of the Digital Talent workforce has been hindering Thailand from prospering in the digital era. Together, the Thai government, academia, and the private sector, have been working to create a better talent development ecosystem. Particularly, the Thai government has been devoting resources to support talent development at the national level.

To improve the supply of Digital Talent within the economy, the government targets to foster digital-era workforce under the Master Plan for Digital Economy, focusing on 4 areas:

1 | Digital Manpower   **2** | Digital Enterprises   **3** | Digitalized Communities   **4** | Digital Infrastructure

The core focus of the governments efforts thus far has been to create a suitable foundation to build a strong Digital Talent ecosystem. **This requires bringing people up to a level of digital literacy and English language capabilities and building an effective and inclusive talent development ecosystem.**

...The main role of depa is to support the development of digital economy in Thailand; we see the importance of digital talent development as the main objective, focusing from students and workforce at all levels across the country...

Dr. Jakkanit Kananurak
(Vice President Digital Manpower Development and Promotion Department)

...Building people cannot be done in a day. It is important to move away from the project-based mentality that capabilities are built over night. By developing targeted programs Thailand can set the right course moving forward...

Theresa Mathawaphan
(Chief Strategy officer)

Despite the government's commitment to these initiatives, the supply of talent has not made significant moves to catch up with demand. To respond to the urgency of the situation, the Digital Economy Promotion Agency of Thailand is supporting the government in drafting the Master Plan for Digital Economy Phase 2. The major part of which will be the development of digital manpower.

However, as noted by the NIA, **it is important to keep in mind that building competencies and developing a sufficient quantity and quality of Digital Talent takes a nation-wide collaborative effort and time.** The quality of the Digital Talent ecosystem is a lagging measure of the success of its improvement initiatives. As such, increased efforts in developing Digital Talent today will not immediately result in more qualified workers tomorrow. This further underlines the importance of allocating effort in the most practical and impactful moving forward.

The next section will examine the current situation and forecasted supply of Digital Talent landscape. The aim is to understand how current initiatives and key stakeholders are contributing to the supply of Digital Talent.

For this paper, the determining factors of Digital Talent supply is based on the following:

1 | Digital literacy by level of education

2 | Percentage of upskilled/ reskilled workforce

3 | Percentage of population which exits the workforce

Figure 4.10:   Supply projection methodology

Workforce supply by level of education/ degree[1]   ✕   **Expected level of digital skill based on education background[2]**   **−**   **Population that exit workforce[4]**   **=**   **Supply of digital workforce**

Percentage of upskilled/ reskilled workforce[3]
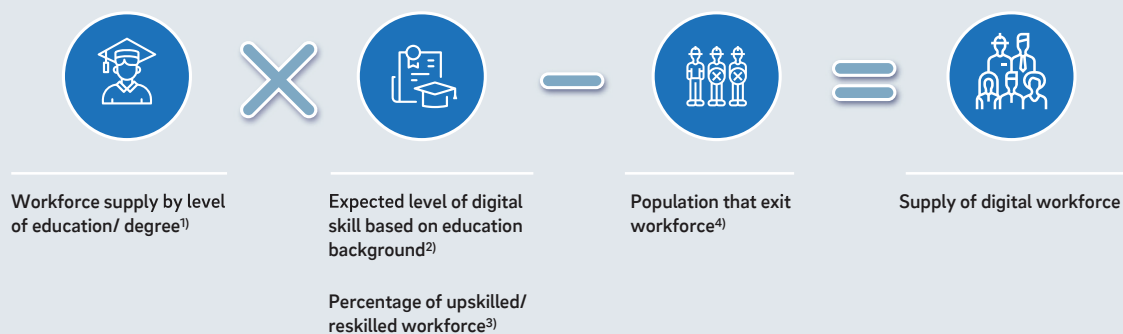
[1]   Supply estimated based on historical data
[2]   Digital skill estimation: Level 1: Population that enters workforce with secondary education, Level 2: Non-ICT related graduates from higher education incl. vocational schools and universities, Level 3: Graduates from ICT-related major from vocational schools and universities, Level 4: Graduates from ICT-related major from masters or doctorates
[3]   Assumption based on desktop research and interviews of percentage of reskilled/ upskilled workforce within the company
[4]   Assume level of digital skill based on age

Source: Roland Berger

3-5% supply growth expected in the talent pool with Level 2 and 3 digital skills, but supply growth of those with Level 4 remain relatively sluggish over the forecasted period

Digital Talent supply is concentrated within levels 1 and 2, taking up over 94% by 2027 (Figure 4.11). However, as heightened by the disruption of the COVID-19 pandemic, public and private sectors have devoted focus to bridging the Digital Talent gap. When incorporating the effort to improve digital literacy by various stakeholders, the digital workforce with at least level 2 and level 3 digital skills are expected to see faster growth within the forecast period.

Figure 4.11:   Digital Talent supply projection[1] [mn people in the workforce]
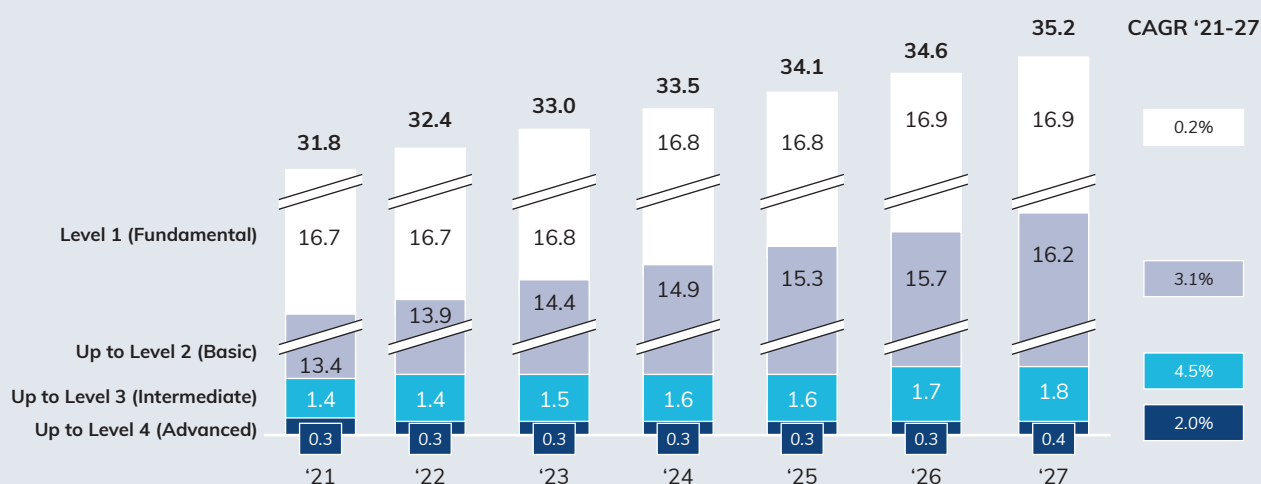
[1]   Level 1 (fundamental) includes ability to use digital tools in daily lives, Level 2 (basic) includes ability to use digital tools to find, create, and communicate information at work, Level 3 (intermediate) includes ability to use digital tools to generate meaningful insights, Level 4 (advanced) includes the ability to create and develop digital solutions

Source: NSO, BOT, Digital Talent Assessment interview (2022)

In their efforts to upskill talent to advanced level digital skills, key stakeholders are placing similar focus across the top tech domains

Figure 4.12: Relative level of focus of the advance technologies

	Government and public sector entities	Academia	Private sector and associations
5G	Low	Mid	Low
AI	High	High	High
Big data	High	Mid	Mid
Coud	Mid	Mid	Mid
IoT	Mid	Mid	Mid

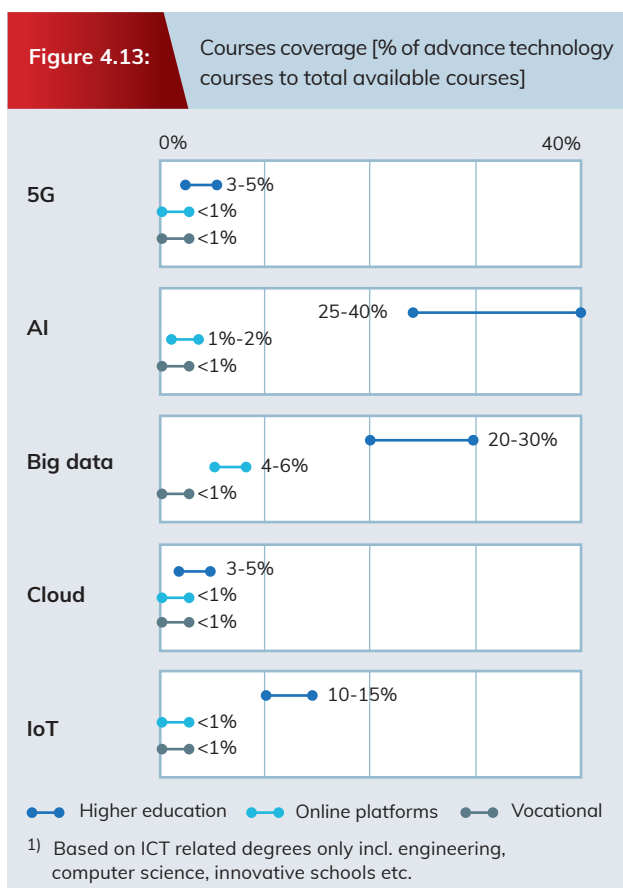Level of focus: High | Mid | Low
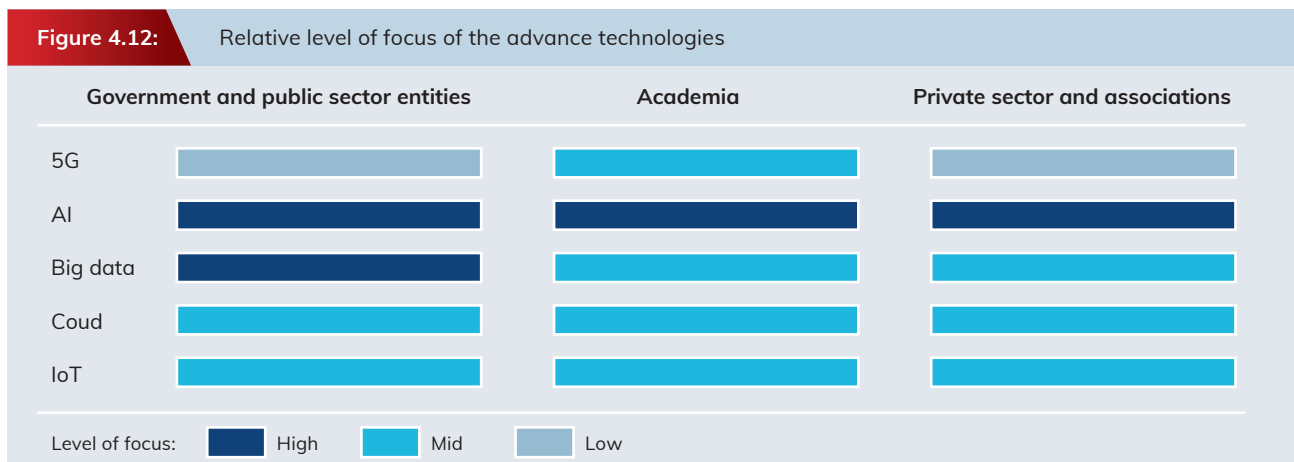
While stakeholders' focus across tech domains are similar (Figure 4.12), the key question on how to build the aspired digital workforce remains.

The academic sector is developing new and updating digital courses to cover the advanced emerging technologies in the five domains: 5G, AI, Big data, Cloud, and IoT. However, the level of coverage remains low except for AI and Big data courses within the higher education institution, signaling the opportunity to further enhance and incorporate the digital courses into the curricula (Figure 4.13). Furthermore, digital-related courses are still limited to students who study within the ICT-related faculties.

Figure 4.13: Courses coverage [% of advance technology courses to total available courses]

0% – 40%

5G
- 3-5%
- <1%
- <1%

AI
- 25-40%
- 1%-2%
- <1%

Big data
- 20-30%
- 4-6%
- <1%

Cloud
- 3-5%
- <1%
- <1%

IoT
- 10-15%
- <1%
- <1%

Higher education | Online platforms | Vocational

1) Based on ICT related degrees only incl. engineering, computer science, innovative schools etc.

Universities and online platforms are investing more in developing digital courses, but planned curricula is still lacking for the years to come. Only few representatives interviewed within this study have concrete plans to curate new digital courses within the next five years. While the universities plan to incorporate more interactive and project base courses to allow students to apply digital knowledge in the field, the topic of technologies and areas of focus remain a question.

The main reason is the rapidly evolving technology, making it impossible for universities to establish a long-term plan for digital courses. As a result, the academia sector is trying to adapt and shorten the process of inventing and updating new learning course, improve collaboration with industries, and encourage field practitioners to involve more within the academic field.

To improve the scarcity of Digital Talent supply, Chulalongkorn has recently established School of Integrated Innovation to offer a new degree of Bachelor of Arts and Science in Integrated Innovation to cultivate Digital Talent for the future.

