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WORLD BANK GROUP

THAILAND
DIGITAL DATA INFRASTRUCTURE ROADMAP REPORT

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- Department of Local Administration
- Department of Social Development and Welfare
- Digital Economy Promotion Agency
- Digital Government Agency
- Electronic Transactions Development Agency
- Fiscal Policy Office
- National Economic and Social Development Council
- National Electronics and Computer Technology Center
- National Institute of Development Administration
- National Statistical Office
- Office of Small and Medium Enterprises Promotion

- Office of the Official Information Commission
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Abbreviations

AI	Artificial Intelligence
APPI	Act on the Protection of Personal Information
ASEAN	Association of Southeast Asian Nations
ATI	Access to Information
AWS	Amazon Web Services
BB	Budget Bureau
BCRs	Binding Corporate Rules
BOT	Bank of Thailand
BPO-ITES	Business Process Outsourcing and IT-Enabled Services
CCA	Computer Crime Act
CDC	Comptroller General's Department
CII	Critical Information Infrastructure
CMP	Cloud Management Platform
CRC	Cybersecurity Regulating Committee
CRM	Customer Relationship Management
CSA	Cybersecurity Act
CSC	Cloud Service Customer
CSF	Cybersecurity Framework
CSP	Cloud Service Provider
DBD	Department of Business Development
DDD	Data-driven Decision-making
DDIR	Digital Data Infrastructure Roadmap
DEPA	Digital Economy Partnership Agreement
DES	Digital Economy and Society
DGA	Digital Government Development Agency
DGDC	Digital Government Development Commission
DGDP	Digital Government Development Plan
DIAB	Data Infrastructure in a Box
DOPA	Department of Provincial Administration
DPO	Data Protection Officer
DXC	Data Exchange Center
EGA	Electronic Government Agency
EGDI	E-Government Index
EPI	E-Participation Index
ERP	Enterprise Resource Planning
ETDA	Electronic Transactions Development Agency
EU	European Union
EUDI	European Union Digital Wallet
FIBA	Financial Institutions Businesses Act
GaaP	Government as a Platform
GCI	Global Cybersecurity Index
GDA	Government Data Architecture
GDCC	Government Data Center and Cloud
GDP	Gross Domestic Product
GDPR	General Data Protection Regulation

GDX	Government Data Exchange
GenAI	Generative AI
GITS	Government Information Technology Services
GNI	Gross National Income
HCI	Human Capital Index
ICO	Initial Coin Offerings
ICT	Information and Communication Technology
IDP	Integration of Digital Public
ILO	International Labour Organization
IoT	Internet of Things
ITU	International Telecommunication Union
JWT	JSON Web Tokens
KPI	Key Performance Indicator
KYC	Know-Your-Customer
MDES	Ministry of Digital Economy and Society
MFA	Multi-factor Authentication
MHESI	Ministry of Higher Education, Science, Research and Innovation
ML	Machine Learning
MSMEs	Micro, Small, and Medium Enterprises
NBTC	National Broadcasting and Telecommunications Commission
NCC	National Cybersecurity Committee
NCSA	National Cyber Security Agency
NCSC	National Cyber Security Committee
NCSCC	National Computer System Security Coordination Center
NDGA	National Data Governance Authority
NDGP	National Data Governance Policy
NDID	National Digital ID
NDQAP	National Data Quality Assurance Program
NDXC	National Data Exchange Center
NECTEC	National Electronics and Computer Technology Center
NESDC	National Economic and Social Development Council
NLU	Natural Language Understanding
NSO	National Statistical Office
NSTDA	National Science and Technology Development Agency
NSW	National Single Window
OCSC	Office of the Civil Service Commission
OECD	Organisation for Economic Co-operation and Development
OIC	Office of Insurance Commission
OJA	Office of Justice Affairs
OPDC	Office of the Public Sector Development Commission
OSI	Online Service Index
OSMEP	Office of Small and Medium Enterprises Promotion
OTP	One-time Password
PaaS	Platform as a Service
PbD	Privacy by Design and Default
PDPA	Personal Data Protection Act
PDPC	Personal Data Protection Committee
PPC	Personal Information Protection Commission

PSA	Payment Systems Act
RoPA	Records of Processing Activities
RTI	Right to Information
RWD	Real-World Data
SaaS	Software as a Service
SCC	Standard Contractual Clause
SCM	Supply Chain Management
SEA	Securities and Exchange Act
SEC	Securities and Exchange Commission
SMEs	Small and Medium Enterprises
SOA	Service-Oriented Architecture
SRO	Supervising or Regulating Organization
TBA	Telecommunications Business Act
TCCT	Trade Competition Commission of Thailand
TDGA	Thailand Digital Government Academy
TDRI	Thailand Development Research Institute
TFP	Total Factor Productivity
TGIX	Thai Government Information Exchange Standard Development Framework
TII	Telecommunication Infrastructure Index
UCS	Universal Coverage Scheme
UNCTAD	United Nations Conference on Trade and Development
VC	Verifiable Credential
WDI	World Development Indicators
WTO	World Trade Organization

1. Introduction and Executive Summary

To reach Thailand's aspiration of achieving upper-income status by 2037, diversifying its economy into the digital sector and taking advantage of digital transformation in traditional sectors is essential. However, the country has yet to fully harness the potential of digital transformation for economic growth, social equity, and innovation.

Data infrastructure is foundational to achieving Thailand's digital ambitions. The World Development Report (WDR) 2021, titled 'Data for Better Lives', highlights that data is a powerful tool for development, holding enormous value. Data infrastructure and an integrated national data system make the storage, processing, and accessibility of data possible to realize this value. Such data infrastructure and systems should be built on both hard and soft infrastructure, regulations, institutions, and human capital.

Currently, while vast quantities of data are generated daily in Thailand from the government, individual, and private sectors, the data are not being harnessed and used effectively for Thailand's digital transformation. One example of such lack of effective use is the lack of data flow and sharing within and across the government and private sectors, which limits the scale of data available for utilization and analysis. This, in turn, makes it difficult for Thailand to adopt newer technologies, like AI, more broadly. The recently approved Personal Data Protection Act (PDPA) intended to address these issues; however, de facto, it imposes compliance burdens for data sharing. With the fragmented government institutions dealing with data policies, usage of data is further constrained by the lack of standardized data-sharing protocols and inconsistent governance rules, which restrict access to valuable public datasets for micro, small, and medium enterprises (MSMEs).

The Digital Data Infrastructure Roadmap (DDIR) for 2025–2029 aims to provide strategic recommendations to enhance Thailand's digital transformation through improved data infrastructure and systems, incorporating international best practices for data governance. The topics for each chapter on data infrastructure, regulation, institutional arrangement, and their usage by government, the private sector and individuals (in social protection) were jointly decided by the Electronic Transactions Development Agency (ETDA) and the World Bank, based on practical needs and reflecting discussions among related agencies.

While suggesting a tailored framework for Thailand's digital transformation is not within the scope of this report, it adopts existing frameworks, particularly from the WDR 2021, to organize key chapters and areas of investigation, and applies it to the Thailand's unique data ecosystem characteristics. Key frameworks are described in Annex A and illustrate that (a) effective usage of data creates value and improves development outcomes through various actors (government, private sector, individuals); (b) both hard components (broadband networks, data centers) and soft elements (data regulations, institutional arrangements) are crucial for effective data governance; (c) the data governance is built by implementing policies, laws, systems, and standards.

Using these frameworks, the report comprises five main chapters, one recommendation chapter, and one complementary report on the social protection case.

- **Chapter 2 - Thailand's Relative Positions to Other Countries.** As a background chapter, it reviews Thailand's status in diverse aspects of digital transformation,

Key Findings and Recommendations

including digital infrastructure, data regulations, digital adoption and usage by firms and industry, and digital skills. The review found Thailand has room to benefit more from digitalization compared to its regional peers. The information and communication technology (ICT) sector contributes only 3.4 percent of gross domestic product (GDP), far below Association of Southeast Asian Nations (ASEAN) peers, and only 5.1 percent of adults possess intermediate digital skills, with moderate gaps in digital infrastructure. Moreover, Thailand's adoption of AI lags behind peer countries, with only 6 percent of internet users engaging with AI tools. Despite government efforts to improve data regulations, the actual implementation of such regulations remains ineffective.

- **Chapter 3 - Data Regulations Landscape.** Using the above-mentioned framework, this chapter investigates the data regulations landscape with a special focus on the recently approved PDPA. Although the PDPA aims to strengthen data privacy, it is often misunderstood by the private sector and sometimes serves as a barrier to efficient data sharing. Additional challenges include unclear cross-border data flow regulations and limited open data policies. It suggests that Thailand should promote a policy shift from consumer-centric privacy protections to organizational accountability models while supporting data privacy frameworks to align with global standards such as the European Union (EU) General Data Protection Regulation (GDPR). Establishing a unified compliance platform for MSMEs could simplify PDPA adherence. The government may consider introducing incentives for private sector participation in data-sharing initiatives.
- **Chapter 4 - Digital Government and Institutional Arrangement**. Fragmentation in governance and data-sharing barriers are key challenges in Thailand; for example, the Government Data Exchange (GDX) platform connects 13 agencies but lacks integration across social sector databases. Digital government initiatives face institutional bottlenecks that delay service delivery. Adoption of AI in government remains low, limiting data-driven decision-making. Establishing an independent National Data Governance Authority could improve the overall coordination of data regulations and their implementation. For cross-border data standards, there is room to improve alignment with ASEAN and EU frameworks for interoperability. Moreover, it is important to strengthen inter-agency data-sharing frameworks and governance, expand digital identity infrastructure to improve public service delivery, and utilize AI and machine learning for policy making.
- **Chapter 5 - Data Infrastructure and Innovation in Thailand.** This chapter reviews current gaps that limit the scalability of emerging technologies such as AI and cloud computing. Data center capacity is growing, with investments from Google and Amazon Web Services (AWS), but broadband constraints remain an issue. MSMEs lack access to high-performance computing and big data analytics. AI adoption is only 6 percent, the lowest in ASEAN, due to limited digital skills and language barriers. In order to improve digital infrastructure, Thailand needs to continuously expand fixed broadband coverage. In parallel, it can provide incentives for MSMEs to adopt AI and cloud computing and develop localized AI models to improve adoption in non-English-speaking markets.
- **Chapter 6 - Empowering MSMEs through Digitalization.** MSMEs struggle to leverage data for growth, primarily due to limited digital adoption and regulatory constraints. Venture capital investments in digital startups remain low. Only 40 percent of MSMEs use digital tools and lack access to government datasets due

to restrictive policies. Targeted training for the private sector to enhance digital adoption, expanded access to government open datasets for business innovation, and public-private partnerships to enhance MSME capabilities for data collection, usage, and sharing are essential. Moreover, the government needs to support AI development and adoption. AI adoption by firms and individuals is relatively low, with limited government strategies and support programs. Investment in AI research and education, and targeted workforce training to utilize AI for both public and private purposes are needed to benefit from the digital economy.

- **Chapter 7: Key Findings from Complementary Report**. The Data and Analytics Strategy for the Social Protection Sector to Enhance Service Delivery and Policy making in Thailand complements this report and focuses on data and analytics systems supporting the operation of social protection programs. It suggests that Thailand has established strong policy and institutional foundations to advance its social protection system through digital transformation, aligning with the Thailand 4.0 strategy. To enhance social protection programs, improve targeting mechanisms, optimize resource allocation, and provide better services to clients, Thailand must strengthen data governance and refine data policies. This will lay the foundation for interoperability and the creation of a Federated Social Registry. By expanding analytics capabilities, fostering collaboration among stakeholders, and leveraging AI, Thailand can enhance service delivery for its citizens.
- **Chapter 8: Policy Recommendations and Roadmap for 2025–2029.** The final chapter outlines a phased roadmap with short-term initiatives (2025–2027) to lay the groundwork for advanced data-driven programs and medium-term strategies (2027–2029) to unlock Thailand's digital potential. Aligned with national digital objectives, the roadmap aims to create a secure, interoperable, and citizen-centric digital ecosystem to empower businesses and drive Thailand's digital transformation. Below is a summary of the recommendations.

Short Term (2025–2027)

- **Modernize Data Infrastructure**: Expand Government Data Center and Cloud (GDCC) capacity and enhance the Government Data Exchange (GDX) platform.
- **Improve National AI Adoption**: Enhance foundational infrastructure, skills, and promote MSME AI adoption and usage.
- **Strengthen Data Governance Frameworks**: Establish a National Data Governance Authority (NDGA) within the Digital Government Development Agency (DGA), develop a unified national data governance policy, and harmonize and modernize data-related legislation.
- **Modernize Cybersecurity Framework**: Build cybersecurity human capacity and cyber literacy.

Table ES 1: Summary of Short-Term (2025-2027) Roadmap

Reform Areas (Ranked by priority)	Actions	Lead Agencies	KPIs
Data Infrastructure	Accelerate the Expansion of Government	Digital Government	• Establishment of digital transformation taskforce

Reform Areas (Ranked by priority)	Actions	Lead Agencies	KPIs
Modernization	Data Center and Cloud (GDCC) Capacity	Development Agency (DGA)	• Percentage of government agencies migrated to cloud infrastructure • Number of government services successfully transitioned to cloud platforms • Number of government employees trained on cloud technologies • Cost savings achieved through cloud migration (%) • Reduction in on-prem data center operational expenses
	Enhance the Government Data Exchange (GDX) Platform	DGA	• Number of inter-agency data exchanges processed monthly • Percentage of workflows automated through smart contracts
AI Strategy and Implementation	Develop Foundational Infrastructure	National Science and Technology Development Agency (NSTDA)	• Number of AI research and development hub projects • AI marketplace transaction volume
	Develop Human Capital and Skills	Ministry of Higher Education, Science, Research and Innovation (MHESI)	• Number of AI focused degree programs established • Annual AI skills training participants • Number of AI professional certfications issued • Private sector investments in AI training programs
	Enhance MSMEs' AI Adoption and Upskilling	Office of Small and Medium Enterprises Promotion (OSMEP)	• Number of MSMEs adopting AI solutions • Productivity improvement percentage for AI-enabled MSMEs • Number of MSMEs participating in the upskilling program
Data Governance Framework	Establish a National Data Governance	DGA	• Estabishment of NDGA

Reform Areas (Ranked by priority)	Actions	Lead Agencies	KPIs
	Authority (NDGA) within the DGA		
	Develop a Unified National Data Governance Policy	DGA	• Development and Implementation of NDGP
	Harmonize and Modernize Data-Related Legislation	DGA, ETDA, Office of the Personal Data Protection Committee (PDPC)	• Review of relevant existing legislation completed
Cyber-security	Enhance and Modernize Thailand's Cybersecurity Framework	National Cyber Security Agency (NCSA)	• Establishment of NCSC as functional central coordinating authority • Implementation rate of unified cybersecurity guidelines across sectors
	Build Cybersecurity Human Capacity and Enhance Cyber Literacy	NCSA, MHESI	• Establishment of NCSC as functional central coordinating authority • Implementation rate of unified cybersecurity guidelines across sectors

Medium Term (2027–2029)

- **Data Governance Framework**: Establish a National Data Compliance Program and real-time dashboard for monitoring data-sharing and security. Mandate interoperability, expand TGIX and GDX with standardized APIs, and enforce automated data synchronization and audits.
- **National AI Strategy**: Develop a regulatory and ethical AI framework, increase AI research investment, enhance AI education, and foster international collaborations. Create sector-specific guidelines, training programs, investment incentives, AI economic zones, and public-private partnerships.
- **MSMEs' Digital Adoption and Skills**: Provide financial support for MSMEs' digital investments, establish a Digital Transformation Fund, and foster public-private partnerships. Expand broadband and 4G/5G coverage, launch upskilling programs, and develop online learning platforms.
- **Data and Analytics for Social Protection**: Establish a data governance framework and committee, assess services, and review data usage to enhance

quality and reduce costs. Foster interoperability, expand analytics capabilities and leverage AI for program effectiveness and service delivery.

Table ES 2: Summary of Medium-Term (2027-2029) Roadmap

Reform Areas (Ranked by priority)	Actions	Lead Agencies	KPIs
Data Governance Framework	Establish Incentives and Compliance Mechanisms for Data Governance	DGA	• Rollout of National Data Compliance and Incentive Program • Launch of data governance compliance dashboard
	Enforce a Comprehensive Data Interoperability Framework	DGA	• Completed expanded implementation of TGIX and GDX
	Strengthen Data Quality, Validation, and Cleaning Capabilities	DGA	• Establishment of NDQAP
	Enhance Public Engagement and Transparency	DGA	• Number of public officials trained on data governance best practices • Citizen engagement rate through digital platforms (participation metrics and feedback volume)
	Promote Open Data Utilization and Economic Impact	DGA	• Number of commercial applications and services developed using government open data
Data Infrastructure	Quantum Computing Infrastructure and Research Capacity	MHESI	• Number of operational quantum-ready data centers established with proper cooling and shielding • Percentage of quantum computing specialists trained through scholarship programs and specialized curriculum • Number of successful public-private quantum research partnerships established

Reform Areas (Ranked by priority)	Actions	Lead Agencies	KPIs
			• Volume of patents and research publications produced through the quantum technology innovation sandbox
AI Strategy and Implementation	Regulatory and Ethical Framework	ETDA, NSTDA	• Percentage of high-risk AI systems successfully evaluated and certified through the comprehensive risk management framework
	Research and Innovation Ecosystem	Thailand Science Research and Innovation (TSR)I	• Number of AI patents filed and commercialized applications developed by Thai researchers and companies annually
	Sector-Specific AI Implementation	ETDA, NSTDA	• Amount of domestic and foreign direct investment secured specifically for AI development initiatives and infrastructure
	Economic and Investment Strategy	Board of Investment of Thailand (BoI), Ministry of Finance (MoF)	
MSMEs' Digital Adoption and Labor Skill	Enhance MSMEs' Digital Adoption	OSMEP, Digital Economy Promotion Agency (DEPA)	• Number of MSMEs supported through digital adoption grants • % increase in digital adoption by MSMEs across targeted indicators
	Enhance Digital Infrastructure Equality for MSMEs	Office of The National Broadcasting and Telecommunications Commission (NBTC)	• % increase in population and MSMEs covered by high-speed fixed and mobile internet, with a focus in underserved areas • Number of local digital access points established
	Elevate Digital Skills for the MSME Workforce	OSMEP	• Number of MSME employees trained in digital skills

Reform Areas (Ranked by priority)	Actions	Lead Agencies	KPIs
Data and Analytics Strategy for Social Protection	Enhance Data Governance and Strengthen Data Policies as a Foundation for Interoperability	DGA, Department of Social Development and Welfare (DSDW)	• Number of cross-agency agreements signed for data sharing • Percentage of social programs using shared data systems
	Establish a Federated Social Registry	DSDW, Big Data Institute (BDI)	• % population coverage in social registry • Number of programs integrated into the registry
	Expand Analytics Capabilities	DSDW, BDI	• Number of predictive models developed and deployed • Frequency of data use for policymaking by DSDW and partners
	Enhance Service Delivery	DSDW	• User satisfaction rate with digital social services • Reduction in processing time for benefits through digital channels

Thailand stands at a pivotal moment in its digital transformation journey. Addressing existing regulatory, infrastructure, and institutional challenges will unlock new economic opportunities and enhance public service efficiency. The DDIR (2025–2029) provides a strategic path forward, emphasizing regional cooperation, investment in digital literacy, and AI adoption. Implementing these recommendations will strengthen Thailand's position as a leading digital economy in Southeast Asia.

2. Thailand's Relative Position to Other Countries

○ Overview

Thailand aims to achieve sustainable and resilient growth, aspiring to reach upper-income status by 2037. Currently, the economy relies heavily on tourism, making it vulnerable to external shocks. Diversifying economic activities is essential to achieving short-term growth targets and maintaining long-term stability. Building a strong digital economy can drive diversification, enhance resilience, and make the economy more sustainable. This chapter provides an overview of Thailand's digital sector, focusing on digital infrastructure, regulations, and artificial intelligence (AI) adoption, to set a background for the report in identifying gaps and opportunities for digital transformation.

The digital sector in Thailand has remained stagnant in the last decade. Despite its potential to drive economic diversification, information and communication technology (ICT) sector value added in Thailand only accounts for 3.4 percent of gross domestic product (GDP) in 2021, lagging behind ASEAN[1] peers. ICT services show moderate growth, but the annual export declines of 3 percent and stagnant ICT manufacturing indicate underperformance. Low ICT input intensity in production limits productivity, while limited venture capital investments and a significant digital skills gap further constrain growth. Only 5.1 percent of adults possess intermediate digital skills, and the preference for Thai over English restricts access to global digital tools, underscoring the need for comprehensive support to expand the digital sector and boost innovation.

Thailand faces moderate digital infrastructure gaps. Fixed broadband penetration remains at just 18 percent in 2022, despite strong progress in mobile broadband adoption. It may restrict the adoption of advanced digital technologies such as cloud computing and AI. While the country's data center capacity is growing, with major investments from Google and Amazon Web Services (AWS), fixed broadband can be a potential barrier to leveraging these resources. Expanding fixed broadband access is vital to ensuring affordable, high-quality internet and accelerating digital adoption across sectors.

Restrictive regulations on data flow and sharing create additional barriers to digital transformation in Thailand. Cross-border data flow is hampered by unclear policies, limiting international business opportunities and domestic innovation. Moreover, domestic data sharing is constrained by compliance burdens, such as those under the Personal Data Protection Act (PDPA), and inconsistent governance rules, which restrict access to valuable public datasets for micro, small, and medium enterprises (MSMEs). Aligning regulations with international best practices and establishing standardized data-sharing protocols would enhance transparency, foster innovation, and support digital economy growth.

Thailand's adoption of AI lags behind peer countries, with only 6 percent of internet users engaging with AI tools. Low awareness, limited incentives, and a shortage of skilled AI professionals pose significant challenges, particularly for MSMEs. Language barriers and workforce limitations further hinder generative AI

[1] ASEAN = Association of Southeast Asian Nations.

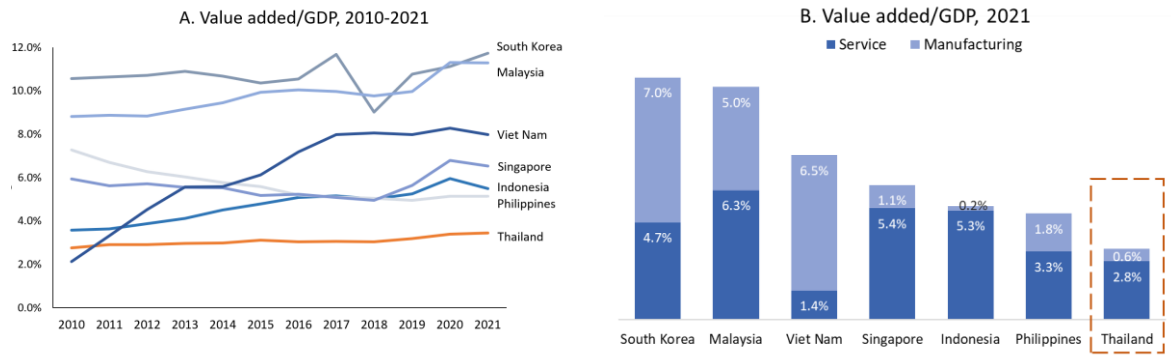
(GenAI) adoption and the fine-tuning of open-source models. Addressing these challenges through targeted training, incentives, and awareness campaigns will be crucial to fostering broader AI adoption and unlocking its transformative potential for Thailand's economy.

The remaining sections of the chapter dive into the digital sector, digital infrastructure, digital regulations, and the AI landscape in Thailand. These sections identify the current state, key challenges, and gaps in Thailand's digital transformation. Together, they lay a comprehensive foundation for the entire report, providing essential context for later chapters to propose strategies, policy recommendations, and actionable pathways to accelerate the country's digital growth.

○ Digital Sector

The digital sector in Thailand remains relatively small compared to countries in the same region. The digital sector in this report refers to industries and activities driven by ICT, digital platforms, and IT-enabled services. It includes ICT manufacturing (for example, electronic devices, semiconductors, telecommunications equipment) and ICT services (for example, e-commerce, digital financial services), as well as digital platform and Business Process Outsourcing and IT-Enabled Services (BPO-ITES). There are multiple measures of the size of the digital sector. According to Thailand Digital Economy 2024, Broad Digital GDP (CVM) is worth THB 4.44 trillion, expanding by 5.7 percent from 2023 and accounting for 23.9 percent of GDP in 2024. However, as another measurement, the ICT secor value added contributed only 3.4 percent to the national GDP as of 2021, lagging behind other ASEAN countries.[2] The ICT sector value added in Thailand has grown from 2.8 percent of GDP in 2010 to 3.4 percent in 2021, with ICT services contributing 2.8 percent and ICT manufacturing contributing only 0.6 percent (Figure 1). Despite this growth, Thailand remains at the bottom among ASEAN countries, highlighting the need for strategic interventions to bolster the digital sector.

Figure 1: ICT Sector Value Added as Share of GDP



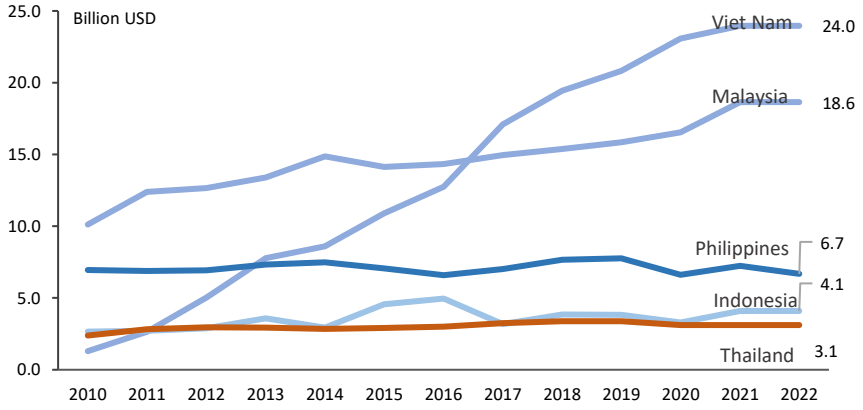
Source: Based on World Bank Digital Transformation Database and World Development Indicators (WDI).

The ICT manufacturing sector in Thailand has shown a steady trend in the last decade. The ICT manufacturing sector produces hardware and components for information processing and communication, such as smartphones and semiconductors. It contributed US$3.1 billion in value added in 2022 for Thailand

[2] ICT sector value added is the difference between the information and communication technology sector gross output and intermediate consumption, which by definition is smaller than gross output.

(*Figure 2*). The development in the manufacturing sector maintained a steady trend, similar to Indonesia and the Philippines, while Viet Nam experienced significant growth in the last decade. This stagnation indicates the need for the Thai government to enhance policies to attract investments and foster innovation in ICT manufacturing to remain competitive. The limited growth of ICT manufacturing has implications for Thailand's ability to diversify and strengthen its economic resilience.

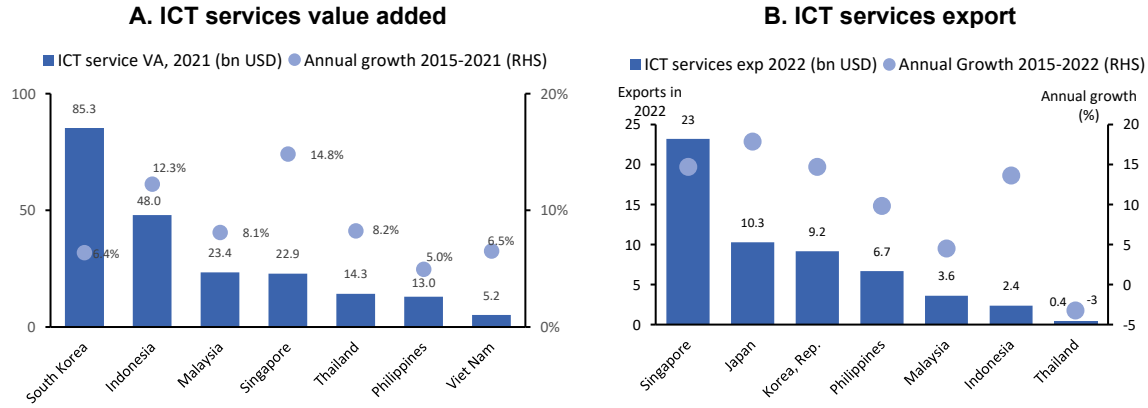
Figure 2: ICT Manufacturing Value Added, 2010–2022



Source: World Bank Digital Transformation Database.

The ICT services sector in Thailand has shown moderate growth. The ICT services sector delivers digital solutions, including software development, cloud computing, e-commerce, and digital financial services. It experienced an annual growth rate of 8.2 percent between 2015 and 2021. However, ICT services exports experienced a 3 percent annual decline from 2015 to 2022, amounting to US$0.4 billion in 2022. Other countries in the region have seen significant growth in ICT services exports, underscoring the need for Thailand to address challenges in competitiveness and market access for ICT services. Low ICT input intensity in production, with IT services and ICT goods accounting for only 0.9 percent and 1.4 percent of total intermediate input expenditure, respectively, limits productivity gains and hinders the overall growth of the digital economy (Figure 3).

Figure 3: ICT Services Value Added and Exports

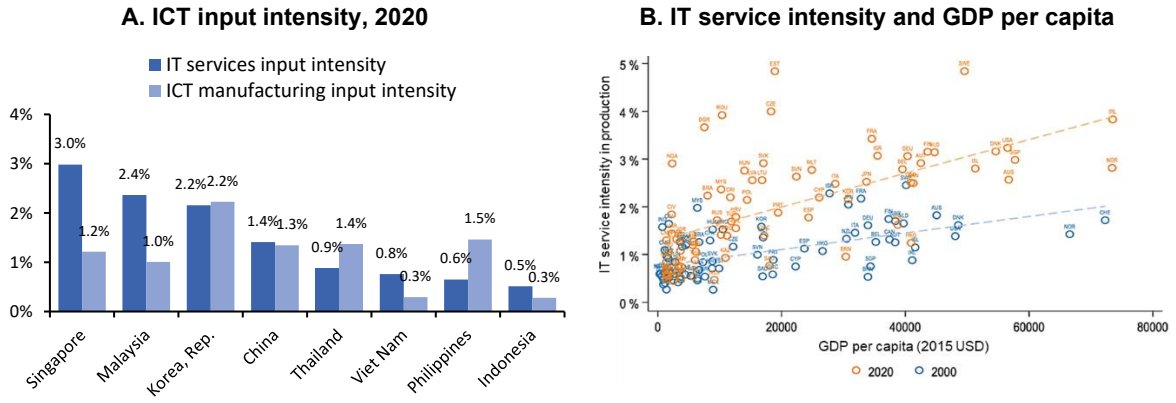


Source: Based on World Bank Digital Transformation Database and World Trade Organization (WTO).

Low ICT input intensity in production limits productivity gains and hinders the overall growth of the digital economy. IT services and ICT goods account for only 0.9 percent and 1.4 percent of total intermediate input expenditure, respectively. ICT input intensity, which reflects the share of digital sector inputs in production, is lower

in Thailand compared to countries such as Malaysia and Singapore, highlighting a gap in digital integration. Increasing ICT adoption is crucial for boosting of productivity and economic development not only for the ICT sector but also for all sectors. For instance, a positive correlation is seen between ICT input intensity and GDP per capita across countries. This correlation became larger in 2020 than 20 years ago, as seen in *Figure 4.* In this regard, low ICT input intensity in Thailand may suggest that the country does not take full advantage of the ICT sector in production.

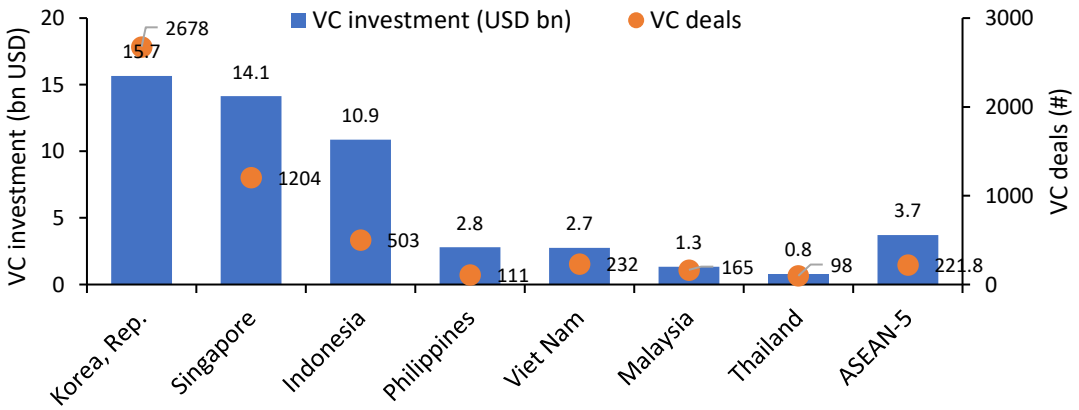
Figure 4: ICT Input Intensity as a Measure of ICT Adoption in Production



Source: Based on Trade in value-added (TIVA) database and WDI.
Note: IT service input is the sum of input from two sectors: ISIC code 62 (Computer programming, consultancy, and related activities) and 63 (Information service activities). ICT manufacturing input includes ISIC code 26 (Manufacture of computer, electronic, and optical products).

Thailand's venture capital investments in digital startups remain limited. Venture capital investments amount to US$0.8 billion between 2020 and 2022, which is significantly lower compared to regional leaders such as Singapore and Indonesia (Figure 5). This lack of venture capital investment constrains the growth and development of the digital sector, highlighting the need for stronger support for innovation and entrepreneurship. Thailand's strong performance in e-commerce adoption is not matched by investments in the broader digital economy, limiting the potential of digital startups to thrive.

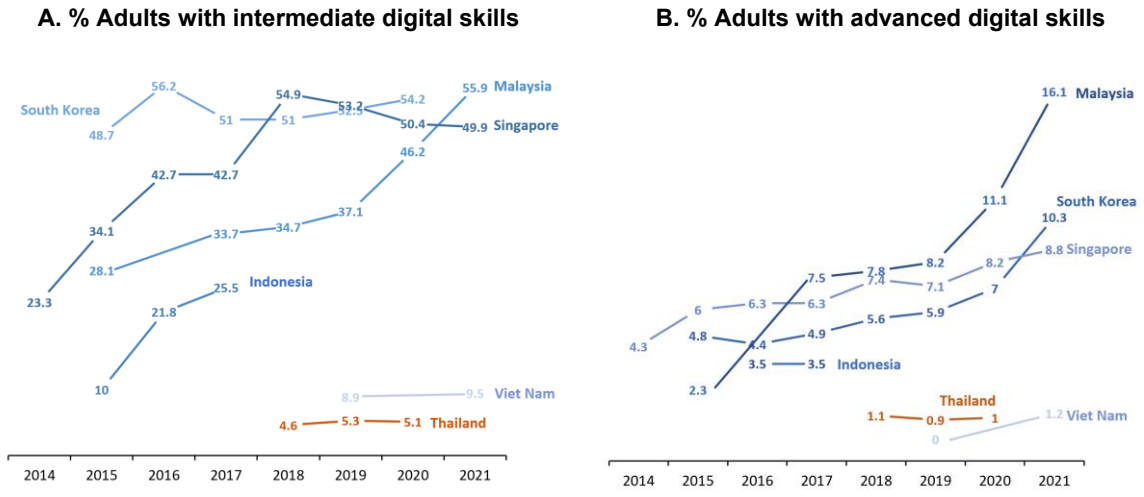
Figure 5: Venture Capital Investment in Digital Startups, 2020–2022



Note: Data for this chart are sourced from CB Insights, a global provider of market intelligence. The chart displays the total venture capital investment amounts in US$ billion (blue bars) and the number of venture capital deals (orange dots) by country, representing the sum of all venture capital investment deals listed in the CB Insights database for 2020–2022.

Digital skills in Thailand are limited, becoming a significant barrier to digital transformation for Thailand. In 2020, only 5.1 percent of adults in Thailand had intermediate skills, such as installing software, and 1 percent possessed advanced skills, such as programming (Figure 6). The level of digital skills in the workforce significantly lags behind other economies in the region. Bridging the digital skills gap in the workforce will lay a stronger foundation for the digital economy.

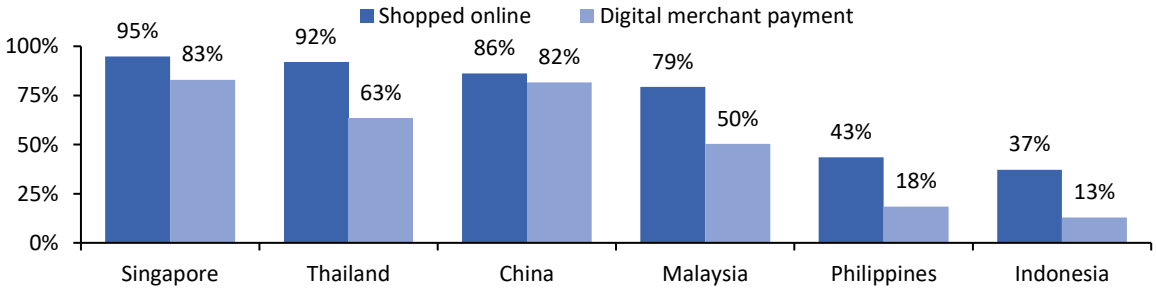
Figure 6: Digital Skills Gap between Thailand and Other Countries



Source: International Telecommunication Union (ITU).
Note: Intermediate digital skills are measured as the percentage of adults with the skill to find, download, install, and configure software. Advanced digital skills are defined as the percentage of adults with the skill to write a computer program using a specialized programming language.

However, Thailand is more advanced than its peers in some aspects such as online shopping. With 92 percent of people having shopped online in 2021, Thailand surpassed China and the rest of the ASEAN countries. However, despite high levels of online shopping, Thailand's digital merchant payment coverage is relatively lower compared to countries such as Singapore and China, although it is higher than other countries in the region (Figure 7). This gap between e-commerce usage and digital payment infrastructure suggests the need for further improvements in payment systems to better match consumer behavior and support seamless digital transactions.

Figure 7: Online Shopping and Digital Merchant Payments, 2021



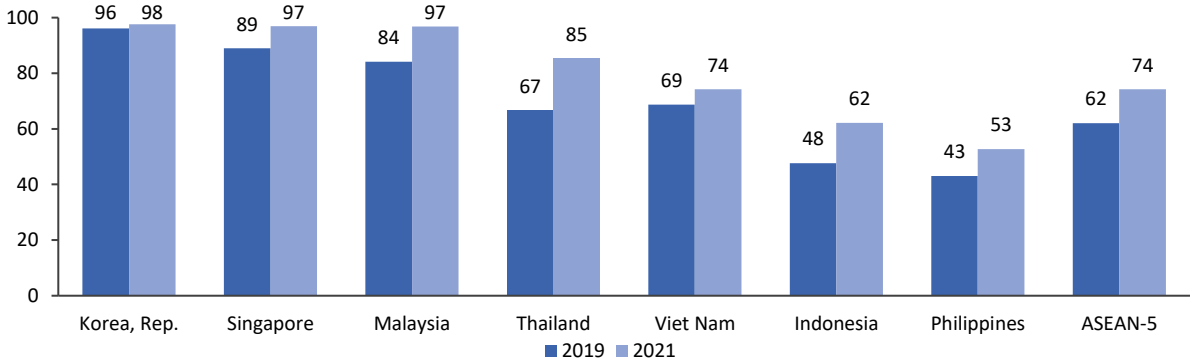
Source: Findex.

○ Digital Infrastructure

Internet usage in Thailand has grown significantly, with 85 percent of the population using the internet in 2021, making it the second highest in ASEAN

(Figure 8)**.** This growth sets a solid foundation for digital activities; however, there are still gaps in ensuring that internet access is affordable and accessible to all. Expanding online access to more people can strengthen Thailand's digital economy by enabling more individuals and businesses to engage in digital activities. Despite this progress, the digital divide between urban and rural areas remains a challenge that needs to be addressed.

Figure 8: % Population Using the Internet, 2019 versus 2021



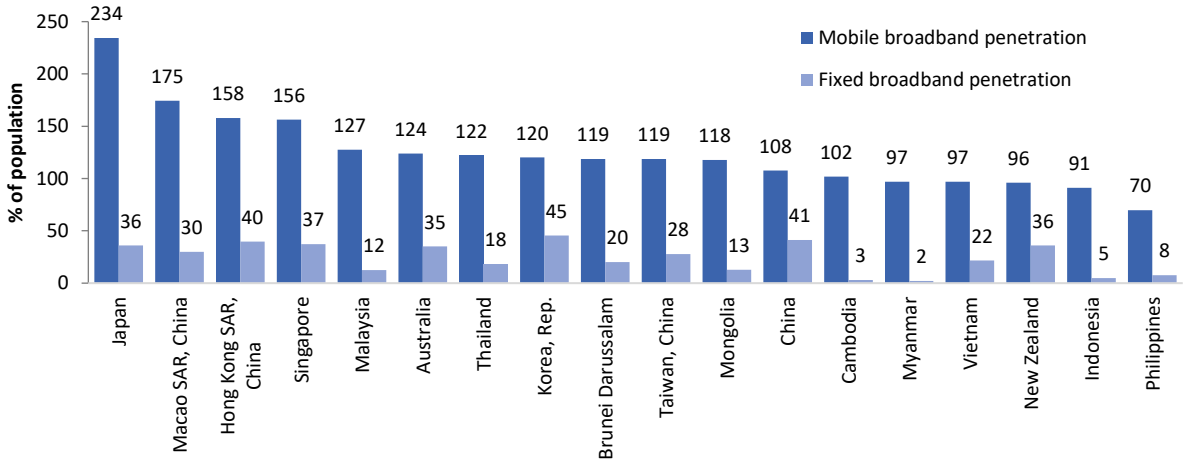
Source: ITU.

Thailand's mobile broadband penetration stands out among the ASEAN countries, reaching levels comparable to high-income countries such as Australia and the Republic of Korea. Thailand has made significant progress in mobile broadband, allowing it to leapfrog from the fixed broadband era to the mobile broadband era. This widespread adoption of mobile broadband has accelerated Thailand's digital transformation, providing a strong foundation for e-commerce, enhancing tourist experiences, and boosting entertainment activities. Progress in mobile broadband has also helped connect remote areas to the internet, ensuring inclusive digital development.