Figure 4.14:   Case study – Chulalongkorn School of Integrated Innovation
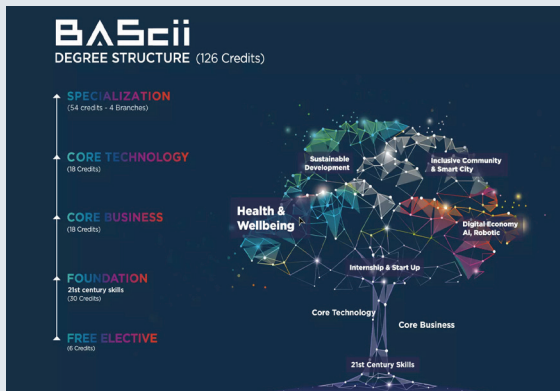
Established in 2018, School of Integrated Innovation (ScII) aim to equip the students with the skills needed for the digital era, focusing on four specializations – sustainable development, health & wellbeing, inclusive community & smart city, and digital economy, AI and robotics

…ScII is a flagship program at Chulalongkorn University, the courses were developed within 6 months which is the fastest process that ever happen in our university… we aim to foster digital knowledge within our university by allowing students from other faculties to take digital courses at ScII…

Ronnakorn Vaiyavuth, PhD
(Professor at School of Integrated Innovation: ScII)

Source: Chulalongkorn University, Digital Talent Assessment interview (2022)

On the other hand, companies are pushing for reskilling and upskilling initiatives so that the skillset of the workforce remain relevant in the workplace. Based on the extensive interview conducted within the scope of this paper, industry players demonstrate dedication in allocating more time and budget to reskill and upskill their current workforce (Figure 4.15).

However, the key success factor of reskilling and upskilling initiatives depends heavily on the actual content, methodologies, and the ability of learners to utilize in the workplace. In the next chapter, the challenges encountered by the three stakeholders in developing the Digital Talent workforce will be examined to identify the root cause of the Digital Talent gap.

Figure 4.15:   Reskilling/ upskilling time allocation and budget [% of survey respondents]
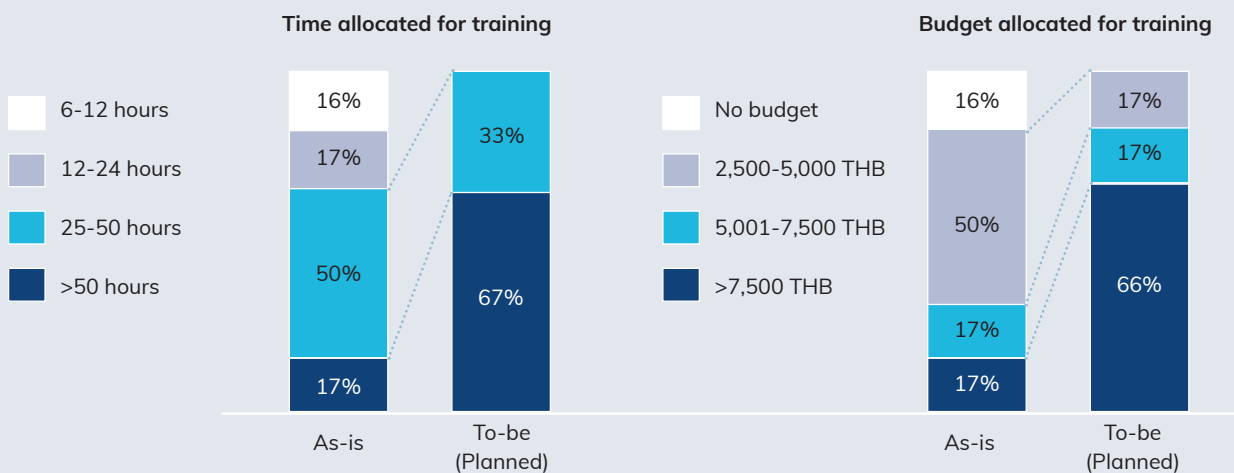
Source: Digital Talent Assessment Survey (2022)

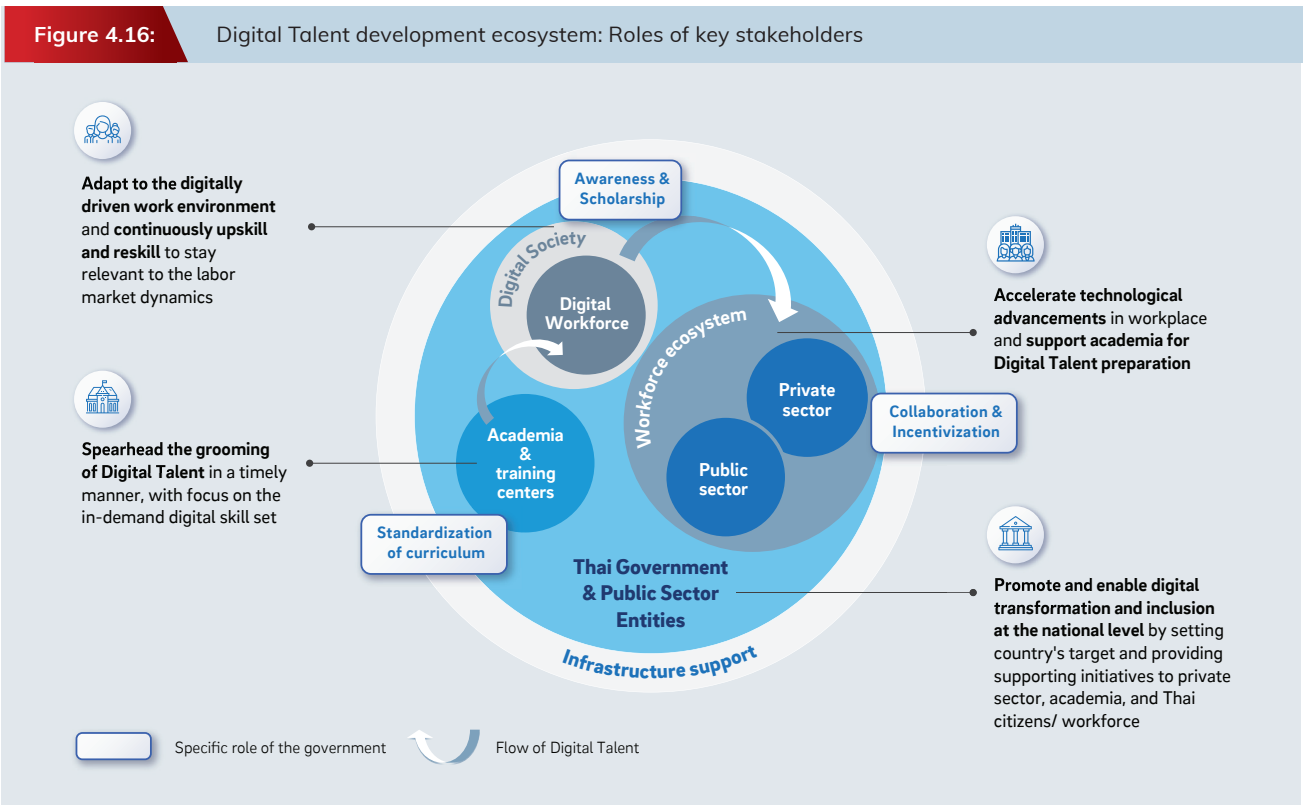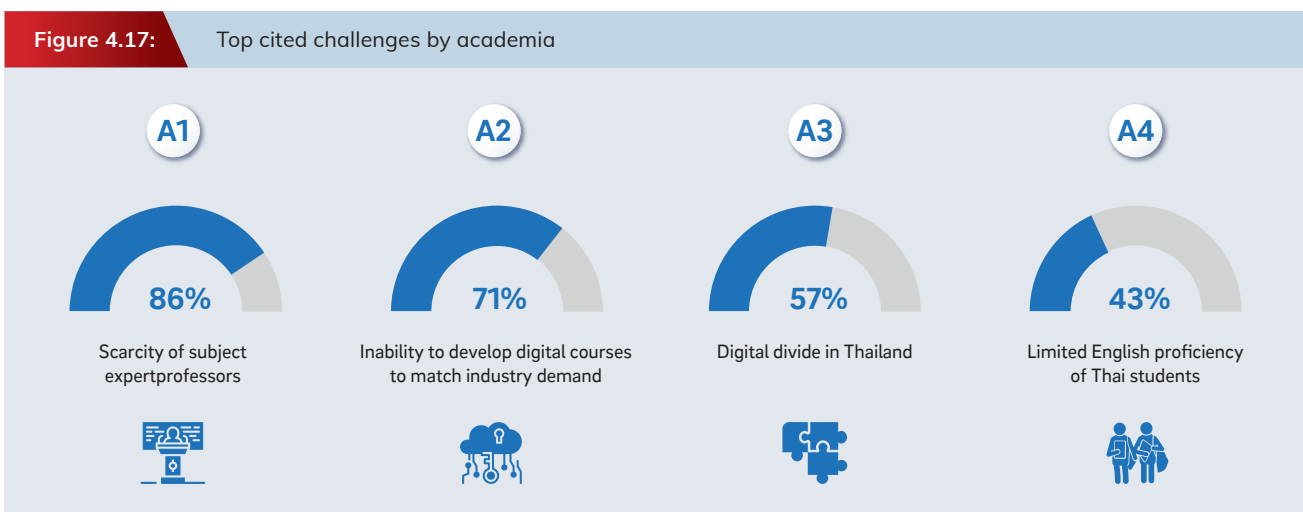# Chapter 4.3: Digital Talent Development Constraints and Bottlenecks

The endeavor of stakeholders to achieve their aspired Digital Talent pool is not without challenges

Each stakeholder in the ecosystem plays a crucial role in contributing to the nation's Digital Talent landscape (Figure 4.16). Due to inter-relationships between these stakeholders, the impact of constraint faced by one stakeholder would also disrupt the responsibilities of other stakeholders.

Figure 4.16: Digital Talent development ecosystem: Roles of key stakeholders

Adapt to the digitally driven work environment and **continuously upskill and reskill** to stay relevant to the labor market dynamics

Spearhead the grooming of Digital Talent in a timely manner, with focus on the in-demand digital skill set

Awareness & Scholarship

Digital Society

Digital Workforce

Workforce ecosystem

Private sector

Public sector

Academia & training centers

Collaboration & Incentivization

Standardization of curriculum

Thai Government & Public Sector Entities

Infrastructure support

Accelerate technological advancements in workplace and **support academia for Digital Talent preparation**

Promote and enable digital transformation and inclusion at the national level by setting country's target and providing supporting initiatives to private sector, academia, and Thai citizens/ workforce

☐ Specific role of the government   ↻ Flow of Digital Talent

For academia, scarcity of subject experts, mis-match of courses to train digital skill, and education/ digital inclusion are key challenges

Figure 4.17: Top cited challenges by academia

A1 — 86% — Scarcity of subject expert professors

A2 — 71% — Inability to develop digital courses to match industry demand

A3 — 57% — Digital divide in Thailand

A4 — 43% — Limited English proficiency of Thai students

Source: Digital Talent Assessment interview (2022)

A1 | Scarcity of subject expert professors

As most advanced digital-related fields are fast-paced, finding qualified and experienced lecturers poses a major challenge, as specialization takes time. In addition, due to the strong demand in the private sector, the salaries for experts are inflated, and it becomes difficult to convince these experts to move into academia as part-time and full-time professors.

Furthermore, professor's KPIs are evaluated based on research output or publications rather than upskilling. As a result, instead of broadening their knowledge, professors are incentivized to deepen their expertise in their currently specialized fields.

A2 | Inability to develop digital courses to match industry demand

Overall, interviewees have explicitly reported a lack of data available to universities about industry needs and in-demand jobs. Combined with the slow-moving nature of academia, especially in the development of new degrees, this results in a delay between a new trend emerging in the industry and universities offering a suitable program to teach said trend. This delay leads to a mismatch between graduates' skills and industry needs. Currently, there are multiple early-stage collaboration initiatives between universities and the private sector; however, the speed of this improvement and the future respon-siveness to industry trends remains a major concern.

> *...Especially for rapidly developing fields, such as Cybersecurity, it is very difficult to find experts that are willing and able to teach classes. The private sector remains highly attractive and there is insufficient homegrown expertise to fill the need...*

Prof Santi Phithakkitnukoon (Associate Professor, Chiang Mai University)

A3 | Digital divide: Accessibility to internet and digital devices at school levels

While Thailand ranks high in terms of internet connectivity in schools, but the cost of accessing the internet in the rural areas are significantly higher than those in the urban areas. Additionally, **nation wide statistic shows over 17 students are sharing one computer at school.** Moreover, the ratio established a red flag of equipment shortage, comparing at a province level. For example, Southern provinces such as Narathiwat and Yala, over 27 students shared one computer (Figure 4.18). As a result, **primary and secondary educations often fall short to cultivate interests of students to pursue advance digital courses in higher education.**
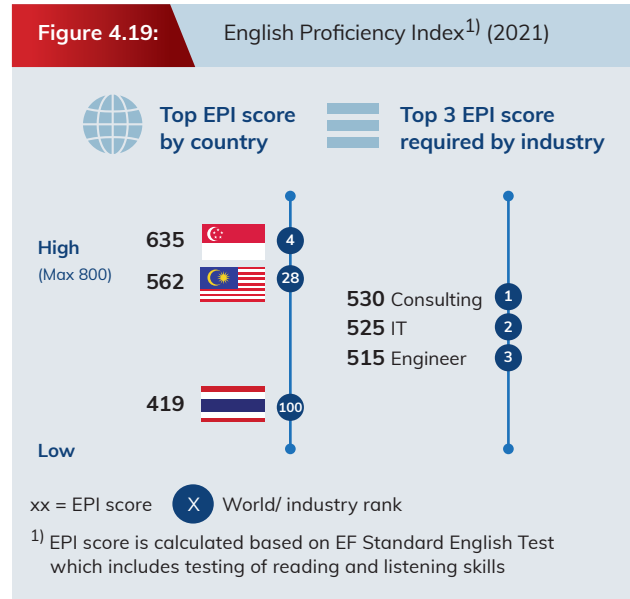
Figure 4.18: Average number of users per computer in Thailand (2021)

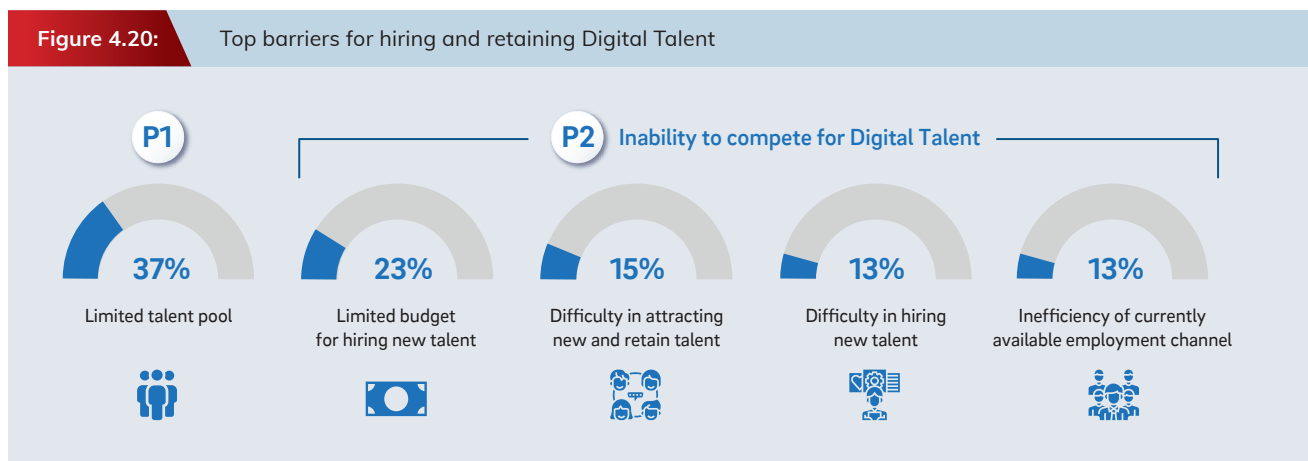8   27
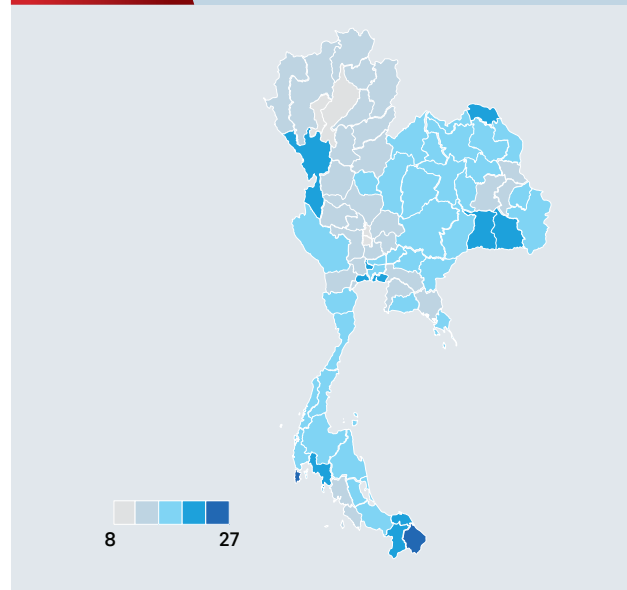
Source: United Nations

A4 | Limited English proficiency of Thai workforce

The available textbooks, training, and learning materials in the market are mostly published in English. Based on EF English Proficiency Index published in 2021, digital related fields such as information technology and engineering require high English proficiency. On the other hand, Thailand ranks the 100th place as a "Very low proficiency" country, dropping from 89th place in 2020 (Figure 4.19). The result establishes an alarming limitation for Thai workforce to access digital knowledge and improve digital skills.
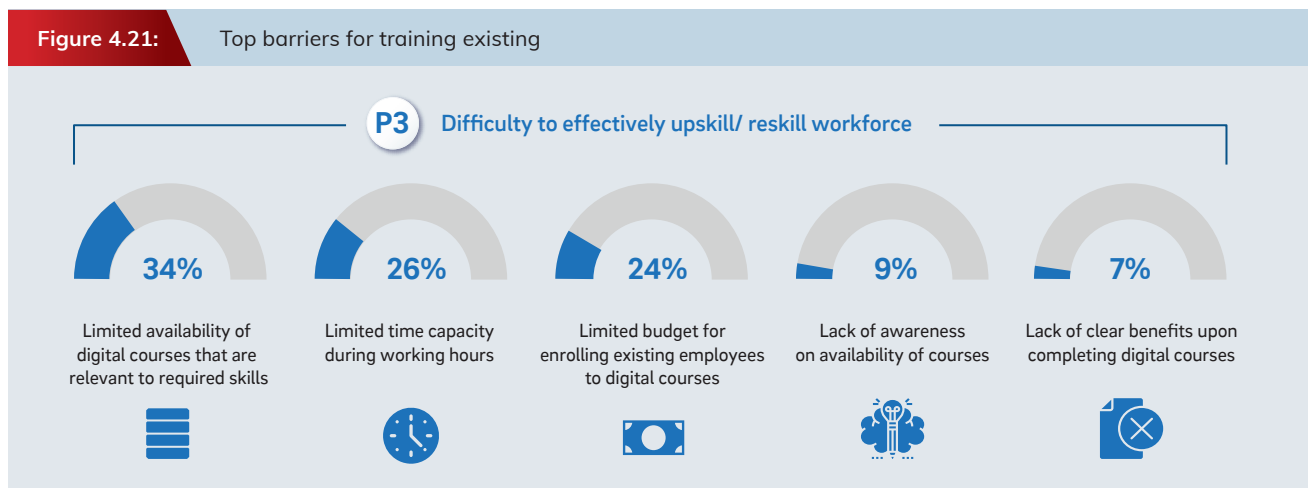
Top EPI score by country

Top 3 EPI score required by industry

High (Max 800)

635 — Singapore — 4
562 — Malaysia — 28

530 Consulting — 1
525 IT — 2
515 Engineer — 3

419 — Thailand — 100

Low

xx = EPI score   X   World/ industry rank

[1] EPI score is calculated based on EF Standard English Test which includes testing of reading and listening skills

Source: Education First

Private sectors encounter challenges from recruitment to employee development and retention of Digital Talent

Figure 4.20: Top barriers for hiring and retaining Digital Talent

P1

37% Limited talent pool

P2 **Inability to compete for Digital Talent**

23% Limited budget for hiring new talent

15% Difficulty in attracting new and retain talent

13% Difficulty in hiring new talent

13% Inefficiency of currently available employment channel

Source: DCT

Figure 4.21: Top barriers for training existing

P3 **Difficulty to effectively upskill/ reskill workforce**

34% Limited availability of digital courses that are relevant to required skills

26% Limited time capacity during working hours

24% Limited budget for enrolling existing employees to digital courses

9% Lack of awareness on availability of courses

7% Lack of clear benefits upon completing digital courses

Source: DCT

The Nation Thailand reported that over 61% of companies in Thailand execute digital related initiatives on an ad-hoc and silo basis, often with neither cross-functional interaction nor enterprise level planning.

The approach to implement digital initiatives is mostly reactive, which inevitably leads to limited effectiveness in holistically tackling the barriers that the private sector is facing in building up their Digital Talent pool.

P1 | Limited talent pool in Thailand

Thai companies cited the limited talent pool in Thailand as top challenge in building their digital workforce. The **shortage of Digital Talent supply in Thailand and the mismatched of labor's skill and industry demand** are biggest constraints for filling digital roles.

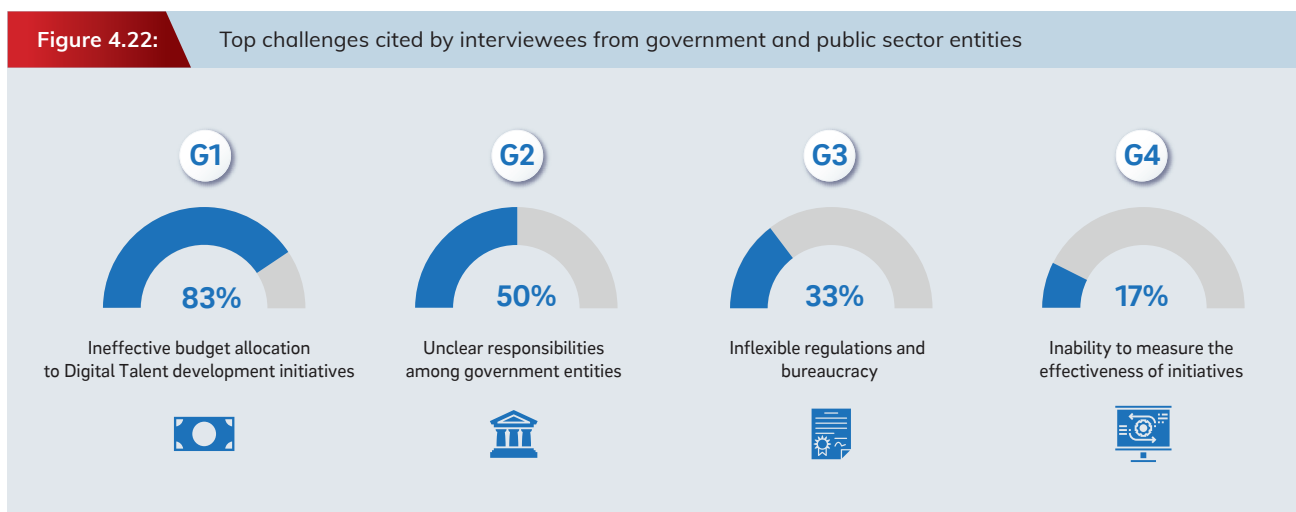## P2 | Inability to compete for Digital Talent

Due to limited hiring budget and less attractive career development (compared to global tech companies), **Thai companies are often unable to secure new digital hires nor retain targeted Digital Talent profile.** Unclear career progression and lack of intriguing job content are the major reasons local small-to-mid-size companies are less attractive for Digital Talent. Lastly, functions to support job-seekers are still lacking on jobs-seeking platform. In this case, an algorithm can be utilized to identify upskilling needs for job-seeker to land employment.

P3 | Difficulty to effectively upskill/ reskill workforce

Currently available digital development courses are scattered and overlapped as Thailand lacks a single online portal to access digital-related learning courses. Companies are struggling to identify appropriate learning courses that fits the need of the job position. With an aggregated learning portal, learners will be able to seamlessly navigate across the available content, matching their interests and aspired digital positions.

Efforts by government and public sector entities to facilitate the development of Digital Talent are constrained by limited budgets allocated for Digital Talent development and a lack of clarity on roles

Figure 4.22: Top challenges cited by interviewees from government and public sector entities

G1	G2	G3	G4
83%	50%	33%	17%
Ineffective budget allocation to Digital Talent development initiatives	Unclear responsibilities among government entities	Inflexible regulations and bureaucracy	Inability to measure the effectiveness of initiatives

Source: Digital Talent Assessment interview (2022)

G1 | Ineffective budget allocation to Digital Talent development initiatives among public entities

Given the disruptive aspect of the digital economy and the unprecedent COVID-19, the Thai government is struggling the manage the increased pressure on the budget.

G2 | Unclear responsibilities among government and public sector entities

Multiple ministries and entities are ramping up the development of a digital economy and Digital Talent ecosystem. As initiatives a launched in a relatively short amount of time, two main issues has risen. Firstly, **organizations often do not know that their activities are overlapping with others. Secondly, there is a lack of transparency on which focus areas have been covered so far.**

G3 | Inflexible regulations and bureaucracy

Interviewees have **named the complex range of regulations on education and training and the long approval processes** as major roadblocks to implementing new talent development initiatives. In a fast-paced environment, speed is key, and long approval processes reduce the responsiveness and decrease the effectiveness digital related initiatives.