However, Thailand's fixed broadband has a penetration rate of only 18 percent nationwide as of 2022 (Figure 9)**.** This low fixed broadband penetration is not uncommon compared to countries such as Malaysia (12 percent), Indonesia (5 percent), and the Philippines (5 percent), where geographical challenges make fixed broadband connections more costly. Despite this, fixed broadband is crucial for advancing professional digital applications, particularly for cloud computing and storage, which are key components of data center infrastructure. Relying on mobile broadband and applications can hinder Thailand's advancement toward a higher level of digitalization.

One key factor behind Thailand's low fixed broadband adoption is the widespread preference for mobile broadband. Mobile broadband offers greater convenience and lower up-front costs. Many users rely on mobile data for everyday internet activities. According to Thailand Digital Outlook 2024, conducted by the National Digital Economy and Society Commission, it was found that 73.35 percent of internet users use the service via mobile phones/smartphones. In addition, mobile service providers have expanded high-speed networks to meet this demand. However, while mobile broadband is sufficient for general usage, it may not provide the stability and capacity needed for more advanced digital services, which are essential for Thailand's long-term digital transformation. This report further highlights this point with the discussion of firms' adoption of advanced digital technology in Chapter 6.

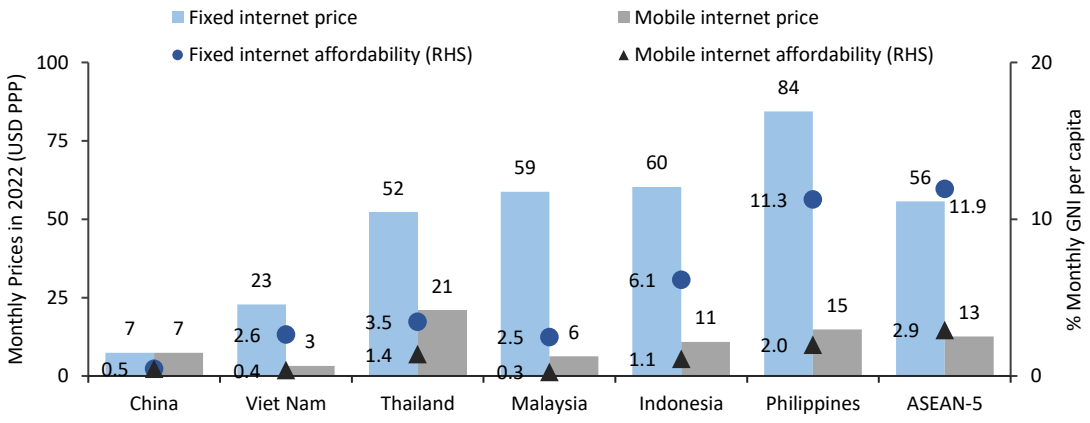
Figure 9: Broadband Penetration by East Asia and Pacific Economies, 2022



Source: ITU.

Affordability of broadband provides opportunities to improve, with fixed broadband costing more than mobile broadband. Mobile broadband is relatively affordable, costing 1.4 percent of monthly gross national income (GNI) per capita in 2022, while fixed broadband remains 2.5 times more expensive. Mobile broadband affordability in Thailand is slightly higher than the ASEAN average and is almost three times more expensive than in China (Figure 10). The combination of lower fixed broadband penetration and the high cost of fixed broadband, despite the availability of high-speed connections, points to limited supply and quality as contributing factors to affordability challenges. Addressing these issues will be key to improving access to digital infrastructure across the country. As the primary means of access for many, mobile internet underpins digital payments and e-commerce. Expanding both fixed and mobile broadband capacity will be essential for ensuring seamless connectivity and supporting the growth of digital services.

Figure 10: Broadband Prices and Affordability, 2022

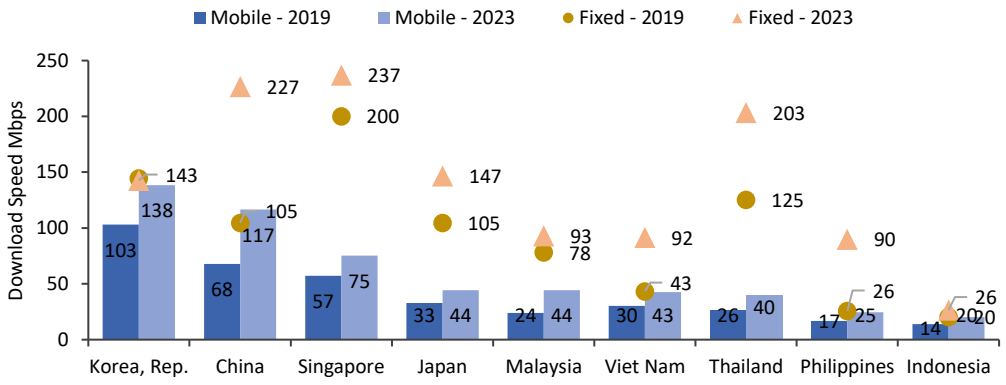


Source: ITU.

Thailand has made significant progress in improving fixed internet speeds, leaving mobile internet speed still space to improve. Fixed internet download speed in Thailand now reaches a median of 203 Mbps in 2023, comparable to the regional leader Singapore. Mobile internet speeds, however, still rank mid-range

among ASEAN countries, with an average download speed of 40 Mbps in 2023. Mobile internet is increasingly important, covering the majority of internet users and playing a central role in digital payments, e-commerce, and other online activities (Figure 11).

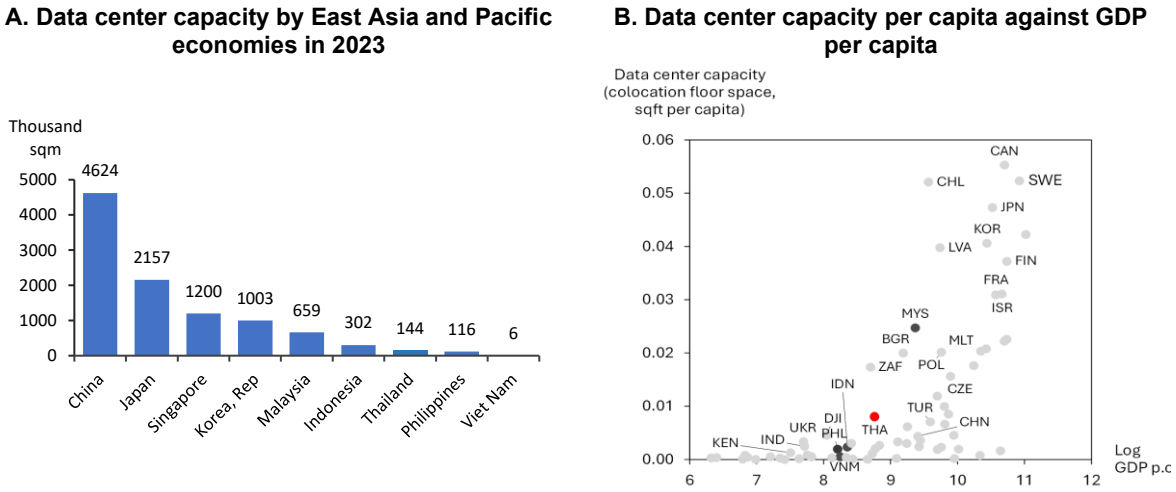
Figure 11: Internet Download Speed, 2019 versus 2023



Source: Ookla.

Data center capacity in Thailand, with a total of 144,000 m^2 in 2023, ranks in the middle among ASEAN countries (Figure 12)**.** Data center capacity reflects a country's ability to store, process, and manage digital data, which is critical for supporting digital infrastructure, enabling cloud services, and driving digital transformation across industries. It is also a key indicator of readiness to meet growing demands for digital services, especially in more advanced data-intensive sectors such as finance, e-commerce, and particularly AI. Firms can choose between local data centers and cloud computing with global resources, but they often rely on local data centers for advanced IT functions when addressing data privacy concerns and complying with cross-border data flow regulations. Additionally, local data centers offer low latency, which is crucial for applications requiring rapid response, such as stock transaction and remote healthcare services. Thailand is estimated to host data centers with a total capacity of 144,000 m^2, a key indicator of data center capacity. While Thailand's data center capacity aligns with its current level of economic development, there is still room for growth. The high-performance computing power is more needed, especially to support advanced technologies such as AI and cloud services. More data center construction is being planned with Google and AWS, which provided significant opportunities.

Figure 12: Data Center Capacity



Note: This chart is sourced from TeleGeography, a global leader in data center and telecom insights. The bar chart displays the total floor space in thousands of square meters for data centers by country in 2023, used as a proxy for capacity, aggregated from raw data providing detailed insights for each data center. The right chart further relates the per-capita data center floor space with GDP per capita (log), with WDI 2023 data.

○ Digital Regulations

Measuring data regulation using cross-country comparable sources is challenging, and a detailed country-specific analysis is more relevant. Widely recognized sources, such as World Bank Global Data Regulation Diagnosis (GDRD), typically measure dimensions like data protection, interoperability, and cross-border data flows. These international benchmarks provide a comparative lens on regulatory enablers (for example, open data policies) and safeguards (for example, personal data security). However, they often emphasize legal frameworks over implementation and may not fully capture the complexities of real-world governance challenges, making Thailand's context critical to explore in the following sections.

The Global Cybersecurity Index by ITU is an example of a cross-country comparison on cybersecurity, where Thailand ranks among the top-tier countries globally, reflecting its commendable standing (Table 3). Despite this, there is a need to enhance capacity-development measures, particularly in promoting cybersecurity awareness, integrating cybersecurity into national education curricula, and incentivizing capacity-building initiatives. Addressing these gaps will help ensure that the country remains secure as it continues to expand its digital footprint. The integration of cybersecurity into educational programs can play a vital role in cultivating the next generation of skilled cybersecurity professionals, enhancing Thailand's digital resilience.

Table 3: Global Cybersecurity Index 2024

Country	Total Score	Legal Measures	Technical Measures	Organization Measures	Capacity Development	Cooperation Measures
Indonesia	100.0	20	20.0	20.0	20.0	20.0
Korea, Rep.	100.0	20	20.0	20.0	20.0	20.0
Singapore	99.9	20	20.0	20.0	19.9	20.0

Country	Total Score	Legal Measures	Technical Measures	Organization Measures	Capacity Development	Cooperation Measures
Viet Nam	99.7	20	20.0	20.0	19.7	20.0
Thailand	*99.2*	*20*	*20.0*	*19.2*	20.0	20.0
Malaysia	98.8	20	20.0	18.8	20.0	20.0
Philippines	93.4	20	19.1	19.5	17.1	17.7

Source: ITU.

Efforts to improve cybersecurity and data governance are ongoing, but further enhancements are necessary to ensure that Thailand's regulatory framework keeps up with the fast-evolving digital landscape. Stakeholder interviews have highlighted challenges around data regulation that need urgent attention, particularly regarding cross-border data flows and domestic data sharing practices.

In terms of cross-border data flow, stakeholders have pointed out that Thailand's regulatory environment still presents obstacles that hinder the seamless movement of data across borders. Ambiguity around cross-border data transfer rules create friction for businesses, particularly for those looking to engage in international digital trade. While the new cross-border data regulation enhances data security safeguard, to attract more data-driven businesses, it is crucial for Thailand to develop clear, balanced regulations that allow for the secure yet efficient transfer of data across borders, ensuring compliance with international standards while promoting economic growth.

Domestically, data-sharing practices face significant challenges, particularly in the burden of regulatory compliance and limited data flow between public and private entities. Stakeholder consultations revealed that existing regulations, such as the PDPA, combined with agency-specific governance rules, have made data sharing cumbersome. This restricts the ability of private sector firms, including MSMEs, to access valuable public datasets that could enhance their decision-making and competitiveness. A more streamlined regulatory framework that encourages transparent and secure data sharing across sectors—especially from government to private businesses—would be instrumental in supporting digital innovation and creating a more data-driven economy.

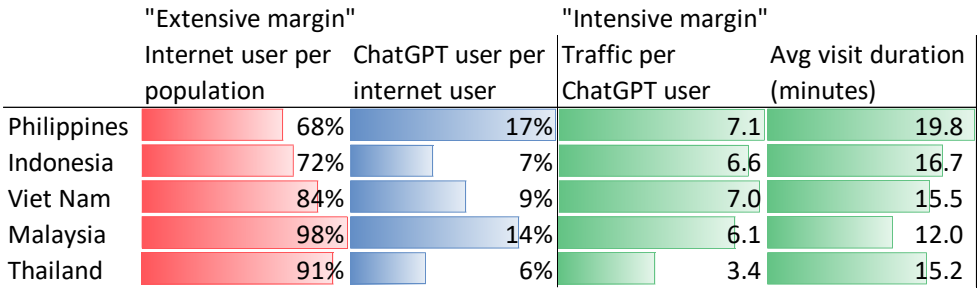
Cross-agency data sharing represents a regulatory barrier that is especially pronounced in the social protection sector. The Complementary Report on Social Protection Data Use Cases details these obstacles in depth. Among them, three critical issues have been identified: first, legal ambiguities in cross-agency data-sharing frameworks complicate the interoperability among agencies; second, the intersection between social protection and financial regulations creates overlapping mandates that further constrain data sharing; and third, ensuring compliance with data protection laws while facilitating benefit eligibility verification poses a substantial operational challenge. Addressing these issues through refined and harmonized regulatory guidelines could markedly improve data interoperability and enhance the delivery of social protection services.

While this chapter provides Thailand's regulatory scores and index in data regulation and cybersecurity, relative to other countries, the following chapter (chapter 3) will provide a closer look at Thailand's current regulations on digital and data infrastructure and usage.

○ Artificial Intelligence

The adoption of AI in Thailand remains limited. Only 6 percent of internet users accessed GenAI tools such as ChatGPT as of March 2024, which is the lowest rate among ASEAN countries (Figure 13). This suggests potential barriers to future technology adoption, such as limited digital literacy and lack of awareness regarding AI's benefits. The government should focus on increasing AI awareness and providing incentives for AI adoption, to improve productivity and drive sustainable growth. Expanding access to AI technologies will be crucial for staying competitive in the evolving digital landscape.

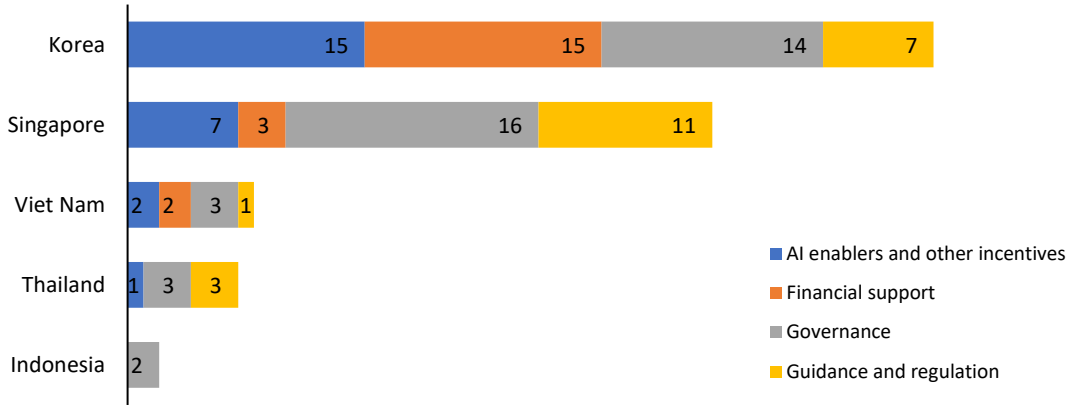
Figure 13: ChatGPT Adoption and Usage Patterns in ASEAN, March 2024



Source: Based on Semrush and ITU data.

Between 2017 and 2023, Thailand issued seven national AI policies and strategies covering AI governance, guidance, regulation, enablers, and other incentives. Despite these efforts, financial support for AI initiatives remains limited compared to higher-income economies such as Singapore and Korea (Figure 14). Expanding financial support for AI development, including funding for research and innovation, can help Thailand bridge the gap with regional leaders and position itself as a key player in AI. This will require strong collaboration between the government, private sector, and academia.

Figure 14: National AI Policies and Strategies, 2017–2023

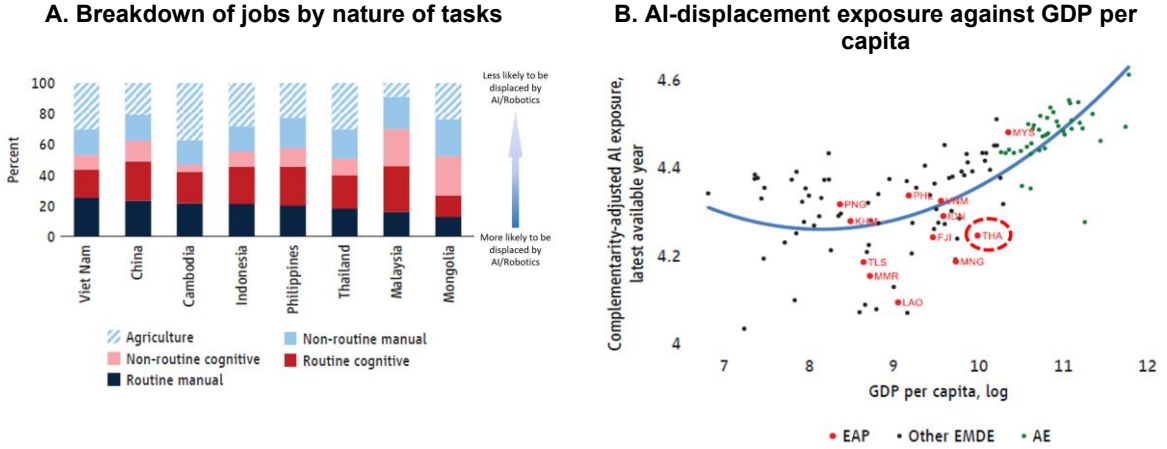


Source: OECD.AI.
Note: OECD = Organisation for Economic Co-operation and Development.

AI adoption presents significant opportunities for boosting productivity but also comes with the risk of labor displacement, particularly in service sectors and routine occupations. AI exposure is measured by the degree of overlap between the tasks performed by humans and those that can be accomplished by AI technologies. A high AI exposure score indicates a greater risk of displacement due to task overlap,

while a low score suggests limited overlap and lower displacement risk. In the age of GenAI, routine cognitive tasks are more vulnerable to AI, while robotics are more likely to replace routine manual labor. These two types of jobs together account for around 40 percent of labor force in Thailand (Figure 15A). Globally, the share of jobs' exposure to AI is positively correlated to a country's economic development level once the GDP per capita exceeds a certain level (Figure 15B). And Thailand is relatively less exposed to AI's displacement effects compared to other East Asia and Pacific countries and peers at a similar income level, owing to moderate engagement in cognitive service sectors. However, proactive measures must be taken to prepare for potential displacement impacts. Encouraging the adoption of AI while implementing reskilling and upskilling programs for the workforce can help mitigate these risks and ensure that AI serves as a productive enabler for sustainable development.

Figure 15: AI Exposure of Jobs in the East Asia and Pacific Region



Source: World Bank East Asia and Pacific Economic Update October 2024.

The barriers to GenAI adoption hinge on language limitations and the need for effective model adaptation, as highlighted by stakeholder consultations. GenAI tools face significant hurdles in adapting to the Thai language, which presents a major challenge for widespread adoption, particularly given the limited proficiency in English among the Thai population. The need for language-specific adjustments is critical to make these tools more accessible and useful.

Fine-tuning open source models is a common practice, but the lack of an AI-skilled workforce remains a significant barrier. Tailoring models to local contexts is essential to enhance their usability and effectiveness, especially for MSMEs, which require such tools to remain competitive and adaptive to the specific demand. It is crucial to address these issues to fully realize the potential of GenAI in Thailand's unique environment.

○ Conclusion

Thailand's digital transformation presents significant opportunities that can enhance the country's economic growth and resilience. Widespread mobile internet usage provides an expansive base of connected individuals and businesses, creating a strong foundation for e-commerce, tourism attraction, and professional services.

However, there are notable challenges that Thailand must address to realize its digital potential fully. The relatively small ICT sector limits the overall capacity of the digital

economy, making it essential for the country to increase investments and policy support in this area. Limited IT adoption in production also restricts productivity improvements, as many firms are not yet leveraging technology to its fullest potential, resulting in inefficiencies across key industries. Insufficient venture capital investments pose another challenge, preventing digital startups from scaling up and limiting innovation and entrepreneurship in the tech space.

Furthermore, gaps in digital skills represent a significant barrier to realizing Thailand's digital ambitions. With only a small percentage of adults possessing intermediate or advanced digital skills, there is an urgent need to expand education and training programs that focus on digital competencies. Fixed broadband challenges, such as limited penetration and high costs, further hinder access to digital services, particularly in rural and underserved areas, exacerbating the digital divide. Finally, low AI adoption rates indicate that Thailand is lagging in implementing cutting-edge technologies, which could impede future competitiveness and growth. These challenges require targeted interventions to foster an inclusive, well-developed, and competitive digital economy.

In conclusion, building a strong digital economy is essential for diversifying Thailand's economic base and achieving sustainable growth. Addressing the existing challenges through investments in infrastructure, human capital, and supportive policies can unlock the full potential of the digital sector.

3. Data Regulations Landscape

○ Introduction

The importance of data infrastructure and governance cannot be overstated, as it forms the backbone of effective, efficient, and transparent public administration in the digital age. As governments worldwide embrace digital transformation, robust data infrastructure has become a critical enabler for evidence-based policy making, improved service delivery, enhanced citizen engagement, and better development outcomes. The World Bank emphasizes that digital data infrastructure is a prerequisite for collecting, exchanging, and utilizing data in governance processes.[3] This infrastructure encompasses both hard components, such as broadband networks and data centers, and soft elements, such as data regulations, data governance frameworks, and interoperability standards.

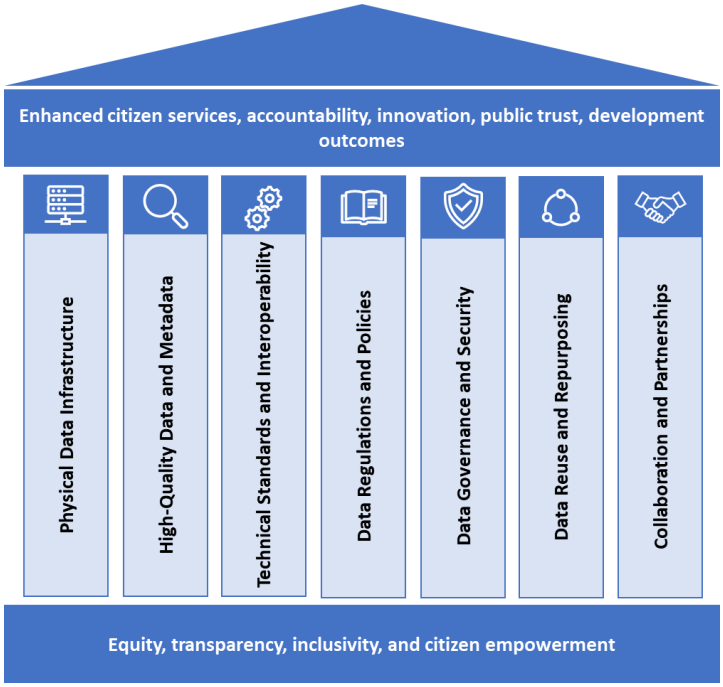
A well-designed digital data infrastructure allows for seamless data sharing across government departments, breaking down silos that have traditionally hampered effective governance. For instance, data produced in one government agency can be easily shared with others, ensuring that programs and policies are informed by data collected across multiple agencies. This interconnectedness is crucial for addressing complex societal challenges that often require coordinated responses across various government agencies. In addition to physical infrastructure, technical data standards and high-quality metadata are essential for enabling data interoperability, allowing data from diverse sources to be integrated and repurposed effectively. By supporting the reuse of data, governments can maximize its value, using insights from one program to inform others and making it possible to adapt existing data to meet new and evolving needs. Together, these elements create an environment where data can be accurately shared, repurposed, and leveraged across systems and programs, significantly increasing its potential impact on governance outcomes and fostering citizen-centered decision-making.

While a well-designed physical data infrastructure coupled with soft technical elements can help deliver better services to citizens with greater accountability and transparency, equally critical are the other soft infrastructure elements, including comprehensive legal frameworks, governance structures, and institutional arrangements. These elements are essential for establishing public trust, safeguarding citizens' rights, ensuring equitable access to data-derived benefits, and fostering a culture of responsible data use. Governments must develop robust legal and regulatory frameworks to protect citizens, ensure data integrity and security, and promote responsible data sharing in the public interest. Effective data governance frameworks should address privacy, ethical use, and data interoperability, creating an environment that encourages innovation while protecting individuals' rights. Collaboration among government, the private sector, and civil society is essential to building a secure and inclusive digital economy. This approach not only enhances the quality and efficiency of public services but also demonstrates transparency and accountability, thereby reinforcing the social contract and empowering citizens to

[3] Foster, Vivien, J. Robert Cull, and Dean Mitchell Jolliffe. 2021. *World Development Report 2021 : Data for Better Lives (English)*. World Development Indicators, World Development Report, Washington, DC: World Bank Group.

make informed choices about their data. By addressing these challenges head-on, governments can lead with integrity in the evolving digital landscape (Figure 16).

Figure 16: Framework for a Robust National Data Infrastructure



Furthermore, effective digital data infrastructure is essential for realizing the full potential of data-driven regulation and policy making. According to the OECD, regulators are expanding their use of digital tools and big data to enhance their effectiveness. By adopting data-driven regulatory methods, they can streamline processes through automation and provide consumers with real-time insights into sector performance. However, these benefits hinge on regulators having the necessary authority for data collection and publication, along with well-designed data governance frameworks. Additionally, digital tools and improved data access may support a transition toward regulations that focus more on achieving desired outcomes.[4]

Thus, digital data infrastructure is not merely a technical necessity but a strategic asset that underpins modern governance. It enables governments to harness the power of data for improved decision-making, service delivery, and citizen engagement. As the World Bank aptly puts it, “Ultimately, effective data governance is critical for reaching the aspirational goal of an integrated national data system.”[5] As countries continue to navigate the complexities of the digital age, investing in robust, secure, and interoperable digital data infrastructure will be crucial for ensuring effective, responsive, and inclusive governance that meets the evolving needs and expectations of citizens in the twenty-first century.

This chapter provides a comprehensive analysis of Thailand’s existing digital data infrastructure, examining its legal, governance, technical, and operational aspects. We begin by critically assessing the legal frameworks governing data in Thailand, focusing

[4] OECD. 2022. “Communication Regulators of the Future.” OECD Digital Economy Papers, No. 333, OECD Publishing, Paris,

[5] Aligning Data Governance with the Social Contract for Data to Promote Value, Trust, and Equity (English). Analytical Insights, Note 6, Washington, DC: World Bank Group.

on key laws and policies, including those related to data protection and privacy. Next, we analyze the country's data governance structure, evaluating the effectiveness of agencies and mechanisms that guide data management and oversight. We then explore the technical data architectures currently in use and undertake a critical assessment of Thailand's operational capacity to support and optimize these systems. To provide context, we present a comparative analysis of leading data ecosystems globally, highlighting best practices and innovative approaches that could inform Thailand's data strategy. Throughout the chapter, we consider how these elements contribute to Thailand's broader digital economy objectives. Finally, based on our analysis, we offer evidence-based recommendations for modernizing Thailand's data infrastructure to strengthen its alignment with international standards, enhance its competitiveness, and better meet future demands in the rapidly evolving digital landscape.

Some Key Messages for Personal Data Protection in Thailand

1. **Shifting the Burden from Consumers to Organizations**

Thailand's PDPA relies heavily on consumers to manage their privacy through consent and disclosure mechanisms. This approach creates challenges like consent fatigue and is particularly burdensome in a country with varying levels of digital literacy. A more robust framework emphasizing organizational accountability is needed to enhance privacy protections.

2. **Embedding Privacy by Design into Systems**

Unlike the EU's General Data Protection Regulation (GDPR), the PDPA does not mandate Privacy by Design and Default (PbD), leaving businesses without a requirement to integrate privacy safeguards into their operations. Adopting these principles would strengthen the framework, ensuring consumer protections are proactive and systematic.

3. **Achieving EU Adequacy for Seamless Data Flows**

Thailand has yet to achieve EU adequacy status, highlighting gaps in its alignment with GDPR standards. Following Japan's example, Thailand could implement targeted measures to bridge regulatory differences, ensuring smoother international data transfers and enhancing trade opportunities.

4. **Streamlining Compliance with a Centralized Platform**

To simplify PDPA compliance, Thailand should develop a centralized online hub similar to the EU's GDPR portal. This platform could offer updated legal guidance, interactive compliance tools, and ready-to-use templates, reducing the administrative burden on organizations and fostering transparency.

5. **Supporting SMEs with Tailored Resources**

Small and medium enterprises (SMEs) in Thailand face significant challenges in PDPA compliance due to limited resources and knowledge gaps. Industry-specific guidelines, public consultations, and focused educational programs are essential to bridge these gaps and foster a culture of data accountability in this vital economic sector.

6. Strengthening PDPC's Capacity for Enforcement

The limited resources and staffing of the Personal Data Protection Committee (PDPC) hinder its ability to enforce the PDPA effectively. Expanding its budget, increasing personnel, and investing in specialized training would enable the agency to handle complaints efficiently, address data breaches, and rebuild public trust in data governance.

7. Enhancing Cross-Border Data Regulations

Thailand's cross-border data flow rules, including the Whitelist Notification, are a positive step but lack clarity for businesses. A dynamic adequacy model and internationally recognized Standard Contractual Clauses (SCCs) could simplify compliance and enhance global interoperability.

8. Aligning Definitions and Standards with Global Norms

The PDPA's differing thresholds for parental consent and limited coverage of online identifiers create compliance challenges for organizations operating globally. Aligning these provisions with international standards would ensure broader and more consistent data protection.

○ Landscape of Data Regulations in Thailand

As the world becomes more digital, strong data regulations and legal structures are more crucial than ever. As evidenced by global trends, comprehensive data protection legislation is becoming a necessity for countries aiming to safeguard their citizens' privacy while fostering innovation and economic growth. Europe has been at the forefront of this movement with its stringent GDPR,[6] which has had a significant impact on legislation worldwide.[7] While some countries, such as the United States, have opted for less stringent frameworks relying on industry-related best practices, others, particularly in Asia and Oceania, have adopted data governance laws to varying degrees. The implementation of such frameworks is crucial for protecting consumers whose data are collected, treated, shared, or used to develop various products and services.[8]

Despite the recognized importance of data protection laws, many countries face significant challenges in drafting and implementing these regulations. According to the 2016 United Nations Conference on Trade and Development (UNCTAD) surveys, government representatives from 48 countries in Africa, Asia, and Latin America and the Caribbean reported difficulties in understanding legal issues related to data protection and privacy. More than 60 percent of respondents highlighted this as a major obstacle. Furthermore, there is a lack of understanding among parliamentarians (43 percent) and law enforcement bodies (47 percent), which can delay the adoption

[6] What is GDPR, the EU's new data protection law?
[7] Daza Jaller, Lillyana Sophia, and Martin Molinuevo. 2020. "Digital Trade in MENA : Regulatory Readiness Assessment (English)." Policy Research Working Paper WPS9199, World Bank Group, Washington, DC.
[8] Sankaranarayanan,Shalini, Ivan Daniel Mortimer-Schutts, Pratibha Chhabra, Mahesh Uttamchandani, and Martin Holtmann. 2021. *The Emergence of New Data Ecosystems in Financial Services - Recent Developments in South East Asia : Discussion Paper (English)*. Washington, DC: World Bank Group.

and enforcement of data protection laws.[9] These challenges underscore the need for capacity building and awareness-raising among lawmakers and the judiciary to formulate informed policies and laws in data protection and to enforce them effectively.

To address the complexities of data governance, countries need to develop clear and comprehensive legal frameworks that cover various aspects of data protection and cybersecurity. These frameworks should explicitly address issues such as data breaches, data minimization, data localization requirements, data ownership, and liability. It is also crucial for these frameworks to balance the need for data protection with the promotion of innovation and economic growth. For instance, the Digital Economy Partnership Agreement (DEPA) between Singapore, Chile, and New Zealand recognizes the need for international collaboration on matters relating to the digital economy, including data governance.[10] By developing such comprehensive frameworks, countries can create an environment that protects individual privacy, fosters trust in digital services, and supports the growth of a robust data-driven economy.

Thailand's data regulation landscape has undergone significant transformation in recent years, marking a shift from a fragmented regulatory framework to a more comprehensive and internationally aligned system. Historically, the country lacked specific legislation for personal data protection, with regulations scattered across various general laws and primarily focused on state agencies. The landscape has evolved dramatically with the introduction of the Personal Data Protection Act B.E. 2562 (PDPA) in 2019, which came into effect in June 2022, alongside other crucial regulations such as the Computer Crime Act and National Cyber Security Act. This regulatory framework now closely aligns with international standards, particularly the EU's GDPR, establishing comprehensive data protection standards and marking Thailand as one of the most dynamic regulatory environments in Asia. The current regulatory structure, while still decentralized among various agencies, represents a significant step forward in protecting individual privacy rights and fostering the growth of Thailand's digital economy.

○ Data Protection and Privacy Laws in Thailand

1. Personal Data Protection Act B.E. 2562 (PDPA) (2019)[11]

Thailand’s data-sharing landscape underwent a significant transformation with the introduction of the PDPA (2019) that was approved by the National Legislative Assembly in February 2019, was published in the Government Gazette in May 2019, and became fully enforceable in June 2022. This legislation represents Thailand’s first consolidated law governing data protection in the digital age and draws substantial inspiration from the European GDPR. The PDPA establishes comprehensive protocols for data processing, collection, storage, and consent, marking a pivotal shift in how organizations handle personal information. The law’s scope is notably broad, applying to all organizations that collect, use, or disclose personal data in Thailand or of Thai residents, regardless of whether these entities are established under Thai law or maintain a physical presence in the country.

[9] Kelly, et al. 2018. “Information and Communication for Development 2018 : Data-Driven Development (English).” Working Paper 12830, World Bank Group, Washington, DC.
[10] Ibid.
[11] The Personal Data Protection Act B.E. 2562 (2019)

Consent and Data Processing Requirements

A distinctive feature of Thailand's PDPA is its emphasis on consent protocols, which, while influenced by the EU's GDPR, incorporate unique Thai perspectives. Under the current regulations, data controllers and processors must obtain explicit consent from data owners before processing their personal information, and the data can only be used for specifically expressed purposes. The law includes a significant provision regarding historical data: organizations are permitted to continue processing personal data collected before June 1, 2022, provided they maintain the same purpose for which the data were originally collected. However, any expansion or modification of data usage beyond the original scope requires obtaining fresh, specific consent from the data subjects. Data controllers are also obligated to provide clear methods for consent withdrawal, ensuring data subjects retain control over their personal information.

Enforcement and Compliance Measures

The PDPA introduces robust enforcement mechanisms with significant penalties for noncompliance. According to the regulations, violations can result in substantial financial consequences, with administrative fines reaching up to THB 5 million and criminal fines up to THB 1 million. For international organizations, particularly US companies, operating in Thailand, the law emphasizes the importance of maintaining local partnerships and representation. For foreign entities interested in the Thai market, working with local agents, distributors, or representatives is considered crucial, as it facilitates better interactions with government regulators and ensures ongoing compliance with PDPA requirements. The legislation also recommends seeking professional legal advice for specific circumstances, acknowledging the complexity of data protection requirements and the need for expert guidance in maintaining compliance.

On January 11, 2022, the PDPC, which serves as the regulatory body under the PDPA, was established. The PDPC has the authority to develop a comprehensive plan for promoting and safeguarding personal data. It is also responsible for setting measures, standards, and guidelines that businesses must follow as well as issuing supplementary regulations and rules in alignment with the PDPA. Following its enactment, the PDPC released several sub-regulations and guidelines under the PDPA, with additional draft regulations still under review.

2. Sector-Specific Regulations

- **Insurance:** The Notification of the Office of Insurance Commission Re: Rules, Methods for Issuing and Offering of Non-life Insurance Policy for Sale and the Performing of Duty of Non-life Insurance Agent, Broker and Bank B.E. 2563 (2020). The regulation aims to enhance market transparency, strengthen consumer protection, and establish standardized practices in the Thai non-life insurance sector that stores and processes sensitive personal data of their users.
- **Public Health:** The National Health Act B.E. 2550 (2007)[12] safeguards personal health information, prohibiting its disclosure without consent unless exceptions apply.

[12] The National Health Act B.E. 2550 (2007)

- **Telecommunications:** Thailand's National Broadcasting and Telecommunications Commission (NBTC) issued the *Notification of the NBTC Re: Measures to Protect Rights of Telecom Service Users relating to Personal Data, Privacy Rights and Communication Freedom in Telecom B.E. 2566 (2023)* to replace the previous 2006 notification of the same. The replacement notification supports compliance with the PDPA, modernizes the regulations in response to technological change and the convergence of digital business, and enhances the protection of telecommunications users' personal data, privacy rights, and freedoms.
- **Credit Bureau:** The Credit Information Business Act B.E. 2545 (2002)[13] aims to regulate credit bureau companies and credit information transactions, protect the rights of data subjects, and ensure the provision of reliable information to credit information processors. This act also imposes an obligation on private organizations (for example, credit information companies) to disclose or provide credit data or credit scoring information to members of the National Credit Bureau for analyzing credits.
- **Child Protection:** The Child Protection Act B.E. 2546 (2003)[14] provides protection for children, including data related to those under 18 and their parents.
- **Banking and E-payment:** The Payment System Act B.E. 2560 (2017)[15] authorizes the Bank of Thailand (BOT) to issue rules regarding the retention and disclosure of personal data for regulated payment systems and services.

3. Official Information Act B.E. 2540 (1997)[16]

This act aims to promote transparency and accountability in government operations by mandating that state agencies publish and disclose official information to the public. It also establishes mechanisms for individuals to access information and outlines exceptions to disclosure to protect national security, personal privacy, and other sensitive matters. This act mandates that personal information management by state agencies be limited to relevant and necessary objectives, with requirements for transparency, security, and restricted sharing. 'Persons' covered under the law include Thai nationals and foreign residents. Under this law, state agencies are required to collect personal data primarily from the individuals themselves; ensure data accuracy; and establish protocols for individuals to inspect, correct, and, if necessary, appeal the handling of their data. Under this act, disclosure of personal data is tightly controlled, with exemptions requiring either written consent or specific, justified scenarios such as research without identifying information, legal compliance, or public safety. State agencies are also obliged to record and track any disclosures made under certain conditions, with an additional layer of accountability. Individuals hold the right to request access to, correct, or delete personal data related to them and may appeal adverse decisions, with provisions allowing representatives to act on behalf of minors or vulnerable persons. This act imposes obligations on public sector organizations to

[13] The Credit Information Business Operation Act B.E. 2545 (2002)
[14] The Child Protection Act B.E. 2546 (2003)
[15] The Payment System Act B.E. 2560 (2017)
[16] The Official Information Act B.E. 2540 (1997)

make official information accessible for public inspection. It also obligates public sector organizations to share or make accessible non-personal data.

4. Key Notifications and Guidelines by the PDPC

- **Exemption for Small Organizations**

  The Notification Re: Exemption from Maintenance of Records Obligation of the Data Controller Which Is a Small Organization B.E. 2565 (2022)[17] provides relief for small organizations from the requirement to maintain detailed records of processing activities ('RoPA') involving personal data, with some clearly defined exceptions. This exemption recognizes that smaller organizations may lack resources to comply with extensive documentation requirements, reducing administrative burdens without compromising data protection standards.

- **Record-Keeping by Data Processors**

  Notification Re: Rules and Methods for Preparation and Maintenance of Records of Personal Data Processing Activities for the Data Processor B.E. 2565 (2022)[18] specifies the mandatory approach for data processors to keep records of processing activities, aiming to promote transparency and accountability. The notification establishes a clear methodology for data processors to maintain records, thereby supporting effective oversight and compliance with PDPA provisions.

- **Data Controller Security Measures**

  In *Notification Re: Security Measures of the Data Controller B.E. 2565 (2022),*[19] the PDPC outlines essential security requirements for data controllers. This notification mandates technical and organizational measures to protect personal data, including risk assessment, encryption, and regular monitoring, aimed at mitigating risks such as unauthorized access or data breaches.

- **Considerations for Orders to Impose Administrative Fines**

  Notification Re: Rules on Consideration for Issuance of Orders Imposing Administrative Fines by the Expert Committee B.E. 2565 (2022)[20] relates to the rules and procedures for the Expert Committee (which will be appointed under the PDPA) when issuing an order to impose administrative fines or other relevant administrative enforcement measures against those who do not comply with the PDPA.

- **PDPC Complaint Procedures and Requirements**

  The Notification Re: Rules of the PDPC on the Filing, Refusal of Acceptance, Dismissal, Consideration, and Timeframe for the Consideration of the Complaints B.E. 2565 (2022)[21] outlines the procedures for submitting

[17] Notification of the PDPC re: Exemption from Maintenance of Records Obligation of the Data Controller Which Is a Small Organization B.E. 2565 (2022)
[18] Notification of the PDPC re: Rules and Methods for Preparation and Maintenance of Records of Personal Data Processing Activities for the Data Processor B.E. 2565 (2022)
[19] Notification of the PDPC re: Security Measures of the Data Controller B.E. 2565 (2022)
[20] Notification of the PDPC re: Rules for Issuance of Orders of Expert Committee under the Personal Data Protection Act B.E. 2562 B.E. 2566
[21] Rules of the PDPC re: the Filing, Refusal of Acceptance, Dismissal, Consideration, and Timeframe for the Consideration of the Complaints B.E. 2565

complaints, which can be presented to an expert committee either in person, by post, or through electronic means to be detailed by the PDPC office. Additionally, these rules specify the essential information and documentation needed for a complaint to be considered valid.