G4 | Inability to measure the effectiveness of Digital Talent development initiatives

Finally, even if the government entities were able to overcome the aforementioned obstacles, assessing the effectiveness of these initiatives remains challenging. As the **currently available measures to evaluate initiatives are not ideal and that some initiatives are simply hard to measure by nature.**

> *...We are able to offer students from weaker socioeconomic backgrounds grants of up to THB 3,000 per year, which is not enough to buy digital devices. Our approach during COVID-19 school closure was to coordinate with others in providing students digital devices, but internet coverage remained a problem regardless...*

Dr. Pumsaran Tongliemnak
(Specialist Level Education Economist, Equitable Education Fund)

> *...We had been conducting trainings on cybersecurity, which were well received. How well the trainees apply their new knowledge in the workplace still needs to be measured...*

Dr. Chaichana Mitrpant
(Executive Director)

Figure 4.23: Summary of top challenges to develop Digital Talent along employment journey
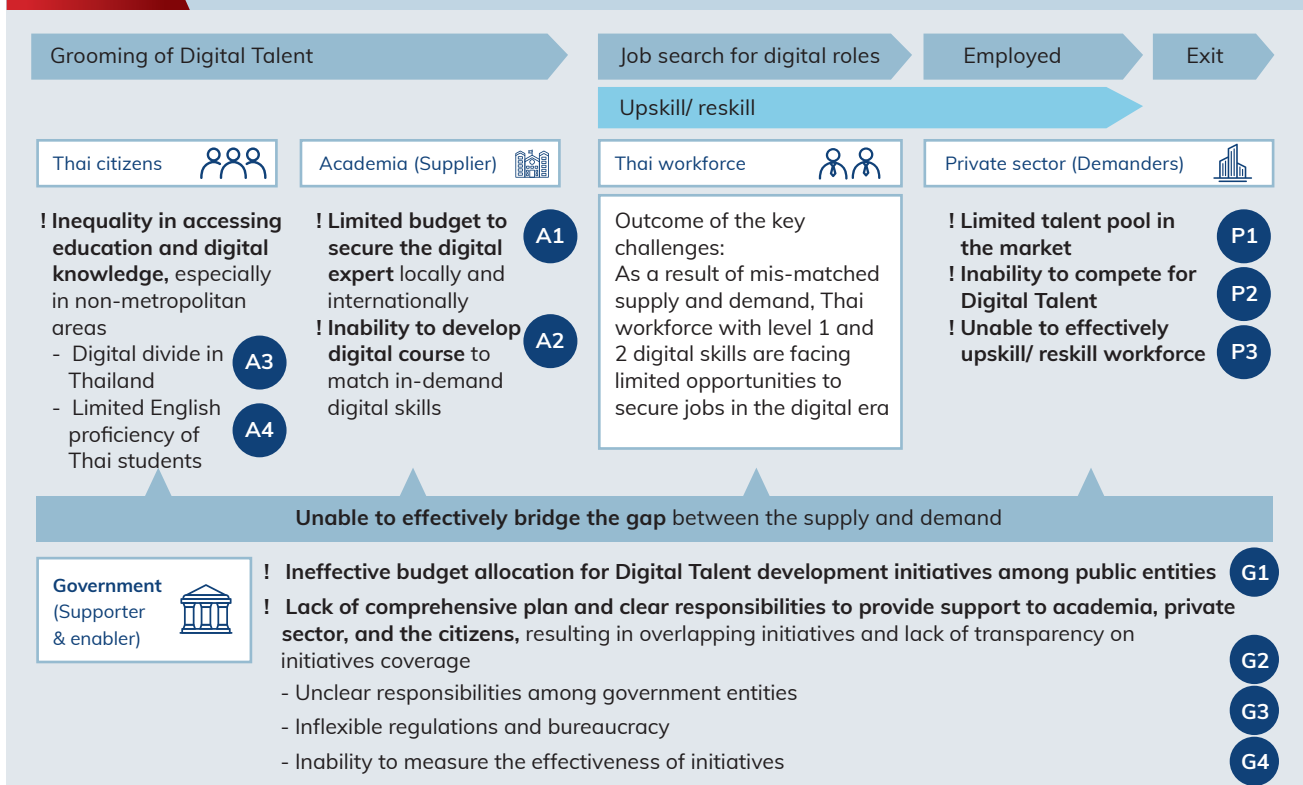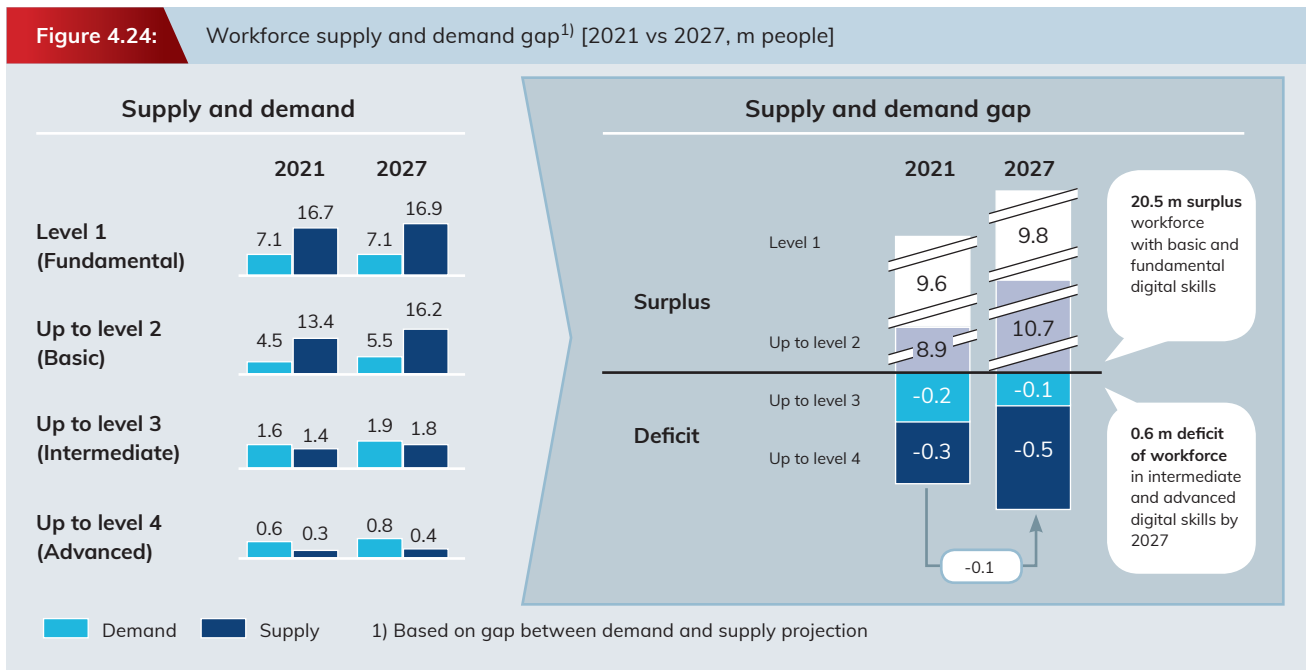

Source: Digital Talent Assessment interview (2022)

Overall, **11 key challenges along the employment journey have limited the effectiveness of Thailand's efforts in closing the Digital Talent gap** (Figure 4.23). Reforming the human-capital development system is a national initiative with the government as the core supporter and enabler. A comprehensive national plan and effective budget allocation to address the key issues would be crucial to close the Digital Talent gap. At the same time, the private sector and academia need to closely collaborate to prepare the Thai citizens to thrive in the digital era.

This chapter has explored the challenges faced by key stakeholders and has decoded the core hindrance in the Digital Talent development ecosystem. In the next chapter, key gaps and the to-be-focused areas to support the development of Digital Talent development plan moving forward, will be highlighted.
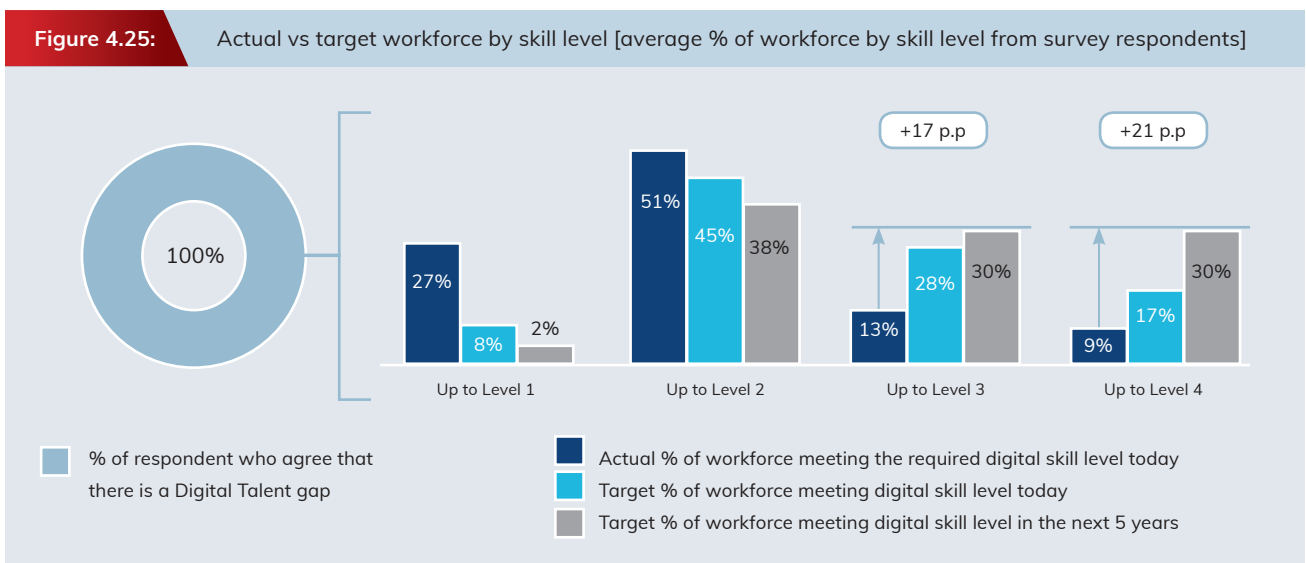
Chapter 4.4 Gap in Digital Skills and Talent

By 2027, Digital Talent gap in Thailand will reach 0.6 m people, with 0.5 m deficit in those with advanced digital skills

Supply and demand

	2021		2027	
	Demand	Supply	Demand	Supply
Level 1 (Fundamental)	7.1	16.7	7.1	16.9
Up to level 2 (Basic)	4.5	13.4	5.5	16.2
Up to level 3 (Intermediate)	1.6	1.4	1.9	1.8
Up to level 4 (Advanced)	0.6	0.3	0.8	0.4

Supply and demand gap

	2021	2027
Surplus Level 1	9.6	9.8
Up to level 2	8.9	10.7
Deficit Up to level 3	-0.2	-0.1
Up to level 4	-0.3	-0.5

-0.1

20.5 m surplus workforce with basic and fundamental digital skills

0.6 m deficit of workforce in intermediate and advanced digital skills by 2027

Demand   Supply   1) Based on gap between demand and supply projection

Key stakeholders have acknowledged the widening Digital Talent shortage and its implications on Thailand's ambition to become a digitalized economy. Based on the demand and supply projection, the widening gap is more pronounced in advanced digital skills (Figure 4.24). Employers cited the major shortage areas for the workforce in level 3 today. However, the demand will shift toward advanced digital skills in the next five years (Figure 4.25).
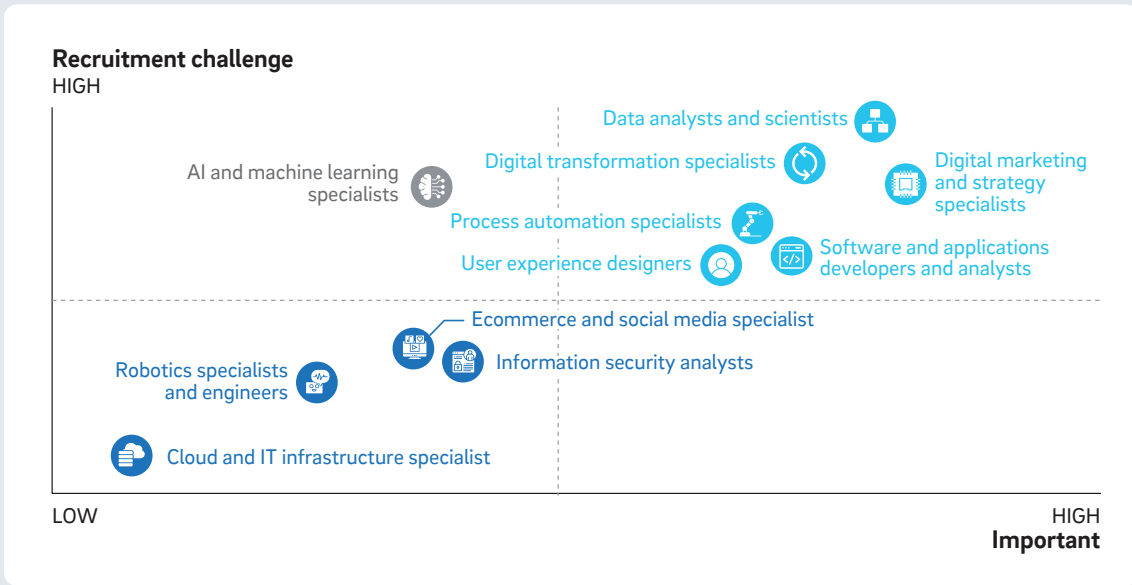
With the current shortage of workforce with level 3 digital skills, significant gap in the labor market among intermediate and advanced digital skills is to be expected in the next five years. As a result, Thailand needs to focus on a holistic approach to upskilling, including workers of all levels of digital skills.