- **Data Breach Notification Protocols**

  The *Notification Re: Rules and Methods of Personal Data Breach Notification B.E. 2565*[22] requires data controllers to follow prescribed protocols when notifying the PDPC and affected individuals of data breaches. These guidelines detail the circumstances under which a notification is necessary, the required information, and timeframes, ensuring that individuals are informed promptly of breaches affecting their personal data.

- **Security Exemptions for Specific Data Controllers**

  The Notification Re: Security Measures of Personal Data for Data Controllers Exempted from the PDPA B.E. 2562 (2019) B.E. 2566 (2023)[23] provides guidelines for security measures applicable to data controllers exempt from full PDPA requirements. Under Section 4 of the PDPA, entities such as public authorities, media organizations, legislative bodies, the judiciary, and the credit bureau are excluded from PDPA enforcement. However, these exempted data controllers are still legally required to establish security measures to protect personal data. This notification details the specific security protocols these exempted entities must follow, aligning closely with those in the PDPC's 2022 Notification on Security Measures for Personal Data Protection. Key requirements include implementing organizational, technical, and physical protections for personal data, whether in digital or physical form. Additionally, exempted data controllers must ensure data confidentiality, integrity, and availability; enforce security protocols on servers, applications, and software that handle personal data; and apply rigorous access control and user authentication processes. Other mandates cover access restrictions, user accountability, and audit trails for tracking data handling. To further enhance data security, the draft requires ongoing privacy and security training for staff and recommends data protection measures such as pseudonymization and encryption to minimize risks of unauthorized access or processing.

- **Issuance of Orders by Expert Committee**

  The *Notification Re: Rules for Issuance of Orders of Expert Committee under the PDPA B.E. 2562 B.E. 2566*[24] empowers the PDPC's expert committee to issue orders to enforce PDPA compliance. It outlines procedural standards for the committee's orders, including investigation methods, decision-making criteria, and timelines, which reinforces the committee's authority to uphold privacy standards.

[22] Notification of the PDPC on Rules and Methods of Personal Data Breach Notification B.E. 2565
[23] Notification of the Personal Data Protection Committee Re: Security Measures of Personal Data for the Data Controller exempted from the Personal Data Protection Act B.E. 2562 (2019)B.E. 2566 (2023)
[24] Notification of the PDPC re: Rules for Issuance of Orders of Expert Committee under the Personal Data Protection Act B.E. 2562 B.E. 2566

- **Appointment of Data Protection Officers (DPOs) in Public Authorities**

  The *Notification Re: the Data Controller and the Data Processor that Are Public Authorities Required to Appoint a Data Protection Officer B.E. 2566 (2023)*[25] mandates the appointment of a DPO for public authorities handling sensitive personal data, enhancing oversight and accountability in governmental and public sector entities.

- **Criteria for Personal Data Protection Officers**

  In *Notification Re: Personal Data Protection Officers under Art.41(2) of the PDPA B.E. 2562 (2019) B.E. 2566 (2023),*[26] the PDPC defines criteria and responsibilities for DPOs. This notification specifies DPO roles and qualifications, ensuring that appointed officers possess the requisite skills to oversee and manage PDPA compliance effectively.

- **Special Collection Purposes for Historical and Archival Data**

  The *Notification Re: Suitable Measures for Collection of Personal Data for Purposes Related to Historical Documents or Archives*[27] provides tailored guidelines for data collected for archival and historical purposes. This allows organizations to preserve data for these purposes while remaining within a legal framework that respects individual privacy rights.

- **Collection of Criminal Records Data**

  The *Notification Re: Criteria on Protection Measures for Collection of Personal Data Related to Criminal Records B.E. 2566*[28] sets out strict criteria for collecting criminal record data not collected by authorized officials, aimed at preventing misuse and upholding individual rights concerning sensitive personal information.

- **Research and Public Interest Data Collection**

  The *Notification Re: Appropriate Measures for Collection of Personal Data for Scientific, Historical, Statistical, or Public Interest Research Purposes B.E. 2566 (2023)*[29] establishes specific conditions under which personal data may be collected and processed for research or public benefit, ensuring such use respects individuals' privacy rights while enabling important research initiatives.

- **Deletion, Destruction, and De-Identification of Personal Data**

  The Notification Re: Deletion, Destruction, or De-Identification/Anonymization of Personal Data (2024)[30] establishes clear directives for data controllers on

[25] Notification of the PDPC Re: the Data Controller and the Data Processor that Are Public Authorities Required to Appoint a Data Protection Officer B.E. 2566 (2023)
[26] Notification of the Personal Data Protection Committee Re: Personal Data Protection Officers under Art.41(2) of the Personal Data Protection Act B.E. 2562 (2019) B.E. 2566 (2023)
[27] Notification of the Personal Data Protection Committee Re: Suitable Measures for Collection of Personal Data for the Achievement of the Purpose relating to Historical Documents or Archives
[28] Notification of the Personal Data Protection Committee Re: Criteria on the Protection Measures for the Collection of Personal Data relating to Criminal Records which is not carried out under Control of Authorized Official Authority under the Law B.E. 2566
[29] Notification of the Personal Data Protection Committee Re: Appropriate Measures for the Collection of Personal Data for the Achievement of the Purpose relating to Research or Statistics under Section 24 (1) and the Scientific, Historical, or Statistic Research Purposes, or other
[30] Thailand Issues Criteria for Deletion, Destruction, and De-identification of Personal Data

managing personal data requests under the PDPA. By defining data controllers' duties, the notification reinforces individuals' rights to have their data safely handled, erased, or anonymized. The notification also introduces detailed procedures, timelines, and exemptions.

5. PDPC Guidelines and Operational Instructions

- **Complaint Procedures and Timelines**

  The *Rules re: Filing, Refusal of Acceptance, Dismissal, and Consideration of Complaints B.E. 2565* provide standardized procedures for handling complaints, including criteria for acceptance, dismissal, and consideration. These rules include specific timeframes, giving data subjects clarity on the process and timeline for addressing their privacy concerns.

- **Guidelines on Consent and Data Collection**
  - *Operational Guideline Re: Obtaining Consent from Data Subjects under the PDPA* offers best practices for obtaining and managing consent in line with PDPA standards.
  - *Operational Guideline Re: Notification of Purposes and Details of Collection of Personal Data from Data Subjects under the PDPA* requires that data subjects are fully informed about the purposes and scope of data collection, reinforcing transparency.

- **Case Study-Based Guidance for Compliance**

  The *Guideline for Data Controllers and Data Processors: Case Studies from Consultation Concerning Enforcement of the PDPA* provides real-world examples to clarify common issues and challenges in PDPA compliance. These case studies help organizations understand the practical applications of PDPA requirements.

○ Efforts to Strengthen Data Protection

Recently, in response to rising privacy concerns, the PDPC has intensified its push for companies and government agencies to strengthen their data protection efforts. In November 2024, the PDPC revealed a marked increase in privacy complaints, with 342 individuals reporting breaches within just the first nine months of the year. Alarmingly, state agencies accounted for a significant share of these complaints, with 63 reports alleging data mishandling by government bodies. Additionally, industries such as finance, insurance, telecommunications, and online sales have all been implicated in these incidents. To expedite resolution, the PDPC urged entities to adhere strictly to Thailand's PDPA and emphasized that any delays in addressing these issues could result in hefty penalties.

The PDPC is actively working to promote greater awareness of data protection requirements among companies and state agencies, with emphasis on businesses that handle sensitive consumer information. Given the recent, high-profile data breaches, including the exposure of 19.7 million personal records from Thailand's Department of Older Persons on the dark web, public trust in data security has been shaken. To help individuals affected by breaches, the PDPC offers support through its PDPA Centre, where victims can seek guidance in person or online. This initiative underscores the PDPC's commitment to safeguarding personal data in Thailand as it

addresses both the rising volume of complaints and the pressing need for organizations to prioritize information security practices.

○ Personal Data Protection - Recommendations

1. Evaluating Consumer-Centric Limitations in Thailand's PDPA Framework

The criticisms of Thailand's PDPA highlight fundamental limitations in its consumer-centered 'Privacy-as-Control' framework, which predominantly emphasizes disclosure and choice. This approach requires data controllers to inform consumers about their data practices and obtain consent, placing the primary responsibility on individuals to understand complex privacy policies and actively manage their privacy settings. In a context where digital literacy varies widely, this model can create disproportionate burdens on consumers, many of whom may lack the resources or knowledge to effectively exercise their rights. Consequently, this reliance on consumer-driven privacy controls may result in diminished privacy protections, as individuals frequently experience 'consent fatigue' and may bypass disclosures and options without full comprehension.

Furthermore, the PDPA's lack of explicit PbD requirements contrasts with international standards, such as the EU's GDPR, which mandates that data controllers implement privacy safeguards directly in their systems and processes. The absence of PbD provisions in Thailand's PDPA places a greater onus on consumer vigilance rather than requiring companies to embed protective measures in their data handling practices. As a result, the PDPA may fail to adequately safeguard personal data, given that it does not compel companies to proactively address privacy risks at an operational level. Incorporating PbD principles into the PDPA would align Thailand's framework with global best practices and provide a more comprehensive, systematic approach to consumer data protection.

The EU's GDPR also exemplifies a global shift toward organizational accountability in data protection, influencing regulations worldwide through the 'Brussels effect'. Unlike earlier frameworks focused primarily on consumer consent, GDPR mandates comprehensive organizational responsibilities, balancing individual rights with corporate compliance obligations and requiring transparency in data processing. This shift has inspired regulatory changes in regions like the Middle East and North Africa (Qatar, the United Arab Emirates, the Arab Republic of Egypt) and India, where data protection laws emphasize notice requirements, purpose limitations, and corporate accountability. A defining feature of this transition is the expanded jurisdictional scope, requiring organizations to comply if they process data related to individuals within a protected region, regardless of their physical location. Moreover, regulations increasingly demand proactive compliance measures, including comprehensive data protection frameworks, transparency obligations, and preventive measures against breaches. This reflects a broader regulatory paradigm shift, where organizations must demonstrate compliance, integrate accountability into oversight, and take a more active role in enforcement processes, reinforcing a global trend toward stronger institutional responsibility in data governance.

2. EU Adequacy Status[31]

Note that Thailand has not achieved adequacy status from the European Commission, which would formally recognize the country as providing a level of data protection comparable to that of the EU. According to the European Commission's adequacy decisions, while several Asian nations, including Japan and Korea, have received adequacy determinations, Thailand remains unlisted. This omission suggests that, despite its alignment with GDPR principles, Thailand's PDPA may not fully meet the EU's stringent data protection standards. The absence of adequacy status implies that additional safeguards are required for cross-border data transfers between Thailand and EU member states, which could introduce complexities for international business operations and hinder seamless data flows.

3. Unified Online Resource for PDPA Compliance and Assessment

Considering the challenges surrounding the interpretation and application of the PDPA in Thailand, it is imperative to establish a centralized online platform designed to help stakeholders evaluate the implications of the act within the context of their specific circumstances. The lack of comprehensive understanding regarding the diverse facets of the PDPA has resulted in ambiguity for organizations, which can hinder compliance efforts and effective data protection practices.

To address this issue, Thailand could benefit from the development of a 'Single Window of Assessment', akin to the platform implemented by the EU for the GDPR (https://gdpr.eu/). This proposed platform would serve as a comprehensive resource hub, providing stakeholders—including businesses, legal entities, and individual data subjects—with access to updated information and tools that are essential for navigating the complexities of the PDPA.

Key features of the Single Window of Assessment could include the following:

- **Updated Information:** A regularly maintained repository of the latest legal interpretations, amendments, and best practices related to the PDPA, ensuring stakeholders remain informed about their obligations and rights.
- **User-Friendly Checklists:** Interactive checklists tailored to various industry sectors that guide users through the necessary steps for compliance, thereby simplifying the assessment process and enhancing user engagement.
- **Ready-to-Use Templates:** A collection of customizable templates for key documents required under the PDPA, such as privacy notices and data processing agreements, designed to streamline compliance efforts and reduce the administrative burden on organizations.
- **Comprehensive Guidelines:** Detailed guidelines that outline the obligations of data controllers and processors, alongside practical advice on implementing effective data protection measures and risk management strategies.
- **Scenario-Based Tools:** An assessment tool that allows stakeholders to input their unique circumstances and receive tailored guidance on compliance requirements and potential implications of the PDPA.

[31] How the EU determines if a non-EU country has an adequate level of data protection

By establishing such a platform, Thailand could not only enhance the understanding of the PDPA among stakeholders but also foster a culture of accountability and transparency in data protection practices. This initiative would ultimately contribute to effective implementation of the PDPA, ensuring that stakeholders are better equipped to navigate the evolving landscape of data privacy and protection.

4. Enhancing SME Compliance through Industry-Specific Support and Targeted Education

A recent National Electronics and Computer Technology Center (NECTEC) study,[32] based on findings from a December 2021 survey of 384 businesses, highlighted critical compliance challenges among Thailand's SMEs under the PDPA framework. Conducted during a two-year delay in enforcing the PDPA, this data survey revealed a concerning nationwide average compliance score of just 6.19 out of 100, with over half of the SMEs lacking publicly accessible privacy policies. This suggests a gap in awareness and resources for effective PDPA adherence. Since the PDPA's full enforcement in 2022, compliance levels may have improved; however, SMEs in Thailand continue to face substantial hurdles. Limited digital literacy, a general lack of knowledge about business laws, and budget constraints have complicated SMEs' ability to implement necessary data protection measures. Many businesses also struggle to interpret and apply PDPA guidelines, adding to the complexity of achieving compliance.

Additionally, the *Notification Re: Exemption from Maintenance of Records Obligation of the Data Controller Which Is a Small Organization B.E. 2565 (2022)* offers relief to small organizations by exempting them from the requirement to maintain detailed RoPA, with some exceptions. While this exemption recognizes that smaller organizations may lack the resources to comply with extensive documentation requirements, it also introduces potential risks. In 2021, SMEs represented 99.54 percent of all enterprises in Thailand and contributed 34.2 percent to the country's GDP. Many of these SMEs collect sensitive personal data and operate online, which means that exempting them from detailed record-keeping, even with exceptions, might undermine the effectiveness of data protection practices. Therefore, while the exemption may reduce administrative burdens, it is not an ideal long-term solution for ensuring that data protection standards are met across such a large and economically significant segment of Thailand's business landscape.

To enhance PDPA compliance among Thailand's SMEs, the following targeted actions are recommended:

a) Develop Industry-Specific Guidelines

- The PDPC should create compliance guidelines tailored to specific industries, addressing the unique data protection needs of sectors such as manufacturing, retail, and telecommunications.
- These guidelines could draw inspiration from the sectoral resources developed by the Faculty of Law at Chulalongkorn University and supported by industry associations in banking and insurance.

[32] Chatsuwan, P, T Phromma, N Surasvadi, and S Thajchayapong. 2023. "Personal Data Protection Compliance Assessment: A Privacy Policy Scoring Approach and Empirical Evidence from Thailand's SMEs." *Heliyon* 9 (10): e20648. doi: 10.1016/j.heliyon.2023.e20648. PMID: 37886776; PMCID: PMC10597812.

b) Refine Guidelines Through Public Consultation

- Building on the public consultation model supported by the Thailand Development Research Institute (TDRI), the PDPC could gather industry-specific feedback to ensure the guidelines address the practical concerns of SMEs.
- Regular feedback loops with businesses and the public could help continually adapt guidelines to evolving industry practices.

c) Conduct PDPC-Led Educational Programs

- The PDPC should consider launching educational initiatives to address limited digital literacy and clarify PDPA requirements for SMEs.
- These programs could offer focused training on data protection practices and practical guidance for meeting compliance standards.

d) Provide Clear, Sector-Specific Compliance Frameworks

- Tailored, accessible compliance frameworks would simplify the PDPA requirements for SMEs, providing sector-focused checklists or tools to facilitate understanding and implementation.
- Such frameworks would foster a stronger culture of data protection across Thailand's SME sector, helping businesses of all sizes meet PDPA standards effectively.

e) Define Clear Guidelines and Exemptions

- Draft regulations proposing exemptions for certain PDPA provisions, especially for government agencies, lack clarity on safeguarding individual data rights, potentially weakening Thailand's data protection standards. To ensure international alignment and avoid hindering cross-border data flows, the government should refine these guidelines to balance necessary exemptions with robust protections.

5. Define Age for Parental Consent

A notable distinction between the PDPA and GDPR is the age threshold for obtaining parental consent for processing children's data. Under the PDPA, the threshold is set at under 10 years of age, while the GDPR mandates parental consent for children under 16. This difference may have an impact on organizations handling children's data, requiring adjustments in consent processes according to the applicable regulation.

6. Define Personal Data

While the GDPR explicitly includes online identifiers (such as IP addresses and cookies) within its definition of personal data, the PDPA does not directly address these identifiers. This omission may create potential gaps in protection of digital identities and online user behavior, affecting the scope of data subject rights in the online context.

7. Establish DPO Requirements

The PDPA and GDPR also differ in their requirements for appointing DPOs. The criteria and obligations for DPOs under the PDPA may vary, affecting how organizations structure their compliance teams and allocate responsibilities for data protection.

8. Strengthen PDPC Capacity for Effective Data Protection Enforcement

As data protection concerns continue to rise in Thailand, the PDPC faces increasing pressure to ensure data security across both public and private sectors. High-profile breaches, such as the exposure of nearly 20 million records from Thailand's Department of Older Persons, have eroded public trust, with intensified calls for stronger data protection. The PDPC received 342 privacy complaints in just the first nine months of 2024, with a significant number—63—related to mishandling by public sector agencies. In response, the PDPC has intensified efforts to raise awareness and emphasize compliance with Thailand's PDPA, underlining the potential penalties for noncompliance. However, enforcement remains challenging, as over 273 complaints are still pending investigation, revealing constraints in both staffing and resources.

To effectively manage these escalating demands, building capacity within the PDPC is essential. Currently, the PDPC operates with limited staff—below the target of 210 personnel—and is pursuing an additional budget of THB 99 billion to address these gaps. Strengthening the PDPC's resources would enable it to resolve complaints more efficiently; improve enforcement timelines; and proactively develop sector-specific compliance guidelines for industries such as finance, telecommunications, and online retail. In addition, investing in specialized training programs for PDPC personnel will equip the committee with the expertise needed to handle increasingly complex data protection issues. Enhancing the PDPC's capacity not only supports timely enforcement of the PDPA but also helps rebuild public trust in Thailand's data protection framework.

9. Overcoming Sectoral Barriers in Thailand's Regulatory Environment

To effectively address the complexity arising from Thailand's fragmented data protection landscape, especially in the context of cross-sectoral data sharing, a multipronged strategic approach is essential. The current scenario, characterized by the PDPA 2019 and multiple sectoral regulations, creates barriers to cross-sector data sharing, which can be mitigated through a comprehensive framework that prioritizes trust, standardization, and collaborative governance. Policy makers and stakeholders should focus on developing a unified data sharing protocol that establishes clear, consistent guidelines across sectors, potentially through a centralized data governance body that can harmonize different regulatory requirements. This approach should incorporate robust risk mitigation strategies, such as standardized data anonymization techniques, comprehensive consent management frameworks, and transparent data usage agreements that balance organizational data control with the broader societal benefits of responsible data sharing while developing sector-specific data sharing protocols that recognize the unique data sensitivity, collection methods, and regulatory requirements of different domains such as healthcare, finance, education, and public services. Furthermore, creating incentive structures that demonstrate the mutual value of cross-sector data collaboration—such as highlighting potential social impact, economic efficiency, and innovation potential—can help

overcome institutional reluctance and the tendency to over-protect data. By developing a flexible yet rigorous approach that addresses legal complexities, builds inter-organizational trust, and clearly defines data sharing parameters, Thailand can transform its current fragmented regulatory environment into a more dynamic, collaborative data ecosystem that supports meaningful cross-sector partnerships while maintaining robust data protection principles.

10. Strengthening Institutional Accountability through Data Protection Impact Assessments (DPIAs)

The current personal data protection regulatory model in Thailand predominantly emphasizes individual data subject rights, potentially overlooking critical institutional accountability mechanisms. This approach creates a regulatory gap that could compromise comprehensive data protection, particularly in sensitive domains like social protection programs.

A concrete step toward achieving this balance is the incorporation of DPIAs as a risk-based regulatory tool, particularly for high-risk data processing activities. While Thailand's PDPA does not currently require DPIAs, integrating them—either as a regulatory requirement or through strong incentives—would align with global best practices in data governance.

1) Consider Mandatory DPIA Requirements

To enhance data protection accountability, Thailand should implement a comprehensive approach to DPIAs that encompasses developing mandatory guidelines for high-risk data processing activities. This strategy should include creating standardized assessment templates tailored for government agencies, enabling a systematic and uniform approach to identifying, evaluating, and mitigating potential privacy and security risks across different administrative contexts.

2) Specific DPIA Objectives in Complex Data Sharing Contexts

In complex data flow environments, particularly within government-to-person (G2P) data ecosystems, a comprehensive approach is essential to systematically identify and mitigate privacy and security risks through rigorous data minimization principles while simultaneously establishing clear accountability mechanisms for data-handling agencies. This holistic strategy ensures that sensitive information is processed with the highest standards of protection, enabling efficient service delivery while maintaining robust safeguards that prevent unauthorized data access, reduce potential breach risks, and create transparent frameworks for institutional data management responsibilities.

3) Institutional Accountability Mechanisms

To strengthen the data protection accountability framework, organizations should be mandated to develop comprehensive documentation of risk mitigation strategies, coupled with mandatory periodic review and update protocols for DPIAs. This approach could be further reinforced by implementing a dynamic compliance mechanism that offers incentives or imposes penalties based on the quality and effective implementation of DPIAs, thereby creating a proactive and responsive regulatory environment that encourages continuous improvement in data protection practices.

○ Cross-border Data Flow Regulations

On December 25, 2023, Thailand's PDPC published two crucial subordinate regulations regarding the cross-border transfer of personal data under the PDPA. These regulations, known as the Whitelist Notification of the Binding Corporate Rules (BCRs) and Appropriate Safeguards Notification, took effect on March 24, 2024. These regulations define "sending or transferring personal data," specifying that data transit or storage outside Thailand, where a third party cannot access the data, does not constitute a transfer subject to PDPA restrictions. For example, transferring personal data to a cloud service provider without third-party access is not considered a cross-border transfer. Businesses are advised to reassess their data processing activities and contracts to identify any that fall under the defined cross-border transfer, thus triggering PDPA restrictions.

The Whitelist Notification introduces criteria for determining whether a country or international organization has adequate personal data protection standards, necessary for permitting cross-border transfers under the PDPA. Currently, no specific countries have been whitelisted, so businesses should monitor updates from the PDPC or seek an adequacy assessment from the Office of the PDPC. The BCRs and Appropriate Safeguards Notification detail the process for submitting BCRs to the PDPC for approval and outline mandatory provisions and minimum requirements. Businesses should review and potentially revise their existing BCRs to ensure compliance. Additionally, the notification specifies appropriate safeguards, such as SCCs, certifications, and binding instruments between government agencies, which can be used if a destination country is not recognized as adequate. SCCs must either meet minimum required clauses or align with recognized international models such as ASEAN Model Contractual Clauses or EU Standard Contractual Clauses. Given the PDPC's unique interpretation, businesses must verify that their cross-border data transfer measures align with Thai PDPA requirements.

The PDPA B.E. 2562 establishes duties and measures regarding the transfer or transmission of personal data abroad under Sections 28 and 29, with further details provided through two notifications issued by the PDPC ('the Committee') as follows.

- *Notification Re: Criteria for Protection of Personal Data for Cross-border Transfer under* ***Art.28 of the PDPA B.E. 2562 (2019) B.E. 2566 (2023)***[33] pertains to transfers based on adequacy assessments. A receiving country is deemed to have adequate personal data protection standards if it has legal measures or mechanisms for personal data protection that are consistent with Thailand's PDPA and if there is an agency or organization with the authority to enforce laws and regulations related to personal data protection. The adequacy and compatibility of data protection standards in destination countries are subject to evaluation by the PDPC. The Office of the PDPC will issue a list of countries or international organizations with adequate standards for receiving personal data from Thailand. Data controllers may also request a review of standards in additional countries where they plan to transfer personal data.

[33] Notification of the PDPC Re: Criteria for Protection of Personal Data for Cross-border Transfer under Art.28 of the Personal Data Protection Act B.E. 2562 (2019) B.E. 2566 (2023)

- *Notification Re: Criteria for Protection of Personal Data for Cross-border Transfer under* ***Art.29 of the PDPA B.E. 2562 (2019) B.E. 2566 (2023)***[34] covers appropriate safeguards for transfers, including standard contractual clauses. These guidelines aim to ensure that personal data sent abroad receive equivalent protection and cross-border transfers align with international data protection standards. Personal data transfers to foreign countries may proceed if both the data sender/controller and the data recipient are part of the same corporate group and have implemented BCRs, which are intra-group data protection policies. The BCRs must be reviewed and approved by the Office of the PDPC to ensure they meet the legal criteria and standards. These rules must be legally binding on all entities and individuals within the group, including data processors, data senders/controllers, and data recipients. They must comply with personal data protection laws and be binding on personnel, employees, and other relevant individuals. Additionally, the BCRs should include provisions that guarantee personal data protection, uphold the data subject's rights, and offer mechanisms for handling grievances related to data transferred abroad. The BCRs must also implement data protection and security measures in line with legal standards, with security measures meeting the minimum legal requirements. Where there is no adequacy decision regarding the data protection standards of the receiving country or if there is no established intra-group data protection policy, data controllers or processors may still transfer personal data abroad by implementing appropriate safeguards. These safeguards may include data transfer contracts that are recognized as compliant; certifications confirming that the data controller or processor's data collection, use, and disclosure meet accepted standards; and legally binding agreements or instruments ensuring personal data protection between Thailand's government agencies and those of other countries.

○ Cross-Border Data Flow Regulations - Recommendations

Thailand's recent cross-border data flow regulations under the PDPA represent a significant effort to align with international standards while addressing domestic data protection needs. Introduction of the Whitelist Notification and BCRs and Appropriate Safeguards Notification aims to balance stringent data protection with facilitation of international data transfers. However, the absence of designated 'adequate' jurisdictions and detailed compliance requirements pose challenges for businesses, highlighting the need for clear, practical guidance. A comparison with international best practices can provide insights for enhancing these regulations.

As mentioned earlier, one notable best practice is the approach adopted by the EU GDPR. The EU's adequacy mechanism provides a robust framework for determining whether third countries ensure a level of data protection equivalent to that of the EU. The European Commission maintains a dynamic adequacy list and conducts periodic reviews to ensure compliance. Thailand could benefit from adopting a similarly dynamic process, coupled with clear timelines and criteria for adequacy decisions, to provide businesses with predictability and facilitate smoother compliance.

[34] Notification of the PDPC Re: Criteria for Protection of Personal Data for Cross-border Transfer under Art.29 of the Personal Data Protection Act B.E. 2562 (2019) B.E. 2566 (2023)

Furthermore, the use of internationally recognized SCCs under the GDPR is a practical mechanism for cross-border data transfers in the absence of an adequacy decision. Thailand's alignment with established SCCs, such as those from ASEAN or the EU, enhances interoperability and reduces the compliance burden for multinational entities. Additionally, Thailand should establish clear guidelines on the approval, monitoring, and enforcement of BCRs to ensure compliance and reduce regulatory uncertainty.

Japan provides a compelling example of how to address adequacy gaps through targeted measures.[35] To secure its adequacy decision under the EU GDPR, Japan implemented Supplementary Rules to align its domestic Act on the Protection of Personal Information (APPI) with GDPR requirements. These rules introduced enhanced protections for EU residents' data, such as restricting onward transfers to third countries lacking adequate protections, thereby ensuring that data integrity and safeguards are maintained throughout the life cycle. Additionally, Japan introduced specific mechanisms for handling sensitive data to align with the GDPR's stricter standards and bolstered the enforcement powers of its Personal Information Protection Commission (PPC).

Thailand could adopt a similar approach by implementing tailored safeguards to align with key global frameworks. Moreover, the PDPC's role in cross-border compliance enforcement should be further clarified. Given its limited enforcement capacity, Thailand must define how the PDPC will monitor BCRs and SCC implementation and what mechanisms will be in place for ongoing oversight and accountability.

By establishing a transparent adequacy decision-making process, strengthening enforcement mechanisms, and aligning with international SCCs and BCRs, Thailand can enhance its cross-border data transfer framework while maintaining regulatory credibility and international stakeholder confidence. These adaptations would not only facilitate international data flows but also build global stakeholders' confidence in Thailand's data protection regime.

○ Open Data Policies and Regulations

In Thailand, the evolution of open data regulations is rooted in the principles enshrined in the country's legal framework, particularly the 2017 Constitution. While the constitution does not explicitly mention "open government," it strongly advocates for transparency, accountability, and public access to information. Key provisions, such as Section 41, affirm the right of individuals and communities to access public data held by state agencies, thereby ensuring that the government operates transparently. Additionally, Sections 58 and 59 emphasize the importance of public hearings and the right to information, especially in matters that significantly affect the public's welfare. Section 77 further reinforces these principles by mandating the government to ensure public accessibility to laws and engage in stakeholder consultations, thereby embedding good regulatory practices into the fabric of Thai governance. These constitutional provisions provide a solid legal foundation for promoting open government principles and ensure that subsequent legislation aligns with these ideals.

Thailand's commitment to transparency and access to information is further demonstrated by the adoption of its first Official Information Act in 1997. This landmark legislation was introduced in response to growing demands from civil society for

[35] Data Protection Laws and Regulations Report 2024 Japan

greater government transparency. The act established the legal framework for citizens' right to access government information, positioning Thailand as a leader in the ASEAN region regarding access to information (ATI) laws. Although the quality of Thailand's ATI legislation is slightly below the OECD average, as indicated by the Right to Information (RTI) Rating, its early adoption underscores the country's recognition of the fundamental right to information. This legal groundwork has not only reinforced citizens' rights but has also set the stage for subsequent open government initiatives, reflecting Thailand's ongoing commitment to transparency and public participation in governance.

The Information Act of 1997 primarily focused on the disclosure of general information to the public under Sections 7 and 9. This initiative aimed at enhancing transparency within government agencies and ensuring that people could access relevant information. The act emphasized dissemination of information in any format, without specific guidelines on presentation of the data. This approach was designed to create transparency within the agencies, allowing the public to gain insight into government operations and decisions. While the Information Act focuses on public agencies, the Credit Data Business Operation Act B.E. 2545 (2002) imposes an obligation on private organizations (for example, credit information companies) to disclose or provide credit data or credit scoring information to members of the National Credit Bureau for the purpose of analyzing credits.

In addition, the Digitalization of Public Administration and Services Delivery Act, B.E. 2562 (2019) aims to enhance the efficiency and accessibility of public services in Thailand by integrating digital technologies into government operations, ensuring secure and interconnected data management, and promoting transparency and public participation. Section 17 mandates that state agencies disclose non-confidential public data through digital means, facilitating public access and enabling the use of such data for innovation and service development. Section 18 establishes an open government data center within the DGA to coordinate data submission and connection among state agencies, ensuring that disclosed data adhere to international open data standards.

In contrast, the launch of the Open Government Data initiative, following the Cabinet resolution of 2013, expanded the concept of information disclosure by emphasizing the utility of data in creating tangible benefits across various sectors. Unlike the Information Act, the Open Government Data initiative sought to not only improve transparency and democratic participation but also enhance the efficiency of government services, foster public participation, and stimulate innovation by providing data that could be used to develop new products and services. The initiative specified that data should be available in at least Excel, CSV, or ODS formats, making it easier for users to access and utilize the information for various purposes, from improving quality of life to developing new business models.

○ Data Protection, Information Security, and Cybersecurity Practices

1. Cybersecurity Regulations

Thailand's cybersecurity governance framework is underpinned by a series of comprehensive regulations designed to monitor, detect, prevent, mitigate, and manage cyber incidents. Key laws include the Criminal Code, the Computer Crime Act (CCA), the Cybersecurity Act of 2019 (CSA), the PDPA, the Electronic Transactions

Act of 2001, the Financial Institutions Businesses Act of 2008 (FIBA), the Telecommunications Business Act of 2001 (TBA), and the Payment Systems Act of 2017 (PSA).

These laws collectively cover a broad range of cybersecurity aspects such as data protection, e-privacy, trade secrets, data breach notifications, confidentiality, and overall information security. Critical to this regulatory framework is the CSA, which defines Critical Information Infrastructure (CII) sectors such as national security, public services, banking and finance, IT and telecommunications, transportation, energy, public health, and others designated by the National Cybersecurity Committee (NCC). CII organizations, or organizations within these sectors, are mandated to perform risk assessments, establish monitoring mechanisms for cyber threats, and report significant cyber threats to the NCC Office and the Supervising or Regulating Organization (SRO).

Enforcement and oversight are carried out by multiple regulatory bodies. The PDPA Committee and its expert committee oversee data protection compliance, while the BOT regulates financial institutions and e-payment service providers. The Securities and Exchange Commission (SEC) of Thailand oversees securities companies, and the National Broadcasting and Telecommunications Commission (NBTC) regulates telecommunication services. The Cybersecurity Regulating Committee (CRC) plays a pivotal role in coordinating cybersecurity efforts for CII organizations. These organizations must report significant cyber incidents to the appropriate authorities, such as the NCC Office and the SRO, and implement prescribed security measures. For instance, under the PDPA, data controllers must notify the Office of the PDPC within 72 hours of a data breach. Similarly, payment service providers and securities companies must report incidents to their respective regulators as mandated by the PSA and the Securities and Exchange Act of 1992 (SEA). This multifaceted regulatory approach ensures a robust cybersecurity environment aimed at safeguarding Thailand's critical infrastructure and sensitive data.

2. Cybersecurity Act of 2019[36]

The draft CSA emphasizes safeguarding Thailand's digital infrastructure from cyber threats, including malware, cyberattacks, and intrusions, which could disrupt services or national security. A primary focus is on identifying and protecting CII sectors. These sectors include state security, essential public services, finance, IT and telecommunications, transportation, energy, and public health, among others, designated by the NCC to ensure they have comprehensive cybersecurity defenses in place. Both public and private sector CIIs must develop strategies to defend against threats, including the integration of private-public partnerships, consistent response frameworks, and robust cyber incident monitoring capabilities.

The CSA categorizes cyber threats into three levels: non-serious, serious, and critical. Each level specifies the impact on national security, ranging from minor disruptions to potential threats to national stability and public safety. For critical threats, the response may include national emergency protocols. The act mandates that CII organizations establish monitoring and incident response mechanisms aligned with predefined standards. Furthermore, it requires these entities to participate in readiness exercises facilitated by the NCC to ensure effective and timely responses to cyber incidents.

[36] The Cybersecurity Act B.E. 2562 (2019)

3. Key Notifications and Guidelines

- **Policy and Plan on Maintaining Cybersecurity (2022–2027)**[37]

  The NCC's *Notification Re: Policy and Plan on Maintaining Cybersecurity (B.E. 2565-2570)* outlines Thailand's strategic goals and initiatives for national cybersecurity from 2022 to 2027. It promotes comprehensive cybersecurity measures and outlines a national resilience approach, facilitating preparedness against routine and extraordinary cyber threats. This policy mandates that CII operators establish advanced risk assessment protocols, continuously enhance detection systems, and report significant incidents. The strategy calls for strengthening capacities across agencies, fostering a collaborative environment where the public and private sectors align their cybersecurity objectives. Additionally, there is an emphasis on promoting cyber literacy, research, and local innovations in cybersecurity solutions to reduce dependence on foreign technology.

- **Delegation of Power to the Critical Cyber Threat Committee (2022)**

  This regulation by the CRC specifies the authority and responsibilities assigned to the Critical Cyber Threat Committee. By delegating these powers, the regulation aims to streamline decision-making in urgent cybersecurity situations, empowering the committee to act swiftly in response to threats impacting Thailand's critical infrastructure.

- **Appointment of Competent Officials under the CSA (2023)**

  The Office of the Prime Minister's *Notification Re: appointment of officials under the Cybersecurity Act (CSA) B.E. 2566* designates specialized personnel as "Competent Officials" responsible for enforcing cybersecurity measures. These officials are equipped with the authority to investigate, respond to, and mitigate cybersecurity incidents in accordance with Thailand's Cybersecurity Act.

- **Establishment of the National Computer System Security Coordination Center (2021)**

  The NCC's 2021 notification establishes the National Computer System Security Coordination Center (NCSCC) to serve as the core agency for managing national cybersecurity efforts. The NCSCC's duties include coordinating cybersecurity initiatives, supporting public and private sectors, and acting as the primary point of contact for national cybersecurity operations.

- **Computer System Security Coordination Center for Critical Infrastructure (2021)**

  This notification by the NCC defines the roles and responsibilities of the Computer System Security Coordination Center specifically for CII organizations. It outlines protocols for monitoring, managing, and responding to cybersecurity threats within essential infrastructure sectors, ensuring protection against cyber risks that could disrupt national services.

[37] Announcement of the NCC on the Cybersecurity Policy and Action Plan (2022–2027)

- **Criteria and Types of Critical Information Infrastructure Organizations (2021)**

  This notification establishes the types and criteria for organizations classified as CII in Thailand. It designates which sectors are considered essential to national security and must adhere to stricter cybersecurity regulations, as well as the standards for control and regulatory oversight for these organizations.

- **Code of Practice for Government and Critical Information Infrastructure (2021)**

  The CRC's Code of Practice and Standard Framework provides a detailed guideline for maintaining cybersecurity standards within government agencies and CII organizations. This framework includes technical and organizational measures designed to secure systems, mitigate risks, and ensure resilience against cyber incidents.

- **Cyber Threat Levels and Response Measures (2021)**

  The NCC's notification defines the characteristics of different levels of cyber threats and establishes the corresponding preventive, mitigation, and response measures. The framework ensures that each level of threat receives a calibrated response, facilitating prompt action by cybersecurity agencies based on the severity of the threat.

- **Rules and Procedures for Reporting Cyber Threats (2023)**

  This 2023 notification from the CRC establishes the required procedures for reporting cyber threats. It outlines reporting obligations for government agencies and CII organizations, detailing the timelines and protocols for communication to ensure that incidents are promptly reported to the appropriate authorities.

- **Fees and Remuneration for Cybersecurity Operations (2023)**

  The National Cybersecurity Agency's 2023 notification sets forth the criteria and rates for fees, maintenance fees, and service charges associated with cybersecurity operations. This fee structure supports the administrative and operational costs of the agency, allowing for sustainable financing of Thailand's cybersecurity infrastructure.

4. **Cybersecurity Capacity Development**

To address cybersecurity workforce shortages, there is a strategic focus on enhancing skill development. This includes establishing educational programs at all levels, from vocational to doctoral studies, integrating cybersecurity into formal education. Additionally, the government encourages private sector involvement through incentives, fostering a skilled workforce prepared for modern cyber challenges. This approach is intended to create a resilient infrastructure that integrates both national and local cybersecurity solutions while promoting an ecosystem that nurtures homegrown innovation.

These policies and frameworks underscore Thailand's commitment to a robust cybersecurity infrastructure, integrating legal, governance, technical, and operational

capacities essential for protecting the nation's digital assets. This framework aims to mitigate risks, ensure compliance, and promote a secure digital environment, supporting both national stability and economic growth.

5. Cloud-specific Cybersecurity Standards

The *Annex to the Notification of the National Cyber Security Committee Re: Cybersecurity Standards for Cloud Systems B.E. 2567 (2024)* establishes comprehensive cybersecurity standards for cloud systems used by government agencies, regulators, and organizations designated as CII under Thailand's Cybersecurity Act B.E. 2562. This annex outlines a 'Cloud First Policy' for public sector cloud adoption, motivated by the increasing prevalence of cyber threats across various sectors. The framework focuses on two main areas:

- **Cloud Security Governance:** This area encompasses information security policies, the distribution of organizational responsibilities, compliance measures, and collaboration between cloud service customers (CSCs) and cloud service providers (CSPs).
- **Cloud Infrastructure Security and Operations:** This section addresses key issues such as access control, cryptography, human resource security, physical and environmental security, and incident management.

The standards emphasize a shared responsibility model between CSCs and CSPs; introduce classification levels for cloud system impact (low, moderate, high); and provide a structured certification process involving self-assessment, attestation by regulators, and certification by accredited bodies.

○ Cybersecurity - Context and Challenges

Thailand has made notable progress in strengthening its cybersecurity ecosystem. According to the ITU's 2024 Global Cybersecurity Index (GCI),[38] the country has achieved remarkable advancements across all five pillars of cybersecurity: legal measures, technical and procedural measures, organizational structures, capacity building, and international cooperation. Thailand achieved perfect scores in all areas except organizational structures, which are vital for guiding the effective implementation of a national cybersecurity framework. These measures involve fostering collaboration among industry, academia, and civil society to align efforts and avoid fragmented approaches. Despite global strides in adopting comprehensive organizational strategies, Thailand's limited progress in this area underscores the need for cohesive partnerships to harmonize cybersecurity development across sectors.

Despite these achievements, Thailand remains a high-risk country for cyber threats, as reflected in the Check Point 2024 Global Threat Index[39] where it scored 55.8 percent. The rapid adoption of digital technologies, including internet connectivity, online banking, and cloud-based software, has expanded the cyberattack surface. This digital transformation aligns with Thailand's ambition to develop a robust digital economy, but it also raises vulnerability to cyber risks. While the government has prioritized making its digital economy resilient, the shortage of skilled cybersecurity

[38] ITU Global Cybersecurity Index 2024
[39] Check Point 2024 Cyber Security Report 2024

professionals poses a critical challenge. For instance, as of September 2023, only 0.5 percent of Thai bureaucrats were in IT fields, with even fewer specializing in cybersecurity. This talent gap could hinder the implementation and growth of advanced cybersecurity solutions, leaving critical systems and industries more exposed to attacks.

The country's digital transformation, driven by cloud computing, Internet of Things (IoT), and big data, has increased the demand for robust cybersecurity measures. However, the shift toward cloud-first strategies presents unique challenges such as securing data in transit, protecting cloud infrastructure, and managing identities in decentralized environments. Additionally, the rise of digital payments and online transactions, particularly in Southeast Asia, has heightened the risk of cyberattacks targeting payment systems. These trends have spurred the growth of Thailand's cybersecurity sector,[40] with tailored solutions addressing the complexities of emerging technologies. As organizations increasingly recognize the importance of safeguarding digital assets, the market continues to adapt to the evolving threat landscape, although long-term growth will depend on addressing workforce shortages and strengthening organizational collaboration.

○ Cybersecurity - Recommendations

Enhancing and Modernizing Thailand's Cybersecurity Framework: As Thailand accelerates its digital transformation, cybersecurity resilience must evolve to match the growing complexity of cyber threats. The country has already established key regulatory frameworks, including the CSA, the PDPA, and sector-specific regulations, but fragmentation and overlapping mandates present challenges. To address these issues, Thailand should focus on strengthening coordination, streamlining regulatory implementation, and aligning with international best practices while maintaining regulatory clarity and efficiency. A more cohesive, risk-based cybersecurity approach will enhance national security, business continuity, and public trust in Thailand's digital infrastructure.

To achieve this, the following measures should be prioritized:

- **Strengthening Coordination among Existing Regulatory Bodies:** Rather than creating a new unified framework, improve inter-agency collaboration by designating the National Cyber Security Committee (NCSC) as the central coordinating authority while establishing clear jurisdictional boundaries and enforcement responsibilities among different regulatory bodies. This approach should include developing a formal mechanism to prevent regulatory redundancies and conflicting enforcement actions, creating a clear hierarchy of applicable laws and their relationships to each other, and ensuring existing regulatory bodies maintain their specialized functions while operating within a well-defined scope.
- **Establish a Clear Cybersecurity Governance Hierarchy:** Define a structured governance model where
    - The National Cybersecurity Strategy serves as the overarching policy framework,

[40] Thailand Cyber Security Market Size & Share Analysis - Growth Trends & Forecasts (2024 - 2029)

- The NCSC acts as the primary authority overseeing coordination and enforcement, and
- Individual regulations (for example, CSA, PDPA) retain their specific functions but follow harmonized implementation guidelines to ensure consistency.

- **Develop Unified Implementation Guidelines:** Create comprehensive cross-framework implementation guidelines that
  - Clearly define how different regulations interact to eliminate confusion,
  - Establish standardized compliance processes where regulatory requirements overlap, and
  - Implement centralized reporting mechanisms to improve response coordination.
- **Align with International Cybersecurity Standards:** Selectively integrate best practices from international frameworks such as the NIST Cybersecurity Framework (CSF), GDPR, and the NIS Directive, ensuring compatibility with ASEAN regional cybersecurity frameworks while adapting them to Thailand's specific national security and economic needs.

○ Other Regulations

Thailand's Statistics Act, B.E. 2550 (2007)[41] regulates the authority and responsibilities of the National Statistical Office (NSO), along with the procedures for conducting censuses and sample surveys. It also includes provisions for ensuring data confidentiality and sharing. However, the act has become outdated and no longer aligns with current technological advancements, the growing demand for diverse data types, or the need for coordination among newly established agencies. To address these challenges, NSO with the TDRI have proposed an amendment to modernize the legislation.

The proposed amendments aim to enhance the clarity and scope of the law by redefining key terms such as "official statistics," "personal data," and "statistical confidentiality;" updating methods of data collection; and revising penalties for noncompliance. Specific changes to the roles and powers of the NSO and the National Statistical Council are also suggested to streamline their functions and improve governance in statistical processes.

A key objective of the amendments is to balance data collection needs with privacy concerns and public benefits while ensuring statistical integrity, accessibility, and transparency. The revisions are designed to align with international standards, such as OECD guidelines, and support efficient data use for informed public policy decisions. To strengthen the framework, the review incorporates insights from comparative studies of statistical laws in ASEAN countries as well as in the UK, Korea, and Japan.

A critical component of the amendment process involves extensive consultations with stakeholders and the public. Several rounds of engagement are planned to ensure

[41] Thailand's Statistics Act, B.E. 2550 (2007)

that the revised law addresses the diverse needs and concerns of various sectors, fostering a robust and inclusive framework for data governance.

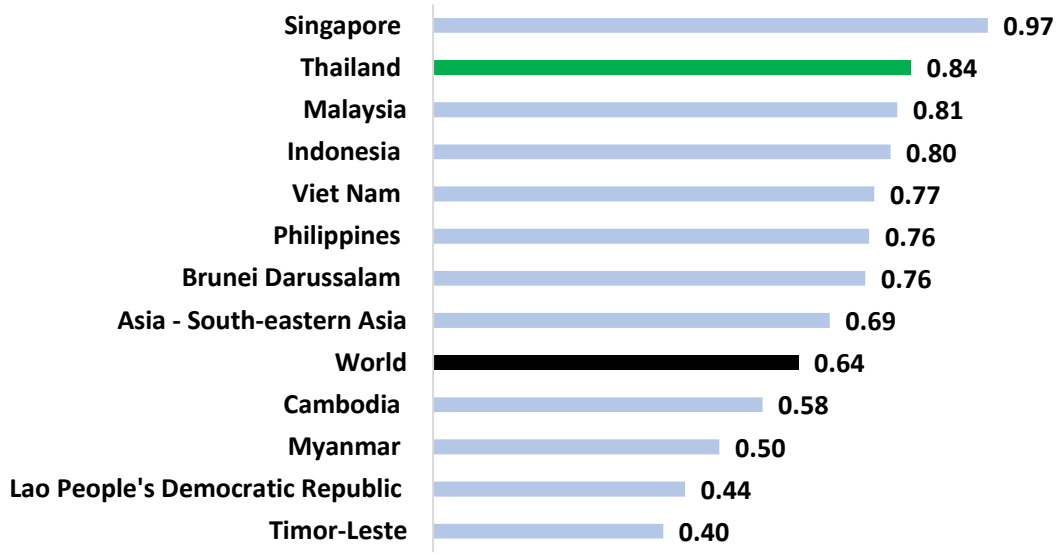
4. Digital Government and Institutional Arrangement

○ Digital Government - Analysis of Progress

The **E-Government Development Index (EGDI)** by the United Nations (UN) is a globally recognized benchmark for assessing how effectively governments use ICT to deliver public services. It comprises three key components: the **Online Service Index (OSI)**, which evaluates the quality, availability, and functionality of digital government services; the **Telecommunication Infrastructure Index (TII)**, which measures the availability and penetration of ICT infrastructure, including internet connectivity and broadband access; and the **Human Capital Index (HCI)**, which reflects education levels and digital skills in a country's population. The data for the EGDI are derived from comprehensive surveys of government websites and other UN databases, enabling countries to gauge their progress in digital governance and identify areas for improvement.

Thailand's EGDI score of 0.8351 in 2024 highlights the country's significant strides in e-government development. This score positions Thailand as a regional leader, second only to Singapore's outstanding score of 0.9691 in Southeast Asia. Thailand has surpassed other regional peers such as Malaysia (0.8111), Indonesia (0.7991), and Viet Nam (0.7709) and is well above both the regional average of 0.6928 and the global average of 0.6382 (Figure 17). Thailand's strong performance reflects its continuous efforts to enhance its digital infrastructure and improve service delivery mechanisms, which are integral to achieving efficient governance in an increasingly digitized world.

Figure 17: UN e-Government Development Index, 2024 - Southeast Asia

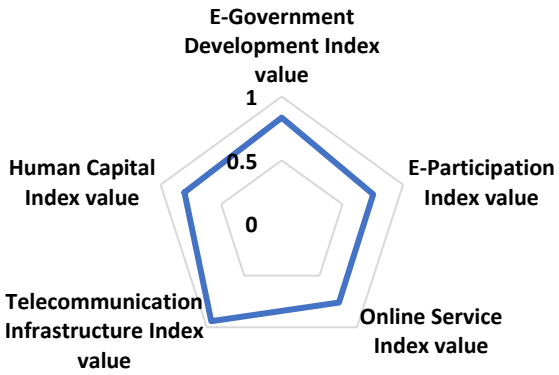


Source: UN e-Government Index 2024.

A key driver of Thailand's success is the remarkable improvement in its **TII**, which reached **0.94101** in 2024, a significant leap from **0.7338** in 2022. This robust growth underscores the country's commitment to expanding internet access, modernizing broadband infrastructure, and bridging the digital divide. Thailand has also maintained a high **HCI score of 0.8032**, reflecting sustained investment in education and skill

development to ensure the population is equipped to participate in the digital economy. Together, these two components have propelled Thailand's EGDI ranking upward, from **55 in 2022 to 52 in 2024**, demonstrating steady progress in enhancing digital governance (Figure 18).

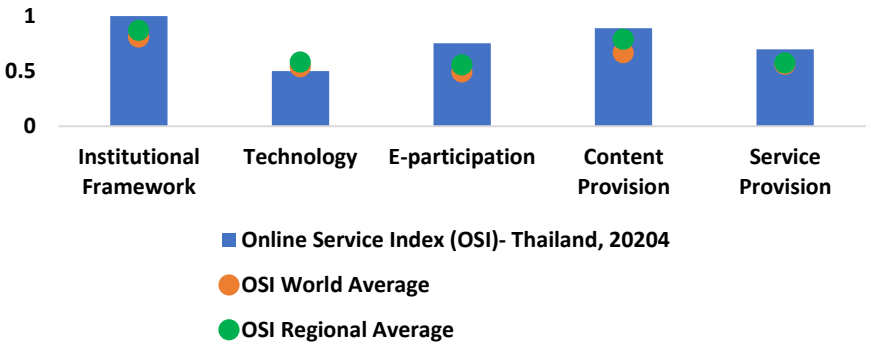
Figure 18: UN e-Government Index - Thailand, 2024



Source: UN e-Government Index 2024.

Thailand's performance in the OSI further emphasizes its strong commitment to providing high-quality digital public services. With scores like 1.0 for Institutional Framework and 0.8889 for Content Provision, Thailand has outperformed both regional and global averages, indicating a well-developed legal and administrative framework for e-governance and comprehensive digital content offerings. However, in the Technology subcategory, Thailand scored 0.5, slightly below the regional average of 0.5795, suggesting room for improvement in integrating advanced technologies such as AI and automation into public service delivery (Figure 19).

Figure 19: Online Service Index (OSI) - Thailand, 2024



Source: UN e-Government Index 2024.

Despite these achievements, challenges remain in the area of citizen engagement. Thailand's **E-Participation Index (EPI)** score of **0.7534** is commendable, far exceeding the global average of **0.4919** and the regional average of **0.5542**, but its ranking dropped significantly from **18 in 2022 to 42 in 2024** (Table 4). This decline may indicate that while the country has robust participatory platforms, other nations are advancing more rapidly in fostering inclusive digital engagement. It suggests a need for Thailand to enhance interactivity, accessibility, and outreach through participatory tools such as open data platforms, citizen consultations, and feedback mechanisms.

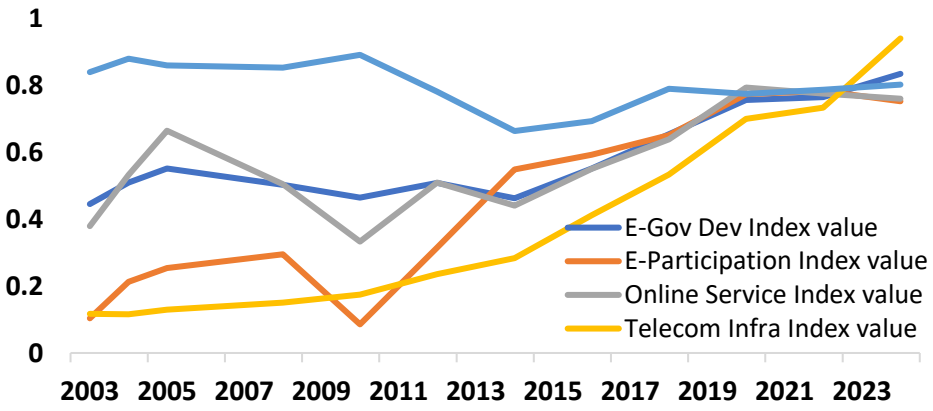
Table 4: E-Government Index (EGDI) and E-Participation Index (EPART), 2024

E-Government (2024 EGDI: 0.8351)	
2024 Rank	52
2022 Rank	55
Change	−3
E-Participation (2024 EPART: 0.7534)	
2024 Rank	42
2022 Rank	18
Change	24

Source: UN e-Government Index 2024.

A historical analysis of Thailand's EGDI performance reveals consistent improvement over the years, particularly in telecommunication infrastructure. For instance, the TII value surged from a modest **0.23608 in 2012** to **0.94101 in 2024**, reflecting decades of investment in modernizing networks and expanding internet penetration. Similarly, the **OSI** has seen growth, though with occasional fluctuations, currently **0.76105**, up from **0.44094 in 2014**, highlighting ongoing efforts to enhance government service delivery (Figure 20).

Figure 20: E-Government Development Index and Sub-Index - Thailand, 2024



Source: UN e-Government Index 2024.

In conclusion, Thailand has emerged as one of the leading nations in Southeast Asia for e-government development, showcasing significant advancements in digital infrastructure, public service delivery, and human capital. However, to maintain its upward trajectory and address emerging challenges, the country must focus on integrating advanced technologies, enhancing participatory mechanisms, and ensuring that digital services remain inclusive and accessible. By addressing these areas, Thailand can strengthen its position as a regional leader in e-government and serve as a model for other developing nations aiming to modernize their governance through technology.

In Thailand, the Office of the Public Sector Development Commission (OPDC) adopted a set of national key performance indicators (KPIs) to ensure all government

agencies meet high standards in the implementation of government initiatives.[42] Digital government transformation is one of the key processes selected for monitoring and evaluation within this framework. Government agencies have been urged to advance digital government under a scheme referred to as 'Government 4.0'. The OPDC created an incentive—the Public Sector Management Quality Award 4.0[43]—to encourage all government agencies to contribute effectively to efforts to transform the country's public services in accordance with the guidelines governing Government 4.0.

Thailand's journey toward a digital government is a testament to its commitment to modernizing public administration, enhancing service delivery, and fostering citizen-centric governance. Spearheaded by the DGA, the country's efforts focus on integrating technology into government operations to create a robust digital infrastructure. This not only improves accessibility and transparency but also strengthens trust between the government and its citizens, a hallmark of effective governance. Below is an in-depth exploration of Thailand's major digital initiatives, contextualized within the broader value of such transformations. Based on DGA's 2023 Annual Report,[44] the following is a summary of some key initiatives and their achievements:

1. Thang Rath Application: Centralizing Public Services

Centralized digital platforms play a transformative role in modern governance by consolidating disparate services into a single access point. This approach not only enhances user convenience but also reduces administrative inefficiencies, fosters inclusivity by broadening access to government resources, and encourages the adoption of digital tools among citizens. Such systems become essential in countries aiming to establish cohesive e-governance structures, bridging gaps between government agencies and the public.

Thailand's **Thang Rath Application** exemplifies these benefits. The app consolidates 128 essential government services, including social security, health insurance, utility payments, and financial support for families. This integration simplifies interactions between citizens and government entities. By 2023, the app recorded over **5.3 million usage instances**, with **656,194 downloads**, showcasing its growing role in everyday public life.

2. LawPortal: Enhancing Public Participation in Legislation

Involving citizens in legislative processes fosters democratic governance and ensures laws reflect public needs. Digital platforms that enable such participation enhance transparency, accountability, and trust in government institutions. By leveraging technology, governments can engage broader audiences, streamline feedback mechanisms, and ensure inclusivity in policy development.

Thailand's **LawPortal** is a pioneering initiative in this domain. It facilitates public feedback on proposed laws, allowing citizens to directly influence policy making. In 2023, the portal opened **1,273 legal issues** for public comment, receiving **200,859 feedback submissions** and attracting **1.8 million website visitors**. These numbers

[42] OPDC. "Strategic Plan of the Public Sector Development B.E. 2564-2565 (2021–2022)" (https://www.opdc.go.th/?lang=en).
[43] "Public sector excellence awards" (https:// www.opdc.go.th/content/Mjc4MQ/?lang=en).
[44] DGA Annual Report 2023.

underscore its critical role in democratizing governance and fostering civic engagement.

3. Open Government Data: DATA.GO.TH

Open data platforms are cornerstones of digital governments, enabling transparency, data-driven policy making, and innovation. By making datasets publicly accessible, governments empower researchers, businesses, and citizens to analyze and utilize information for societal benefits. These platforms also drive accountability by providing insights into government operations.

Thailand's **DATA.GO.TH** platform exemplifies the value of open data. Hosting **10,777 datasets**, it serves as a central repository for government information, supporting initiatives in research, policy analysis, and innovation. With nearly **3.9 million users** and **14.9 million visits**, the platform demonstrates its widespread utility and contribution to transparency and knowledge sharing.

4. Transparency in Government Spending

Public trust in government finances hinges on transparency and accessibility to spending data. Platforms showcasing government expenditure allow citizens to understand how their taxes are utilized, fostering trust and encouraging accountability in public financial management.

Thailand addresses these concerns through the '**Where Do Our Taxes Go?'** platform. By presenting government revenue and expenditure data in easy-to-understand dashboards, it promotes financial literacy and transparency. The platform garnered **1.26 million visits** in 2023, highlighting its effectiveness in enhancing public understanding of fiscal policies.

5. Digital Transcripts: Modernizing Education Documentation

Digitizing academic records streamlines administrative processes in education, reduces costs, and enhances accessibility. Digital transcripts ensure secure storage, simplify verification, and minimize delays in accessing important credentials, benefiting students, institutions, and employers alike.

Thailand's **Digital Transcript service** has been adopted by **82 universities**, allowing for secure issuance of digitally signed academic records. This innovation significantly reduces administrative workloads and paper use, aligning with sustainability goals while improving service efficiency.

6. BIZPORTAL.GO.TH: Streamlining Business Services

Centralized business service platforms reduce bureaucratic hurdles, foster ease of doing business, and stimulate economic growth. Such platforms enable entrepreneurs to access necessary permits and certifications efficiently, enhancing their ability to focus on business development rather than administrative tasks.

The **BIZPORTAL** platform consolidates licensing processes into a single digital system. By 2023, it facilitated the submission of **24,458 license applications** by **16,794 entrepreneurs**, covering **125 types of licenses**. The portal's secure and user-friendly design significantly reduces processing times and improves business satisfaction.

7. SMEOneID: Empowering Small Businesses

SMEs are crucial for economic development and innovation. Digital platforms that support SME registration and link them to government resources enhance their growth potential and integration into formal economies.

Thailand's **SMEOneID** connects over **118,656 entrepreneurs** with government benefits and services, bolstering the SME ecosystem. By streamlining access to resources, the platform promotes entrepreneurship and economic resilience.

8. Digital Entrepreneurs Hub: Enabling Procurement Innovation

Centralized registries of technology entrepreneurs simplify procurement processes for government agencies and encourage innovation. Such platforms ensure that public projects benefit from cutting-edge solutions while offering opportunities to local tech innovators.

The **Digital Entrepreneurs Hub** lists **596 entrepreneurs**, expanding procurement options for government agencies. In 2023, it also highlighted **six innovation prototypes**, demonstrating its role in fostering technological advancements in public projects.

9. Building Capacity through Standards and Training

Establishing digital governance standards ensures uniformity, security, and efficiency across government services. Simultaneously, upskilling government personnel in digital technologies is crucial for sustainable implementation of digital transformation initiatives.

The DGA has developed **33 digital government standards** since 2019, covering areas such as data governance and digital ID implementation. Additionally, the **Thailand Digital Government Academy (TDGA)** trained over **2 million government personnel** in digital skills, preparing the workforce for a technology-driven future.

○ Digital Government - Recommendations

Thailand's digital governance initiatives showcase commendable progress in modernizing public administration and enhancing service delivery. These achievements position Thailand as a frontrunner in e-government within the region. However, a closer examination reveals critical areas requiring attention to fully realize the transformative potential of these initiatives. This evaluation underscores opportunities for improvement in outreach, engagement, innovation, and capacity building to ensure inclusive and sustainable digital governance.

1. Inclusive Reach and Accessibility

The **Thang Rath Application**, which integrates 128 government services, exemplifies the power of digital platforms to centralize and streamline public services. With 5.3 million instances of use and 656,194 downloads, the app has demonstrated a promising start. However, these figures constitute a small portion of Thailand's population, which exceeds 70 million. This disparity points to significant gaps in penetration, particularly among rural populations, marginalized communities, and individuals with limited digital literacy.

Recommendations:

1. **User-Centric Design:** Simplify interfaces with intuitive navigation and visual guides, making the platform accessible for users with varying levels of technological familiarity.
2. **Infrastructure Investment:** Expand high-speed internet access in underserved and remote areas to ensure equitable digital inclusion.
3. **Community Outreach:** Conduct awareness campaigns and digital literacy workshops, targeting underprivileged communities to raise awareness about the app's benefits.

By prioritizing these measures, the **Thang Rath Application** can evolve into a truly universal tool that bridges Thailand's digital divide rather than deepening existing inequities.

2. Enhanced Public Engagement and Transparency

Digital platforms such as **LawPortal** and **'Where Do Our Taxes Go?'** have been pivotal in fostering transparency and public participation. These tools empower citizens to voice their opinions and gain insights into fiscal governance. The impressive metrics—1.8 million visitors to LawPortal and 1.26 million visits to the tax transparency platform—signal growing public interest. However, the volume of feedback (200,859 submissions) remains modest relative to the population, suggesting barriers to broader participation.

Recommendations:

1. **Simplified Access:** Streamline participation mechanisms with features such as automated language translation, mobile-friendly surveys, and voice-based feedback options to lower entry barriers.
2. **Gamification and Incentives:** Introduce gamified elements such as points or badges for active participants and rewards for constructive contributions to foster sustained engagement.
3. **Real-Time Transparency:** Enhance the 'Where Do Our Taxes Go?' platform with real-time updates, interactive charts, and data visualization tools. These features can deepen citizen understanding of government spending and build trust.
4. **Awareness Campaigns:** Leverage social media, influencers, and grassroots organizations to promote these platforms, particularly among younger demographics and rural communities.

Greater public engagement can strengthen democratic participation and promote accountability in governance.

3. Open Data Utilization and Economic Impact

The **DATA.GO.TH** platform's repository of 10,777 datasets and its usage by 3.9 million users reflect Thailand's robust commitment to open data. While these figures are promising, the platform's untapped potential for economic growth and innovation warrants attention.

The **DGA** has launched various initiatives, including hackathons and capacity-building programs, with successful outcomes that should be scaled up. For example, the **DIGI**

Data Camp, established in 2022, has promoted data-driven organizations, engaging over 3,000 participants. Many participating agencies have applied their acquired knowledge to real-world operations, leading to notable success stories such as:

The **Department of Livestock Development** has developed a **Dairy Cow Service data analysis system** to monitor milk quantity and raw milk quality from government sources. This system also identifies key areas and numbers for dairy farming, enabling data-driven planning and strategic development of the dairy sector. It further supports the expansion of services to ensure sufficient milk production to meet public demand.

Thailand Post Co., Ltd. has implemented a **data analysis system for oil consumption and CO_2 emissions** to promote the adoption of electric vehicles. This system provides insights into key factors affecting CO_2 emissions in the transport sector, enabling more informed planning and decision-making. By leveraging data to optimize transport patterns, the initiative supports more effective emissions reduction strategies.

The **Department of Agricultural Extension** has developed a **data analysis system for PM2.5 emissions from agricultural activities**, particularly from burning agricultural waste in plantation areas. This system helps the government formulate strategies and policies through targeted projects and measures, promote the adoption of technology and innovation, and invest in sustainable agricultural initiatives. Additionally, it facilitates economic incentives for the private sector to transition away from agricultural burning, contributing to long-term environmental sustainability.

Recommendations:

1. **Cross-Sector Collaboration:** Forge partnerships with startups, academic institutions, and international organizations to co-create data-driven solutions for pressing societal challenges.
2. **Hackathons and Innovation Challenges:** Continue to organize events to incentivize innovative applications of open data, such as tools for disaster management, agriculture optimization, and urban planning.
3. **Capacity Building:** Offer training workshops on data analytics and visualization to empower businesses and researchers to harness the platform's full potential.
4. **Data Standardization:** Ensure datasets are machine-readable, well-documented, and interoperable to maximize usability.

By positioning open data as a catalyst for innovation, Thailand can stimulate economic growth and strengthen its reputation as a hub for digital entrepreneurship.

4. Business Ecosystem Support

Initiatives such as **BIZPORTAL** and **SMEOneID** play a crucial role in fostering entrepreneurship and supporting Thailand's SMEs, which constitute over 99 percent of businesses. Despite their potential, current engagement metrics (24,458 license applications and 118,656 entrepreneurs connected) indicate room for improvement.

Recommendations:

1. **Simplified Onboarding:** Develop step-by-step onboarding guides and offer live support to help less tech-savvy entrepreneurs adopt these platforms.

2. **Training Programs:** Introduce targeted workshops on e-commerce, digital marketing, and financial literacy to empower SMEs to thrive in the digital economy.
3. **Incentive Structures:** Provide tangible benefits for platform users, such as discounted fees, expedited approvals, or exclusive access to government contracts.
4. **Localized Support Centers:** Establish regional digital hubs offering in-person assistance and training, particularly in provinces with high SME activity.

Through such enhancements, these platforms can become powerful enablers of SME growth and economic resilience.

5. A Future-Ready Workforce

TDGA's training of 2 million government personnel in digital skills marks a significant step toward institutional digital transformation. However, sustaining the momentum and ensuring adaptability in an evolving technological landscape requires continuous investment in skill development.

Recommendations:

1. **Advanced Training Modules:** Expand training to cover emerging fields such as AI, blockchain, and cybersecurity to future-proof the workforce.
2. **Citizen Digital Literacy:** Launch nationwide campaigns to promote digital literacy among the general population, with a focus on youth, the elderly, and informal sector workers.
3. **Public-Private Partnerships:** Collaborate with tech companies and educational institutions to design and deliver cutting-edge training programs.
4. **Monitoring and Evaluation:** Implement mechanisms to regularly assess the impact of training programs and adapt them to changing needs.

Building a digitally fluent workforce is essential for sustaining Thailand's digital governance efforts and unlocking new opportunities for innovation and growth.

Thailand's achievements in digital governance underscore its potential as a regional leader in e-government. However, addressing challenges such as digital inequality, limited public engagement, and underutilized platforms is crucial for maximizing impact. A holistic approach—encompassing infrastructure development, user-centered design, targeted capacity building, and innovation-driven initiatives—will ensure these efforts translate into long-term socioeconomic benefits. By prioritizing inclusivity, transparency, and adaptability, Thailand can set a global benchmark for digital governance.

○ Institutional Arrangements

Thailand's data infrastructure and regulatory landscape are managed by a variety of specialized agencies, each focusing on different facets of digital technology, data privacy, telecommunications, cybersecurity, competition, and sector-specific regulation. Below is an overview of the key agencies involved in the governance of data and digital infrastructure in Thailand.

1. Key Regulatory Bodies

The institutional arrangements for data governance in Thailand involve three key regulatory bodies: the Personal Data Protection Committee (PDPC), the National Cyber Security Committee (NCSC), and the Cybersecurity Regulating Committee (CRC). Each of these bodies plays a crucial role in ensuring compliance with respective data protection and cybersecurity laws and regulations.

1) Ministry of Digital Economy and Society (MDES)

The MDES is the central authority responsible for shaping and overseeing Thailand's digital transformation. It plays a critical role in defining the country's digital policies, promoting technology adoption, and ensuring the integration of digital infrastructure within the broader economy. The MDES supervises several important agencies, including the ETDA and the Office of the PDPC), which focus on specific aspects of digital and data regulation.

Structure and oversight of MDES

The MDES not only leads Thailand's digital transformation but also plays a foundational role in coordinating efforts across various regulatory and supporting agencies.

The Act on the Reorganization of Ministries, Sub-Ministries, and Departments (No. 17), B.E. 2559, Chapter 8/1, Section 21/1 stipulates that the MDES is responsible for planning, promoting, developing, and conducting operations related to the digital economy and society, meteorology, statistics, and other government functions as prescribed by law for the MDES or departments under its jurisdiction.

Currently, the MDES comprises the following departments:

1. Office of the Minister
2. Office of the Permanent Secretary
3. Meteorological Department
4. National Statistical Office
5. Office of the National Digital Economy and Society Committee.

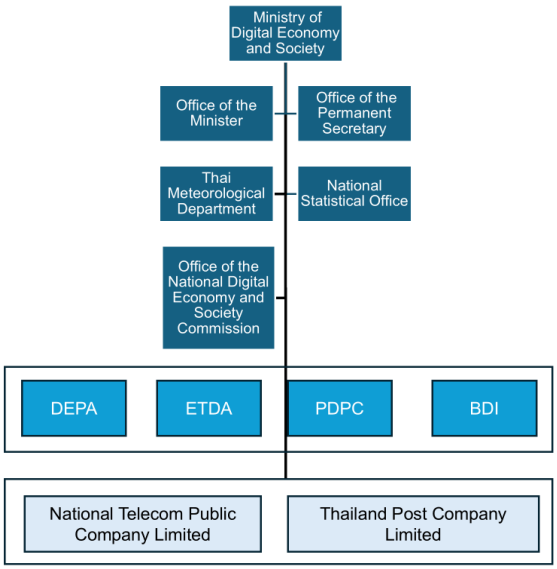
State enterprises under the ministry include two entities:

1. National Telecom Public Company Limited
2. Thailand Post Company Limited.

The ministry also supervises four agencies:

1. Digital Economy Promotion Agency
2. Electronic Transactions Development Agency
3. Office of the Personal Data Protection Committee
4. Big Data Institute (Public Organization).

Figure 21: MDES's Organizational Chart



Source: MDES.

Office of the ETDA

The ETDA is a key agency under the MDES, tasked with overseeing the development and regulation of electronic transactions in Thailand. It plays a vital role in ensuring secure and efficient digital interactions by setting standards for the national digital ID and e-signature authentication. The ETDA also regulates digital platform services, ensuring that online businesses adhere to national standards. In certain sectors, such as finance, specific agencies like the BOT or the SEC take on additional regulatory roles.

Personal Data Protection Committee

Officially established on January 18, 2022, the PDPC is moderately active in its regulatory functions. The committee is responsible for overseeing the implementation and compliance with the PDPA. This includes overseeing compliance with data privacy regulations, resolving disputes, and fostering trust in the country's data governance system. It regularly conducts public consultations before issuing sub-regulations and publishes various educational infographics to raise public awareness about the PDPA. The PDPC is accessible for discussions and consultations on PDPA compliance and accepts complaints from data subjects. In 2023, the expert committee under the Office of the PDPC issued several administrative orders against government authorities and business operators. However, these orders are communicated to data controllers and processors without publicly naming specific companies. Both criminal and civil cases have been initiated by data subjects in Thai courts. For the upcoming year, the PDPC has drafted a national data protection promotion and safeguarding plan for 2024–2027, with a focus on strengthening law enforcement and promoting data protection awareness. The PDPC's mandate extends to cross-border data transfers, ensuring that data handling practices in Thailand meet international standards for privacy protection.

National Broadcasting and Telecommunications Commission

The NBTC is an independent regulatory agency responsible for the governance of Thailand's telecommunications sector. It regulates the operation of telecom

businesses, issues licenses for both public and private telecommunications entities, and oversees the competitive dynamics within the market. The NBTC's work is aimed at ensuring fair practices and maintaining service quality across the sector. Beyond telecommunications, the NBTC also regulates the broadcasting, television, and satellite orbit access industries. As an independent state agency established under the Constitution, it is tasked with allocating and supervising frequency usage, regulating radio communication equipment, overseeing the operation of broadcasting, television, and telecom businesses, and managing satellite orbit access. Its overarching goal is to maximize national benefits while ensuring users receive high-quality, efficient, reliable, and fair services. The NBTC Office serves as its administrative arm, supporting the agency in fulfilling its legally mandated responsibilities.

National Cyber Security Committee and Cybersecurity Regulating Committee

These committees are tasked with implementing the Cybersecurity Act B.E. 2562 (2019). They regularly issue sub-regulations to detail compliance requirements under the CSA. While both regulators have issued warnings and requested cooperation, no specific court cases have been publicly reported yet. The NCSC and CRC are moderately active, and their enforcement priorities for the next 12 months include implementing policies and operational plans to address cybersecurity threats efficiently. The framework for 2022–2027 emphasizes preventing and mitigating cyber threats through stricter enforcement of laws, particularly focusing on CII organizations to comply with the newly established standards. The NCSC is responsible for managing national cybersecurity and protecting Thailand's critical infrastructure from cyber threats. This includes defending the country's economic and national security interests from cyberattacks that may target key sectors, such as energy, finance, and government services. The NCSC coordinates efforts to safeguard against cyber risks, develop security frameworks, and ensure resilience in the face of emerging digital threats.

2) Office of Trade Competition Commission of Thailand (TCCT)

The TCCT is responsible for promoting fair competition across all sectors of the Thai economy, including the digital and platform-based markets. It prevents anti-competitive practices that may harm consumers or disrupt market equilibrium. The TCCT plays an essential role in regulating the digital economy, particularly in areas where competition may be distorted by monopolistic behavior, such as in e-commerce, online platforms, and digital services.

3) Bank of Thailand

The BOT is the primary regulatory body overseeing Thailand's financial sector, with a particular focus on ensuring the stability and safety of financial institutions. It establishes best practices for financial organizations and plays a key role in mitigating risks that could negatively affect the economy. The BOT also works to modernize the financial sector through initiatives such as digital payments and the adoption of new technologies, ensuring that the financial system remains secure and efficient.

4) Securities and Exchange Commission

The SEC is tasked with regulating the Thai capital markets, ensuring that securities trading, investments, and financial transactions comply with the country's laws and standards. It is responsible for overseeing business conduct, fundraising activities, and financial transparency, and it safeguards investors from fraudulent or deceptive

practices. The SEC also supervises the growing market for digital assets, helping to regulate cryptocurrency exchanges, initial coin offerings (ICOs), and other digital asset-related activities to ensure their integrity.

5) Other Agencies

Data governance and stewardship within the public sector in Thailand are orchestrated by four key players, each with distinct roles in ensuring the effective management of data. The OPDC leads the charge in driving policy for data linkage and establishing performance indicators. The DGA plays a critical role in overseeing data governance and managing the Open Data Platform, as mandated by the Digitalization of Public Administration and Services Delivery Act (2019). The Thai NSO fosters knowledge sharing among government agencies and is pivotal in establishing the Government Data Catalog, where it also serves as the Registrar. Additionally, government and local government sectors are responsible for supplying data to users and stakeholders.

This data governance framework is built on three core elements: the governance structure, the definitions and rules, and the governance process. High-level executives within each agency appoint individuals to lead these efforts, ensuring that strategies and objectives are clearly defined; the governance environment is assessed; and data definitions, rules, and policies are thoroughly clarified. Regular audits are conducted to guarantee compliance, reinforcing the framework's effectiveness and sustainability.

In addition to the key regulatory bodies outlined above, *Table 5* provides a detailed overview of the main agencies tasked with implementing specific aspects of Thailand's data policy. These agencies, along with the relevant laws governing their mandates, play critical roles in ensuring the effective operationalization of Thailand's digital and data strategies (Table 5 and Table 6).

Table 5: Laws and Roles, Main Agencies in Data Policy Implementation

Main Agencies	Relevant Laws	Roles
Office of the Digital Economy and Society Committee	Digital Development for Economy and Society Act B.E. 2560 (2017)	Driving policy under the National Digital Economy and Society Committee, as well as specialized committees for advancing the data strategy
Digital Government Development Agency (Public Organization)	Digitalization of Public Administration and Services Delivery Act, B.E. 2562 (2019)	1. Support the integration of digital services within government agencies. 2. Monitor and evaluate the performance in accordance with the DGDP. 3. Establish a central data exchange system.
Office of the Personal Data Protection Committee	Personal Data Protection Act B.E. 2562 (2019)	Data protection regulatory authority
Office of the National Cybersecurity Committee	Cybersecurity Act B.E. 2562 (2019)	Cybersecurity regulatory authority
National Statistics Office	Digitalization of Public Administration and Services Delivery Act, B.E. 2562 (2019)	Government data reporting agency

Table 6: Laws and Roles, Supporting Agencies in Data Policy Implementation

Supporting Agencies	Relevant Laws	Roles
Electronic Transaction Development Agency (ETDA)	Electronic Transactions Act B.E. 2544 (2001)	Promoting and regulating electronic transactions

Supporting Agencies	Relevant Laws	Roles
Digital Economy Promotion Agency (DEPA)	Digital Development for Economy and Society Act B.E. 2560 (2017)	Promoting the development and adoption of digital technologies
Big Data Institute (Public Organization)	Royal Decree on Establishment of the Community Organization Development Institute (Public Organization) Act, B.E. 2543 (2000)	Driving big data innovation and utilization in Thailand

2. Digital Governance Framework - Analysis and Recommendations

Thailand's governance structure for digital infrastructure and data is characterized by a layered and comprehensive approach involving multiple agencies with specific mandates. While this ensures specialization and focus, it also creates challenges related to coordination, redundancy, and enforcement. Below is a critical evaluation of the governance structure:

Strengths of the Governance Structure

1) Comprehensive Framework:

- The presence of distinct agencies such as the MDES, PDPC, NCSC, and CRC demonstrates a detailed division of labor that covers various facets of digital infrastructure, including cybersecurity, data protection, and telecommunications.
- Oversight by both general (MDES) and specialized agencies (ETDA, NBTC, and so on) ensures depth in policy design and enforcement.

2) Focus on Key Sectors:

- Agencies such as the BOT and SEC cater to highly sensitive sectors such as finance and capital markets, providing targeted regulation for areas prone to disruption.
- The NCSC's focus on CII is critical for national security and economic stability.

3) Alignment with International Standards:

- The PDPC's efforts to align cross-border data transfer policies with international privacy standards enhance Thailand's credibility and ability to engage in global digital trade.
- Agencies such as the SEC and BOT provide frameworks for integrating emerging technologies such as cryptocurrency and digital payments, aligning with global trends.

4) Centralized Leadership by MDES:

- The MDES acts as a linchpin for digital transformation, driving policy coherence and overarching strategy across different regulatory bodies.
- The inclusion of public-private partnerships and state enterprises (for example, National Telecom Public Company Limited) demonstrates efforts to foster synergy between governmental objectives and market forces.

5) Public Engagement and Transparency:

- Initiatives such as public consultations by the PDPC and regular updates from the NCSC and CRC reflect a commitment to transparency and inclusivity.

Challenges and Weaknesses of the Governance Structure

1) Fragmentation and Overlap:

- The large number of agencies with overlapping mandates (for example, cybersecurity roles of the NCSC and CRC or digital platform regulation by the ETDA and TCCT) may lead to inefficiencies and unclear jurisdictional boundaries.
- Coordination across these agencies is critical but may be challenging given their diverse focuses and priorities.

2) Enforcement Gaps:

- Moderate activity levels reported for the NCSC and CRC suggest potential enforcement gaps, especially in a rapidly evolving threat landscape.
- Lack of transparency in enforcement, as seen in the PDPC's approach of not publicly naming violators, might weaken accountability and deterrence.

3) Limited Cross-Sector Integration:

- While individual sectors (for example, finance, capital markets) have tailored regulations, there may be insufficient integration across these sectors to address systemic risks and interconnected vulnerabilities.
- The dual role of the MDES as a policy maker and coordinator could result in bottlenecks, particularly if subordinate agencies work in silos.

4) Capacity and Resource Constraints:

- Some agencies, such as the PDPC and DGA, are relatively new or moderately active, suggesting potential limitations in operational capacity or resources to meet their ambitious mandates.
- The reliance on voluntary compliance and warnings (for example, by the NCSC and CRC) may reduce the perceived seriousness of regulations.

5) Regulatory Burden on Businesses:

- Businesses operating in multiple sectors (for example, e-commerce or telecommunications) may face complex and overlapping regulatory requirements from agencies such as the ETDA, NBTC, and TCCT, increasing compliance costs and potentially stifling innovation. To minimize regulatory overlap and reduce compliance burdens, regulators should clearly define their authority and establish structured coordination mechanisms, ensuring that domain experts take the lead in cross-sector issues—for example, the capital market regulator relying on the relevant agency's rules for digital transactions. Additionally, regulatory frameworks should be aligned with overarching standards, such as those set by the National Cyber Security Agency (NCSA), to promote consistency and reduce fragmentation.

6) Public Awareness and Adoption:

- While educational campaigns by the PDPC are commendable, broader public understanding and trust in data governance and cybersecurity frameworks remain crucial for their success.