100%

+17 p.p
+21 p.p

	Up to Level 1	Up to Level 2	Up to Level 3	Up to Level 4
Actual	27%	51%	13%	9%
Target today	8%	45%	28%	17%
Target next 5 years	2%	38%	30%	30%

% of respondent who agree that there is a Digital Talent gap

Actual % of workforce meeting the required digital skill level today
Target % of workforce meeting digital skill level today
Target % of workforce meeting digital skill level in the next 5 years

Figure 4.26: Talent gap and importance of digital skill

Recruitment challenge
HIGH

- Data analysts and scientists
- Digital transformation specialists
- Digital marketing and strategy specialists
- AI and machine learning specialists
- Process automation specialists
- Software and applications developers and analysts
- User experience designers
- Ecommerce and social media specialist
- Information security analysts
- Robotics specialists and engineers
- Cloud and IT infrastructure specialist

LOW — HIGH
Important

Source: Deloitte

Thailand must focus on specific skills required by the market today and, in parallel, prepare for the futuristic skills in-demand to ease the pressure in the labor market effectively. Figure 4.26 shows the positive relationship between the importance of ICT job roles and the difficulty of recruiting. The highly challenging position to recruit requires an intermediate and advanced skill set, which are currently lagging in the job market. On the other axis, the importance of each job function reflects the private sector's expected to benefit from digital transformation.

Thai companies target to improve customer experience, transform business processes, and utilize data to support the transformation, supporting the demand in those related functions (Figure 4.27). **Thailand needs to carefully assess the digital skill landscape and the private sector's ambition, in order to focus on developing the right skills in its workforce to bridge the Digital Talent gap.**

Figure 4.27: Thai companies' main objectives for digital transformation [% of respondents]

- **62%** Enhancing the digital customer base and end-user experience
- **62%** Transforming business processes
- Better utilization of data
- **60%**
- Accelerate new product development
- **57%**
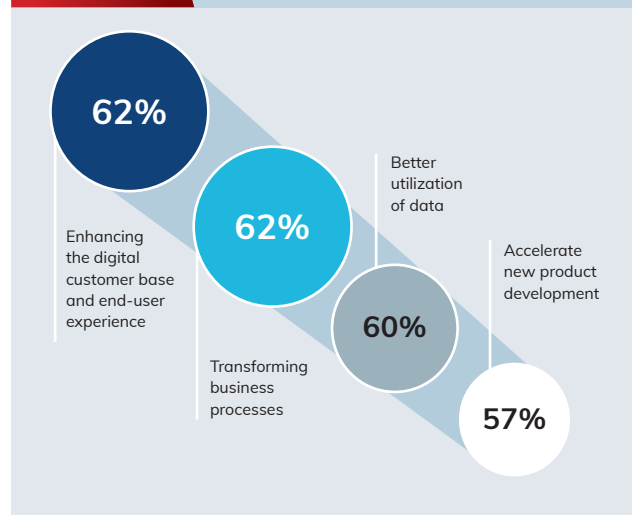
Source: Deloitte

The talent gap in Thailand is expected to reach 0.6 m people by 2027. The gap will have significant implications on Thailand to realize its full economic potential and ascending to become one of the regional and global leaders in the digital economy. Tackling the series of key obstacles faced by the private, public, and academia stakeholders, as discussed in this chapter, is crucial to fully unlock the potential of Thailand's digital workforce. The upcoming chapter will lay out a comprehensive approach to architect Thailand's digital economy by addressing the root causes of the Digital Talent gap.

CHAPTER 5
WAY FORWARD FOR THAILAND
DIGITAL TALENT: COLLECTIVELY
ARCHITECTING THAILAND'S
DIGITAL ECONOMY

THAILAND NATIONAL DIGITAL TALENT DEVELOPMENT

TRANSFORMING THAILAND INTO ASEAN'S DIGITAL POWERHOUSE

Chapter 5.1 Strategies, Initiatives, and Policies Outline

Chapter 5.1.1: Key Challenges and Phases in Developing Digital Talent

What actions can the government, private sector and academia take to address the challenges?

Chapter 4 detailed and analyzed the supply shortage of Digital Talent in Thailand and its several underlying reasons ranging from the inability of academia to adapt its curriculum to match the fast-changing industry demand to insufficient budget dedicated to Digital Talent development. Given the constraints, Digital Talent development progress has staggered in recent years despite several initiatives being rolled out by each stakeholder. These constraints can be further categorized (Figure 5.1) and addressed via initiatives and policies, which will be discussed in Chapter 5.1.2.

Figure 5.1: Digital Talent development initiatives and the challenges they aim to address

Initiative type/focus area   Challenges that the initiative aims to address

A Skills Development
- A1 Lack of digital skills amongst the youth
- A3 Scarcity of subject expert faculty

B Career/ Job Matching
- P1 Scattered understanding of digital roles
- P3 Low employability of today's graduates in digital roles

C Infrastructure Development
- A3 A4 Limited accessibility to digital tools and education
- P2 A2 Mis-match of courses taught in the university and industry demand; lack of practical know-how

D Policy Making, Standardization, and Monitoring
- G2 G4 Lack of comprehensive plan and clear responsibilities among government entities
- G4 Ineffective monitoring protocol to ensure campaign's effectiveness
- G1 G3 Ineffective budget allocation

E Funding and Sponsorship
- A1 G1 Lack of funding for the recruitment of teachers/profs/experts...

To ensure a stable foundation for the development of Digital Talent, initiatives need to be developed along 5 phases

To develop a future-ready workforce, a comprehensive approach to addressing various aspects of the upskilling and reskilling journey is needed. Developing the future workforce is more than creating upskilling and reskilling courses. It requires many components to build a robust system that is sustainable in impacting change. There are 5 development phases behind this comprehensive approach: Awareness, Accessibility, Knowledge, Suitability, and Adaptability. Combined, they would sufficiently tackle challenges during the workforce development journey.

Figure 5.2: Development phases of building future-ready workforce

Source: Roland Berger

First, creating awareness of the importance and impact of digital technologies on the economy, aids in organically boosting the program's reach and participation. It is important for individuals to understand and aspire to upskill themselves to keep up with the fast-changing labor market. Even though free courses are available in Thailand, the uptake is low, as little is known about the benefits of participation. Providing clear visibility on upskilling benefits will motivate people to seek development that will help further their career. Upskilling could open avenues for new job opportunities, career progression, salary increment and profile improvements with certifications.

Second, expanding the accessibility of technologies and online learning channels will help to ensure more people have the means to access upskilling opportunities. Digital inclusion is one of the core elements in driving an uplift in Digital Talent. As there are still students who do not own a computer or have no access to the internet, a significant portion of the population is being left out of Thailand's digital workforce transformation journey.

Learning course participation involves costs, directly through course fee and indirectly through the income lost during absence from working for training, resulting in upskilling being perceived as unaffordable to many. Additionally, many companies, especially SMEs, run on strict budgets that are insufficient to fund training for employees. Therefore, support such as government subsidies can make training more affordable to individuals and employers, increasing their ability to join upskilling and reskilling programs.

Third, ensuring that digital knowledge and skills are cultivated in the potential workforce at a young age and consistently throughout all education levels, strengthens the employment readiness of talent. Skill level mismatch between individuals and emerging roles is the key reason behind current gap in Digital Talent. This is perpetuated by the lack of an adaptive education system that should follow the continuous changes in industry needs as jobs evolve. Thus, more collaboration between the private sector and academia is crucial in developing relevant curricula, meeting the latest industry needs. Additionally, professors and teachers also need to stay ahead of the curve to keep up with industry trends. This will ensure the latest industry requirements are integrated into the teaching content and methodologies.

Fourth, increasing employability among new graduates and assisting them with integrating into the workforce, helps to sustain the level of talent. To ensure that each graduating talent finds a suitable job that matches their skillsets, career guidance is required. Through expert guidance, graduates will be able to land roles in which they are able to add value to a digital society. Such initiatives need to address the promotion of advanced digital skills, filling in future-proof jobs, and the creation of effective job matching channel.

Huawei's Digital Bus Initiative

- A solar-powered bus initiative was launched to address the digital divide issue, through an interactive mobile digital classroom
- Aims to improve education through technology by providing digital knowledge for over 1,500 students in 10 provinces, covering over 40 rural Thai communities
- Training curricula that are practical and accessible have been co-developed by Huawei and various industry experts

Lastly, embedding an adaptability mindset in students and current workforce is the way to ensure sustainability in Digital Talent development. Without lifelong learning mindset, the skills that the workforce possess will become obsolete as technology changes. While government, companies and academia continue to develop cutting edge training programs, it is equally important for the talent themselves to exercise enough efforts to realize the benefits from the courses. An adaptability mindset does not only apply to upskilling but also directly influence employee's ability to navigate an increasingly complex working environment where each job role requires complementary capabilities like critical thinking and innovation.

Building on these 5 development phases, stakeholders can design and implement initiatives that effectively work towards developing Thailand's digital economy. By benchmarking with international best practices, we have curated a series of suggestions to strengthen Thailand's Digital Talent development efforts.
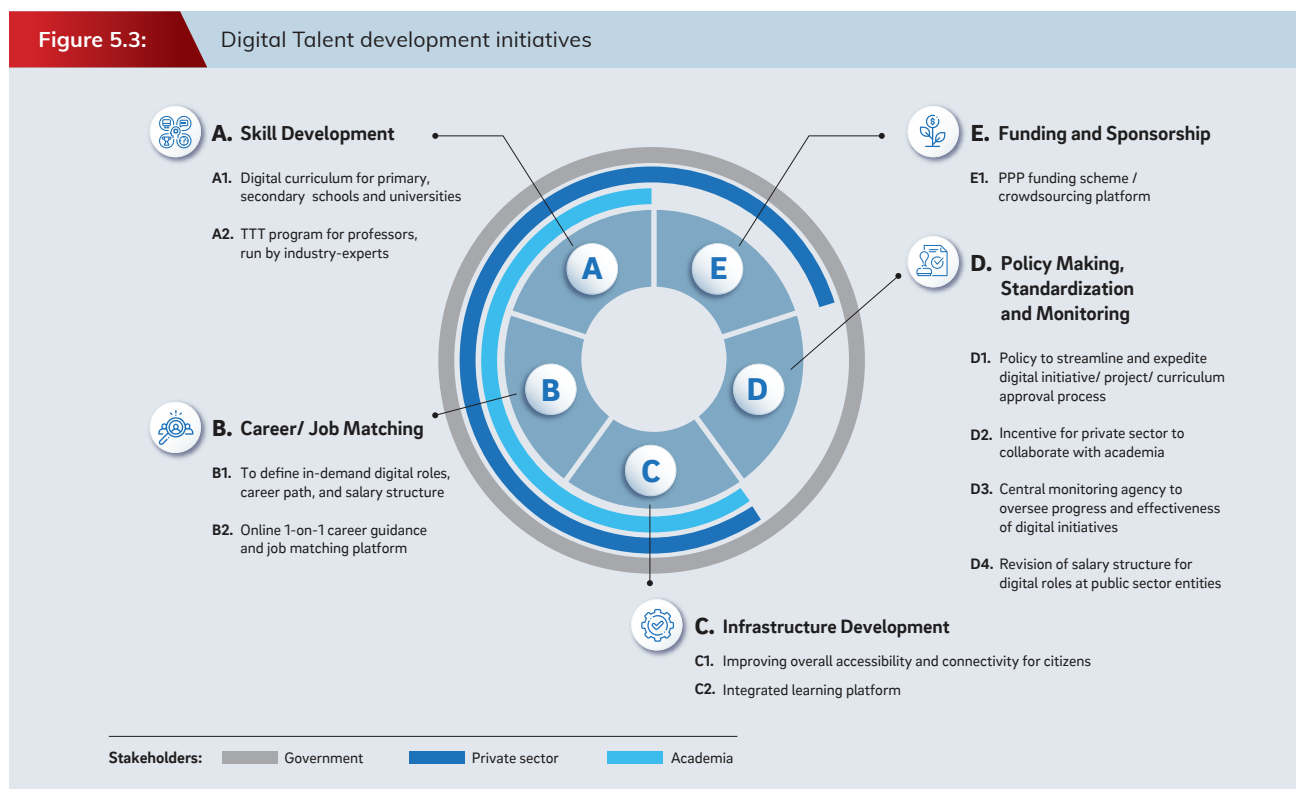
Chapter 5.1.2: Recommended Initiatives for Bridging Digital Talent Gap in Thailand

A holistic set of initiatives need to be co-developed with the government playing key role in setting a clear and actionable plan

Thailand has been investing in the development of its Digital Talent to a certain extent, as laid out in Chapter 3. However, these initiatives have been launched by different entities with no central governing body, resulting in a lack of transparency and overlaps. Together with the lack of a structured mechanism to measure the effectiveness of each initiative, this resulted in slow progress on Digital Talent development.

In order to bridge the gap in talent supply, the government is best positioned to take the lead role to track and measure result of all initiatives. Through collaboration with the private sector and academia, a holistic set of initiatives can be derived based on the groupings in Figure 5.3.

Figure 5.3: Digital Talent development initiatives

A. Skill Development

A1. Digital curriculum for primary, secondary schools and universities

A2. TTT program for professors, run by industry-experts

B. Career/ Job Matching

B1. To define in-demand digital roles, career path, and salary structure

B2. Online 1-on-1 career guidance and job matching platform

E. Funding and Sponsorship

E1. PPP funding scheme / crowdsourcing platform

D. Policy Making, Standardization and Monitoring

D1. Policy to streamline and expedite digital initiative/ project/ curriculum approval process

D2. Incentive for private sector to collaborate with academia

D3. Central monitoring agency to oversee progress and effectiveness of digital initiatives

D4. Revision of salary structure for digital roles at public sector entities

C. Infrastructure Development

C1. Improving overall accessibility and connectivity for citizens

C2. Integrated learning platform

Stakeholders: Government | Private sector | Academia

Source: Industry expert interviews

A1. Digital curriculum for primary and secondary schools, and universities

A2. TTT program for professors, run by industry-experts

A1. Digital curriculum for primary, secondary schools and universities

As Thailand immerses itself further into the digital transformation journey, it is inevitable that the academic sector will need to be transformed as well. The concept of "learning by doing" in youth has become more popular than ever, and digital skills learning is no exception. Schools' curriculum starting from primary all the way to universities need to be revisited to ensure that they integrate the relevant digital/ ICT aspects.