Comparative Analysis of Existing Systems

Table 7: Analysis of Success from Selected Countries

Country	Key features
Estonia	• **X-Road Infrastructure:** Pioneering secure data exchange platform that enables seamless communication between public and private entities, forming the backbone of Estonia's digital governance[45] • **Comprehensive Digital Coverage:** 100% of government services from birth registration to marriage and now even separation, are available online 24/7.[46] • **Mandatory Digital ID System:** Universal digital identification system implemented since 2002, with approximately 1.2 million electronic ID cards enabling secure access to services[47] • **Efficiency Gains:** Some estimates claim that Estonia reduced bureaucracy resulting in savings of 844 years of working time through digitalization. • **Secure Mobile Access:** Addition of smartphone-based secure access to government services considerably enhanced accessibility. • **Interoperability Platform**: Decentralized database system enabling secure data exchange between existing systems[48]
Singapore	• **Quick and Secure Data Access:** The Government Data Architecture (GDA) enables access to quality data within 7 working days, ensuring efficient cross-agency collaboration.[49] • **Cloud-First Approach:** 70% of eligible government systems are targeted to be hosted on commercial cloud platforms, promoting scalability and cost-effectiveness.[50] • **Automated Data Infrastructure:** The Data Infrastructure in a Box (DIAB) system accelerates deployment and maintenance of data infrastructure on Government Commercial Cloud, streamlining agency operations.[51] • **Digital Utility Stack:** Advanced soft infrastructure enables seamless digital transactions, including digital identity verification, e-payments, and data exchanges.[52] • **Pre-filled Services:** As part of its Digital Blueprint, 100% of government services are designed to be pre-filled with government-verified data, enhancing user experience.[53] • **Smart Nation Initiative:** Operates at a national scale, leveraging Singapore's advantage as a city-state with a single layer of government to drive comprehensive digital transformation.[54] The approach involves purchasing services from technology startups rather than simply offering grants, fostering a more sustainable tech ecosystem.[55]

[45] Estonia's Digital Strategy Shines in the 2024 UN E-Government Report
[46] Finally 100% Digital: Estonia's 30-Year Journey from the USSR to e-Estonia
[47] Estonian e-Government Ecosystem: Foundation, Applications, Outcomes
[48] Estonia's Digital Transformation: Mission Mystique and the Hiding Hand
[49] Bringing Data into the Heart of Digital Government
[50] Digital to the Core, and Serves with Heart
[51] DIAB
[52] Singapore - Country Commercial Guide
[53] Digital Government
[54] Smart Nation: The Way Forward
[55] Singapore is Seeking Business with Startups to Spur Them

Country	Key features
	• **Smart Nation Sensor Platform (SNSP):** This is a crucial component of the Smart Nation initiative, serving as a whole-of-government technology platform. The platform translates data from sensors and IoT devices into situational awareness of urban spaces in Singapore.[56]
Korea, Rep.	• **Network Infrastructure Excellence:** First country globally to achieve nationwide 5G coverage in 2019, with plans already in motion for 6G development[57] • **Comprehensive Data Sharing:** Operates a 'National Data Sharing Platform' that efficiently manages government agency data for extraction, refinement, processing, and utilization[58] • **Open Data Access:** Provides citizens with access to approximately 87,000 open datasets through their national portal, promoting transparency and innovation[59] • **Digital Platform Government:** Constantly refining its digital transformation strategies, covering artificial intelligence, data infrastructure, and industrial ecosystem development[60] • **Data Protection Framework:** Maintains strong data asset protection measures while establishing standardized systems for data transactions and distribution[61]
Denmark	• **Global Digital Leadership:** Consistently ranks at the top of the UN E-Government Survey, leading the world in digital government services and infrastructure[62] • **Holistic Digital Transformation:** Excels in delivering user-centric digital transformation of public services, ranking in the top 10 across all six OECD Digital Government Index criteria[63] • **Strong Digital Foundation:** Maintains robust digital infrastructure that effectively supports comprehensive online services and public sector digitalization[64] • **Advanced Planning Approach:** Implements a sophisticated social and political approach to digital government planning, moving beyond traditional e-government frameworks[65]

3. Digital Transformation Insights for Thailand: Learning from Estonia, Singapore, Korea, and Denmark

Based on the analysis of digital government implementations in these leading countries, here are some strategic recommendations for Thailand's digital transformation journey:

1) Comprehensive Strategic Recommendations

1.1 Integrated Digital Infrastructure

Thailand should prioritize developing a robust, secure, and interoperable digital infrastructure inspired by these successful models:

- Implement a decentralized data exchange platform similar to Estonia's X-Road.

[56] Smart Nation Sensor Platform (SNSP)
[57] Digitalization: Government-Driven, Infrastructure-First Approach
[58] New Journey to Digital Platform Government Korea's Strategy for Government Innovation
[59] South Korea leverages open government data for AI development
[60] What is "Digital Platform Government"?
[61] Korea to Come up with the Roadmap of Digital ROK, Realizing the New York Initiative
[62] Denmark ranked as the world's top government for digitalisation
[63] Denmark has the second most digital public sector globally
[64] Denmark, Finland and South Korea top the 2022 UN e-government ranking
[65] Changes in planning approach: a comparative study of digital government policies in South Korea and Denmark

- Create a national digital identity system with robust security protocols.
- Develop a whole-of-government data-sharing platform that ensures seamless inter-agency collaboration.

1.2 Citizen-Centric Digital Services

Drawing from Singapore and Estonia's approaches, Thailand should focus on

- Aggressively digitizing government services with 24/7 online accessibility,
- Pre-filling government services with verified citizen data, and
- Ensuring services are designed with user experience as the primary consideration.

1.3 Technology and Innovation Ecosystem

Inspired by Singapore's Smart Nation approach, Thailand could

- Create a national digital transformation strategy with clear, measurable objectives;
- Develop a startup-friendly ecosystem that encourages technology innovation; and
- Implement a 'government as a platform' model that purchases services from innovative local tech companies.

1.4 Advanced Digital Infrastructure

Learning from Korea's network excellence, Thailand should

- Accelerate 5G and prepare for future 6G network infrastructure,
- Develop a comprehensive national data-sharing platform, and
- Create an open data portal with extensive, accessible datasets.

1.5 Governance and Regulatory Framework

Drawing from Denmark's sophisticated approach, Thailand must

- Establish a robust legal framework for digital government transformation,
- Develop standardized data protection and privacy regulations, and
- Create a holistic digital government strategy that goes beyond traditional e-government models.

2) Key Implementation Strategies

2.1 Phased Approach: Implement digital transformation in strategic phases, learning and adapting continuously.
2.2 Stakeholder Engagement: Involve citizens, private sector, and academic institutions in the digital transformation process.
2.3 Continuous Learning: Establish mechanisms for ongoing skill development and technological adaptation.
2.4 Investment in Human Capital: Train government employees in digital skills and innovative service delivery.

5. Data Infrastructure and Innovation in Thailand

○ Introduction

Data innovation and infrastructure have become fundamental pillars for evidence-based policy-making and development effectiveness in modern governance. The World Bank emphasizes the critical role of data collection and management systems that can effectively inform policy decisions and measure progress across various development initiatives.[66] This includes developing robust data infrastructure that enables the collection, storage, and analysis of both traditional and alternative data sources. Particularly important is the emphasis on open-access data products, tools, and approaches, coupled with open-source technological solutions that are simple and replicable across different contexts[67] and allow for effective data use and reuse. These innovations in data infrastructure not only help identify gaps in existing datasets but also enable strategies to overcome data limitations through alternative sources.

The value of data innovation extends beyond mere collection to include the democratization of data access and usage across multiple stakeholders. The World Bank advocates for data infrastructure that can bridge the gap between innovation and users through co-productive approaches and user consultations, ensuring that data systems serve both public and private sector needs. This includes creating partnerships across public, private, nongovernmental organizations (NGO), and academic sectors to develop cross-sectoral and collaborative teams that can maximize the utility of data resources. Furthermore, data infrastructure must be complemented by training and capacity development components for users, enabling various stakeholders—from government agencies to NGOs, banks, insurance companies, and agribusinesses—to leverage data for better decision-making and operational efficiency. This comprehensive approach to data innovation and infrastructure development helps ensure that investments in data systems deliver greater impact and contribute to broader development objectives.

○ Data Innovation in Thailand

Thailand's data innovation agenda is supported by several government agencies, each playing a pivotal role in driving digital transformation and leveraging data for public sector development. At the forefront is the **DGA**, tasked with advancing digital government frameworks, focusing on data integration and innovation to improve public service delivery, and reporting directly to the Office of the Prime Minister. Also supporting Thailand's data agenda is the **MDES**, which oversees national digital policies and leads strategic digital transformation initiatives across sectors. Another critical player is the **NSO**, responsible for managing and innovating Thailand's statistical data systems to enhance evidence-based decision-making. The **DEPA** further complements these efforts by promoting digital innovation and fostering cross-sectoral adoption of transformative technologies.

In addition to these lead agencies, other institutions bolster the country's data innovation ecosystem. The **NECTEC** drives research and development in

[66] A Roadmap to SupTech Solutions for Low Income (IDA) Countries (English). Fintech Note, no. 7 Washington, D.C.: World Bank Group.
[67] Universal Financial Access 2020 : Lessons for the Future (English). Washington, D.C.: World Bank Group.

technological infrastructure, with a focus on data-driven solutions. Meanwhile, the **OPDC** supports data-driven governance initiatives, coordinating public sector reforms and improving the integration of data for enhanced service delivery. Together, these agencies collaborate on key initiatives such as Government Big Data Analytics, Open Government Data, Digital Service Infrastructure, Data Integration Platforms, Digital ID Systems, and E-Government Services. Despite the ongoing evolution of Thailand's digital landscape, this cohesive and integrated framework reflects the government's commitment to fostering data-driven innovation and enhancing digital capacity across all sectors.

- **Leadership in Digital Government Transformation: Exploring the Role of the DGA**

The **DGA** traces its origins to 1997, with the establishment of the Government Information Technology Services (GITS) under the Ministry of Science and Technology. In 2011, the Electronic Government Agency (EGA) succeeded GITS, operating under the Ministry of Information and Communication Technology (later renamed the Ministry of Digital Economy and Society). The EGA emphasized modernizing Thailand's e-government services to ensure transparency, efficiency, and accessibility for the public. By 2017, its focus expanded to creating a **'Smart and Open Government'** through secure, integrated, and systematic digital solutions, connecting data across sectors to improve public administration.

In 2018, the DGA was officially established under the Office of the Prime Minister, tasked with **'Transforming Government to the Digital Age'.** It became the central agency driving Thailand's digital government transformation, supporting public organizations with modern IT solutions. In 2023, the DGA rebranded itself as a **'Smart Connector',** collaborating with all sectors to integrate digital government into everyday life. This shift reflects its commitment to enhancing Thailand's global competitiveness and improving quality of life through innovative, accessible, and impactful digital solutions.

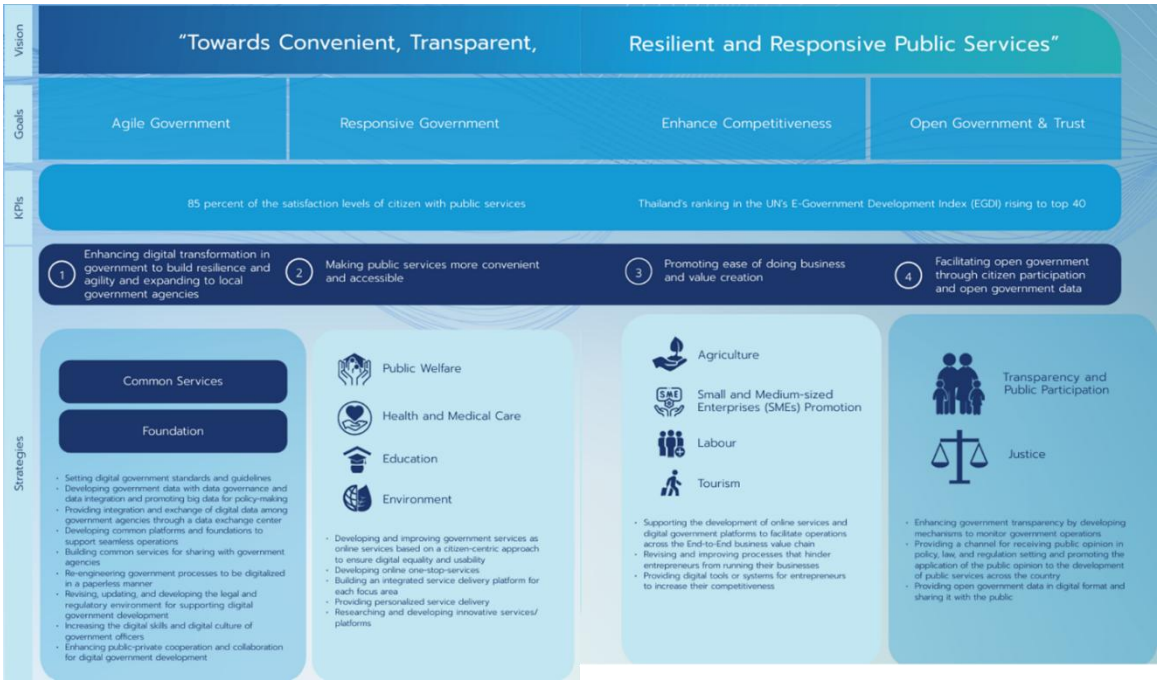
The DGA is focused on digitizing the operations of the Thai government. Its mission includes setting goals and standards, establishing best practices, and training government employees to enhance digital governance. The DGA aims to make government services more accessible and efficient for citizens through various digital initiatives. The DGA also works on improving data security and promoting the use of digital platforms for public services.

- **Digital Government Development Plan 2023–2027**[68]

The recent **Thailand DGDP 2023–2027**, prepared by the DGA, approved by the Cabinet on February 28, 2023, and effective from April 11, 2023, envisions **"convenient, transparent, modern government services that meet the needs of the people."** The plan aims to enhance public sector services, reduce inequality, increase business competitiveness, promote transparency through open information sharing, and support public participation. It seeks to position the public sector as adaptive, innovative, and foundational to Thailand's economic and societal progress (Figure 22).

[68] แผนพัฒนารัฐบาลดิจิทัล-ราชกิจจา.pdf; Thailand Digital Government Development Plan 2023-2027

Figure 22: Plan Overview



Source: Digital Government Development Plan (2023–2027).

The Plan outlines **four key strategies**:

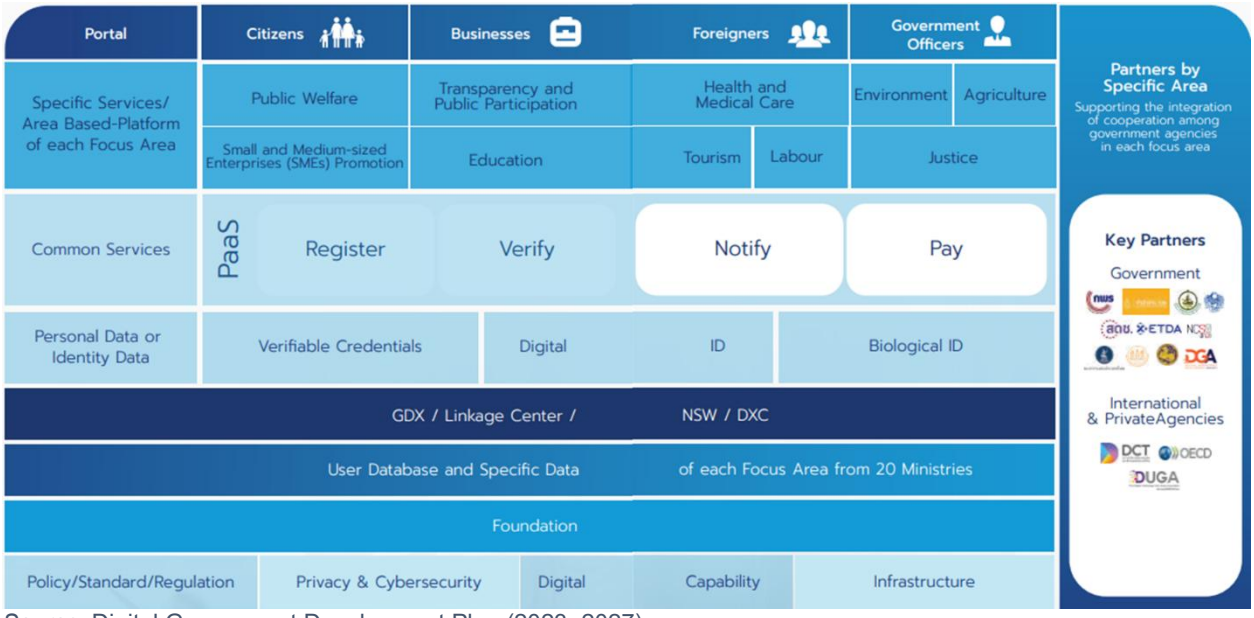
- **Strategy 1:** Enhance the digital transformation of the public sector for flexible and agile administration and expand to local government agencies.
- **Strategy 2:** Develop convenient and easily accessible services.
- **Strategy 3:** Create added value to facilitate the business sector.
- **Strategy 4:** Promote public participation and disclose open government data.

To ensure effective implementation, the plan focuses on **10 development areas**: education, health, welfare rights, environment, agriculture, tourism, SMEs, labor, justice, and public participation. Success requires integration and cooperation across all government agencies to align with national goals, delivering tangible benefits and meeting global standards.

- **Digital Government Framework**

As part of the DGDP (2023–2027), the DGA published its conceptualization of Thailand's Digital Government Framework (Figure 23). It illustrates a structured approach to digital transformation, integrating services for citizens, businesses, foreigners, and government officers through a cohesive platform-based model. The framework recognizes six elements or components fundamental to the successful delivery of the government's ambitious digital agenda, aiming to ensure comprehensive, secure, and innovative service delivery.

Figure 23: Digital Government Framework



Source: Digital Government Development Plan (2023–2027).

The foundational component encompasses soft and hard elements such as infrastructure, security, human capacity, and governance (policies, standards, and regulations).

The second component comprises data infrastructure that includes some of Thailand's government data-sharing systems complemented by data from 20 ministries. The data-sharing platforms that are envisioned to be a part of this component are the following:

1. **Government Data Exchange (GDX)** serves as a cornerstone in Thailand's digital transformation journey, designed to centralize and standardize the exchange of information between government agencies. It is an essential platform that streamlines operations, fosters interoperability, and enhances public service delivery by enabling secure and efficient data sharing *[more details in **Government Data Exchange Center**].*
2. **National Single Window (NSW)**[69] is an integrated digital platform designed to streamline trade, logistics, and customs processes by enabling seamless data exchange among government agencies and businesses. Established as part of Thailand's commitment to international standards and regional integration, the NSW facilitates the electronic submission and real-time tracking of import/export documents, significantly reducing processing times and costs. It serves as a centralized hub for connecting stakeholders, enhancing efficiency, and supporting paperless customs operations through its alignment with the ASEAN Single Window framework. By promoting interoperability, reducing trade barriers, and fostering compliance with global standards, the NSW strengthens Thailand's role as a regional trade hub and boosts its competitiveness in the global economy.
3. **Linkage Center (Population Database Integration System and Government Services)**[70] is a centralized digital infrastructure initiative led by the Ministry of

[69] National Single Window
[70] Linkage Center

Interior that interconnects various government databases through citizens' 13-digit ID numbers. Established through multiple Cabinet resolutions, it serves as a unified platform where different government agencies can access and verify citizens' information (such as civil registration data, ID card photos, marital status, and biographical data) without requiring citizens to submit physical documents. This system represents Thailand's effort to modernize public services, reduce bureaucratic paperwork, and improve government efficiency by allowing authorized agencies to access verified citizen data through a secure gateway, with proper permissions and controls in place. As of the document's date, it had successfully connected 74 databases, with another 66 in progress, demonstrating Thailand's commitment to digital government transformation and improved citizen services.

4. **Data Exchange Center (DXC),**[71] overseen by the Office of Justice Affairs (OJA) under the Ministry of Justice, serves as a centralized platform for inter-agency data sharing to enhance the efficiency and effectiveness of the justice system. Designed to break down silos and streamline access to critical information, the DXC facilitates seamless and secure data exchange among key agencies, such as the police, courts, correctional facilities, and other justice-related entities. Its primary objectives include supporting law enforcement with real-time data, integrating and standardizing datasets across government bodies, and expediting judicial processes by reducing redundancies and delays. Additionally, the DXC strengthens transparency and accountability in the justice sector while ensuring compliance with privacy and data protection standards. As part of Thailand's broader digital transformation initiatives, the DXC plays a vital role in promoting data-driven decision-making (DDD) and improving public service delivery in the realm of justice and law enforcement.

The third building block of this framework entails offering key services that support both government operations and citizen engagement. These services include the preparation and submission of application forms (Register), enabling citizens to track the status of their requests and receive notifications, and a verification system (Verify) that uses digital ID and single sign-on for secure access across various platforms. Additionally, the platform supports e-payment through the national e-payment system, facilitating secure, low-cost, and convenient digital transactions such as money transfers via the PromptPay system. These integrated services aim to streamline government processes, improve citizen experience, and enhance the efficiency of public administration.

The fourth component envisions the provision of specific services focused on 10 key areas: Education, Health, Agriculture, Public Welfare, Public Participation, SME promotion, Environment, Labor, Tourism, and Justice. These services aim to streamline access to government functions through a **Central Portal**, which connects digital services from various agencies into a unified platform. This one-stop service system is tailored to meet the diverse needs of four main user groups: the general public, businesses, foreigners, and government entities, ensuring easy access to information, services, and government monitoring across sectors.

[71] Data eXchange Center

The fifth component involves the identification of key government agencies that would be responsible for leading the implementation of the above components. Several key agencies are expected to collaborate to advance Thailand's digital government initiatives, including the Ministry of Digital Economy and Society (MDES), National Economic and Social Development Council (NESDC), Office of the Public Sector Development Commission (OPDC), Office of the Civil Service Commission (OCSC), Comptroller General's Department (CDC), Department of Provincial Administration (DOPA), National Cyber Security Agency (NCSA), Budget Bureau (BB), and Electronic Transactions Development Agency (ETDA). These agencies are expected to work together to support digital transformation across the government and drive development in the 10 priority focus areas, ensuring comprehensive and coordinated efforts.

Lastly, captured as the final layer or interface of the implementation of this framework, the DGDP identifies four key user or beneficiary groups:

1. **Citizens**: Tailored services include public welfare, SME promotion, and transparency in governance, enabling individuals to access support and participate in the national economy effectively.
2. **Businesses**: It emphasizes promoting transparency, public participation, education, and economic growth opportunities.
3. **Foreigners**: Key focuses are health and medical care, tourism, and labor services to cater to international stakeholders.
4. **Government Officers**: The model aims to incorporate solutions for environmental protection, agriculture, and justice to optimize governance efficiency.

- **Critical Assessment of the Digital Government Framework**

Implementation Gaps: In the case of Thailand, the gap between policy formulation and practical implementation represents a significant challenge. While the DGDP (2023–2027) presents a comprehensive and well-structured vision for digital transformation, the reality on the ground reveals substantial operational hurdles. For example, in the past, the lack of willing pilot agencies to test and demonstrate standards for digital systems created a chicken-and-egg problem, where the absence of successful examples made other agencies hesitant to adopt new practices. The use of central platforms has also been marred by the absence of standardized procedures and criteria, leaving agencies without clear operational guidelines for implementation. Perhaps most critically, the human capital gap—manifested in government personnel's limited knowledge and skills in crucial areas such as security—undermines the plan's execution. These implementation challenges reflect a broader pattern seen in many digital transformation initiatives where theoretical frameworks, despite their sophistication, stumble when confronting practical realities, institutional inertia, and capacity constraints within the bureaucratic ecosystem. The situation underscores how success in digital government initiatives depends not just on well-crafted policies but on building practical implementation capacity, creating demonstrable success stories, and developing human resources that can effectively bridge the gap between policy vision and operational reality.

Long-term Adaptability of Digital ID: As envisioned in the DGDP, Thailand's Digital ID system should not only focus on addressing current challenges but also ensure long-term adaptability and inclusivity. Beyond interoperability, the system must prioritize data privacy and security by adopting a privacy-by-design approach, where citizen data are safeguarded through encryption and decentralized storage solutions, minimizing risks of breaches and building trust. While biometric verification is already implemented, the system should complement it with alternative authentication methods, such as one-time passwords (OTPs) or physical tokens, to cater to citizens with diverse levels of digital access. Inclusivity must remain a core focus, with provisions for citizens who lack access to smartphones or digital literacy. Assisted mechanisms, such as public kiosks or community service points equipped with necessary infrastructure, can ensure equitable access. The system should also serve as a gateway to broader digital empowerment by integrating with services such as financial inclusion initiatives (for example, enabling e-wallets or credit access) and other critical public platforms.

Prioritizing User Needs: The framework's agency-driven approach highlights a critical gap in prioritizing the needs of its end users, including citizens, businesses, and foreign stakeholders. By focusing primarily on the operational requirements of government agencies, the system risks overlooking the diverse capabilities, expectations, and challenges that users face. A user-centric approach would place greater emphasis on understanding and addressing these needs, ensuring that the framework delivers accessible, intuitive, and practical solutions that enhance user experience. Without shifting the focus to the people and organizations it is designed to serve, the framework may fail to achieve its full potential in driving digital transformation and fostering trust in government services.

Lacking Emphasis on AI/ML: The framework lacks a clear emphasis on leveraging advanced technologies such as artificial intelligence (AI), machine learning (ML), or other innovative tools to enhance efficiency, accuracy, and security. These technologies have the potential to transform government services by automating routine processes, enabling DDD, and improving service delivery through predictive analytics and personalized user experiences.

PaaS Component: Platform as a Service (PaaS) is a cloud computing model that offers a complete development and deployment environment in the cloud. In true PaaS, developers get access to a framework they can use to develop, customize, and deploy applications. The platform typically includes operating systems, development tools, database management systems, middleware, and infrastructure software. The key characteristic of PaaS is that it removes the complexity of managing underlying infrastructure while providing developers with robust tools and services to build and deploy applications efficiently.

Based on the description provided in the DGDP, this component appears to be more of a Service-Oriented Architecture (SOA) or a Government Service Platform rather than a true PaaS. The components described—registration services, notification systems, identity verification, and payment processing—are pre-built applications and services that other government agencies can consume. These could in fact be more accurately described as Software as a Service (SaaS) offerings or microservices, as they do not provide a development platform or environment where agencies can build and deploy their own applications. Instead, they offer ready-to-use functionalities that can be integrated into existing systems. The focus is on service delivery and

integration rather than providing a development platform, which is the core purpose of PaaS.

Accelerating Expansion of Government Data Center and Cloud (GDCC): Based on the strategic vision outlined by Thailand's National Telecommunications (NT),[72] the Thai government should prioritize a phased, comprehensive approach to expanding its GDCC capacity. The current infrastructure of over 40,000 virtual machines supporting 800 government agencies provides a robust foundation,[73] but immediate investments are needed to enhance data integration capabilities and overcome existing siloed data limitations. Specifically, the government should allocate dedicated budget and technical resources to rapidly develop the Cloud Management Platform (CMP), ensuring seamless interoperability between existing government data centers and new cloud systems.[74] This will require close collaboration with global cloud service providers and other hyperscale cloud providers to develop standardized API protocols that enable secure, efficient data sharing across different government agencies.

GDX: The GDX platform enables inter-agency data sharing through APIs, including features such as the Laser Code API for identity verification. While it is functional, its design suffers from inefficiencies that could likely hinder optimal performance, explained in detail in the section ***Government Data Exchange Center***.

Legislative Support: In light of Thailand's ongoing efforts to enhance digital data infrastructure, we recommend adopting key provisions from Estonia's Public Information Act to systematically improve data interoperability and sharing across public sector agencies. Specifically, Thailand should legislate a comprehensive framework that prohibits redundant data collection by mandating a centralized 'base data' concept, where each data element has a single, authoritative source. This approach would not only reduce administrative inefficiencies but also minimize data inconsistencies across government systems. By establishing a mandatory inter-agency consultation process involving IT coordination, data protection, and statistical bodies during the creation or modification of public sector databases, Thailand can ensure that new data systems are designed with inherent interoperability, standardization, and privacy protection from their inception.

Furthermore, we recommend that Thailand develops secondary legislation similar to Estonia's model, which comprehensively defines critical infrastructure components such as classification systems, geodetic frameworks, address detail standards, information system security measures, and a robust data exchange layer. Such a holistic approach will create a structured, legally mandated ecosystem for data sharing that goes beyond mere technical specifications. By legally embedding these interoperability principles, Thailand can transform its current fragmented data landscape into a cohesive, efficient digital infrastructure that promotes transparency, reduces duplication, and enables more effective public service delivery. The proposed framework would serve as a strategic blueprint for digital governance, positioning Thailand as a regional leader in innovative public sector data management.

[72] GDCC Launches Marketplace to Integrate Platform Services and Applications for the Government Sector
[73] Thailand gears up toward full-scale cloud government next year
[74] NT reiterates its role in leading technology to support the government's transition to the digital era

- **Key DGA Initiatives**

1) Government Data Exchange Center

The GDX platform, developed by Thailand's DGA, serves as a central digital infrastructure for facilitating seamless data exchange between government agencies.[75] This platform functions as a cornerstone of Thailand's digital government transformation, specifically designed to enable the exchange of digital registry data and documents between various government departments. The GDX platform is particularly significant as it forms part of Thailand's broader digital governance framework, working in conjunction with the Thai Government Information Exchange Standard Development Framework (TGIX) to improve data and information exchange across government entities.[76]

At its core, the GDX platform operates as a centralized system for exchanging crucial government data, including citizen registry information and legal entity data.[77] The platform's primary objective is to enhance the efficiency of government services by enabling digital document exchange and reducing redundancy in data collection across different agencies. This digital infrastructure is accessible through gdx.dga.or.th, where authorized government users can access and exchange necessary information.[78] The implementation of GDX represents a significant step forward in Thailand's e-government services, ultimately aimed at improving service delivery to Thai citizens while maintaining secure and standardized data exchange protocols between government agencies.

Core Purpose and Functionality

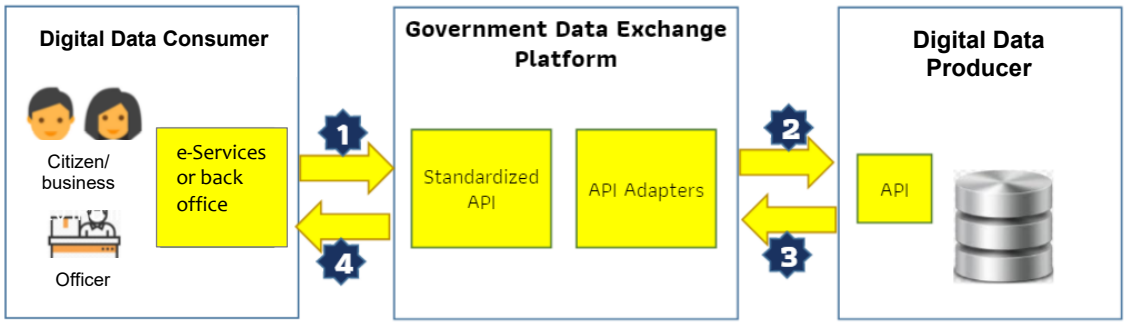
GDX was conceptualized to act as a centralized digital hub, enabling the exchange of information and documents between government entities (Figure 24). By facilitating **real-time data sharing** and **digital integration**, GDX aims to

- Eliminate redundancies in data collection by government agencies;
- Ensure seamless exchange of digital information to improve service delivery; and
- Enable the 'once-only principle', where citizens or businesses provide their information just once, reducing administrative burdens.

Beyond government agencies, GDX also improves interactions with the private sector, fostering efficient public-private collaborations.

[75] GDX Service Introduction
[76] Thailand: Data governance profile
[77] Public Organization Information Center
[78] Government Data Exchange Center [GDX]

Figure 24: GDX Technical Characteristics



Source: https://www.dga.or.th/our-services/digital-platform-services/gdx/

Technical Implementation

Key System Components and Architecture Overview

1. **Data Exchange Core (GDX Core):**
   - The GDX Core is the central system responsible for managing data linkages and exchange requests between agencies. It uses APIs to allow secure machine-to-machine data transfer.
   - It supports **RESTful Web Services** and adheres to HTTPS protocols for secure communication.
   - Data are transmitted and received in **JSON format**, which ensures lightweight and fast processing.
   - The architecture emphasizes modularity, allowing agencies to add or remove datasets without significant reconfiguration.
2. **Smart Card Integration:**
   - Agencies primarily access personal data through **national ID cards** using **smart card readers**. These devices are easy to procure and cost-effective.
   - The smart card readers enable agencies to extract and digitize ID card data, reducing the reliance on physical document submission.
   - The **Laser Code** feature on ID cards acts as an additional verification layer, ensuring the accuracy and authenticity of retrieved data.
3. **User Authentication and Authorization:**
   - The platform employs a multilayered authentication mechanism:
     - **Consumer Key and Consumer Secret:** These credentials, issued during agency registration, validate API access.
     - **Token-based Authentication:** Tokens are generated after validation and have a limited life-span (for example, 60 minutes) to enhance security.
   - Users must register with their respective agency administrators for role-based access control, ensuring that only authorized personnel can access sensitive data.

4. **Data Linkage Management:**
    - The **Linkage Management System** serves as the hub for monitoring, controlling, and approving data-sharing requests across agencies.
    - Agencies can view available datasets through the **Data Catalog/Dictionary**, which provides metadata and API documentation for seamless integration.
    - The system ensures compliance with Central Registration Office regulations, particularly for sensitive datasets such as population registration.
5. **Data Transfer Protocols:**
    - The platform uses HTTP status codes to communicate the success or failure of API calls and binary data, such as images, use **Base64 encoding** for compatibility.
6. **Administrative Tools:**
    - **Organization Administrator Panel:** Enables central agency admins to manage users, approve access rights, and monitor API usage.
    - **Linkage Center Super User:** Provides advanced controls for managing agency-specific privileges and datasets.
7. **API Development and Integration:**
    - The GDX platform supports direct integration with agency systems via APIs:
        - **RESTful API Standards:** Enable data exchange in a stateless, secure manner.
        - **GovAMI Compatibility:** The GovAMI program allows agencies to connect using citizen rights for additional data layers.
    - Developers can utilize sample source codes and technical guides available in C#, JSON, and Base64 encoding to simplify integration.
8. **Compliance and Governance:**
    - Agencies must adhere to strict guidelines for data protection, ensuring accuracy and preventing unauthorized access.
    - Data usage is governed by memorandums of understanding or formal agreements with data owners such as the Department of Business Development (DBD) or the Bureau of Registration Administration (BORA).

Recommendations for Enhancement

The GDX platform enables inter-agency data sharing through APIs, including features such as the Laser Code API for identity verification. While it is functional, its design suffers from inefficiencies that could likely hinder optimal performance:

1. **Authentication and Access Control**

    The system uses token-based authentication with static tokens that expire every 60 minutes, requiring frequent manual re-authentication. This process is

rigid, lacks scopes for granular permissions, and relies on outdated methods such as physical PINs and card readers, adding unnecessary complexity.

2. **Audit and Transparency Gaps**

   Unlike systems such as Estonia's X-Road, which logs every data transaction for transparency, GDX lacks robust logging and audit mechanisms to track data access, approvals, and usage. GDX seems to capture basic logs, however they do not seem to be as sophisticated.

3. **API Design Limitations**

   Based on the limited documentation we were able to access, GDX relies on synchronous GET requests with seemingly limited error handling and no clear versioning strategy. This outdated approach limits extensibility, scalability, and security, making it less adaptable to evolving needs.

4. **Manual Processes**

   Time-intensive workflows, such as letter-based approvals and physical verifications for data access requests, slow down operations and increase administrative burdens, contradicting the goals of digital transformation.

Proposed Solutions

To address these limitations, we propose the following solutions, offering them as flexible options for consideration:

1. Enhancing Authentication with OAuth 2.0 and OpenID Connect

Since GDX already uses OAuth 2.0, its implementation could be optimized to include advanced features such as **scopes** and **refresh tokens**.

- **OAuth 2.0**: Allows users to grant limited access to their data through scoped tokens, specifying permissions for different data types. For example,
  - read:citizen_address permits read-only access to address data, and
  - write:citizen_record enables updates to citizen records.
- **OpenID Connect**: This is a layer on top of OAuth 2.0 that enables secure user authentication, ensuring identity verification via trusted third parties.

The use of scoped tokens provides granular access control, enhancing security by allowing fine-grained permissions. This approach also improves user experience by reducing repetitive logins and streamlining interactions. Additionally, it is future-proof, offering seamless integration with advanced technologies such as biometrics, blockchain-based identity systems, and mobile authentication methods.

2. Building Robust Audit Trails

Introducing a logging system similar to **Estonia's X-Road** can improve accountability. This system would log every data request and response, recording timestamps, user identities, and purposes.

- Use cryptographic signing to ensure logs cannot be tampered with.
- Include real-time monitoring and alerts for suspicious activities.

Comprehensive logging enhances transparency by clearly recording who accessed data and for what purpose, ensuring accountability and deterring misuse. It also strengthens security measures while aligning with global data protection standards, fostering trust and compliance.

3. Streamlining Access with Biometric and Mobile Authentication

To reduce the reliance on physical PINs and card readers, **biometric authentication** and **mobile multi-factor authentication (MFA)** can be employed.

- **Biometric Authentication**: Uses fingerprints or facial recognition for identity verification.
- **Mobile MFA**: Includes OTPs, push notifications, or QR code scans for secure, device-based verification.

Biometric authentication and mobile MFA enhance security by leveraging hard-to-replicate physical traits and secure mobile methods. They offer convenience by eliminating the need for in-person verifications while ensuring accessibility, even in rural areas with basic infrastructure.

4. Upgrading API Architecture

Adopting a modern **RESTful API** design with structured payloads, error handling, and support for JSON Web Tokens (JWTs) will significantly enhance the platform.

- **RESTful Design**:
  - Replace GET requests with POST for secure data exchanges.
  - Incorporate versioning to support continuous improvements.
- **JWTs**:
  - Encoded JSON objects securely pass user claims (for example, permissions, identity).
  - Include expiration timestamps and cryptographic signatures to enhance security.

Modern APIs are highly scalable, enabling large-scale operations with minimal latency. They offer flexibility to integrate new features or data types seamlessly while being developer-friendly, with rich responses and metadata that enhance debugging and user integration.

5. Automating Workflows

Replacing manual, letter-based processes with **digital workflows** and **smart contracts** can improve efficiency.

- **Smart Contracts**: Automatically enforce data-sharing agreements and access rules on blockchain.
- **Digital Workflows**: Streamline request and approval systems with real-time notifications.

Automating repetitive tasks improves efficiency by reducing delays, while blockchain technology ensures transparency and accountability in applying rules. This approach also minimizes administrative workload, leading to significant cost savings.

6. API Gateway Integration *(if not being currently used)*

Integrating a centralized API Gateway can enhance security, streamline API management, and improve scalability.

- **Centralized Management:** Provides a unified entry point for all API calls, enabling streamlined authentication, request routing, and rate limiting.
- **Enhanced Monitoring and Auditing:** Offers improved logging, analytics, and real-time performance tracking to ensure reliability and transparency.

An API Gateway simplifies managing APIs across multiple services, improving scalability and security while ensuring better monitoring. If an API Gateway is already in place, optimizing its configuration can further enhance performance, reduce latency, and ensure seamless integration with GDX's infrastructure. This enhancement can support GDX's long-term goals of efficient and secure data exchange.

By standardizing data exchange processes, enhancing inter-agency collaboration, and prioritizing data security, GDX sets the stage for a more efficient, responsive, and citizen-focused government in Thailand. However, ongoing innovation and investment are necessary to keep pace with evolving challenges and expectations in digital governance.

2) Thang Rath application

The **Thang Rath application**—meaning 'government way'—is a transformative initiative by DGA, serving as the primary platform for the country's **government e-services**. Initially gaining attention for facilitating the distribution of a 10,000-baht digital handout aimed at vulnerable population groups such as the elderly and people with disabilities, the app has since grown to encompass over 128 integrated services. These services include social security benefits, financial aid for newborn care, credit bureau checks, basic health insurance, and utility payments for water and electricity. As of August 2024, over 30 million people have registered on the application. With over 656,194 downloads and usage volumes exceeding 5.3 million transactions, as of 2023, Thang Rath exemplifies the Thai government's commitment to leveraging digital solutions to enhance public service accessibility.

Technical Architecture and Features: The Thang Rath application operates on a sophisticated technical architecture designed to support large-scale financial transactions and user management:

- **User Account Management**: The app can handle up to 47 million user accounts, encompassing 45 million individual citizens and 2 million participating businesses.
- **Registration and Verification**: To apply for Thang Rath, Thai citizens can use their national ID card. However, the 10,000-baht cash transfer, which can be applied through this app, includes stringent eligibility checks, integrating age, income, and asset criteria, supported by government databases for verification.
- **Security Features**: Spending restrictions, geographical and merchant category limitations, and anti-fraud measures provide robust safeguards against unauthorized or inappropriate usage.

Despite the ambitious goals of the Thang Rath app in facilitating the government's digital wallet program, its implementation has encountered several significant challenges that need to be addressed to ensure its long-term success.

Implementation Challenges

1. **Scale and Performance:** The app has struggled with scalability, particularly in handling large volumes of simultaneous transactions. During its initial days, the system was overwhelmed by the demand from the 47 million registered users, leading to issues such as unsuccessful transfers linked to the PromptPay system.[79] The high volume of users and transactions strained system resources, affecting user experience and trust.
2. **Addressing Security Concerns:** Trust and security are critical factors for the successful adoption of digital wallet solutions. To foster user confidence, the government should ensure that the Thang Rath app incorporates strong security measures, including robust encryption protocols and continuous monitoring to protect sensitive user data. As the app facilitates financial transactions, it is essential to maintain high standards of cybersecurity to ensure the safe handling of users' personal and financial information.
3. **Addressing Integration Complexity and Ecosystem Development:** The successful integration of the Thang Rath app with various banking systems, government databases, and merchant payment platforms necessitates the creation of a robust and scalable ecosystem around the new Open Loop payment system. This ecosystem must ensure seamless interconnectivity across different systems and stakeholders, facilitating efficient data exchange and reliable transaction processing. As the app is now in production, it is crucial to continuously monitor the integration to identify and resolve any operational issues swiftly. Additionally, the system architecture should remain flexible, enabling future innovation and integration with emerging technologies. Also, ongoing monitoring of system performance and the management of any risks related to integration will be key to maintaining stability. A well-established ecosystem will not only support current operations but also provide the foundation for future services and applications, fostering further innovation within the digital economy.
4. **Scams and Fraud Risks:** A growing concern with the Thang Rath app is its susceptibility to exploitation by scam gangs. Reports have emerged of fraudulent SMS messages impersonating government authorities, luring victims with fake links to check registration status for the 10,000-baht handout. These scams have already victimized numerous citizens, particularly in provinces such as Roi Et.[80] This highlights a critical gap in the app's security measures, especially regarding public education and awareness about fraud prevention.
5. **System Crashes Due to High Demand:** Another significant issue arose when the app crashed as thousands of users rushed to download it and verify their

[79] Bangkok Post - B10,000 handouts fail to reach 44,000 recipients. The first two days, the Treasury has not successfully transferred '10,000 baht' to more than 1.9 people. It is recommended to quickly link PromptPay and correct your bank account - Money & Banking Magazine.
[80] Bangkok Post - Digital wallet registration scam alert issued

identities in preparation for the registration process.[81] This indicates a lack of adequate load testing and failure to scale the platform to handle spikes in user demand. The inability to handle such surges compromises the app's usability and could hinder the registration process for a large portion of the population.

Future Developments and Recommendations

1. **Scalability and Performance Enhancements:** The app's infrastructure needs to be optimized to handle high volumes of simultaneous users, especially during peak periods. Advanced cloud-based solutions and load-balancing mechanisms should be extensively leveraged to enhance the app's performance and prevent crashes during critical registration windows.
2. **Enhanced Security Protocols:** Strengthening security protocols is paramount. This includes advanced encryption for data in transit and at rest and continuous monitoring for suspicious activities. Additionally, public awareness campaigns on identifying and avoiding phishing attempts should be launched to mitigate the risks posed by scammers.
3. **Streamlined Integration:** The government must invest in improving the technical integration between the Thang Rath app, banking systems, government databases, and third-party payment providers. Implementing a more robust, standardized API infrastructure can help minimize errors and ensure smoother transactions.
4. **User Education and Awareness:** Given the rise in scams, it is crucial to educate the public on how to safely use the Thang Rath app. More public service announcements and in-app security tips should be provided to help users recognize legitimate communication from the government and avoid falling victim to fraudsters.
5. **Continuous Testing and Monitoring:** Ongoing testing, including stress testing and vulnerability assessments, should be part of the app's development life cycle. Regular system updates and a dedicated technical support team will ensure the app can adapt to new challenges and maintain reliable service delivery.

Nonetheless, the Thang Rath application is great step toward digital transformation, aiming to revolutionize how public services and financial assistance are delivered in Thailand. While challenges remain, its large-scale implementation highlights Thailand's potential to implement population-scale digital innovation. Success will depend on overcoming technical and operational hurdles while maintaining trust and reliability among millions of users.

3) Law Portal

In alignment with Section 77 of the **Constitution of the Kingdom of Thailand B.E. 2560**, which emphasizes public access to laws and active participation in the legislative process, the **DGA** has developed **law.go.th**, a centralized legal system. This platform is designed to streamline the creation, evaluation, and dissemination of legal information while fostering public engagement in the legislative process. By

[81] Tang Rat app crashes amid rush for 10,000 baht digital wallet | Thaiger

leveraging advanced digital technologies, law.go.th ensures that the drafting and implementation of laws are transparent, participatory, and adaptive to societal needs.

The **Central Legal System** was developed and continues to be developed in three phases to achieve its objectives:

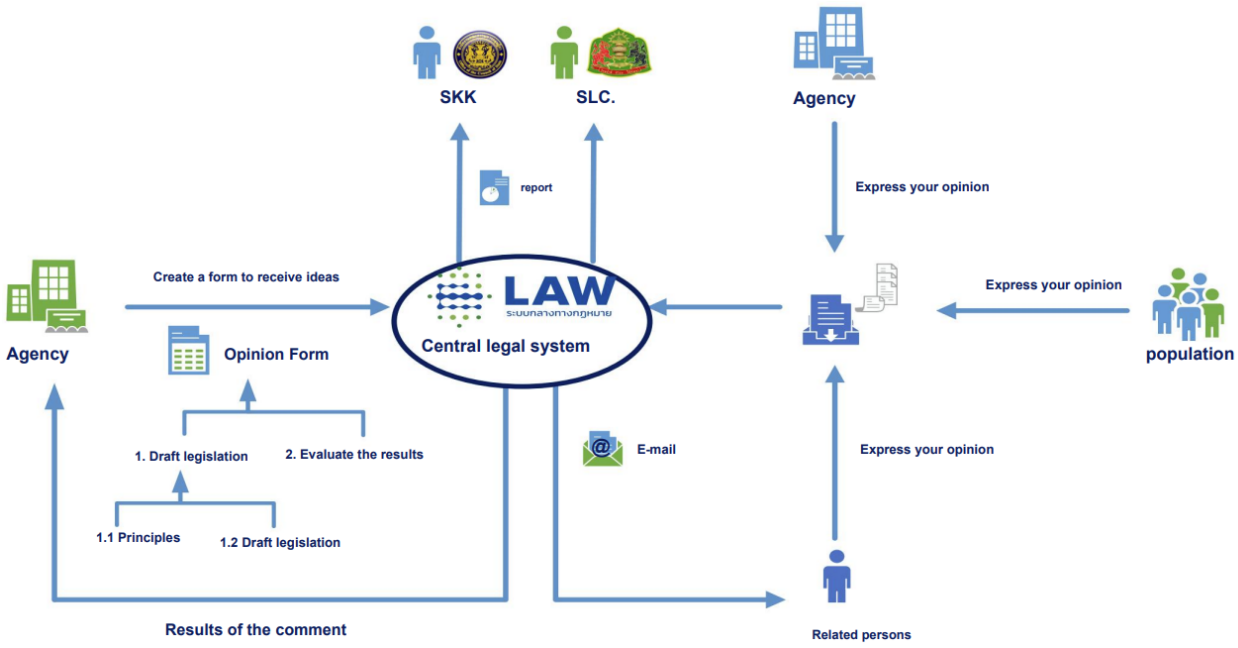
1. **Public Opinion and Evaluation:** In the initial phase, the system facilitates the gathering of public feedback and evaluates these inputs to shape draft laws.
2. **Legal Database:** The second phase focuses on creating a comprehensive legal database, enabling quick and easy access to legal texts and regulatory information.
3. **Advanced Integration:** The final phase incorporates advanced technologies such as big data analytics and artificial intelligence to enhance service delivery and optimize the legislative process.

Front-end features such as user registration, progress tracking, and response history make the platform user-friendly, while back-end functionalities, including public hearing management and centralized data storage, ensure transparency and efficiency as described in Figure 25.

Promoting Participation and Transparency

A significant feature of **law.go.th** is its emphasis on **e-Participatory mechanisms**, where citizens, organizations, and agencies can express their views on draft laws through online questionnaires, discussion boards, and public hearings. By centralizing feedback collection, the system ensures that all opinions are systematically analyzed and used in drafting or amending legislation. Additionally, government agencies benefit from reduced operational costs, centralized data storage aligned with the **PDPA**, and seamless knowledge retention across administrative changes.

Figure 25: Central Legal System Workflow



Source: https://www.dga.or.th/

Significant Impacts

Since its implementation, law.go.th has demonstrated remarkable progress in enhancing public engagement. As of 2023, the platform facilitated feedback collection 200,859 times, hosted 1,273 laws open for public comment, and attracted over 1.8 million visitors. By consolidating legal processes into one transparent, digital framework, the Central Legal System not only supports compliance with constitutional mandates but also establishes a foundation for a participatory democracy.

Recommendations

- **Advanced AI-Powered Legal Research and Analytics:** Implement an intelligent legal research assistant powered by advanced natural language understanding (NLU) and ML technologies.

Intelligent Search Capabilities

- Develop context-aware search algorithms that understand legal semantics.
- Enable semantic searching beyond keyword matching.
- Provide intelligent document recommendation systems.
- Implement natural language query processing.

Blockchain-Enhanced Document Authentication and Verification

- Integrate blockchain technology to ensure document integrity and create an immutable legal record system.
- Implement cryptographic document verification.
- Create tamper-proof legal document repositories.
- Enable transparent tracking of legislative changes.
- Provide verifiable digital signatures for legal documents.

Advanced Public Consultation Platform with AI Insights

- Transform the public consultation platform using AI-driven sentiment analysis and engagement tracking.

AI-Enhanced Public Engagement

- Use natural language processing to analyze public feedback.
- Generate real-time sentiment reports on draft legislation.
- Identify key public concerns through advanced text analysis.
- Create interactive visualization of public opinion trends.

Looking ahead, the Central Legal System's integration of big data and AI promises to further revolutionize how laws are drafted and evaluated, ensuring they remain relevant in a dynamic social and economic context. Law.go.th exemplifies how digital innovation can transform public services, making governance more inclusive, efficient, and responsive to the needs of the people.

4) Open Government Data Platform (data.go.th)

Thailand's Open Government Data platform, housed under **data.go.th**, is a cornerstone of the country's digital governance framework. Established following a 2013 Cabinet Resolution, this initiative seeks to enhance public services, promote transparency, and foster innovation by providing open access to government data. It aligns with Thailand's broader goals, including its preparation for the ASEAN Community integration in 2015, and continues to evolve in response to global e-government standards.

The **DGA** oversees the platform, ensuring its alignment with Thailand's digital transformation objectives. Hosting over 27,000 datasets, the platform empowers users from various sectors—public, private, academic, and civil society—with quality data to drive governance, social equality, and economic development.

This platform aims to serve as a centralized portal for accessing and utilizing open government data. It provides a structured system for data retrieval, visualization, and metadata management, supporting the government's aim of enhancing transparency and fostering DDD.

Technical Overview

The platform employs two primary APIs for accessing datasets:

- The CKAN Data API enables structured queries on datasets in tabular formats such as CSV or Excel files. It provides precise filtering and retrieval capabilities for compatible data resources.
- The Open-D Data API is an enhanced solution that addresses limitations in dataset formatting by incorporating basic data cleansing and user-friendly query generation. This ensures accessibility to a broader range of data files.

To enable user access, the platform integrates API key-based authentication, ensuring security while allowing controlled interaction with government data. Metadata management is supported through APIs that allow querying and retrieval of details about datasets and their resource files, ensuring comprehensive documentation and traceability.

Additionally, the platform offers tools for data analysis and visualization. Users can aggregate, filter, and analyze datasets directly within the platform, supporting operations such as grouping, summarizing, and generating insights for decision-making. Graphical visualizations can be generated to represent aggregated data trends.

Recommendations

While data.go.th represents a significant step toward open data governance, several areas require attention to enhance its usability, efficiency, and strategic alignment:

1. **Scalability and Authentication:** The platform's reliance on static API keys for access management limits its scalability in environments with high user demand or complex integration needs. Transitioning to a dynamic, standards-

based authentication framework such as OAuth 2.0 would improve scalability and support more advanced integration scenarios.

2. **Data Quality and Readiness:** Inconsistent data formatting affects API performance and usability. By implementing automated validation systems at the data submission stage, government agencies can ensure consistent data quality. Integrating Open-D's cleansing capabilities more seamlessly into the CKAN framework could further streamline the user experience.
3. **Visualization and Analytical Tools:** Current visualization capabilities, while functional, lack flexibility for in-depth or customized analysis. Enhancing the range of visual analytics options and integrating advanced tools such as ML-based insights or dynamic dashboards would better support policy formulation and public engagement.
4. **User Experience and Accessibility:** For non-technical users, the platform's interface and workflow could be more intuitive. Simplifying the querying process through guided workflows or natural language interfaces would improve accessibility while reducing reliance on technical expertise.
5. **Global Interoperability:** Aligning the platform with international data standards such as DCAT-AP or ISO/IEC frameworks would ensure greater compatibility with global datasets and enhance its utility for cross-border research and initiatives.

To maximize its impact, the data.go.th platform must evolve beyond its current technical framework to address broader governance and user engagement challenges. By integrating advanced authentication methods, enhancing data quality protocols, expanding analytical capabilities, and fostering international collaboration, the platform can position itself as a leader in open data governance and innovation. Coupled with the DGA's commitment to continuous improvement, including the integration of cutting-edge technologies and the expansion of data categories, these efforts will not only streamline operations for end-users but also reinforce trust and confidence in Thailand's digital governance initiatives.

5) SME ONE ID

The Office of SMEs Promotion (OSMEP), in collaboration with the DGA, has developed the SME ONE ID platform, a crucial step in integrating Thailand's digital public infrastructure for SMEs. It leverages a robust technical architecture to streamline government and financial processes, facilitating seamless interaction between SMEs and various government agencies.

The SME ONE ID system serves as a centralized digital identity framework for SMEs, ensuring secure, standardized, and efficient data exchange across multiple agencies. The platform integrates three primary technical components: data collection, identity verification, and inter-agency communication.

Technical Architecture (Figure 26)

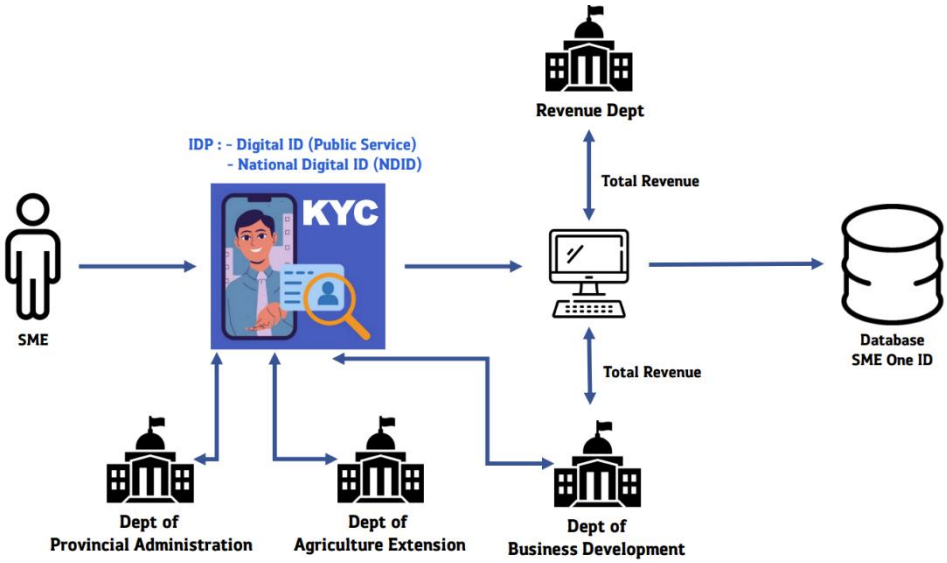
The SME ONE ID system incorporates the following components:

1. **Data Sources and Standardization:** SMEs interact with various government agencies, such as the Revenue Department, Department of Business

Development, and Department of Provincial Administration, to submit essential documents (for example, permits, certifications, and financial records). Data are standardized and centralized in the SME ONE ID database, allowing efficient processing and retrieval.

2. **Digital Identity Verification (KYC):** A key technical feature is the integration of Digital Public Identity (IDP) services using the National Digital ID (NDID) framework. This ensures that SMEs undergo know-your-customer (KYC) verification to confirm their identity. Once they are verified, SMEs gain access to services across various departments without resubmitting their credentials.
3. **Integration with Financial Institutions:** The system enables SMEs to directly share verified documentation with financial institutions for loan applications and other financial services. This functionality reduces manual processes and improves financial accessibility.
4. **Real-Time Data Sharing and Analysis:** A data integration module supports real-time data exchange between agencies. Key tools include the following:
    - 4.1. **APIs and Web Services:** Allow direct communication between departments such as agriculture, finance, labor, and industry.
    - 4.2. **Data Analytics and Visualization:** Advanced analytics provide insights for public policy planning and operations, while early warning systems enhance SME risk monitoring.

Figure 26: SME One - High-Level Architecture



Source: OSMEP.

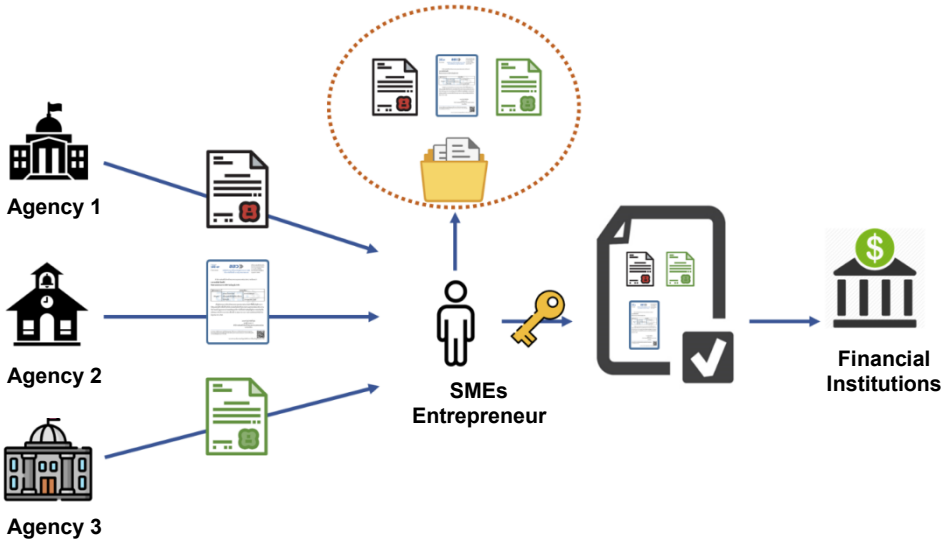
Functional Workflow (*Figure 27*)

The SME ONE ID platform functions as follows:

1. **Data Submission:** SMEs upload documents to the respective agencies via the platform.
2. **Data Verification:** Agencies verify the documents and standardize data into the centralized SME ONE ID database.
3. **Access Facilitation:** Verified data are shared securely with financial institutions and other relevant bodies upon SME consent.

4. **Public and Agency Use:** Public users can access anonymized datasets for research, while government agencies use tools such as APIs to analyze SME performance and develop policies.

Figure 27: SME One - Functional Workflow

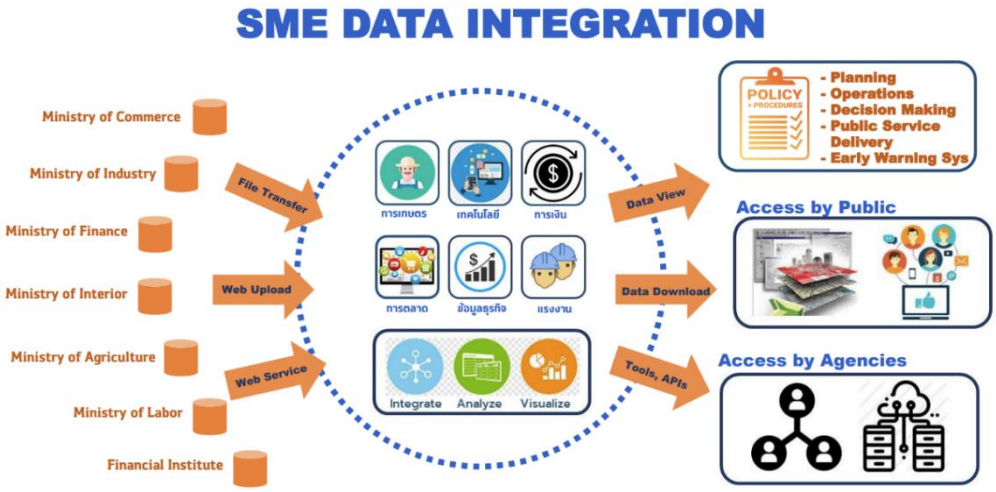


Source: OSMEP.

Inter-Agency Integration

Key government agencies, such as the Ministry of Commerce, Ministry of Finance, and Ministry of Agriculture, are interconnected via the SME ONE ID system. Each agency provides data through web uploads or file transfers, contributing to a shared database. This architecture reduces redundancy and accelerates service delivery, offering a cohesive interface for SMEs.

Figure 28: SME One - Inter-Agency Integration



Source: OSMEP.

Impact

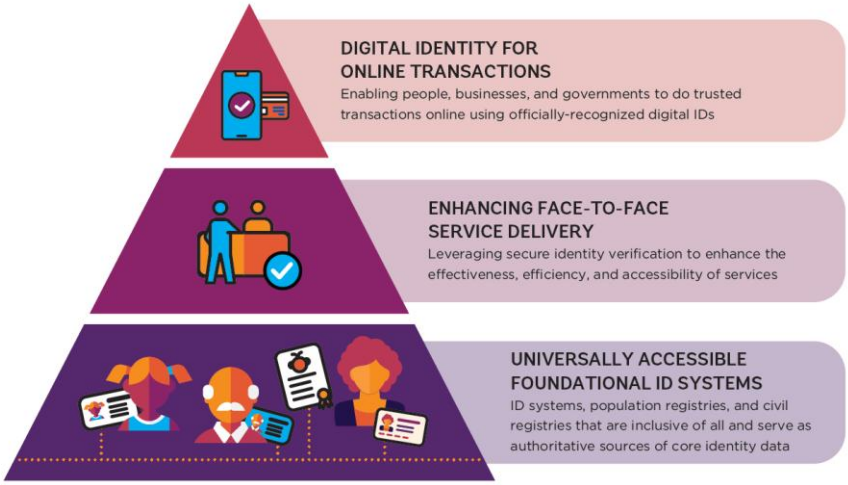
- **Improved Accessibility:** SMEs interact with a single platform to manage government-related tasks.
- **Operational Efficiency:** Automated processes reduce duplication of effort, saving time and resources.
- **Policy Support:** Comprehensive datasets enable more informed decision-making and early-warning mechanisms for economic fluctuations.

○ Digital Identity Ecosystem

Thailand has made significant strides in developing its digital identity ecosystem, positioning this digital public infrastructure (DPI) as a cornerstone of the country's digital transformation. Moreover, the development of the digital identity ecosystem in Thailand can serve as a useful model for other developing countries going through the same evolution from physical identification for in-person transactions to *digital* identification for remote transactions, especially through the enablement of a decentralized identity/verifiable credential ecosystem.

The World Bank has developed a three-layered maturity model for national digital identity ecosystems. According to this model, Thailand is moving into the top layer, developing comprehensive methods of allowing people and entities (for example, juristic persons) to verify their identity online.

Figure 29: World Bank Digital Identity Ecosystem Maturity Model



Source: World Bank Identification for Development (ID4D) initiative.

Within ASEAN, only Singapore fully occupies the third layer. However, Thailand is joined by Indonesia, Malaysia, and Viet Nam in moving from the second to the third layer. This momentum in the region highlights an opportunity for the development of regional standards to enable cross-border interoperability and mutual recognition of digital identity ecosystems in ASEAN, similar to what has been achieved in the European Union through the eIDAS (electronic Identification, Authentication, and Trust Services) Regulation.

To this end, there are currently three key initiatives in Thailand for digital identity, interestingly covering all three of the generally accepted models of digital identity (centralized, federated, and decentralized):

- **ThaID application (centralized):** A digital ID smartphone application, developed by the BORA of the DOPA under the Ministry of Interior, was launched nationwide in 2023. As of the end of 2024, more than 21 million Thais had onboarded themselves for ThaID.
- **NDID (federation):** The NDID platform was launched in 2020 as an identity federation, primarily within and for the financial services sector. Through this platform, customers can reuse a digital ID issued by a participating company (for example, based on identity checks conducted by a bank when opening bank accounts) when transacting with another participating company. NDID is a private company.
- **Verifiable credentials (decentralized):** Building on the stabilization of international standards on decentralized identity and the emergence of similar ecosystems in countries such as Bhutan, Korea, and in Europe, ETDA is developing standards to enable the creation of an ecosystem of credential issuers and verifiers, and digital document wallets. Importantly, this would have an impact not just on identity (proving who you are) but also on data sharing (proving particular data points, such as academic transcripts).

In addition to the above, a digital identity industry is emerging in Thailand, with a number of local players. For example, Krungthai Bank has developed the Paotang (wallet) application that provides a range of (non-banking) services, including digital identity (distinct from the NDID capability in Krungthai's banking application). Paotang can be used to sign in to file taxes with the Revenue Department, for instance. True Corporation (one of two mobile network operators) has its own digital identity solution called TrueID. Finema and iApp are examples of two local startups developing digital identity solutions, among others, in the space of digital trust and fraud management.

1. National ID and civil registration system

Before delving into digital identity initiatives in Thailand, it is critical to understand the national ID and civil registration system that underpins. Thailand has an excellent national ID and civil registration system, characterized by universal coverage and widespread usage. The system is managed by BORA of the DOPA under the Ministry of Interior, with frontline services delivered through district and sub-district offices. The system is governed by the Civil Registration Act, B.E. 2534 (1991), which has been amended multiple times and most recently in B.E. 2562 (2019). Civil registration (that is, the recording of births, death, marriages, and other vital events) is fully integrated with population and national ID card registration. A 13-digit personal ID number is issued to all registered persons from birth. Apart from individual registration, all persons are recorded in a household book (*tabien baan*).

Figure 30: Thailand National ID card

Source: Royal Thai Embassy, Washington, DC.

The system's success can be attributed to the long history of registration in Thailand. The current system's origins date back to the household registration system established in 1917 by King Rama VI, aimed at standardizing record-keeping of the Kingdom's residents. The first national ID cards were issued in 1956 and paper records were digitized beginning in 1984. In 2005, BORA began collecting biometrics and issuing a national ID smartcard. In 2019, BORA launched the development of the ThaID smartphone application, which was rolled out nationally in 2023—see next section.

According to the 2021 ID4D-Findex survey, 99 percent of adults have a national ID card. Similarly, the latest data on birth registration (2019 Multiple Indicator Cluster Survey) show that 100 percent of children under five have had their birth registered. Notably, most stateless persons and migrant workers can also access registration services. Key factors for achieving universal registration coverage are integrating registration services into local government (supply-side) and the widespread usage of national ID and civil registration documents, including household books (demand-side).

In terms of utilization, the national ID and civil registration system underpins the ability of government agencies to improve the quality of service delivery and their own databases. For example, the national ID system is credited in playing a key role in Thailand's celebrated universal health coverage (UHC) system, with every person possessing a national ID number being automatically enrolled in one of three public health insurance programs. Similarly, Thailand has used the national ID system to target various social welfare programs, such as the Social Welfare Card and the Leave No One Behind program that was rolled out in response to the COVID-19 pandemic. For example, the Ministry of Finance could not only validate if an individual was receiving another benefit (for example, a subsidy from the Ministry of Agriculture) but also if someone else in the same household was receiving a benefit.

Government agencies, state-owned enterprises, and some regulated financial service providers can use the national ID and civil registration system to verify the identity of their customers against BORA's database, including through facial verification. These entities and other private companies can also verify the identity of customers by authenticating the smartcard chip. However, the Civil Registration Act restricts access to the database for most private companies, which could constrain use by emerging sectors such as e-commerce. Hence, utilization of the national ID and civil registration database is not as widespread for service delivery as in similar countries such as India and Indonesia.

2. ThaID application

ThaID is a digital ID smartphone application developed by BORA of the DOPA under the Ministry of Interior. Users can onboard themselves either physically at a district or sub-district office or remotely through facial recognition and liveness detection. The application serves three main functions:

- **Presentation of national ID card, household book, and other civil registration documents:** ThaID allows users to show these documents and for these to be accepted in the same manner of physical equivalents. However, documents in ThaID are not in a standardized verifiable credentials format (for example, W3C or mDoc).
- **Verifying when signing into other apps:** ThaID can be used as a single sign-on when accessing more than 32 services, including filing taxes and accessing digital health books managed by the Ministry of Public Health. For example, applicants for the THB 10,000 digital wallet scheme in 2024 could use ThaID for KYC purposes. ThaID is available to be used through the NDID platform, but only for relying parties that have signed an agreement with BORA.
- **Accessing BORA services:** Users can conduct and track transactions with BORA, such as to update their household book.

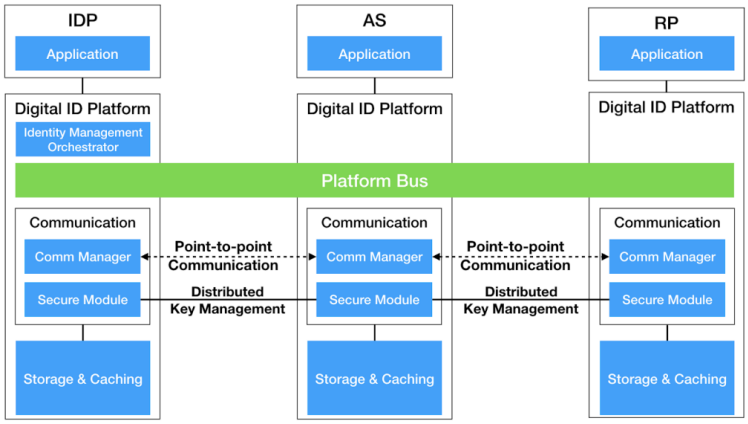
As of January 8, 2025, more than 21.4 million Thais have onboarded themselves for ThaID, making it the largest digital ID application in ASEAN, recently surpassing Viet Nam's VNeID, which has more than 20 million users according to most recent public reports.

ThaID reflects a trend among middle- and high-income countries, where national ID agencies are creating smartphone apps as digital alternatives to physical identity cards. They do so in response to widespread smartphone adoption, the desire to improve convenience for citizens, and the pressure to reduce government costs (particularly as ID cards are often provided at low or no charge). At the same time, many countries' ministries of ICT or digital—or electronic transaction regulators—are also developing frameworks for digital identity to facilitate secure online transactions. This parallel work creates a significant opportunity for convergence—but also highlights a common challenge of bringing together various stakeholders around a common vision.

3. NDID platform

The NDID platform is an identity federation, licensed as the first such platform by ETDA in December 2023. Through the platform, people who are customers of 13 NDID-participating companies (11 commercial and government banks, one telecommunications provider, and one FinTech provider) can reuse digital IDs issued by one company when transacting with other companies. NDID digital IDs have also been trialed for transacting with the government, including the Revenue Department. ThaID has also been integrated as an identity provider (IDP) within NDID but is limited to relying parties that have signed an agreement with BORA for ThaID acceptance.

Figure 31: NDID Transaction Flow



Source: National Digital ID Co., Ltd.

NDID was initiated by the government in 2018 as a public-private partnership. Since then, it has evolved to be managed by a fully private company, with participating companies as shareholders. The platform leverages blockchain technology to strengthen the integrity of transactions. As of March 2023, there were 9.2 million users of NDID.

4. Verifiable credentials

Reliable proof of identity is invaluable to a digital service provider, but services also need to satisfy an individual's eligibility (for example, to receive a government payment) or take that person though an onboarding process such as an application for financial services (as in KYC processes). This goes far beyond simple identity and requires trusted data about the individual.

In response to this need, ETDA and its experts have created the Thai Verifiable Credential (VC) Framework to facilitate the foundation of a vibrant decentralized identity wallet ecosystem in Thailand to increase trust in digital transactions and to reduce complexity in existing transactions particularly where government documents are required. This framework has drawn inspiration from relevant international standards, such as those of the World Wide Web Consortium (W3C) and the European Union Digital Wallet (EUDI) initiative.[82]

Thailand has over 2,623 online government services; the Thang Rath app, a one-stop access point for government service access; ThaID providing digital ID to approximately 18 million citizens; and 71 different government welfare programs managing citizen data vital for social protection services. All of these initiatives could potentially benefit from the standardized and interoperable use of trusted data centered around strong identity verification in the form of the Thai VC framework.

The Thai VC Framework compares well to international best practice and standards. With the EU Digital Identity specifications for digital document wallets considered as a baseline, the Thai VC Framework only differs in minor areas such as the lack of selective disclosure in the pilot specifications. There are opportunities to introduce a comprehensive Trust Framework and associated governance structures to define data schema, to explore how credential issuance and/or use can be monetized for

[82] Note: Analysis of the Thai VC Framework was conducted by the World Bank team in late 2024; for further details, reference the resulting Verifiable Credentials Standards Evaluation Report, an evaluation of the proposed standards and specifications for the use of VCs in Thailand.

sustainability of the ecosystem, and to specify identity verification and ID credential issuance. Another key issue is that the government needs to make a policy decision on its official digital document wallet application or if there would be multiple government-managed digital document wallet applications.

As part of the framework analysis conducted by the World Bank, a number of potential use cases were identified for consideration by ETDA and its partners:

- **Education Credentials:** An existing pilot seeks to demonstrate how digital credentials based on the Academic Transcript (currently provided in paper form) can facilitate a more efficient, verifiable mechanism for individuals to provide proof of education attainment.
- **Social Protection:** Obtaining access to personal data from other agencies has been problematic due to data protection law. If the citizen can hold the relevant data in credentials (in a digital document wallet) then they could be shared directly by the person increasing privacy, reducing oversharing, and possibly facilitating the creation of a single welfare record.
- **Proof of Significant Control for Corporations:** Correctly identifying company directors when registering corporations is vital for creating a secure, transparent, and trustworthy business environment. Strengthening this identity verification through the use of digital identity and digital credentials will reduce the paperwork and process for doing business, reduce the potential for fraud and increase trust in registers.
- **Access to Healthcare:** National Health Security Office-led reforms of the Universal Coverage Scheme (UCS) includes an initiative to increase convenience when accessing healthcare regardless of the access point. This means UCS beneficiaries will be able to access medical care at any facility regardless of their registered address. There is an opportunity to work with the NHSO to explore how VCs and the Thai VC Framework may enhance this initiative and provide an additional means for patients to interact with health services digitally.
- **Land Registration:** Currently, land registration in Thailand must be completed in person and requires multiple documentary evidence types such as ID cards, Land Title Deed, the House Book (Tabien Baan), and Building Permits. Digital identity and digital document wallets present an opportunity to reduce application processing time while increasing trust in the process, by enabling individuals to go online to complete the application, prove their identity, and potentially share trusted data in place of paper documents.

5. Digital Identity Ecosystem Development - Recommendations

Thailand is at an exciting point in the development of its digital identity ecosystem. With key building blocks in place—a strong national ID and civil registration system, a widely used government digital ID application, a functioning identity federation, and strong progress in creating standards to cultivate a VC ecosystem—the country is uniquely positioned to become a world leader, not just among developing countries but also among developed countries.

Realizing this potential will depend on optimizing and further harmonizing various ongoing initiatives, including the following:

- **Form a specific government committee on digital identity:** Current efforts on digital identity are somewhat fragmented across the domains of digital government and the digital economy. Given that digital identity cuts across both these domains, forming a dedicated committee will strengthen coordination and the sustainability of decision-making. Ideally, the committee would be chaired by the Prime Minister or Minister of Digital Economy and Society, with ETDA (as a regulator) acting as secretariat.
- **Complete development of the verifiable credentials standards framework:** Decentralized identity and VCs are undoubtedly the future of digital identity. ETDA has given Thailand a head start compared to most other middle-income countries by developing a framework of standards with the objective of 'any credential in any wallet'. Efforts to operationalize this framework—including intensifying collaboration across public and private sectors to find a set of use cases and a business model to sustain an ecosystem—are essential.
- **Create a comprehensive digital identity trust framework to harmonize existing centralized, federated, and decentralized identity efforts:** While there have been good steps toward harmonization, including ThaID's incorporation into NDID as an ID provider and ThaID's exploration of adopting VCs, these efforts should be widened and formalized through a trust framework that creates an overarching set of regulations and standards. ETDA is best placed to spearhead such an effort.
- **Decide on a single digital document wallet application:** For citizen convenience, the government should decide to have a single digital document wallet application. Ideally, it should be ThaID or a dedicated wallet application and not the Thang Rath application because global experience has shown that there are benefits of splitting identity and service portal functions. The existence of a government digital document wallet should not exclude private sector wallet providers.
- **Scale up usage and adoption of ThaID:** ThaID has had considerable success but there is much more potential. There are around 40 million Thais between 16 and 60 years old, and hence there is an opportunity for ThaID to get closer to this number of users. Likewise, there is potential to increase the number of government services that can be accessed by signing in with ThaID. Finally, it is recommended to extend ThaID to be able to be used for private sector transactions, particularly in the financial sector and e-commerce, which could be game-changing for Thailand's digital economy.
- **Spearhead development of an ASEAN trust framework for digital identity:** Given that many ASEAN countries are moving toward digital identity for online transactions and the ongoing negotiations for an ASEAN Digital Economy Framework Agreement (DEFA), this is the right time to develop standards and other tools to facilitate cross-border usage of digital identity ecosystems. Importantly, as has been shown in Europe, such a framework would facilitate interoperability without imposing a particular model on countries, safeguarding national sovereignty.

○ Thailand's AI Strategy

1. Overview of Thailand's AI Strategy (2022–2027)

Thailand's **National AI Strategy and Action Plan (2022–2027)**[83] outlines a comprehensive roadmap to establish a thriving AI ecosystem that enhances economic growth, competitiveness, and quality of life by 2027. Approved in July 2022, the plan revolves around five core strategies designed to position Thailand as a leader in AI innovation and application.

1) **Ethical and Legal Frameworks**: Thailand prioritizes building trust in AI by ensuring ethical usage and robust regulatory oversight. The strategy aims to educate at least 600,000 people on AI law and ethics, creating widespread awareness of responsible AI practices. To support this, an AI-specific legal framework and enforceable regulations will be developed, addressing key concerns such as data privacy, fairness, and accountability. By fostering an ethically sound AI environment, Thailand seeks to build confidence among businesses, consumers, and international partners.
2) **Infrastructure Development:** Developing sustainable digital infrastructure is at the heart of Thailand's AI ambitions. The strategy includes a 10 percent annual increase in digital infrastructure investments to enhance capabilities across both public and private sectors. Key initiatives include the establishment of high-performance computing systems and national AI platforms for advanced data analytics and management. By boosting Thailand's AI Government Readiness ranking into the global top 50, this strategy ensures the foundational support needed for long-term innovation and large-scale AI adoption.
3) **Human Capacity Building:** Recognizing the importance of a skilled workforce, the strategy aims to cultivate over 30,000 AI professionals by 2027. This includes initiatives to improve AI education, introduce scholarship programs, and foster international collaborations with leading researchers and institutions. The focus is on developing market-responsive curricula and training programs to meet industry demands, ensuring a pipeline of talent that can drive AI development across sectors. By strengthening human capital, Thailand seeks to secure its competitiveness in the rapidly evolving AI landscape.
4) **Innovation and Research and Development (R&D):** To drive AI innovation, Thailand is focused on developing at least 100 R&D prototypes with real-world applications in strategic sectors such as healthcare, finance, agriculture, and tourism. These innovations aim to generate a THB 48 billion impact by 2027, highlighting the economic and societal benefits of AI integration. The strategy also emphasizes advancing core AI technologies and platforms, such as autonomous systems and advanced analytics, to position Thailand as a hub for cutting-edge research and technology development.
5) **AI Adoption:** Accelerating the use of AI in public and private sectors is a key component of the strategy. By 2027, at least 600 organizations, including government agencies, businesses, and startups, are expected to integrate AI into their operations. To support this, the strategy promotes mechanisms such as innovation sandboxes and system integrator programs that enable businesses to test, refine, and scale AI solutions. By fostering AI adoption

[83] AI Thailand | Thailand national AI strategy and action plan (2022–2027)

across industries, Thailand aims to boost its global competitiveness and establish itself as a leader in AI-driven transformation.

2. **Thailand's AI Strategy - Implementation Overview**

Thailand is proactively implementing its **National AI Strategy and Action Plan** to establish itself as a key player in the AI landscape. Notably, Thailand has launched a **national AI service platform** supported by the Government Data Centre and Cloud Service. Another critical infrastructure component is **LANTA**, ASEAN's most powerful supercomputer, which serves as a hub for AI research in both the public and private sectors.

Strategic Position and Rankings

Thailand's efforts in AI have earned it a strong global standing. In the **2023 AI Government Readiness Index**, Thailand ranks 37 among 193 countries. The country excels in the following:

- **Public Sector Implementation:** Scoring 77.21, reflecting the effective integration of AI in public services.
- **Infrastructure Development:** Achieving a score of 70.55, showcasing its advanced AI infrastructure.

However, the **technology score of 41.33** highlights the need for further progress in overall AI capability development.

Thailand has made significant headway in executing its AI strategy. According to recent reports,[84]

- Over **100,000 workers** have upgraded their AI skills via various platforms.
- The Education Ministry has driven innovation by supporting the creation of over **50 AI-based prototypes** by startups.
- A **Medical AI Consortium** now manages over **1.6 million medical images**, enabling advancements in healthcare.
- The **OpenThaiGPT project**, developed by the NECTEC, has created a large-scale Thai language model to enhance AI applications in local contexts.

3. **AI Strategy and Implementation - Recommendations**

1) Foundational Infrastructure Development

Currently, Thailand's AI infrastructure shows both promise and limitations. According to the Government Artificial Intelligence Readiness Index, Thailand is ranked 60 globally, with a notably higher score in data and infrastructure (65.01) compared to other dimensions. The country has established AI Thailand as a national program to prepare essential infrastructure for AI development.[85] The current ecosystem includes basic computing facilities, data centers, and initial frameworks for AI development, operating under the Thailand National AI Strategy and Action Plan (2022–2027). However, the infrastructure remains relatively nascent, with limitations in high-performance computing capabilities and comprehensive data infrastructure necessary for advanced AI development.

[84] Bangkok Post
[85] AI Thailand | Thailand national AI strategy and action plan (2022–2027)

To emerge as a regional leader, Thailand needs to significantly enhance its AI infrastructure through several strategic initiatives.

- **Enhance AI Research and Development Hubs:** Building on the success of the National Science and Technology Development Agency (NSTDA), develop additional AI research and development hubs equipped with advanced computing infrastructure. These centers should focus on both broader AI and GenAI applications, positioning Thailand as a regional leader in AI R&D.
- **Expand National AI Cloud Infrastructure:** Invest in expanding Thailand's national AI cloud infrastructure, building on the capabilities provided by the GDCC. Ensure this cloud ecosystem is optimized for a range of AI workloads, from training models to dedicated inferencing capacity for GenAI use cases. The AI cloud should support scaling AI solutions and foster collaboration across public and private sectors, enabling the deployment of AI applications for government services and beyond.
- **Develop Specialized GenAI Infrastructure:** Thailand's AI infrastructure should specifically address the growing demand for GenAI. Provide dedicated high-performance inferencing resources for GenAI models, enabling efficient deployment of AI solutions for tasks such as text generation, image synthesis, and other advanced use cases. This specialized infrastructure will support AI-driven innovation across industries, including government, healthcare, finance, and education.
- **Create an AI Marketplace on GDCC:** Establish a centralized AI marketplace within the GDCC, building on the foundation of existing cloud platforms. This marketplace should facilitate access to both public and private sector AI solutions, encouraging the development of novel applications, services, and tools powered by AI. The AI marketplace can promote collaboration with academic institutions and startups, driving the broader adoption of AI technologies.
- **Foster Public-Private Collaboration and Expansion:** Create partnerships to capitalize on Thailand's growing private investments to expand access to cutting-edge AI resources. These collaborations can ensure government agencies and academic institutions continue to benefit from advanced AI computing resources while maintaining sovereignty over critical infrastructure. Public-private partnerships can also help ensure sustainable and scalable infrastructure growth, supporting Thailand's long-term AI ambitions.
- **Develop AI Innovation Hubs across Thailand:** Strengthen the AI ecosystem by establishing interconnected innovation hubs in major cities across Thailand. These hubs will focus on testing, experimentation, and application development, with dedicated facilities for AI model validation, regulatory compliance, and security standards. Such a network will foster collaboration, knowledge sharing, and capacity building across both public and private sectors.