Based on interviews with Thai universities and professors from the engineering, ICT and science departments, 66% of respondents said that incoming high school students are expected to have strong quantitative, logical thinking and most importantly, digital literacy and basic programming skills. However, there is very small number of students who enter university with the required skills and majority of those who do, are self-taught.

As digitalization takes over and changes the foundation of the labor market, digital skills become more important for every discipline of work. It is important for primary and secondary schools to incorporate foundational digital courses in their curriculum, to begin early in their digital competence journey (Figure 5.4).

The learning environment and consistency of digital courses for primary and secondary school students is another key factor in facilitating good learning experience for youth across the country. The ease of access to quality education differs among young Thai learners, whether its public schools, private schools or those who have lesser access to education. Given the potential barriers like geography and financial means, digital tools such as tablets and internet can be provided for hybrid learning. This solution would not only serve as a single learning platform for all schools in Thailand but also give students who live in remote part of the country, access to quality education.

Figure 5.4:   Illustrative of digital courses

Education level

Primary   Secondary

Algorithmic logic	Visual Basic and macro programming
Mind-mapping	Basic database management
Functional drawing/ design	Human computer interaction
Basic security concepts	Cybersecurity

- As the cost of learning facility, textbooks, and teacher-associated costs are reduced by going online, so will the tuition fees.
- Cost could be further reduced by using AI to build automated teaching and gamification features.
- Through smart application-based learning, students will be able to conveniently perform practical tasks and interact with each other in a new-normal format.
- At university level, curricula need to align with the latest technological trends and should prepare students in terms of practical capabilities required by the companies.
- Co-development and iterative amendments of curricula between academia and private sector is inevitable to ensure that there is minimal or no skill gap.

This initiative can be driven by the government, private sector and academia in terms of funding and curriculum planning, and further supported by the private sector for application design and development. The case example from Malaysia illustrates this collaboration.
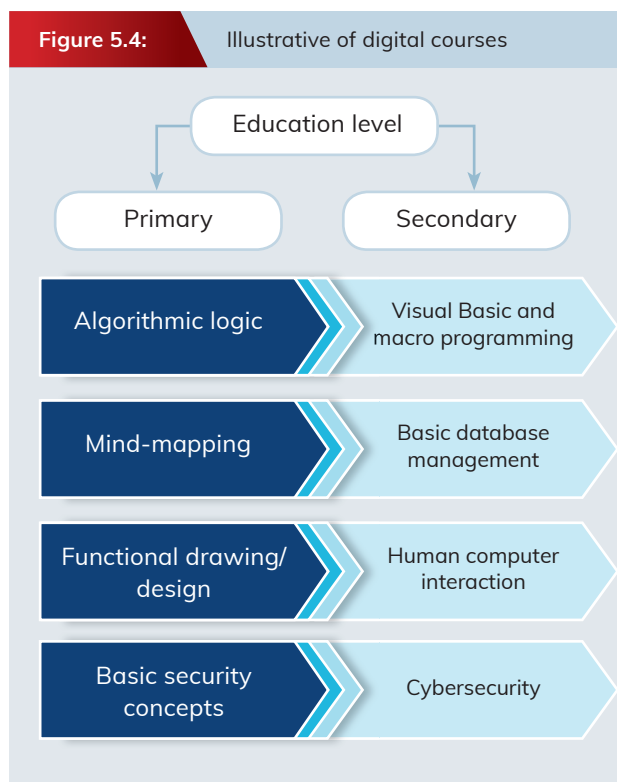
- Digital Educational Learning Initiative Malaysia (DELIMa) is an online learning platform for teachers, educators and students aimed at democratizing education for all by supporting digital, distance, and hybrid learning
- Developed in collaboration with Microsoft, Google and Apple
- Applications and tools which includes Microsoft Office 365, Google Classroom, and Apple Teacher Learning Center
- Averages 1.7 million users per month, making it one of the largest national deployments of online schooling worldwide

Source: Government of Malaysia

A2. Train-the-Trainer (TTT) program for university professors, run by industry- experts

In interviews with academic stakeholders, more than 50% highlighted the ability to keep up with today's rate of technological changes as the core challenge for professors. Together with the lack of time spent on self-learning, this leads to the professors currently not being able to deliver the most up to date information or practical knowhow to their students resulting in a skill gap of students.

The solution for this challenge could be
1. Ensure professors receive frequent and up-to-date training
2. Prioritize and align Talent Development with faculty's performance criteria

Firstly, a cross-sector collaboration model needs to be developed between academia and the private sector (Figure 5.5). As illustrated, the goal of this model is to upskill university professors into subject matter experts through multi-channel learning. Through the convenience of online/ virtual training channel, professors will be able to take courses relevant to them at their own pace, similar to the case study from Australia below. Companies, especially leading technology firms will play a pivotal role in upskilling professors through providing industry-centric learning content, practical guidance and most importantly, skill assessment, to encourage professors who opt for Train-the-Trainer (TTT). They can become certified trainers and be able to train their peers, which inadvertently will create a cascading sustainable knowledge loop within the universities.

The initiative is suggested to be led by the government agency, MHESI, as the governing body, for ensuring that the agenda for private sector and academia are aligned and incentives are attractive enough. As Thailand works towards its goal of becoming a leading digital hub, Thai professors who teach digital/ICT courses must re-prioritize their focus on Digital Talent development. One way of this is through government-suggested Key Performance Indicators (KPI).

Figure 5.5: Illustrative of faculty training model
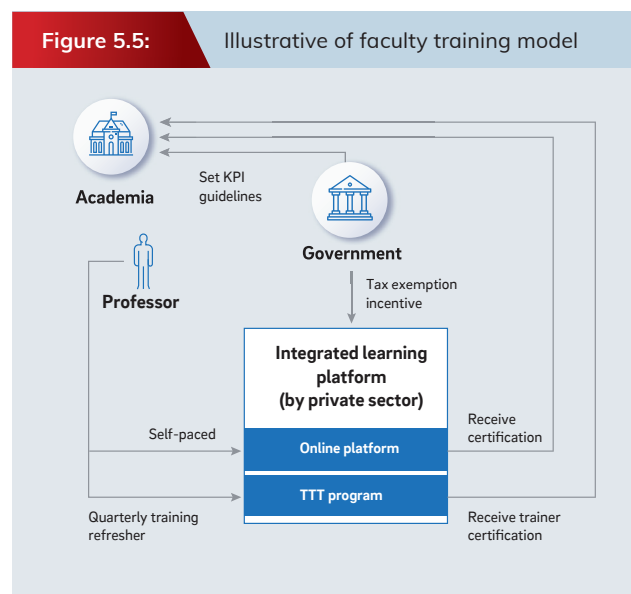
• HCIA/HCSA Certification (industry example)

Written test

- Location: **Pearson VUE test centers**
- Obtain an **e-Cert after passing the HCIA/HCSA written test**
- Certificate validity: **3 years**

• HCIP/HCSP Certification (industry example)

Written test

- Location: **Pearson VUE test centers**
- Obtain an **e-Cert after passing the HCIP/HCSP written test**
- Certificate validity: **3 years**

• HCIE Certification (industry example)

Written test .... **Lab test** .... **Obtain certificate**

- Location: **Pearson VUE test centers**
- Pass the **HCIE written test**
- Certificate validity: **18 months**

- Location: **Huawei HCIE test centers**
- **Pass the HCIE lab test**

Case study: TTT example

TTT

- **01** Selection interview
- **02** Solution design — Customized training plan
- **03** Technical learning — Theory, laboratory practice
- **04** Local internship — Growth in the project
- **05** Trail lecture — 80% of certification courses
- **06** Assisted teaching — Teaching project internship
- **07** Certification — Strict rejoinder
- **08** Remote answering — Long-term concern

Implementation Roadmap and Action Plan – Stakeholder Perspective

Category	Project Description	Key Results	Targeted People	Stakeholders
Digital curriculum Development	Develop or develop digital courses for students and social groups. Including Online MOOC, Practice Only Course, and Practice Based Course, where the duration of Practice Based Course accounts for at least 30%.	Number of courses developed; Course Duration		
TTT program	Cultivate trainers based on digital courses to meet talent cultivation requirements.	Number of trainers		
Talent Development Program - Student	Provide digital enablement for the industry based on the development requirements of the digital industry. In-cludes soft skills, fundamental skills (L1), basic skills (L2)	Training person-times; Delivery Class Days		
Talent Development Program – Employee	Provide digital enablement for the industry based on the development requirements of the digital industry. Includes soft skills, fundamental skills (L1), basic to advance skills (L2-L4)	Training person-times; Delivery Class Days		
Funding Scheme /Crowdsourcing platform	Create a digital talent development fund and fund use platform, and cooperate with stakeholders (consulting procurement, course development procurement, course delivery procurement, teaching facility procurement, etc.) to support the development of the digital talent develop-ment project in Thailand.	Training person-times; Delivery Class Days		

Government   Government association   Industry   University   School lecturer   Workforce   Students

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Case study: Australia's Digital Skill Learning Platform "Arc"
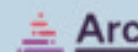
- The Arc digital hub is a digital learning platform developed by the Ministry of Education in collaboration with over 90 partners, including Google, Microsoft, ClickView, and Adobe
- Digital tools and learning resources for students and teachers in the state of Victoria
- Provide teachers and educators with resources to build their expertise using digital tools and platforms for virtual learning
- Events and conferences for teachers to improve their skills and share their experiences

Source: Victoria State Department for Education and Training

> **B1. To define in-demand digital roles, career path, and industry salary structures**
>
> **B2. Online 1-on-1 career guidance and job matching platform**
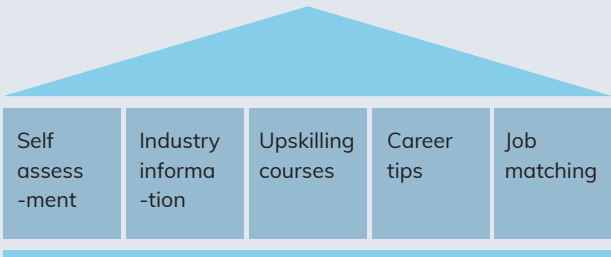
B1. To define in-demand digital roles, career path, and industry salary structures

One key challenge that the stakeholders interviewed have identified for hiring Digital Talent and increasing the Digital Talent pool, is the lack of awareness amongst the workforce about roles and careers in the digital economy.

By providing a centralized databank or portal that collects job roles and corresponding career paths and makes them easily accessible for the general population, citizens will have a better overview of the opportunities. It would further increase the transparency of the Digital Talent landscape and increase inflow of Digital Talent.

Case study: Singapore's MySkillsFuture portal

Self assess-ment	Industry informa-tion	Upskilling courses	Career tips	Job matching

- MySkillsFuture portal is a one-stop solution for all career, upskilling, and personal development needs of its citizens
- Offers a combination of self assessment tools, industry resources, upskilling opportunities, and job matching services
- The centralized platform creates an equitable economy while also making Singapore's talent more competitive

Source: MySkillsFuture

B2. Online 1-on-1 career guidance and job matching platform

A further approach to improve the transparency of the Digital Talent landscape is to provide an online 1-on-1 career guidance and job matching platform. By centralizing access to upskilling measures combined with career and learning journey planning tools, such a platform is able to create an easy to navigate resource that makes access to the labor market more equitable, while simultaneously providing companies a better overview over the available talent in the market. One example for such a platform is MySkillsFuture, launched by the government of Singapore in 2017. This platform centralizes self assessment, upskilling courses, career planning and recruiting resources in one place, making the talent market significantly more transparent for both, job seekers and employers.

C   Infrastructure Development

C1. Improving overall accessibility and connectivity for citizens
C2. Integrated learning platform

C1. Improving overall accessibility and connectivity for citizens

Aside from the issue of digital literacy, a key issue singled out by several stakeholders in the interviews, was access to the internet itself. The fact that Thailand is ranked 46th out of 79 nations on the Global Connectivity Index in 2020 also reiterates the issue of limited connectivity.

Complicating matters, is the lack of computer equipment especially among people from weaker socioeconomic backgrounds. While bringing a continuous supply of computers, laptops, and tablets in education, the government also needs to take more resourceful steps.

By introducing a program that collects, refurbishes and redistributes used computer and network equipment, the Thai government would be able to have a wider inventory to be released to the masses.
1. Help close the technological equipment gap and give more people access to digital resources
2. Reduces electric waste and exemplifies recycling

Case study: Computer & Communications Equipment Recycling Program (CCRP)

- The CCRP, launched in Hong Kong, collects used computers and computer accessories for refurbishment and recycling
- The recovered and recycled products are made available to families in need
- Over 1,700 housing estates and commercial and industrial buildings signed up to the program through a free collection service
- In the pilot program alone, CCRP had recovered and processed nearly 150,000 waste computers and computer accessories

Source: Hong Kong Environmental Protection Department

C2. Integrated learning platform

Formal education like university has been the backbone of Thai education system for many decades. There have been changes brought by digital disruption and the pandemic, during which the number of online learning platforms have been significantly rising. These online learning programs come from a wide range of providers like academia, private sector and government entities. Despite the enhancements in digital learning paradigms, students and professionals are still reverting to offline learning models while the pandemic situation improves, as it provides effective human interaction.