These improvements need to be supported by substantial investment in high-capacity connectivity infrastructure, including 5G networks and edge computing capabilities, to enable real-time AI applications and services.

2) Human Capital and Skills Development

Currently, Thailand's AI human capital and skills capacity has significant room for improvement, as reflected in its global AI readiness ranking of 60.[85] The country has recognized this challenge and has begun addressing it through the Thailand National AI Strategy and Action Plan (2022–2027), which includes human capacity development as one of its core pillars. The current ecosystem includes basic AI education programs and some industry-academia partnerships but lacks comprehensive workforce development initiatives. The country's AI Thailand program has started laying the groundwork for human capacity building, but the existing skill base remains relatively limited compared to regional leaders.

To strengthen its position and become a regional AI leader, Thailand needs to implement several strategic initiatives in human capital development.

- Establish a comprehensive AI education framework that spans from primary education through advanced research levels, incorporating AI and data science into core curricula.
- Create specialized AI degree programs at leading universities, develop professional certification tracks, and establish continuous learning platforms that bridge academic knowledge with industry requirements.
- Focus on international collaboration through partnerships with leading global tech universities, sponsoring research exchanges, and developing targeted scholarship programs.
- Incentivize private sector participation in AI skills development through tax benefits and grants for companies that invest in AI training programs.
- Establish AI centers of excellence in key economic sectors and create mentorship programs connecting experienced AI professionals with emerging talent to help build a sustainable AI talent pipeline.

These initiatives should be supported by substantial investment in research and development facilities and the creation of specialized AI innovation hubs across major cities.

3) Regulatory and Ethical Framework

Thailand has made significant strides in establishing AI regulatory and ethical frameworks, particularly through its National AI Strategy and Action Plan (2022–2027). The country was notably the first in Asia-Pacific to develop AI ethics guidelines,[86] which were drafted by the Digital Economy and Society (DES) Ministry in collaboration with multinational technology partners and Mahidol University. The current framework is anchored in the Kingdom's 20-Year Digital Economy and Society Development Plan (2017–2036).[87] The nation has set ambitious targets, including raising AI awareness and ethics understanding among at least 600,000 Thai citizens and implementing enforceable AI laws and regulations.[85] The current framework includes policy standards for AI ethics and initiatives for driving awareness and education in AI ethics.

[86] Thailand drafts ethics guidelines for AI
[87] From AI Policies to Practices: Insights from Thailand's AI Governance Clinic (AIGC)

To strengthen its position as a regional AI leader, Thailand should consider several key enhancements to its regulatory and ethical framework.

- Focus on developing more comprehensive risk management protocols, potentially adopting and localizing international standards such as ISO/IEC 23894:2023 for AI risk management.[88]
- Establish more robust mechanisms for tracking and understanding AI incidents, following the OECD's framework for Trustworthy Artificial Intelligence.[89]
- Create more specific guidelines for different sectors and use cases, moving beyond general ethical principles to detailed, actionable frameworks.
- Strengthen its international collaboration efforts, particularly within the ASEAN region, to harmonize AI governance standards and facilitate cross-border AI development and deployment.
- Build stronger enforcement mechanisms and monitoring systems to ensure compliance with AI ethics guidelines and regulations while maintaining flexibility to adapt to rapidly evolving AI technologies.

4) Research and Innovation Ecosystem

Thailand's current AI research and innovation ecosystem is showing promising development, supported by strong institutional frameworks and government initiatives. The country's ecosystem is anchored by the Ministry of Higher Education, Science, Research and Innovation (MHESI) and various academic institutions, working in collaboration with the MDES.[90] Thailand has established a foundation of high-performance computing infrastructure and thriving data centers.[91] The national program 'AI Thailand' aims to prepare essential infrastructure for AI development to promote economic growth and increase the country's competitiveness. However, current assessments indicate that while Thailand has strong advantages in data infrastructure, it performs only moderately in education, skills, and innovation, as reflected in its 60th position among 172 countries in the 2020 Government AI Readiness Index.[92]

To strengthen its AI research and innovation ecosystem and emerge as a regional leader, Thailand should implement several strategic initiatives.

- Significantly increase its investment in AI research and development facilities, focusing on creating specialized AI research centers and innovation hubs that can foster collaboration between academia and industry.
- Enhance its efforts to transition from being primarily an AI user country to becoming an AI application creator. This transformation requires strengthening the education system to produce more AI specialists and researchers, potentially through expanded partnerships with leading international institutions.

[88] Thailand's AI Governance Guideline for Executive
[89] Tools for trustworthy AI
[90] Two ministries unveil six projects to drive AI transition in Thailand
[91] AI Trends in Thailand: Outlook for the Second Half of 2024
[92] Thailand's Science, Research and Innovation Capability Part 3

- Establish more robust funding mechanisms for AI startups and research projects, creating a more vibrant innovation ecosystem.
- Focus on developing sector-specific AI applications that address local and regional challenges, thereby creating unique value propositions.
- Consider establishing more public-private partnerships to accelerate AI innovation, following the vision of creating "an effective ecosystem to promote AI development and application to enhance the economy and quality of life."[85]
- Strengthen its international research collaborations and knowledge exchange programs, particularly within the ASEAN region, to build a more comprehensive and competitive AI research ecosystem.

5) International Collaboration and Positioning

To strengthen its international collaboration and positioning as a regional AI leader, Thailand should pursue several strategic initiatives.

- Actively seek to establish more formal partnerships with leading AI nations and institutions, particularly focusing on knowledge transfer and capacity-building programs.
- Work toward becoming a bridge between Western and Eastern AI development approaches, leveraging its strategic position in Southeast Asia.
- Consider establishing an ASEAN AI Hub, facilitating regional collaboration and standardization of AI governance frameworks.
- Focus on developing specialized AI expertise in sectors where it has competitive advantages, such as healthcare, agriculture, and tourism, and actively promote these capabilities internationally.
- Work toward harmonizing its AI governance framework with international standards while maintaining flexibility to address regional specific needs.
- Establish more international research partnerships and exchange programs, particularly focusing on practical applications of AI that can address common challenges faced by developing economies in the region.

6) Sector-Specific AI Implementation

Thailand has begun measuring organizational readiness for AI implementation across both private and public sectors as of 2023, marking a significant step in sector-specific AI adoption.[93] The current implementation faces several challenges, particularly in adapting existing regulatory frameworks to AI applications, as evidenced by the limitations of current Thai product liability laws in addressing AI-generated outputs.[94] The country's sector-specific implementation is currently focused on ensuring compatibility with existing software and hardware systems to facilitate smooth data flow and operational efficiency, though it faces challenges related to talent scarcity and technical integration.[95]

[93] Thailand National AI Strategy and Action Plan – Annual Report 2023
[94] AI regulation in Thailand: Current state and future directions
[95] Implementing Sector-Specific AI Models

To strengthen its sector-specific AI implementation and emerge as a regional leader, Thailand should adopt several strategic approaches.

- Establish sector-specific AI implementation guidelines and standards, particularly for key industries such as healthcare, agriculture, manufacturing, and financial services. This should include developing clear frameworks for data governance and integration specific to each sector.
- Create specialized training programs to address the talent shortage, focusing on developing expertise in sector-specific AI applications.[96]
- Establish sector-specific regulatory sandboxes to allow for controlled testing and implementation of AI solutions while ensuring compliance with relevant regulations.
- Focus on developing Real-World Data (RWD) collection and analysis capabilities across different sectors, particularly in healthcare and public services.[97]
- Establish sector-specific AI oversight and advisory bodies that can provide targeted recommendations and monitor implementation progress, similar to successful models in other countries.[98]

7) Economic and Investment Strategy

To strengthen its AI economic and investment strategy and become a regional leader, Thailand should implement several key initiatives.

- Establish more attractive investment incentives specifically targeted at AI development and implementation, including tax benefits and grants for both local and international companies investing in AI technologies.
- Create a dedicated AI investment fund to support startups and scale-ups in the AI sector, similar to successful models in other countries.
- Develop specific economic zones or technology parks dedicated to AI development, offering infrastructure and support services to attract both domestic and foreign investment.
- Establish more public-private partnerships to accelerate AI adoption across various sectors, particularly in areas where AI can have the most significant economic impact.
- Develop sector-specific AI investment roadmaps, identifying key areas where AI can drive economic growth and create competitive advantages.
- Create special economic incentives for companies that establish their regional AI operations in Thailand while also investing in developing the necessary talent pool and infrastructure to support these operations.

[96] Organizing public sector AI adoption: Navigating between separation and integration
[97] Chapter 22 - Artificial intelligence from a regulatory perspective: Drug delivery and devices
[98] An overview of national AI strategies and policies

6. Empowering MSMEs through Digitalization

This chapter outlines how MSMEs in Thailand leverage digital technology and data, focusing on their adoption of digital tools, the challenges they face, and proposed policy recommendations.

This chapter first highlights existing research on digital adoption by MSMEs and its impact on productivity and firm performance. It addresses four key channels: improving product quality, reducing costs, fostering innovation, and extending market access.

Using data from the ICT establishment survey, the chapter documents the adoption of digital tools by MSMEs across various sectors in Thailand. Mobile broadband has played a critical role in bridging the gap, but reliance on mobile broadband limits MSMEs' ability to fully leverage professional applications. The findings show that MSMEs lag significantly behind larger firms in adopting advanced digital technologies such as computers, fixed broadband, and e-commerce platforms. Moreover, the manufacturing sector in particular lags in technology adoption compared to the ICT sector and business trade and services sectors.

Enhanced digital connectivity, primarily driven by broader 4G coverage and faster internet speeds, plays a pivotal role in boosting technology adoption and firm performance among MSMEs. Regions with superior internet quality, such as Bangkok and its vicinity, experience higher digital uptake—including increased use of e-commerce and online recruitment platforms—leading to improved labor productivity and total factor productivity (TFP). Conversely, significant regional disparities in internet infrastructure hinder equal digital adoption, underscoring the need for targeted investments to ensure all areas benefit from digital advancements.

The policy recommendations are derived from empirical analysis, literature, and insights gained from interviews with private sector representatives and academics, focusing on three key areas:

- **Optimizing Digital Infrastructure:** Address the gap between mobile and fixed broadband by expanding fixed broadband infrastructure and encouraging computer usage.
- **Streamlining Data Sharing:** Simplify the regulatory environment to encourage better data sharing across sectors. Thailand should also enhance capacity to improve fraud detection and create a fair and competitive environment for MSMEs.
- **Building Digital Skills:** Invest in training programs to address the skills gap, particularly digital skills and English proficiency, which are essential for operating professional software and accessing international markets. Updating curricula and providing targeted digital training will be essential for fostering a competitive, digitally skilled workforce.

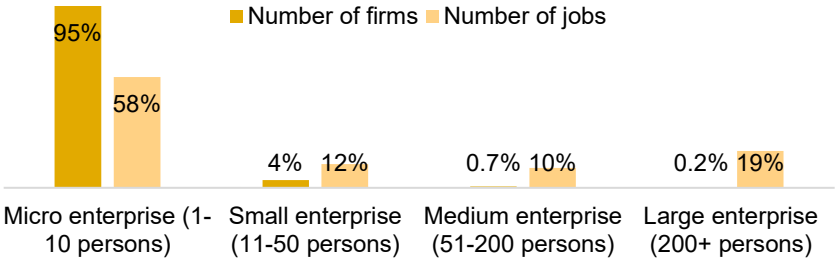
○ Introduction

MSMEs are at the heart of economic growth, creating jobs and contributing significantly to GDP. MSMEs account for the majority of businesses worldwide,

providing essential goods and services. They play a key role in reducing poverty and promoting inclusive economic development.

In Thailand, MSMEs account for over 99 percent of businesses and provide more than 80 percent jobs. Thailand's MSME classification, based on the Ministerial Regulation on the Characteristics of Small and Medium Enterprises B.E. 2562, considers both employment size and annual income. However, to maintain consistency and align with international standards, this report follows the International Labour Organization (ILO) classification. In this report, we use the number of persons engaged in the business as the primary measure to define MSMEs: micro enterprises engage up to 10 persons, small enterprises engage 11 to 50 persons, and medium enterprises engage 51 to 200 persons. The distribution of number of firms and number of jobs by the type of enterprise is presented in *Figure 32*. Other classifications, such as legal status and economic establishment type, offer valuable insights, as household enterprises may face greater barriers to digital adoption, and branch establishments may have different operational needs than head offices. However, firm size remains the primary focus of this report, as it is a key determinant of digital adoption and economic outcomes.

Figure 32: Distribution of MSMEs in Thailand



Source: Survey on ICT used in Establishmenti 2022.

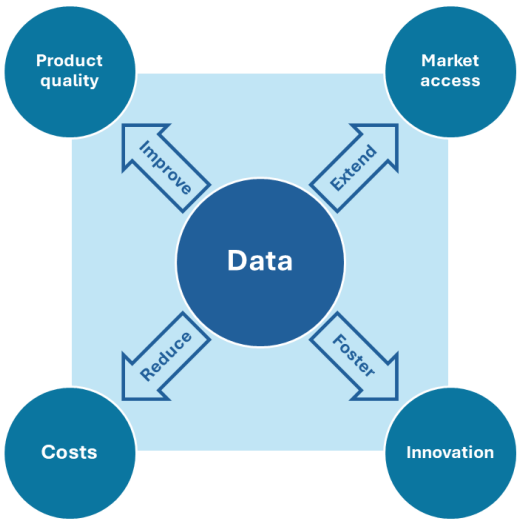
The adoption of digital tools by MSMEs helps streamline operations, reduces costs, and opens access to broader markets. For instance, cloud computing provides affordable access to high-quality services, enabling MSMEs to compete more effectively with larger firms. To draw maximum value from digital tools, MSMEs need to leverage data for informed decision-making, optimizing supply chains, and understanding customer needs. Embracing these technologies is crucial for their survival and growth in the digital economy. However, data privacy concerns, data sharing regulations, limited infrastructure, and inadequate workforce capabilities often hinder their ability to fully benefit from digital technologies. Understanding the digital progress of Thailand's MSMEs, identifying barriers, and overcoming these challenges is crucial for MSMEs to thrive in a competitive digital landscape.

This chapter focuses on how MSMEs leverage digital technology and data to enhance decision-making. It begins by discussing existing research on the use of digital tools by MSMEs. Next, it documents ICT adoption using data from the ICT establishment survey. Complemented by the business and industrial census, the chapter further examines how digital adoption affects firm performance in Thailand. Drawing on private sector interviews, literature surveys, and empirical findings, the chapter concludes with recommendations on how MSMEs in Thailand can maximize value from data and digital tools.

○ Leveraging Digital Technology and Data to Drive MSME Decision-Making

Data and digital technology is critical in benefiting firms through four key channels: improving product quality, reducing costs, fostering innovation, and extending market access (*Figure 33*)**.** While these benefits apply to firms of all sizes, data are particularly important for MSMEs as it allows them to overcome resource constraints and compete with larger firms (World Bank 2021).

Figure 33: Role of Data in Enhancing Firm Performance



Source: Based on World Development Report 2021.

DDD enhances firms' product and service quality. By integrating customer behavior insights, optimizing resource allocation, and refining internal processes, data enable firms to transition from intuition-based decision-making to data-driven analytics. This shift is facilitated by the adoption of enterprise technologies such as Enterprise Resource Planning (ERP), Supply Chain Management (SCM), and Customer Relationship Management (CRM) systems. These digital tools enable firms to gather and utilize detailed data from customers and suppliers, thereby enhancing DDD and firm performance (Aral, Brynjolfsson, and Wu 2020). For instance, a study involving 179 large firms found that adopting DDD improved productivity by 5–6 percent and increased asset utilization and return on equity (Brynjolfsson, Hitt, and Kim 2011). Although MSMEs face challenges such as limited access to financial and technological resources, CRM systems and similar tools play a significant role in supporting DDD by enabling MSMEs to gather and analyze customer data. This capability allows MSMEs to offer customized services efficiently without substantial investments in customer research, thereby helping them compete with larger enterprises.

Data also contribute to reducing operational costs, enabling MSMEs to operate more efficiently and maintain competitiveness. By optimizing resource allocation and processes, data analytics helps firms identify inefficiencies, streamline workflows, and reduce unnecessary expenses. Enhanced insights into demand, supply chains, and overall performance allow firms to improve operational efficiency. In the financial sector, improved credit scoring driven by big data reduces the costs associated with loan

delivery, resulting in lower interest rates for consumers. In retail, a field experiment on eBay's Seller Hub showed that small businesses using analytics increased revenue by 3.6 percent without raising prices (Bar-Gill, Brynjolfsson, and Hak 2024). MSMEs often operate on tighter margins compared to larger firms. While larger firms can readily leverage economies of scale, MSMEs may struggle to fully capture these benefits, which makes cost efficiencies through strategic data-driven practices even more vital.

Data foster innovation by empowering MSMEs to develop new products and services that address emerging market needs. Data drive the creation of innovative products and services by analyzing market trends and customer behavior. Large firms such as Capital One have utilized randomized trials to develop products such as balance transfer cards (World Bank 2021). Although MSMEs typically lack dedicated R&D departments, data empower them to identify new market opportunities and adapt to changing customer demands. This agility allows MSMEs to innovate and remain competitive. For example, by using data from digital platforms, MSMEs can identify unmet customer needs, personalize offerings, and optimize supply chains, enabling them to seize niche opportunities and respond effectively to market shifts.

Digital payment and e-commerce platforms further reduce transaction costs and create new pathways for MSMEs to reach larger markets. These platforms enhance market efficiency by extending MSMEs' reach beyond local customers, allowing them to access broader markets. Online payment systems, such as PayPal and Alipay, improve transaction security and streamline payment processes, forming the foundation for online sales. By leveraging e-commerce and digital marketing, MSMEs can connect directly with buyers and suppliers, reducing reliance on intermediaries and improving sales. Under adverse conditions, e-commerce can help MSMEs improve their performance and maintain sustainability by providing expanded market access and reducing operational barriers (Gao et al. 2023). In agriculture and similar sectors, these platforms enable MSMEs to enter markets traditionally dominated by larger firms, promoting broader participation.

In the age of GenAI, MSMEs can gain more substantial benefits through digital adoption. GenAI increases labor productivity and provides cost-effective services that were previously unattainable, such as customer support automation, virtual assistants, and AI-based accounting (Leitner-Hanetseder et al. 2021). Additionally, AI tools are particularly effective at improving the productivity of junior workers, especially those with less experience. This is especially beneficial for small firms and startups struggling to recruit experienced workers, helping them improve overall efficiency with minimal resources (Humlum and Vestergaard 2024).

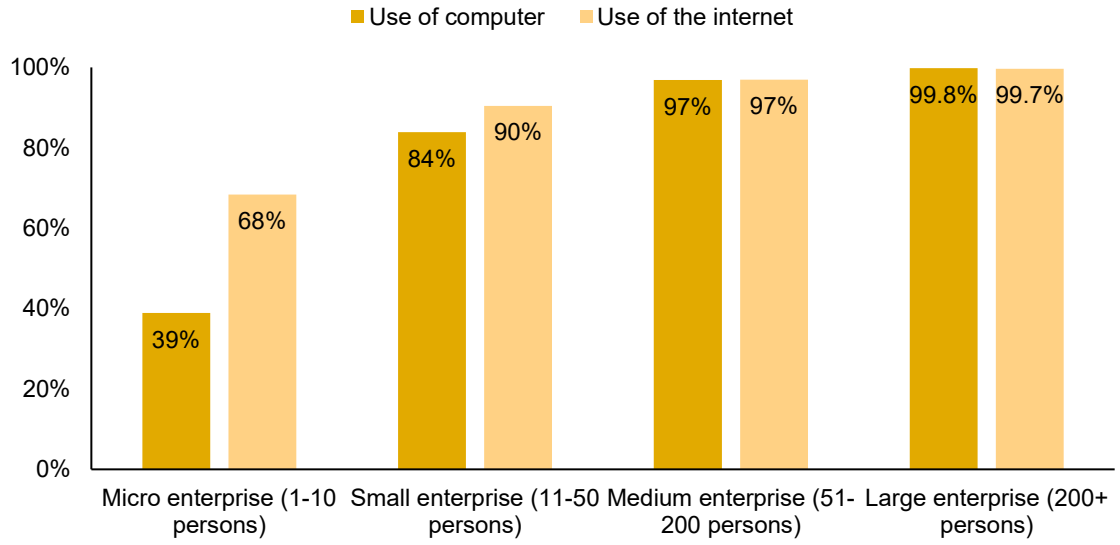
○ Digital Technology Adoption by MSMEs in Thailand

This section benefits from the rich micro-survey data on MSMEs in Thailand. The Thailand Survey on ICT used in Establishment, conducted by the NSO of Thailand, focuses on the adoption and utilization of ICT technologies among businesses. The survey provides detailed information on the use of computers, mobile devices, internet connectivity, e-commerce activities, and so on. With access to data from 2012 to 2022, this section explores digital adoption by MSMEs, analyzing variations by firm size and

across different sectors. By leveraging this granular information, the analysis sheds light on the drivers and barriers to digital transformation and highlights opportunities for supporting MSMEs in their digital journeys.

The use of computers and the internet varies significantly among different firm sizes, with MSMEs consistently lagging behind large firms, which have nearly universal adoption rates. Overall, 41 percent and 69 percent MSMEs use computers and the internet in businesses, respectively. Micro enterprises exhibit the lowest levels of technology use, with 39 percent using computers and 68 percent using the internet (*Figure 34*). Small enterprises show increased adoption rates, with 84 percent using computers and 90 percent using the internet. Medium and large enterprises report very high adoption rates, with nearly all firms (97.0–99.8 percent) using both computers and the internet. Notably, internet usage is more prevalent than computer usage across all firm sizes, indicating that mobile phones are more dominantly used in businesses, especially for micro enterprises. Larger firms may have better access to resources and capabilities to integrate technology effectively into their operations (*Figure 34*).

Figure 34: E-commerce Activities by Firm Size, 2022

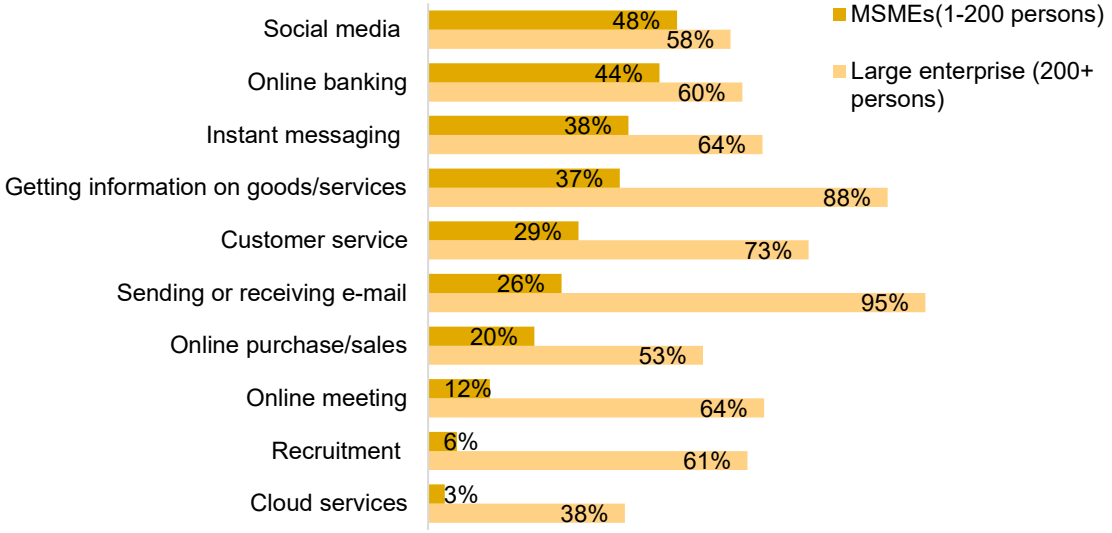


Source: Thailand Survey on ICT used in Establishment 2022, NSO.

The participation of MSMEs in online business activities shows a distinct pattern compared to large enterprises, reflecting the nature of MSMEs while also indicating potential areas for improvement. The most commonly used digital tools for MSMEs are social media (48 percent), online banking (44 percent), and instant message (38 percent), while the least used are cloud services (3 percent), online recruitment (6 percent), and online meeting (12 percent) (see Figure 35). This pattern reflects the widespread popularity of smartphones and mobile internet in Thailand, which makes social media and instant messaging more accessible and practical for MSMEs compared to more advanced and professional applications. For communications, instant messaging is more popular among MSMEs, with 38 percent using it compared to 26 percent using email, whereas large firms use more email (95 percent) over instant messaging (64 percent). In contrast, the gap in social media usage is relatively small, with 48 percent of MSMEs and 58 percent of large enterprises using it. MSMEs also use online meetings and recruitment

far less frequently than large firms, with 12 percent and 6 percent of MSMEs using these activities compared to 64 percent and 61 percent of large firms, respectively, highlighting a significant gap that reflects their distinct business needs. Additionally, only 3 percent of MSMEs use cloud services compared to 38 percent of large firms, underscoring the need for better support to help MSMEs leverage advanced technologies for operational efficiency (*Figure 35*).

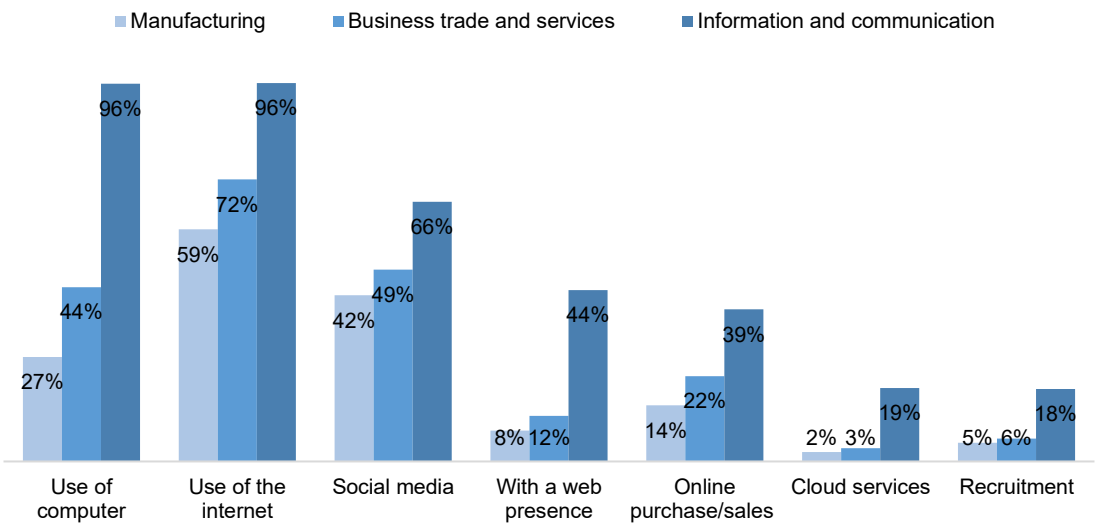
Figure 35: Online Business Activities between MSMEs and Large Enterprises



Source: Thailand Survey on ICT used in Establishment 2022, NSO.

The manufacturing sector significantly lags in digital adoption compared to both the business trade and services and information and communication sectors, with notable differences in computer and internet use (*Figure 36*)**.** For example, both computer and internet use is at 96 percent in the information and communication sector, while manufacturing lags far behind, with only 44 percent using computers and 27 percent using the internet (*Figure 36*). The business trade and services sector falls in between, with 59 percent using computers and 42 percent using the internet. The information and communication sector's working nature requires greater ICT adoption, making it a benchmark for other sectors and demonstrating the potential for broader digital growth. The gap in e-commerce adoption is also noteworthy, with the information and communication sector showing significantly higher participation compared to manufacturing and business trade and services. E-commerce is used by 39 percent of firms in the information and communication sector, whereas only 14 percent of manufacturing firms and 22 percent of business trade and services firms engage in online purchases and sales. This distinction reflects the nature of manufacturing operations but also highlights significant potential for manufacturing firms to boost internet engagement, enhance SCM, expand sales opportunities, and ultimately improve firm performance.

Figure 36: Digital Adoption by Sectors

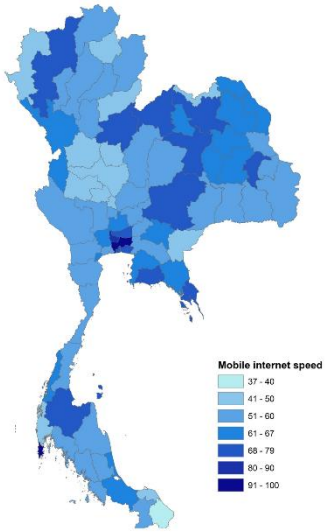


Source: Thailand Survey on ICT used in Establishment 2022, NSO.

○ Digital Connectivity and MSMEs' Technology Adoption and Performance

Digital connectivity is a fundamental driver of technology adoption and firm performance. Firms with better internet access and quality are more likely to adopt digital tools, which in turn enhances productivity and business growth. The relationship between internet quality, digital adoption, and firm outcomes follows a clear pathway: broader 4G coverage enables faster internet speeds and enables firms to integrate digital solutions, which then improve their efficiency and competitiveness.

Figure 37: Mobile Internet Speed by Province

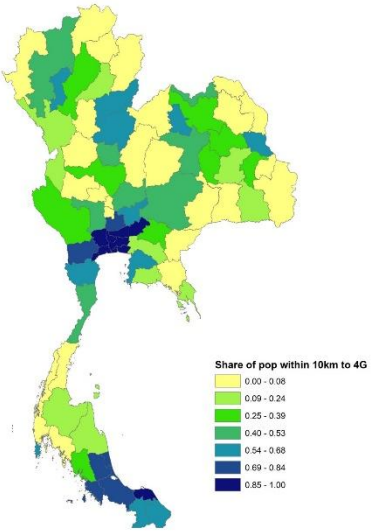


Source: Based on Ookla Internet speed maps, 2022Q1.

Significant regional disparities in internet quality exist across Thailand, affecting firms' ability to leverage digital technologies. *Figure 37* illustrates the mobile internet download speed across provinces, showing that some regions enjoy fast internet, with speeds reaching up to 100 Mbps in Bangkok, while other remote areas experience speeds that are less than half of that. The considerable variation in internet quality across provinces underscores the need for targeted investments in digital infrastructure to ensure that MSMEs in all regions can benefit from the opportunities provided by digital technologies.

Expansion of 4G infrastructure is the key factor for improvement in internet quality, directly enhancing connectivity in underserved areas. *Figure 38* presents the 4G coverage by province, highlighting that regions with broader 4G coverage tend to have better internet speeds. Emerging technologies like satellite internet, such as Starlink, offer an alternative way to expand connectivity in remote areas. These technologies can enhance internet quality, support IoT applications, enable real-time information access, and reduce risks from cyberattacks on fiber-optic networks. However, at this stage, 4G mobile networks remain the primary internet infrastructure for individuals and firms.

Figure 38: 4G Tower Coverage by Province



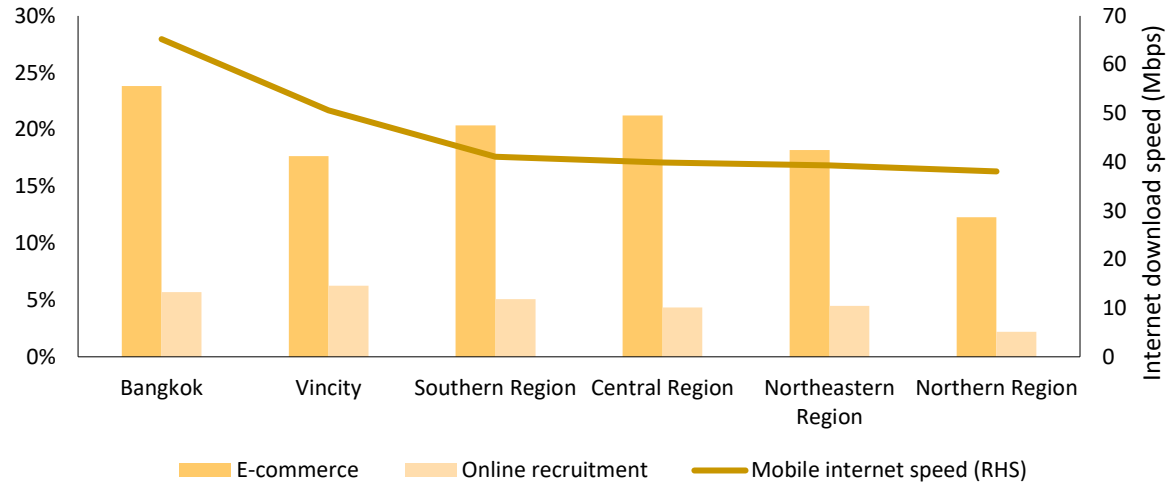
Source: Based on OpenCellID and WorldPop.

The regional disparity in internet quality leads to disparities in ICT uptake across regions. Improved internet infrastructure enhances internet quality, which is crucial for firms to fully leverage digital technologies. Better internet access ensures smoother experiences with digital tools, allowing firms to adopt and use technology more effectively, thereby improving operational efficiency.

Higher IT technology adoption occurs in regions with improved internet infrastructure, which enhances operational efficiency. There is a clear correlation between internet speed and ICT adoption (*Figure 39*), with regions that have faster internet speeds, such as Bangkok and the vicinity, showing higher usage of e-commerce and online recruitment platforms. E-commerce usage—for both purchasing and selling products—and online recruitment are key indicators of digital adoption. These measures

are significant as they show how better internet access enables firms to expand their market reach, both in product sales and labor market access, reducing search frictions and improving overall efficiency. Improved infrastructure and internet speed directly contribute to business growth and increased market participation, highlighting the importance of digital infrastructure investments in fostering economic development.

Figure 39: Internet Speed and IT Adoption by MSMEs by Region, 2021



Data: Based on Ookla Internet speed maps and Thailand Survey on ICT used in Establishment 2021.

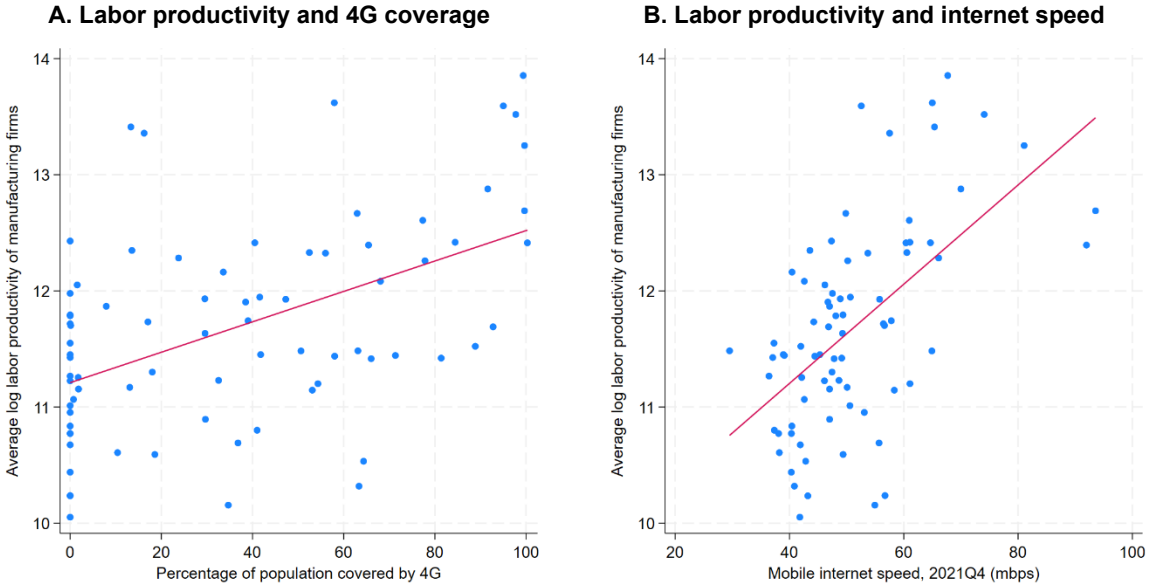
The use of economic census data provides a valuable opportunity to analyze firm performance with high granularity and reliability. This section uses 2022 business and industrial census data for manufacturing and services firms, which align well with internet connectivity and speed data, enabling a precise assessment of digital infrastructure's impact. Firm performance is measured using two key indicators: labor productivity and TFP. Labor productivity is calculated as total sales divided by the number of persons engaged in the business, showing the output from each worker.[99] TFP is estimated using a production function regression to decompose a firm's value added, which accounts for both labor and capital inputs to measure how efficiently a firm transforms all its resources into output. This measure is particularly important for manufacturing firms, where capital investments in machinery and equipment play a key role in driving productivity improvements. Unlike labor productivity, TFP captures broader efficiency factors such as technology adoption, management quality, and innovation. Measuring firm performance is crucial for understanding how digital connectivity translates into economic gains, as higher productivity indicates that firms are leveraging digital tools to optimize operations, expand market reach, and improve competitiveness in an increasingly digital economy.

Stronger internet connectivity is associated with better firm productivity, confirming the link between digital access and firm performance. Firms in areas with faster internet speeds and broader 4G coverage experience higher labor productivity and

[99] An alternative measure is a firm's value added per worker, which abstracts from the impact of intermediate input factors beyond labor. Both measures are highly correlated, but sales per worker is the simplest, as it relies on only two variables.

TFP, as they can utilize digital platforms for communication, market access, and operational efficiency. *Figure 40* presents a clear correlation between internet speed and firm labor productivity, suggesting that expanding digital infrastructure can yield significant economic benefits. In addition, a related regression analysis with regressing Labor productivity and TPF on mobile internet speed and controlling for firm features and sector fixed effects confirm the results. A 1 Mbps increase in mobile internet speed is correlated with 1.0 percent and 0.8 percent increase in labor productivity and TPF, respectively, and the correlation is statistically significant. These findings highlight the need for policies that integrate broadband expansion with digital adoption support for MSMEs.

Figure 40: Firm Labor Productivity, Internet Speed, and 4G Coverage



Source: Based on the 2022 Business and Industrial Census (Manufacturing Industry), Ookla Internet speed maps, and Opencellid.
Note: Each point represents the average value for a province. Labor productivity for a firm is measured as total sales divided by the total number of employees.

The analysis underscores the critical role of digital infrastructure in driving both digital adoption and firm performance. Improved internet connectivity, particularly through the expansion of 4G infrastructure, is a fundamental enabler of digital technologies, facilitating smoother operations and greater market access for MSMEs. The findings reveal how better connectivity directly boosts productivity and enhances e-commerce and online recruitment adoption, which are key indicators of digital uptake. However, the regional disparity in internet quality is a challenge, with some areas benefiting from high-speed internet and 4G coverage, while others remain underserved. These disparities highlight the need for targeted policy investments in digital infrastructure, ensuring that MSMEs across all regions can leverage digital tools to increase operational efficiency, expand their market reach, and foster economic growth. The integration of broadband expansion with digital adoption support programs is essential for ensuring that all firms, regardless of location, can fully benefit from the opportunities digitalization offers.

○ How MSMEs Maximize Value from Data and Digital Tools

1) Digital Infrastructure Side: Optimizing the Balance between Mobile Broadband, Mobile Applications, and Fixed Broadband and Computer Usage

Thailand's mobile technology is crucial for digital adoption, with near-universal 5G coverage and a significant reliance on mobile broadband and applications. This mobile-first approach has enabled Thailand to leapfrog from fixed broadband and computer usage to a mobile broadband and smartphone era, accelerating digital transformation across the country. It has particularly benefited remote and underserved areas by providing essential access to digital services. As noted in Chapter 2, Thailand has greater mobile broadband penetration and better mobile internet affordability compared to fixed broadband, underscoring the critical contributions of mobile broadband in enhancing digital connectivity in Thailand.

However, fixed broadband infrastructure significantly lags behind, indicating a need for more balanced development to fully support Thailand's digital transformation. While mobile solutions have provided significant benefits, MSMEs are lagging far behind larger firms in adopting advanced and professional technologies. These professional technologies—such as online meetings, email, customer service tools, online recruitment, and cloud computing—require robust fixed broadband and extensive computer usage. The analysis of MSMEs' digital adoption further reveals that their adoption rates of these professional applications are extremely low compared to large firms, emphasizing the need to bridge the digital divide. Enhancing the quality and reliability of fixed broadband—and promoting greater computer adoption—will be crucial for MSMEs to effectively leverage sophisticated digital tools and improve their competitiveness.

As Thailand continues to embrace cloud computing and AI technologies, the demand for fixed broadband and advanced data infrastructure is becoming increasingly critical. Interviews with private and academic sectors highlight the planned construction of data centers by Google and AWS, which will play a pivotal role in supporting cloud services in the coming years. Additionally, Thailand's pursuit of supercomputing capabilities emphasizes the need for robust fixed broadband infrastructure to support these advanced technologies. Therefore, expanding fixed broadband access and encouraging more computer usage should be prioritized as key steps for infrastructure improvement, ensuring the successful implementation of cloud and AI technologies and supporting Thailand's evolving digital economy for inclusive growth.

2) Digital Regulation Side: Streamlining Data Sharing while Enhancing Fraud Detection and Governance

Data sharing in Thailand faces numerous regulatory hurdles, mainly due to overlapping and outdated regulations such as the PDPA, the Statistical Act, and internal governance rules within government agencies. These regulations create significant barriers not only between different government bodies but also when collaborating with the private sector. This complex regulatory landscape hampers the

efficient sharing of data needed for innovation and growth. This also affects MSMEs, limiting their ability to access valuable data that could enhance their usage of digital tools such as e-commerce and data analytics, ultimately hindering their competitiveness. To overcome these obstacles, there is a need for streamlined regulations and perhaps a centralized consent mechanism to simplify data sharing, foster collaboration, and promote responsible data use across sectors. Chapter 3 describes the regulatory and institutional challenges the private sector faces in Thailand.

Fraud remains a prominent issue, particularly within the telecommunications and banking sectors. Despite the need for collaboration to mitigate fraudulent activities, the private sector struggles with sharing data due to regulatory constraints and the absence of a trusted third-party intermediary. The lack of proper data-sharing frameworks prevents proactive efforts to detect and prevent fraud. This also affects MSMEs, which require a fair and safe competitive environment to thrive. Addressing this challenge may require establishing a centralized platform or trusted third-party entity that can securely manage and facilitate data sharing for fraud detection. This would not only bolster business security but also help build a safer digital ecosystem in Thailand, enabling MSMEs to operate with greater confidence.