While traditional education remains relevant for Thai society, alternative learning pathways are required to advance into the digital era at higher speed and at a larger scale. As highlighted in the previous chapters, Thai universities currently have limited capacity for ICT/digital degrees resulting in an underserved labor market. Vocational schools, despite its extensive network throughout the country, simply do not offer the education quality required by many companies.

The solution to overcome these challenges lies in having a hybrid learning platform that combines online and offline. Figure 5.6 illustrates the components of a practical platform that aims to capture wider range of audience than traditional universities, providing more advanced curriculum than vocational schools and enhancing the convenience of online learning platform with on-the-job training opportunities.

The integrated learning platform initiative requires expertise from the industry to co-develop courses along with academia. Through an extensive network of universities, vocational schools, and private companies, this platform will consist of cutting-edge content, advanced methods of teaching, expert teaching personnel and access to practical learning hubs nationwide, anywhere and any time.

Concurrently, the government's involvement in this initiative would be to promote and enlist the learning platform as one of the preferred education channels for citizens as credibility and recognition are the key success factors in attracting audience. The learning platform could also be made available through subsidies, sponsorships, and easy loans. With this platform, both urban and rural population will receive equal opportunities for education. Examples of different learning paths in high demand domains such as AI/ Big data and 5G are illustrated in Appendix B and C.

Figure 5.6: Illustrative of an integrated learning platform
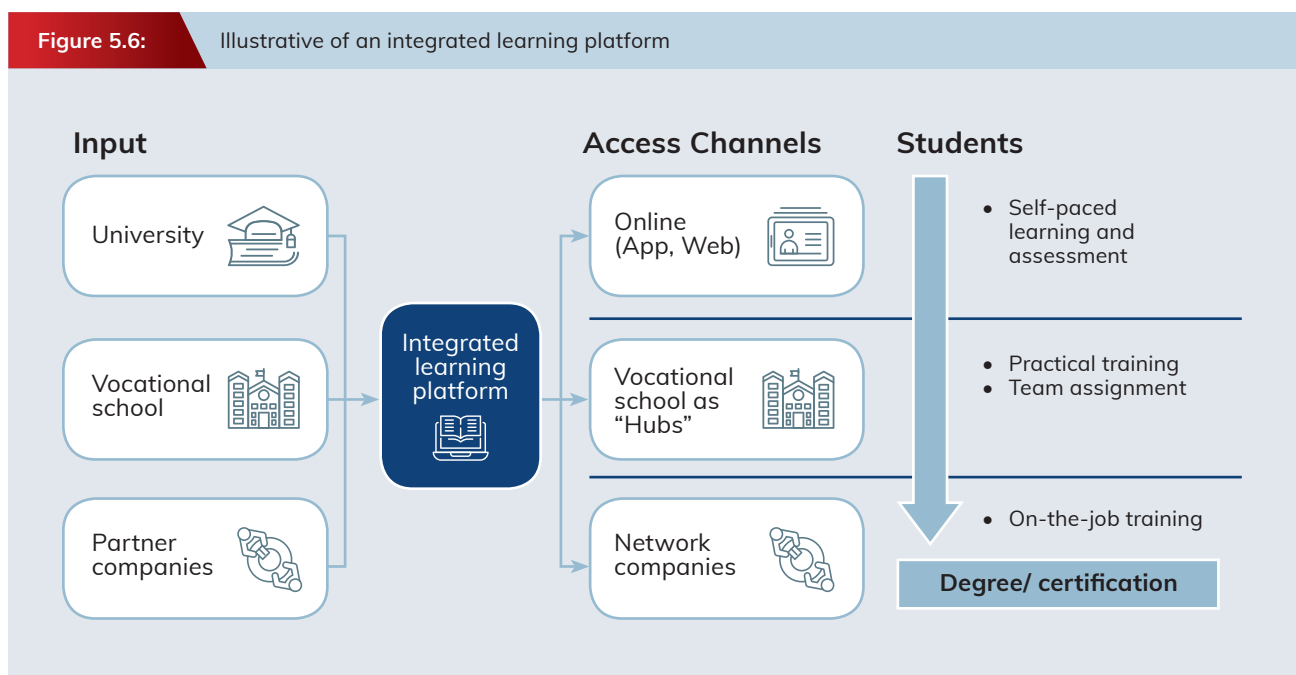
Case study: Korea's SMART Education Initiative (SEI)

Office of education

LMS class management system	Wireless infrastructure	Remote video education system

Government

Teacher device · Wireless access points · Student's device · Solution of remote video

Solution for class ⟷ Display

- Existing component
- Additional component
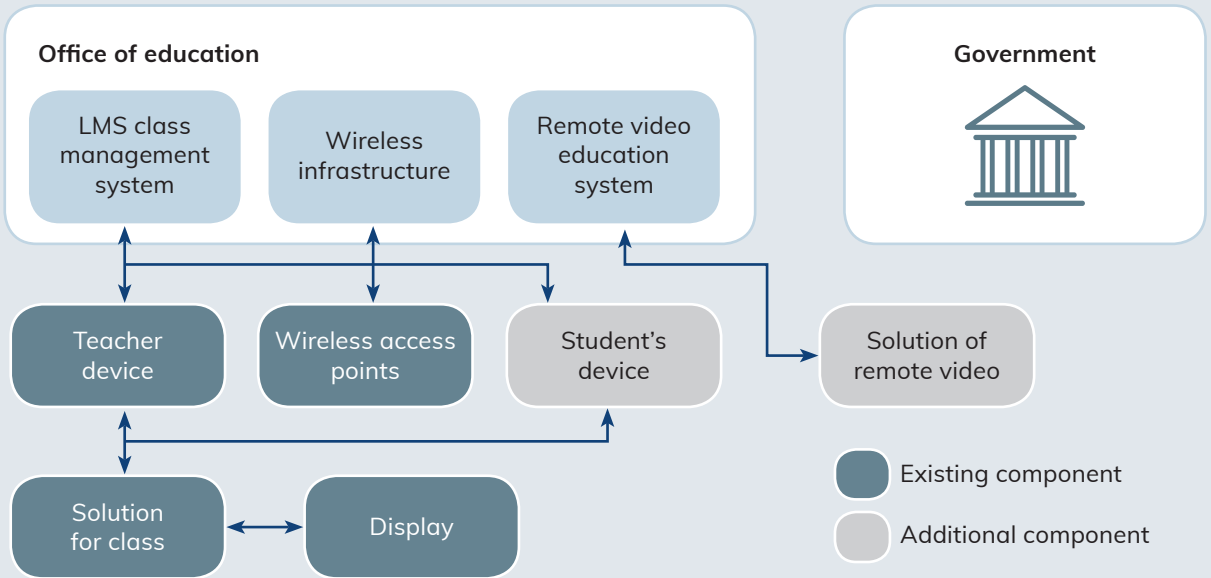
- The SMART Education Initiative, launched in 2011, aims at improving the ICT competitiveness of South Korea's economy and talent
- Self-paced and problem-solving oriented education
- Variety of public and private learning resources, delivered in a digital manner, making the learning omni-channel

Source: UNESCO

Case study: Cross-sector collaboration example
An Eco-Circulation Scheme of Multi-Party Cooperation and Win-win

Capability improvement & Incentive → Subcontractor

Training of personnel Accreditation

Training strategic cooperation

Co-sponsored

Transfer talent Screening Interns

Government agencies · Agency

Graduate student → Training → CENTEX Training Center → Job application → CENTEX Talent Selection Meeting → Employment → Enterprise /Organization

Promote Employment

Improve training capabilities
Enrich required courses

Improve training capabilities
Improve Brand influence

- **Graduated students:** After training, they can find employment smoothly and their willingness to train is improved.
- **CENTEX:** The strength and brand of the training are enhanced to attract more trainees.

- **Subcontractors:** Improve subcontracting capabilities, expand talent acquisition, and better serve the company.
- **Company:** Sustainable Cooperation with CenterExs, Helping Customers Achieve Success

The multi-party cooperation model helps the development of local ICT digital talent in Salawak and effectively facilitates the rapid economic development of the state.

D   Policy making, standardization and monitoring

D1. Policy to streamline and expedite digital initiative/ project/ curriculum approval process

D2. Incentive schemes (e.g., tax exemption) for private sector to collaborate with academia

D3. Central monitoring agency to oversee progress and effectiveness of digital initiatives

D4. Revision of salary structure for digital roles at public sector entities

D1. Policy to streamline and expedite digital initiative/ project/ curriculum approval process

The need for stronger and contemporary digital curricula in education institutions was echoed by multiple stakeholders from the public and private sector. However, a major obstacle for this, are the long approval processes of new educational programs and any government-related initiatives, which usually takes between 6 months to 1.5 year.

By introducing policies that create a fast-track approval process for Digital Talent development initiatives, the Thai government would encourage innovation in academia and enable it to develop targeted, in-demand, and future-ready programs in line with industry needs.

Case study: UK government's Policy lab

- A testing ground for government innovation
- Uses human-centered design, data, and digital tools to explore transformative solutions to some of the country's most complex problems, from homelessness and policing to health and childcare
- Introduce prototyping mindset to policy making, to explore the potential effects of different policies before a scaling the implementation
- These policies have been proven to reduce the time taken to implement new initiatives

Source: UK government

D2. Incentive schemes (e.g., tax exemption) for private sector to collaborate with academia

As in many other geographies, funding remains a central constraint for the education sector, keeping it from expanding sufficiently. By strengthening the existing incentive schemes to further motivate the private sector to engage with academia, in terms of experience, expertise sharing, and funding, the Thai government can encourage closing the gap between skill demand and supply. It would additionally reduce costs for the government, freeing up capital for other critical projects.

Case study: Partnership model between industry players and local institutes

- The National Research Foundation (NRF) provides funding to universities who provide researchers and facilities, to engage in R&D with the private companies
- Private industry players provide funding and expertise to develop designated research in collaboration with universities
- Industry player will own its respective Intellectual Property (IP) rights pertaining to the research results in return for 1% royalties on net sales that exceed THB 222 million

Source: National Research Foundation

D3. Central monitoring agency to oversee progress and effectiveness of digital initiatives

As confirmed in our interviews, a challenge that any entity faces when starting new initiatives is the prioritization of projects. In the case of Thailand's digital transformation ambitions, a key challenge also is the inconsistency in measuring and evaluating the success and impact of initiatives.

In order to alleviate this issue, this paper propose the creation of a standardized central monitoring agency that oversees and evaluates all Digital Talent development initiatives launched by government entities. By centralizing the monitoring of all digital workforce transformation projects in a dedicated entity, the government would be able to create a better set of tools to evaluate and prioritize initiatives which would improve the effectiveness of its efforts and increase the societal ROI of its investments. The central monitoring agency's scope must cover the entire Digital Talent value chain from primary education up to workforce participation in order to ensure continuity and coherence of the initiatives.

Case study: Singapore's Future Economy Council (FEC)

- The FEC oversees the implementation of the recommendations put forth by the Committee on the Future Economy, convened in 2016
- Comprised of leaders from the private, public and academia sector
- Together with the Emerging Stronger Taskforce, it oversees initiatives that aim to drive the growth and transformation of Singapore's future economy

Source: Future Economy Council

D4. Revision of salary structure for digital roles at public sector entities

In order to be able to collaborate efficiently with the private sector, it is important for the Thai government to keep up with digital developments of its own internal processes. However, in order to build a future-oriented and digital government infrastructure, the government itself needs to hire Digital Talent with desired skills to develop and maintain ICT platforms and services such as data platforms and E-Government services. By strengthening their own digital capabilities, government entities will simultaneously inspire Thailand's digital ecosystem as well.

In order to do so, the Thai government needs to review and redesign salary structures for ministry and public sector employees, especially in digital roles. By offering packages, including compensation and benefits such as remote work, that are in sum somewhat competitive with the private sector, the government would be able to recruit talent that can support its digital transformation ambitions.

Case study: UK's digital leader salary overhaul

- The Senior Salaries Review Body (SSRB) of the UK government is developing a payment plan for digital leaders to compete better with industry
- The salary overhaul will be rolled out to 7 specialist roles in the digital, data, and technology sector (DDaT)
- It aims to attract senior professionals to specialist roles in the UK government

Source: SSRB

E1. PPP funding scheme / crowdsourcing platform

Another key challenge commonly raised among the stakeholders is the limited budget allocated for Digital Talent development. The limitation of budget continues to hamper the following areas:

1. Workforce upskilling/ reskilling
2. Recruitment of talent with required digital skill
3. Recruitment of experienced professors
4. Supply of digital equipment for the underprivileged and inaccessible groups

Given the challenges, a PPP funding scheme can be leveraged to pool funds from different sources such as private sector, public sector, and FDI. Figure 5.7 illustrates a central governing body who manages and distributes the funds on the behalf of the stakeholders.

Case study: Korea Fund of Funds (KFoF)

Korea Venture Investment Corp. (KVIC) has established the Fund of Funds (KFoF) in 2005 as the intermediary fund for the government to invest in SMEs and startups jointly with the private sector
- Invested in job creation and startup-focused funds
- Currently runs, among others, 2 job creation funds (total size of KRW 419.9 bn) and a startup-focused Foreign VC Investment fund with a total size of KRW 3.67 tn, 75% of which are foreign capital
- Approximately 380 Korean startups have received a total of KRW 801.6 bn in funding

Source: Korea Venture Investment Corp

Figure 5.7: Illustrative of PPP funding scheme model

1 Local investors

- Private sector
- Government

2 FDI

Commit funds into TDTDF

Thailand Digital Talent Development Funds (TDTDF)

Manage funds

TDTDF Management Committee

Provide management guidelines

- Submit management plans
- Report operating performance

MDES — Ministry of Digital Economy and Society

- Funding
- Subsidies
- Provision of equipment

- Companies/SMEs/ Startups
- Academia
- Citizens

Chapter 5.2 Implementation Roadmap and Action Plan

Initiatives should be prioritized based on urgency and impact, and should run in a coherent manner

Programs and initiatives	Year 1 (1-12 months)	Year 2 (13-24 months)

A. Skill Development

A1. Digital curriculum for primary, secondary schools and universities
- Curriculum design and approval → Curriculum will be continuously reviewed, updated, and approved
- App development and pilot testing
- App roll-out

A2. TTT program for professors, run by industry-experts
- Curriculum design and approval → Curriculum will be continuously reviewed, updated, and approved
- Platform development
- TTT training for professors → Training will be conducted continuously

B. Career/ Job Matching

B1. To define in-demand digital roles, career path, and industry salary structures
- Develop knowledge portal on top of the platform in A2 → Portal will be continuously updated with the latest data and insights

B2. Online 1-on-1 career guidance and job matching platform
- Develop job-matching feature on the platform in A2
- Recruit industry & academia professionals to join the platform
- Pilot job matching and career guidance services

C. Infrastructure Development

C1. Improving overall accessibility and connectivity for citizens
- Assess current equipment and internet access gap by school level, district level
- Engage private sector for donation and distribution of equipment → Yearly gap assessment and procurement of equipment

C2. Integrated learning platform
- Co-develop content for courses including practical assignment and on-the-job training program
- Pilot program – first batch of students
- Promote education platform → Open platform to all students

D. Policy making, Standardization, and Monitoring

D1. Policy to facilitate and expedite digital initiative/ project/ curriculum approval process
- Review policy and internal process
- Benchmark with international peers
- Redraft policy → Policy will be continuously reviewed, updated, approved and institutionalized

D2. Incentive for private sector to collaborate with academia
- Design incentive structure
- Raise funds for the incentive
- Initiate incentive to stake-holders

D3. Central monitoring agency to oversee progress and effectiveness of digital initiatives
- Define key measurement metrics
- Define governance structure
- Kick-off initiative tracking → Monthly initiative monitoring and tracking process

D4. Revision of salary structure for digital roles at public sector entities
- Revise salary structure
- Roll-out salary changes across the ministries and entities

E. Funding & Sponsorship

E1. PPP funding scheme / crowdsourcing platform
- Define funding mechanisms and identify initial list of sources
- Reach out to the shortlisted sponsors
- Kick-start funding scheme

Governance structure and operational committee development

Appendix

Appendix A: Talent Visa Global Benchmark

Country	Thailand	Singapore	Japan	China	Australia	Great Britain
Responsible Agency	Ministry of Labour	Ministry of Manpower	Immigration Bureau of Japan	State Administration of Foreign Experts Affairs	Department of Home affairs	Government of United Kingdom
Visa name	Digital Nomad Visa	Overseas Networks & Expertise Pass (ONE PASS)	Highly skilled foreign professional visa	High End Talent Visa	Global Talent Visa Program	High Potential Individual Visa (HPI)
Issuance year	2022	Jan 2023	2012	2018	2019	May 2022
Target group	Digital Talent / remote workers looking to claim temporary residence in Thailand	Top talent in business, arts and culture, sports, science and technology, and academia and research	Advanced academic, specialized or technical, and business management background	Technology leaders, entrepreneurs and scientists	Highly skilled talent in ten future-focused industries	Recent graduates of top global universities
Validity	10 years	5 years	5 years	5-10 years	Unlimited	2 years
Salary criterion	• Earn USD 80 k (THB 2.95 mn) annually in the last two years	• Fixed monthly salary of 30 k SGD (THB 786 k) within the last 1 year • Will earn a fixed month salary of 30 k SGD in Singapore	• Minimum annual salary of JPY 3 mn (THB 761 k)	• n.a.	• At or above the Fair Work high income threshold of AUD 162 k (THB 3.9 mn)	• n.a.
Other criterion	• Health insurance coverage of at least USD 50 k (THB 1.8 mn) in Thailand • Work for at least three years at a publicly traded company or a company that generates at least USD 150 mn in annual revenue	• Outstanding achievements in the arts and culture, sports, science and technology, and academia or research	• At least 70 points on the Point Evaluation Mechanism, comprising of background, academic background, professional career, annual salary, and age	• Outstanding achievements e.g., Nobel Prize winners, scholars from Academy of Science or Academy of Engineering in foreign countries	• Internationally recognized with evidence of outstanding achievements • An exceptional track record of professional achievement	• Awarded a qualification by an eligible university • At least GBP 1.27 k (THB 53 k) in bank account • English language to at least CEFR[1] Level B1 (equivalent to IELTS 4.0)

[1] Common European Framework of Reference

Appendix B: AI/Big Data Expert Learning Path illustration

Service Process	Platform Architecture	Data Management	Data Analysis and Mining	Data Application

Learning Path

Big Data and AI application Personnel

All	Information	Network

Technical Expert

		Big Data Analysis and Mining **Ultra-Practice** (Wireless) (4 days)	Big Data Analysis and Mining **Ultra-Practice** (Core Network) (5 days)	Telecom Scenario
Big Data Developer (8 days)	AI-EI Developer (9 days)	Artificial Intelligence Algorithm **Professional Practice** (8 days)		

Intermediate

Big Data Processing and Mining **Practice Based Training** (3 days)

Python Programming Foundation Training (2 day)

Big Data Application Best Practice Sharing (3 Days)

Artificial Intelligence Overview (1 Day)

Basic

Big Data Training (5 days)	AI Training (5 days)

All Personnel

Everyone Learns IT - Artificial Intelligence Technology (MOOC)
Everyone Learns IT - Big Data Technology (MOOC)

Appendix C: 5G Network Expert Learning Path Illustration

Public class

5G technology exploration	5G network evolution	5G business exploration	5G intelligent O&M

Network → **Application** → **Scenario** → Certification

5G Prospect and Technology Preparation	5G Network Technology Tracking	5G network planning	5G Network Deployment and Maintenance	5G network optimization /orchestration	Application provisioning and optimization	5G B2B Networking Design

Capability improvement based on O&M scenarios

Every-one Learns

Trend sharing
- 5G Industry Development and Evolution
- 5G industry applications
- 5G Intelligent O&M Overview

Technology Foresight
- 5G E2E Network Evolution and Key Technologies
- 5G Network Architecture and Network Slicing Technology
- 5G terminal technology training
- 5G mmWave Technology and Applications

	Wireless network	Care network	Bearer network	Telecom cloud

Wireless network
- 5G Wireless Air Interface and Protocol Process Training
- 5G Wireless Network Design
- 5G Wireless Network Advanced Maintenance
- 5G Wireless Network Optimization
- 5G Radio Network Planning
- 5G Wireless Network Basic Maintenance
- 5G wireless network optimization

Care network
- 5G core network principles and key technologies
- 5G Core Network Planning and Design
- 5G Core Network Advanced O&M
- 5G Network Slice Orchestration and Maintenance
- Basic 5G Core Network Maintenance
- 5G MEC Design, Deployment, and Maintenance

Bearer network
- 5G bearer network principles and key technologies
- 5G bearer network planning and design (medium backhaul/ fronthaul)
- 5G Bearer Network Upgrade and Reconstruction Training Camp
- 5G Bearer Network Deployment and Maintenance Practice Camp

Telecom cloud
- NFV network evolution and key technologies
- SDN Key Technologies and Applications
- NFVI Planning and Deployment
- SDN Design and Orchestration
- NFVI Advanced Maintenance
- Telecom Cloud Bearer Advanced Maintenance
- Basic NFVI Maintenance
- Telecom Cloud Bearer Maintenance Basic Training

E2E 5G services activating Special training camp for experts (Cloud VR) (Video upload) (Vo5G) (peak speed test)

5G 2B Scenario Networking Design Expert Training Camp

- 5G wireless Network optimization
- 5G wireless network
- 5G core network
- 5G bearer network

Basic knowledge supplement

Everyone learn 5G –Basic knowledge (MOOC)	Everyone Learns 5G -Advanced Technology (MOOC)	Everyone Learns NFV - Basic knowledge (MOOC)	Everyone Learns SDN – Basic Knowledge (MOOC)

Appendix D: Career Path of Top Emerging Digital Roles (1/2)

Position and responsibilities: AI/ ML engineer

		Monthly salary ['000 THB]	Skills path
ML engineer (2-5 years of experience)	• Research, design and develop scalable ML models • Apply algorithms and ML tools to perform statistical analysis • Run AI systems experiments and tests	35-55	• Applied mathematics • Data science and programming • ML/ AI, cloud technologies
Deep learning engineer (2-5 years of experience)	• Define, collect, clean, and augment data requirements • Train deep learning models and define evaluation metrics • Set up cloud environment, deploy deep learning model, and maintain response time	40-60	• Applied mathematics • Data science and programming • ML/ AI/DL, cloud technologies
Senior ML engineer (>5-6 years of experience)	• Participate in technical design • Assume the role of subject matter expert in the ML domain • Drive roadmap creation and execution for ML development	80-150	• Domain knowledge • Project management

Position and responsibilities: Software developer

		Monthly salary ['000 THB]	Skills path
Junior software developer (0-4 years of experience)	• Writing and maintaining basic code • Fix minor bugs and assist development manager in all design-related tasks	28-35	• Programming language • Mathematics and problem solving
Deep learning engineer (5-9 years of experience)	• Implement AI-related products in the area of Natural Language Processing • Identify new opportunities for ML process automation • Write automated unit, integration and functional tests for the features	60-90	• Vast knowledge of multiple programming language • AI, ML
Lead developer (>10 years of experience)	• Direct development team to design, develop, code, test, and debug applications • Led code reviews and ensure codes are scalable and efficient • Work closely with senior stakeholders to understand business requirements	100-120	• Deep understanding of software and business field • Project management
Software development manager (>8 years of experience)	• Initiate work plan to design new software/ applications • Monitor design process and provide guidance to the team • Responsible for submitting of proposals/ work progress to client or upper management	120-150	• Competent of the organization's core technologies • Project management

Source: World Economic Forum, Expert interviews, Desktop research, Roland Berger

Appendix D: Career Path of Top Emerging Digital Roles (2/2)

Position and responsibilities: Cloud developer

Monthly salary ['000 THB]		Skills path

Cloud developer
(0-3 years of experience)
- Develop cloud computing solutions
- Design, create, and maintain applications that are used by end-users
- Manage cloud infrastructure e.g. networks, storage, computer services

35-50

- Cloud computing
- Programming language
- API and webservice infra. integration

Cloud engineer
(3-5 years of experience)
- Design virtual networks/ infrastructure resources and development of automation scripts
- Deployment and configuration of hardware appliance
- Design disaster recovery plans

70-90

- Programming and scripting
- API and webservice infra. integration
- DevOps and containerization

Cloud solution architect
(>6 years of experience)
- Design architectural blueprints for development team
- Collaborate with stakeholders to determine software requirements
- Create high level product specifications
- Troubleshoots and resolves issues with coding or design

80-150

- Networking
- Data storage and security fundamentals
- DevOps and containerization Programming

Position and responsibilities: Cybersecurity analyst

Monthly salary ['000 THB]		Skills path

Cyber security analyst
(0-5 years of experience)
- Monitor computer systems and detects anomalies
- Escalate and resolve anomalies

20-30

- Scripting and programming
- Cybersecurity framework

Cyber security architect
(5-10 years of experience)
- Design key infrastructure and robust security structure
- Conduct penetration tests and identify vulnerabilities of the systems

40-70

- Network security architect Auditing and cloud risk assessment methodology

Cyber security engineer
(5-10 years of experience)
- Instruct and implement new set of security protocols
- Recommend modifications required for the technical areas and automating security improvements

70-80

- Firewall intervention protocols
- Security and encryption technologies

Director of IT security
(>12 years of experience)
- Create security roadmaps for the company
- Manages security team

180-250

- Knowledge of IT Security related hardware, software and vendor solutions
- Scripting and source code programming languages Leadership skill

Source: World Economic Forum, Expert interviews, Desktop research, Roland Berger
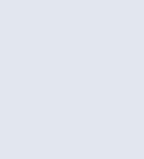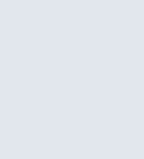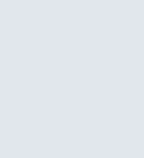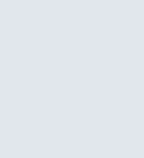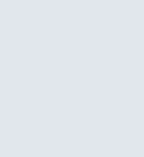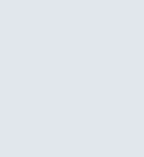
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