3) Digital Skill Side: Building Digital Skills for a Competitive Workforce

The shortage of labor with required digital skills is a significant challenge affecting Thailand's digital technology ecosystem. Embracing advanced computer-based applications and the AI era requires upgraded digital skills. This gap is further exacerbated by insufficient English proficiency, which limits the ability to stay updated with technological advancements—essential for operating professional software and engaging with international markets. Both the public and private sectors face challenges in finding and retaining talent capable of handling advanced technologies, affecting their ability to effectively leverage digital tools.

The low level of digital skills is one of the primary barriers for MSMEs in adopting technology. According to interviews with the private sector and academia, the labor force does not meet the demand, making it challenging for MSMEs to recruit a competitive workforce. Addressing this shortage through targeted training programs, increased support for tech education, and talent retention initiatives will be crucial for fostering a digitally capable workforce and supporting the country's digital transformation. Additionally, updating outdated higher education curricula is essential to equip graduates with the skills needed for the evolving digital landscape.

7. Key Findings from the Complementary Report

○ Delivery systems for SP programs in Thailand

1. Findings

Thailand's social protection (SP) system—covering social insurance, social assistance, and active labor market programs—is broad but fragmented. The institutional landscape includes the Ministry of Finance (MoF), Ministry of Social Development and Human Security (MSDHS), Ministry of Education (MoE), Ministry of Labor (MoL), Social Security Office (SSO), National Savings Fund (NSF), and local authorities. While programs cover a wide range of vulnerable groups, data systems and operational practices vary significantly across agencies.

2. Challenges include:

- **Fragmented Systems and Data Silos**: SP data are dispersed across agencies with minimal interoperability. Even though platforms like the GDX and efforts such as the *Thang-Rath* app and the *NoCopy* project have improved certain functions, integration remains limited.
- **Governance Gaps**: Unlike sectors such as taxation, where data governance committees exist, no sectoral data governance framework has been established for SP. This absence leads to ad hoc data exchanges without standardized protocols or long-term strategies.
- **Limited Interoperability and Analytics**: While some automation and digital document management have been introduced, Thailand lacks a federated social registry and the widespread use of advanced analytics tools for eligibility determination, service coordination, or performance monitoring.
- **Untapped Potential for Efficiency Gains**: The lack of standardized data sharing increases administrative burdens and costs, limits the effectiveness of decision-support systems, and prevents the proactive identification of "blind spots" in SP coverage.

3. Recommendations (2027–2029)

The report proposes a phased, medium-term approach aligned with Thailand's broader digital transformation and data governance efforts:

Table 8: Recommendations on Delivery systems for SP programs in Thailand

Focus Area	Key Recommendations
Assessment and Efficiency Review	Conduct a comprehensive review of SP delivery systems to identify unautomated services, evaluate data usage efficiency, and define external data needs. Focus on improving data quality, enhancing transparency, and reducing administrative costs.

Focus Area	Key Recommendations
Data Governance	Establish a **sectoral SP data governance framework and committee**, following models used in other domains. Define core SP business data and establish mechanisms to monitor performance within the national digital data ecosystem.
Federated Social Registry	Design and implement a **decentralized federated social registry** to enable dynamic, secure data sharing across SP programs, while maintaining agency ownership and compliance with privacy regulations.
Interoperability Standards	Develop standardized protocols for data sharing and ensure alignment with national interoperability guidelines and best practices, such as EU Interoperability Framework and ISSA Guidelines.
Analytics and Decision Support	Leverage advanced data analytics and business intelligence (BI) to enhance decision-making, targeting, and benefit optimization. Introduce policy microsimulation tools in areas like social insurance for forecasting and reform planning.
Capacity Building	Develop training and education initiatives on data management, interoperability, and analytics tailored to SP agencies and staff.
Compliance and Monitoring	Establish a compliance dashboard to track data quality, system performance, and policy outcomes.

These measures will lay the foundation for an integrated SP delivery system that improves service quality, reduces costs, and enhances the government's ability to respond dynamically to citizens' needs.

○ Big Data Analytics in the Public Sector in Thailand

1. Findings

Thailand has made significant strides in harnessing big data analytics within the public sector, spearheaded by the Big Data Institute (BDI). BDI operates at the forefront of fostering data-driven decision-making across government and private sectors and has become a hub for cultivating data science talent and driving innovation.

- **Institutional Capacity and Talent Development**:
  BDI employs nearly 70 data scientists, over 30 data engineers and developers, and a team of on-demand data analysts. It has established partnerships with 16 universities to develop specialized curricula, ensuring a pipeline of skilled data practitioners.
- **Decentralized Data Model**:
  Given legal constraints requiring purpose-based data sharing, BDI operates a decentralized model rather than a centralized national data warehouse. This

approach involves project-based collaborations with line agencies, allowing BDI to consolidate, clean, and analyze data as needed for specific initiatives.

- **Strategic Partnerships and Governance**:
  BDI has cultivated a collaborative relationship with the Digital Government Development Agency (DGA), combining data analytics services with DGA's expertise in service integration and digital workflow development.
- **Applications and Use Cases**:
  BDI's analytics work is concentrated in sectors including public health, travel, and the environment. Notable achievements include:
  - **Healthcare**: Development of tailored prevention plans and spending optimization for the 30 Baht health insurance program, leveraging a data warehouse containing over 4 trillion records.
  - **Social Protection**: Under a Cabinet Decree, BDI collaborated with MSDHS on the 10,000 Baht program to identify vulnerable groups excluded from registration.
- **Sectoral Expansion**:
  Beyond health and SP, BDI has supported the Ministry of Finance and the Department of Revenues in enhancing data analytics capacities, and the Social Security Office (SSO) has independently developed its own data warehouse for social insurance analytics

2. Implications

The BDI's experience illustrates Thailand's growing capacity for data analytics in the public sector. However, efforts remain fragmented, particularly in the SP domain where analytics adoption is inconsistent across agencies. While BDI's decentralized model aligns with legal requirements and facilitates flexible partnerships, the lack of a unified data governance structure and limited cross-sectoral interoperability continue to pose challenges for scaling data-driven innovations nationwide.

3. Recommendations

Building on Thailand's initial successes with big data analytics—particularly through the Big Data Institute (BDI)—the following strategic actions are recommended to enhance the effective and responsible use of data analytics across social protection (SP) and wider public sector programs.

Table 9: Recommendations on Big Data Analytics in the Public Sector in Thailand

Focus Area	Recommendations
Strategic Assessment	Conduct a **comprehensive needs assessment** of data analytics applications in the SP sector, mapping program objectives, instruments, and potential impact areas to guide future analytics investments.
Descriptive Analytics	Expand the use of **descriptive analytics** for program monitoring and policy design, but avoid creating a static centralized database. Instead, continue pursuing a **decentralized, dynamic federated model** for operational purposes. Descriptive tools should also identify system "blind spots"—underserved populations or administrative bottlenecks.
Institutional and Technical Capacity	Strengthen the **community of practice** linking data scientists, program administrators, and academics. Build institutional and technical capacity for advanced analytics and foster collaborative learning across agencies.
Predictive and Prescriptive Analytics (AI)	Introduce AI-driven **predictive and prescriptive analytics tools** to automate eligibility assessments, compliance monitoring, fraud detection, and benefit optimization. These tools should support holistic case management across programs and administrative levels.
Policy Microsimulation	Explore **policy microsimulation tools** for forecasting and scenario planning in social insurance (e.g., pensions). The Social Security Office (SSO) is identified as a leading candidate to pilot such tools, leveraging either external or in-house development options.
Business Intelligence (BI)	Broaden the deployment of BI solutions to support decision-making, performance monitoring, and dynamic reporting across SP programs and agencies.

8. Policy Recommendations and Roadmap for 2025–2029

Digital Data Infrastructure Roadmap (DDIR) 2025–2029

In the rapidly evolving digital landscape, Thailand has recognized the vital importance of building a robust and comprehensive digital data infrastructure to drive its economic growth and societal transformation. This DDIR 2025–2029 outlines a strategic plan to further strengthen Thailand's digital ecosystem, enhance data governance and privacy protections, foster innovation and collaboration, and position the country as a regional leader in digital development. This comprehensive roadmap sets forth a phased approach, with short-term initiatives (2025–2027) laying the groundwork for more advanced data-driven programs and medium-term strategies (2027–2029) to unlock the full potential of Thailand's digital future.

The proposed multifaceted approach addresses key areas such as data infrastructure modernization, data governance, cybersecurity enhancement, data collection and utilization, and AI strategy implementation. By aligning these initiatives with Thailand's overarching national digital development objectives, the roadmap aims to promote a secure, interoperable, and citizen-centric digital ecosystem that empowers businesses, drives social progress, and elevates Thailand's global competitiveness.

Short Term (2025–2027)

1. Data Infrastructure Modernization

a) Accelerate the Expansion of Government Data Center and Cloud (GDCC) Capacity:

- Allocate dedicated budget and technical resources to rapidly develop the Cloud Management Platform (CMP) and ensure seamless interoperability between existing government data centers and new cloud systems.
- Develop a comprehensive regulatory and operational framework that enables multiple cloud providers to offer services to government agencies. Implement standardized guidelines, certification processes, and interoperability standards to ensure security, compliance, and seamless data exchange
- Establish a dedicated digital transformation taskforce within the Digital Economy and Society Ministry to oversee the 'Go Cloud First' policy implementation, with clear milestones for data migration, open data platform development, and technology adoption.
- Initiate a comprehensive workforce training and development program focused on cloud technologies, data integration, and emerging technologies like AI and blockchain.
- Provide seamless, secure access to cloud-native, enterprise-grade big data platforms (such as Databricks, Google BigQuery, Snowflake, Microsoft Azure Synapse Analytics, AWS Analytics Suite or similar) through the CMP, enabling

government agencies to process terabyte-scale datasets with advanced analytics capabilities, robust security, and scalable infrastructure.

- **Suggested KPIs**:
  1. **Establishment of digital transformation taskforce**
  2. **Percentage of government agencies migrated to cloud infrastructure**
  3. **Number of government services successfully transitioned to cloud platforms**
  4. **Number of government employees trained on cloud technologies**
  5. **Cost savings achieved through cloud migration (%)**
  6. **Reduction in on-prem data center operational expenses**

b) Enhance the Government Data Exchange (GDX) Platform:

- Introduce robust audit trail capabilities to improve transparency and accountability, similar to the Estonian X-Road system.
- Automate workflows by integrating smart contracts and digital workflows to improve efficiency and reduce administrative burdens.
- Implement other technical enhancements recommended in section GDX
- **Suggested KPIs**
  1. **Number of inter-agency data exchanges processed monthly**
  2. **Percentage of workflows automated through smart contracts**

2. AI Strategy and Implementation

a) Foundational Infrastructure Development:

- Enhance AI research and development hubs, focusing on both broader AI and GenAI applications.
- Expand the national AI cloud infrastructure, ensuring it is optimized for a range of AI workloads, including dedicated resources for GenAI use cases.
- Establish an AI marketplace on the GDCC platform to facilitate access to public and private sector AI solutions.
- Foster public-private collaboration to capitalize on Thailand's growing private investments and expand access to cutting-edge AI resources.
- **Suggested KPIs:**
  1. **Number of AI research and development hub projects**
  2. **AI marketplace transaction volume**

b) Human Capital and Skills Development:

- Establish a comprehensive AI education framework, spanning from primary education to advanced research levels.

- Create specialized AI degree programs at leading universities and develop professional certification tracks.
- Incentivize private sector participation in AI skills development through tax benefits and grants for companies investing in AI training programs.
- Establish AI centers of excellence in key economic sectors and create mentorship programs to build a sustainable AI talent pipeline.
- **Suggested KPIs:**
  1. **Number of AI focused degree programs established**
  2. **Annual AI skills training participants**
  3. **Number of AI professional certfications issued**
  4. **Private sector investments in AI training programs**

c) Enhance MSMEs' AI Adoption and Upskilling:

- Launch targeted pilot projects and promotional initiatives that support MSMEs in adopting AI solutions—such as automation, predictive analytics, and chatbots—to quickly enhance operational efficiency and competitiveness.
- Develop a targeted strategy to improve fixed broadband affordability and coverage in rural and underserved areas, thereby narrowing the digital divide.
- Create a dedicated hub in collaboration with industry associations to provide access to mentorship, regulatory sandbox environments, and partnerships with technology providers, enabling rapid testing, iteration, and scaling of AI applications tailored to MSME needs.
- Boost digital literacy and tailor support for communities facing digital access challenges, ensuring that MSMEs in less advantaged areas can also leverage digital tools. This advances a citizen-centric digital economy by empowering businesses and reducing inequality in digital access and literacy.
- Suggested Milestone: Successfully onboard and upskill 100,000 MSMEs through digital platforms, training programs, and support services by 2027.
- **Suggested KPIs:**
  1. **Number of MSMEs adopting AI solutions**
  2. **Productivity improvement percentage for AI-enabled MSMEs**
  3. **Number of MSMEs participating in the upskilling program**

3. Data Governance Framework

a) Establish a National Data Governance Authority (NDGA) within the Digital Government Development Agency (DGA):

- Empower the NDGA to coordinate, enforce, and ensure uniform implementation of data governance practices across government agencies.

- Mandate the NDGA to oversee technical and regulatory enforcement, eliminate data silos, and ensure consistent data governance policies across the public sector.
- Facilitate the NDGA's collaboration with the NSO to align statistical and administrative data governance policies.
- Carefully assess the NDGA's scope to avoid overlaps with existing agencies while ensuring its establishment aligns with the Cabinet's manpower ceiling to optimize resource and budget efficiency.

b) Develop a Unified National Data Governance Policy:

- Consolidate existing governance structures, including the DGA's digital standards, the NSO's statistical governance, and OPDC's performance data policies.
- Incorporate AI and emerging technology governance, establishing ethical standards for automated decision-making, predictive analytics, and real-time data processing.
- Align the policy with international best practices, including the OECD Digital Government Framework and GDPR, to enhance Thailand's global digital competitiveness.

c) Harmonize and Modernize Data-Related Legislation:

- Conduct a comprehensive legal review to identify inconsistencies and modernize existing legislation, such as the Official Information Act, PDPA, CSA, and Statistics Act.
- Consider the development of a unified Data Governance Act to integrate personal data protections, statistical data-sharing mandates, and cybersecurity requirements.
- Ensure the new law accommodates emerging technologies, including cloud computing, blockchain-based data verification, and AI-driven analytics.

d) Suggested KIPs:

1. **Established NDGA**
2. **Developed and implemented NDGP**
3. **Completed review of relevant existing legislation**

4. Cybersecurity Enhancement

a) Enhance and Modernize Thailand's Cybersecurity Framework:

- Strengthen coordination among existing regulatory bodies, with the NCSC serving as the central coordinating authority.
- Develop unified implementation guidelines to eliminate confusion and ensure consistent compliance across different cybersecurity regulations.

- Align Thailand's cybersecurity framework with international best practices, such as the NIST Cybersecurity Framework, GDPR, and the NIS Directive.

b) Build Cybersecurity Human Capacity and Enhance Cyber Literacy:

- Develop sector-specific cybersecurity training modules to address unique cyber threats in industries such as finance, healthcare, energy, and telecommunications.
- Increase cyber range simulations, penetration testing exercises, and real-world incident response training to equip professionals with applied cybersecurity skills.
- Launch public awareness campaigns, digital safety workshops, and cybersecurity education programs in schools and rural areas to improve cyber literacy.
- Strengthen partnerships with the private sector to create industry-driven cybersecurity training programs and facilitate knowledge sharing.
- **Suggested KPIs:**
  1. **Establishment of NCSC as functional central coordinating authority**
  2. **Implementation rate of unified cybersecurity guidelines across sectors**
  3. **Number of professionals trained through sector-specific programs**
  4. **Frequency and participation in cyber range simulations and incident response exercises**
  5. **Public awareness campaign reach and effectiveness**
  6. **Digital safety education implementation in schools**
  7. **Reduction in successful social engineering attacks/incidents**

- ## Medium Term (2027–2029)

1. Data Governance Framework

a) Establish Incentives and Compliance Mechanisms for Data Governance:

- Introduce a National Data Compliance and Incentive Program, including performance-based funding, recognition programs, and monetary penalties for noncompliance.
- Develop a national data governance compliance dashboard to enable real-time monitoring of agency performance in data-sharing, accuracy, and security.

b) Enforce a Comprehensive Data Interoperability Framework:

- Mandate interoperability as a legal requirement under the proposed Data Governance Act.

- Expand the implementation of TGIX and GDX, ensuring all agencies use standardized APIs, metadata schemas, and ‘base data’ principles.
- Implement automated data synchronization across government databases and enforce inter-agency data exchange audits.

c) Strengthen Data Quality, Validation, and Cleaning Capabilities:
- Develop a National Data Quality Assurance Program (NDQAP) under the NDGA to implement automated data validation tools and regular data audits.
- Provide training programs for public officials on data governance best practices to improve data quality across the public sector.

d) Enhance Public Engagement and Transparency:
- Implement automated language translation, mobile-friendly surveys, and voice-based feedback options on digital platforms to improve citizen engagement.
- Introduce gamification elements and incentives to encourage sustained citizen participation and make engagement more interactive.
- Offer real-time updates and interactive data visualization tools to deepen citizen understanding of government spending and build trust.

e) Promote Open Data Utilization and Economic Impact:
- Create collaborative innovation spaces with tech startups, universities, and international organizations to co-develop solutions using open data.
- Organize hackathons, innovation competitions, and data challenges to encourage the creation of new apps and tools from open data.
- Provide capacity-building workshops on effective use of open data for business, research, and governance, focusing on data analytics, visualization, and machine learning.
- Encourage private sector companies to leverage open data to develop industry-specific solutions such as improving logistics and transportation services or supporting smart farming initiatives.

f) Suggested KPIs:

1. **Rollout of National Data Compliance and Incentive Program**
2. **Launch of data governance compliance dashboard**
3. **Completed expanded implementation of TGIX and GDX**
4. **Establishment of NDQAP**
5. **Number of public officials trained on data governance best practices**
6. **Citizen engagement rate through digital platforms (participation metrics and feedback volume)**
7. **Number of commercial applications and services developed using government open data**

2. Data Infrastructure Modernization

a) Quantum Computing Infrastrcture and Research Capacity

- Establish quantum-ready data centers with advanced cooling systems and electromagnetic shielding. These specialized infrastructure investments will provide the critical physical environment necessary for cutting-edge quantum research and development.
- Establish targeted scholarship programs, specialized curriculum with top universities, and international research exchange initiatives, to cultivate a new generation of quantum technology experts.
- Establish public-private research partnerships, creating a national quantum technology innovation sandbox, and developing strategic collaborations with global quantum technology leaders.
- **Suggested KPIs:**
  1. **Number of operational quantum-ready data centers established with proper cooling and shielding**
  2. **Percentage of quantum computing specialists trained through scholarship programs and specialized curriculum**
  3. **Number of successful public-private quantum research partnerships established**
  4. **Volume of patents and research publications produced through the quantum technology innovation sandbox**

3. AI Strategy and Implementation

a) Regulatory and Ethical Framework:

- Develop more comprehensive risk management protocols, potentially adopting and localizing international standards such as ISO/IEC 23894:2023 for AI risk management.
- Establish more robust mechanisms for tracking and understanding AI incidents, following the OECD's framework for Trustworthy Artificial Intelligence.
- Create more specific guidelines for different sectors and use cases, moving beyond general ethical principles to detailed, actionable frameworks.
- Strengthen enforcement mechanisms and monitoring systems to ensure compliance with AI ethics guidelines and regulations.

b) Research and Innovation Ecosystem:

- Significantly increase investment in AI research and development facilities, focusing on creating specialized AI research centers and innovation hubs.
- Enhance efforts to transition from being primarily an AI user country to becoming an AI application creator, strengthening the education system to produce more AI specialists and researchers.

- Establish more robust funding mechanisms for AI startups and research projects, creating a more vibrant innovation ecosystem.
- Strengthen international research collaborations and knowledge exchange programs, particularly within the ASEAN region, to build a more comprehensive and competitive AI research ecosystem.

c) Sector-Specific AI Implementation:

- Establish sector-specific AI implementation guidelines and standards, particularly for key industries such as healthcare, agriculture, manufacturing, and financial services.
- Create specialized training programs to address the talent shortage and develop expertise in sector-specific AI applications.
- Establish sector-specific regulatory sandboxes to allow for controlled testing and implementation of AI solutions while ensuring compliance with relevant regulations.
- Focus on developing RWD collection and analysis capabilities across different sectors, particularly in healthcare and public services.

d) Economic and Investment Strategy:

- Establish more attractive investment incentives specifically targeted at AI development and implementation, including tax benefits and grants.
- Create a dedicated AI investment fund to support startups and scale-ups in the AI sector.
- Develop specific economic zones or technology parks dedicated to AI development, offering infrastructure and support services to attract both domestic and foreign investment.
- Establish more public-private partnerships to accelerate AI adoption across various sectors, particularly in areas where AI can have the most significant economic impact.
- **Suggested KPIs:**
    1. **Percentage of high-risk AI systems successfully evaluated and certified through the comprehensive risk management framework**
    2. **Number of AI patents filed and commercialized applications developed by Thai researchers and companies annually**
    3. **Amount of domestic and foreign direct investment secured specifically for AI development initiatives and infrastructure**

4. MSMEs' Digital Adoption and Labor Skill

a) Enhance MSMEs' Digital Adoption:

- Provide targeted financial support—including tax credits, grants, and low-interest loans—to incentivize investments in advanced digital tools (for example, ERP, CRM systems).
- Establish a dedicated MSME Digital Transformation Fund to support pilot projects in cloud computing, e-commerce, and data analytics.
- Foster public-private partnerships and digital mentorship networks that streamline access to support programs and share best practices for digital integration.
- **Suggested KPIs:**
  1. **Number of MSMEs supported through digital adoption grants**
  2. **% increase in digital adoption by MSMEs across targeted indicators**

b) Enhance Digital Infrastructure Equality for MSMEs:

- Prioritize investments to expand fixed broadband networks in underserved regions.
- Incentivize telecom providers through financial mechanisms to extend 4G/5G mobile internet coverage and improve internet quality to underserved regions.
- Develop transparent infrastructure mapping and progress dashboards to monitor broadband expansion, ensuring accountability and guiding further investment to bridge regional disparities.
- **Suggested KPIs:**
  1. **% increase in population and MSMEs covered by high-speed fixed and mobile internet, with a focus in underserved areas**
  2. **Number of local digital access points established**

c) Elevate Digital Skills for the MSME Workforce:

- Launch comprehensive, government-backed upskilling and certification programs in collaboration with academic institutions and industry associations, focusing on critical digital competencies such as cloud computing, cybersecurity, and data analytics.
- Establish regional digital skill centers and accessible online learning platforms in Thai, complemented by financial incentives and subsidies to support continuous workforce development in underserved areas.
- **Suggested KPIs:**
  1. **Number of MSME employees trained in digital skills**

5. Data and Analytics Strategy for Social Protection

a) Enhance Data Governance and Strengthen Data Policies as a Foundation for Interoperability:
   - Establish a dedicated sectoral data governance framework and committee to improve data policy coordination and data harmonization across social protection agencies.
   - Assess un-automated social protection services and review data usage efficiency across the delivery chain of social protection programs to improve data quality and availability as well as to reduce administrative costs.
   - **Suggested KPIs:**
     1. **Number of cross-agency agreements signed for data sharing**
     2. **Percentage of social programs using shared data systems**

b) Establish a Federated Social Registry:
   - Foster interoperability to create a dynamic data ecosystem to support delivery of social protection programs across multiple agencies.
   - Use such an ecosystem to strengthen both institutional and technical capacity in identifying 'blind spots' within the national social protection system (minimizing errors of exclusion).
   - **Suggested KPIs:**
     1. **% population coverage in social registry**
     2. **Number of programs integrated into the registry**

c) Expand Analytics Capabilities:
   - Foster collaboration among government agencies, academic institutions, and data experts to build institutional capacity for DDD.
   - Expand descriptive analytics to improve insights into operational matters and to support evidence-based policy making.
   - Introduce policy microsimulation tools, especially in social insurance, to support sustainable pension reforms.
   - **Suggested KPIs:**
     1. **Number of predictive models developed and deployed**
     2. **Frequency of data use for policymaking by DSDW and partners**

d) Enhance Service Delivery:
   - Develop a program of systematic deployment of AI-enabled chatbots to improve client services and enhance user experience.

- Leverage AI technologies for predictive and prescriptive analytics to enhance program effectiveness in developing benefit packages that are tailored to the needs of different population groups.
- **Suggested KPIs:**
  1. **User satisfaction rate with digital social services**
  2. **Reduction in processing time for benefits through digital channels**

Annex

A. Framework

As an outcome of the discussion between ETDA and the World Bank, the report aims to provide practical recommendations for enhancing Thailand's digital data infrastructure. The topics of each chapter were jointly decided between ETDA and the World Bank based on practical needs. Each chapter reflects the discussions among related agencies and the World Bank.

The report does not intend to suggest a framework, or theoretical foundations related to the importance of data infrastructure and regulations. Rather, the report adopts the existing frameworks, building on the framework from the World Development Report (WDR) 2021 on Data for Better Lives, in organizing key chapters and areas of investigation while considering the unique characteristics of relevant infrastructure, policy, and institutional aspects of the country's data ecosystem.

Key frameworks the report benefits from are described below:

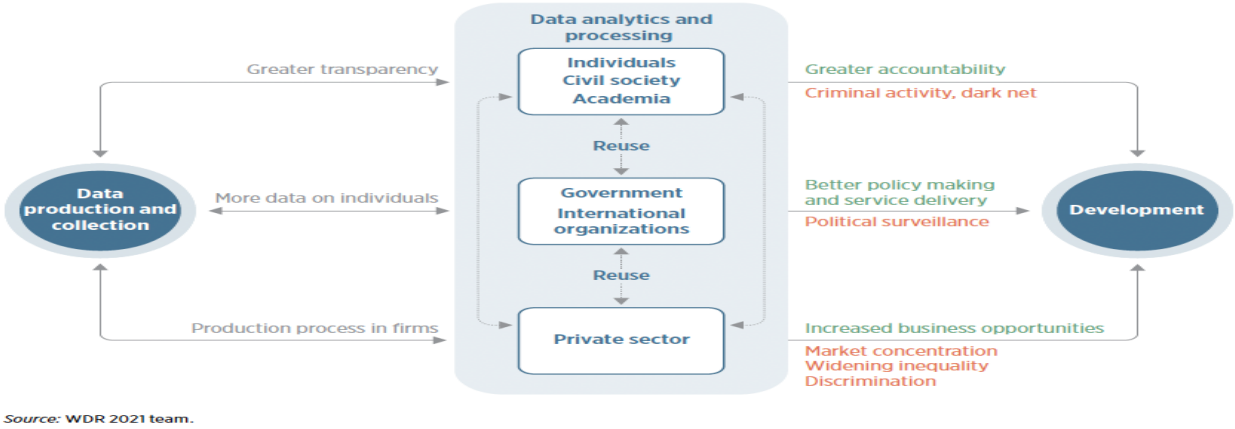
1. Data For Better Lives

Data creates value and improves development outcomes through multiple actors and channels. The WDR 2021 advocated for applying the principles of trust, value, and equity for data governance that reinforces a social contract aligned with each society's values, including an individual's rights over the use of their data (World Bank 2021, 35). Green lettering indicates positive effects on improving lives, and red lettering indicates negative ones.

The theory of change in *Figure 41* describes this value-creating process, connecting the three domains of society—individuals, government, and the private sector—through the input/generation of data, analytics and processing, and outcome.

The report reflects this theory of change and organizes the chapters for the usage of data for government (chapter on digital government) and private sector (chapter on MSMEs), and the broader application between the government and private sector (the parallel note on the social protection use case).

Figure 41: Theory of Change - Data for better lives



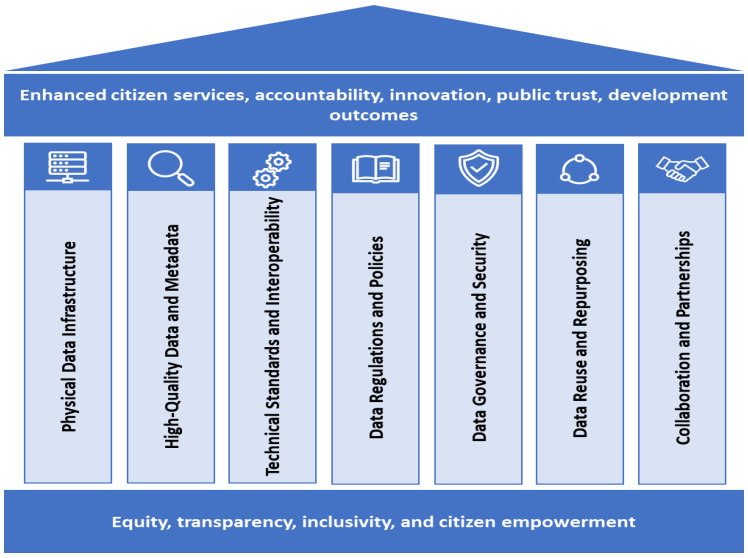
Source: WDR 2021

2. Data infrastructure and governance

Figure 42 describes the different factors contributing to the effective usage of data, including data infrastructure, collection and storage of data, standards and interoperability, regulations, governance and security, reuse, and repurposing, as well as collaboration and partnerships.

The WDR 2021 highlights the importance of digital data infrastructure for effective governance, encompassing both hard components, such as broadband networks and data centers, and soft elements, such as data regulations and governance frameworks. A well-designed infrastructure enables seamless data sharing across government departments, breaking down traditional silos and fostering coordinated responses to complex societal challenges. Technical data standards and high-quality metadata are crucial for data interoperability, maximizing the value of data by allowing it to be repurposed across programs. Additionally, comprehensive legal frameworks and governance structures are essential for public trust, safeguarding citizens' rights, and promoting responsible data use. Collaboration among government, the private sector, and civil society is vital for building a secure and inclusive digital economy, enhancing public service quality, and reinforcing transparency and accountability.

Figure 42: Factors for Robust Data Infrastructure and Governance



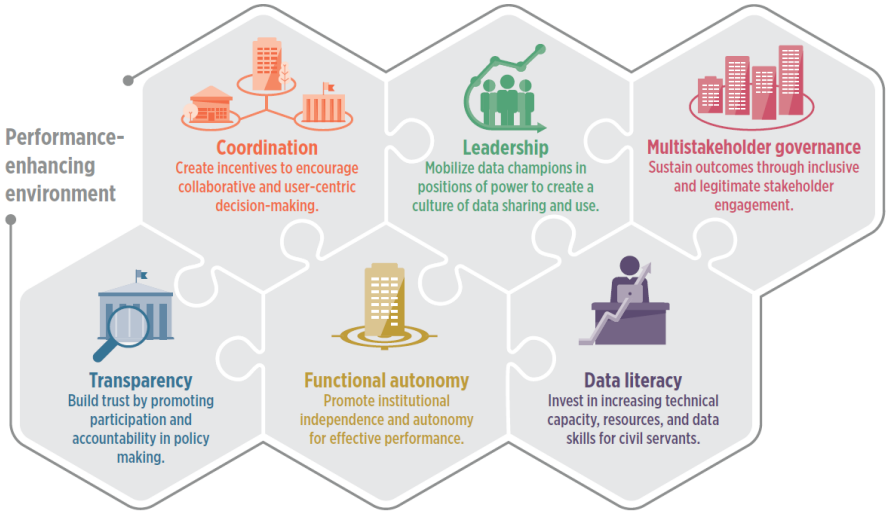
Source: Original illustration for this report.

3. Institutional Arrangement for Data Governance

Institutions form the data governance ecosystem, implementing policies, laws, systems, and standards. Their functions include designing strategies and policies, creating rules and regulations, enforcing and engaging, and monitoring and ensuring improvements. Effective institutional arrangements distribute roles and competencies among key participants, ensuring performance-enhancing environments.

The chapter on digital government and institutional arrangement follows the framework from the WDR 2021, as shown in *Figure 43*.

Figure 43: Institutional Arrangement for Effective Data Governance



Source: WDR 2021.

B. Digital Data Infrastructure Roadmap (2025–2029) - Details

1. Data Infrastructure Modernization

a) **Accelerate Expansion of GDCC Capacity:** Based on the strategic vision outlined by Thailand's NT,[100] the Thai government should prioritize a phased, comprehensive approach to expanding its GDCC capacity. The current infrastructure of over 40,000 virtual machines supporting 800 government agencies provides a robust foundation,[101] but immediate investments are needed to enhance data integration capabilities and overcome existing siloed data limitations. Specifically, the government should do the following:

- Allocate dedicated budget and technical resources to rapidly develop the CMP, ensuring seamless interoperability between existing government data centers and new cloud systems.[102] This will require close collaboration with global cloud service providers and other hyperscale cloud providers to develop standardized API protocols that enable secure, efficient data sharing across different government agencies.
- The expansion of GDCC capacity must be accompanied by a comprehensive workforce training and development program focused on cloud technologies, data integration, and emerging technologies such as AI and blockchain.
- Establish a dedicated digital transformation taskforce within the Digital Economy and Society Ministry to oversee the 'Go Cloud First' policy implementation, with clear milestones for data migration, open data platform development, and technology adoption.

This approach will not only support the technical infrastructure transition but also build internal governmental capacity to leverage cloud technologies for more efficient public service delivery, data-driven policy making, and long-term national competitiveness. By creating a structured, collaborative framework for cloud technology adoption, Thailand can position itself as a regional leader in digital government transformation.

b) **Enhance the GDX Platform:**

Refer to ***Government Data Exchange Center***

c) **Modernize Legacy Applications and Systems:** Based on Thailand's impressive progress in digital transformation through the Government as a Platform (GaaP) initiative, the government should prioritize a comprehensive cloud migration strategy

[100] GDCC Launches Marketplace to Integrate Platform Services and Applications for the Government Sector
[101] Thailand gears up toward full-scale cloud government next year
[102] NT reiterates its role in leading technology to support the government's transition to the digital era

that systematically modernizes legacy public service applications using contemporary microservices architectures.[103] This approach should involve the following:

- Create a centralized cloud migration framework that establishes standardized protocols for application assessment, refactoring, and deployment. Specifically, agencies should conduct thorough legacy application audits to categorize systems by complexity, interdependencies, and criticality, enabling a phased migration approach. Each application should be evaluated for potential re-architecting using cloud-native principles, focusing on decomposing monolithic systems into modular, independently deployable microservices that can enhance scalability, resilience, and performance. The migration strategy should also incorporate robust security protocols, ensuring that each migrated service maintains stringent data protection standards consistent with Thailand's emerging digital governance framework.
- Invest in comprehensive workforce upskilling programs targeting IT professionals across public sector agencies. These programs should focus on developing expertise in cloud technologies, containerization technologies such as Kubernetes, and modern software development methodologies such as DevOps and continuous integration/continuous deployment (CI/CD) practices.
- Consider establishing a centralized cloud governance team within the DGA to provide technical guidance, establish best practices, and offer ongoing support for agencies navigating complex migration challenges. This team could develop reference architectures, provide technical consultation, and create standardized toolkits that simplify the transition to cloud-native application designs.

By combining strategic technical planning with robust human capital development, Thailand can accelerate its digital transformation while maintaining the reliability and security of critical public service platforms.

2. Enhance Data Governance Framework

Thailand has emerged as a dynamic player in digital transformation, strategically advancing its national data governance through landmark initiatives such as the Digitalization of Public Administration and Services Delivery Act (2019) and the establishment of the GDX. Key institutions such as the DGA and the Thai NSO have been instrumental in setting standards and managing statistical data, demonstrating the country's commitment to modernizing its digital infrastructure.

Despite these commendable efforts, Thailand continues to face critical challenges in creating a fully integrated digital government ecosystem. Persistent issues of policy fragmentation, inconsistent enforcement, and technological interoperability limitations have hindered the comprehensive realization of a streamlined national data framework. To overcome these obstacles, a strategic approach focusing on strengthening governance structures, unifying policies, harmonizing legislation, and enhancing

[103] Transforming Public Services: Thailand's Cloud Strategy

compliance mechanisms will be essential in establishing a more secure, efficient, and standardized national data environment.

a) Establish NDGA within DGA

Thailand's data governance is currently managed by multiple entities, including DGA, the Thai NSO, OPDC, and sectoral ministries, leading to fragmentation and inconsistent enforcement. While the DGA is responsible for digital government standards, no single authoritative body is empowered to enforce compliance and oversee cross-agency coordination. The DGDC provides high-level oversight, but its role in direct enforcement remains limited. A centralized authority is needed to coordinate, enforce, and ensure uniform implementation of data governance practices across government agencies.

To address this, Thailand should consider establishing an NDGA within the DGA, with the following responsibilities:

- Ensure cross-agency coordination by streamlining data governance policies, standards, and compliance.
- Oversee technical and regulatory enforcement to eliminate data silos and inconsistencies in government databases.
- Align statistical and administrative data governance policies by working closely with the Thai NSO.
- Establish an inter-agency Data Governance Council, co-chaired by the NDGA and the Thai NSO, to ensure continuous collaboration among government, private sector, and academic stakeholders.

b) Develop a Unified National Data Governance Policy

Thailand lacks a single, unified data governance policy, leading to inconsistencies in implementation across government agencies. While existing frameworks such as TGIX, GDX, and the Government Data Classification and Data Sharing Framework provide useful technical guidelines, they lack enforcement mechanisms and clear integration with sectoral policies. Furthermore, AI governance, ethical data use, and real-time data processing are not explicitly covered in existing policies. A unified approach is required to align governance principles across agencies, improve interoperability, and ensure compliance with international standards.

To achieve this, Thailand should develop a National Data Governance Policy (NDGP) that

- Consolidates existing governance structures, including the DGA's digital standards, the Thai NSO's statistical governance, and the OPDC's performance data policies;
- Mandates compliance with TGIX and GDX, ensuring all agencies follow uniform data interoperability and sharing standards;
- Clearly defines roles and responsibilities for the NDGA, the Thai NSO, the OPDC, local governments, and private sector data custodians;

- Incorporates AI and emerging technology governance, establishing ethical standards for automated decision-making, predictive analytics, and real-time data processing; and
- Aligns with international best practices, including the OECD Digital Government Framework and GDPR, to enhance Thailand's global digital competitiveness.

c) Harmonize and Modernize Data-Related Legislation

Thailand's data governance framework is governed by multiple overlapping laws, including the Official Information Act (1997), PDPA (2019), CSA (2019), and Statistics Act (2007). While these laws provide a foundation for privacy, security, and transparency, their fragmentation leads to legal ambiguities and enforcement challenges. The lack of a harmonized legal framework results in inconsistent data-sharing practices across government agencies and limits the full potential of digital governance. A unified legislative approach is needed to create legal clarity, ensure compliance, and facilitate seamless data integration.

To address this, Thailand should do the following:

- Conduct a comprehensive legal review to identify inconsistencies and modernize existing legislation.
- Consider development of a unified Data Governance Act, integrating
    - The PDPA's personal data protections with statistical data-sharing mandates under the Statistics Act,
    - Cybersecurity protections under the CSA with open data policies for non-sensitive public datasets, and
    - Clear compliance requirements for both government agencies and private sector entities handling public data.
- Ensure the new law accommodates emerging technologies, including cloud computing, blockchain-based data verification, and AI-driven analytics.

d) Establish Incentives and Compliance Mechanisms for Data Governance

While agencies are encouraged to adopt data governance best practices, there are no formal incentives or penalties to drive compliance. Many government agencies remain hesitant to share data, citing bureaucratic resistance, lack of incentives, and unclear regulatory benefits. Without structured incentives or accountability measures, progress in data interoperability and governance adherence remains slow. To build a culture of data sharing and best-practice adoption, Thailand must introduce stronger compliance mechanisms and incentives.

To achieve this, Thailand should do the following:

- Consider introducing a National Data Compliance and Incentive Program, including
    - Performance-based funding for agencies successfully implementing interoperability standards;

- Recognition programs and rankings (for example, a Data Governance Excellence Index) to encourage competition and accountability; and
- Monetary penalties for noncompliance, ensuring agencies adhere to the NDGA's standards.

- Develop a national data governance compliance dashboard, allowing real-time monitoring of agency performance in data-sharing, accuracy, and security.

e) Enforce a Comprehensive Data Interoperability Framework

Thailand has developed key interoperability frameworks such as TGIX and GDX, but implementation remains inconsistent across agencies. There is no legally binding requirement ensuring all agencies adhere to standardized metadata, APIs, or 'base data' principles. Without full compliance, data fragmentation and duplication persist, preventing the realization of a truly integrated digital government. Strengthening enforcement mechanisms is essential to ensure seamless, secure, and standardized data sharing across the public sector.

To enhance data interoperability, Thailand should do the following:

- Mandate interoperability as a legal requirement under the proposed Data Governance Act.
- Expand TGIX and GDX implementation, ensuring all agencies
  - Use standardized APIs and metadata schemas for data exchange;
  - Follow 'base data' principles, where each dataset has a single authoritative source to eliminate redundancy; and
  - Implement automated data synchronization across government databases.
- Enforce inter-agency data exchange audits, ensuring continuous adherence to interoperability standards.

f) Strengthen Data Quality, Validation, and Cleaning Capabilities

Data quality remains a significant challenge in Thailand's public sector, with inconsistent records, outdated datasets, and weak validation mechanisms. While the Thai NSO manages data cataloging and Statistical Data and Metadata eXchange (SDMX) standards, there is no centralized quality assurance mechanism to ensure data accuracy, completeness, and reliability. Poor data quality has a negative impact on policy decision-making, citizen services, and cross-agency collaboration. Investing in data validation, cleaning, and quality assurance infrastructure is critical to enhancing trust in government data.

To improve data quality, Thailand should consider developing an NDQAP under the NDGA, responsible for

- Automated data validation tools, ensuring real-time accuracy and consistency;
- Regular audits of government datasets, identifying and rectifying inconsistencies; and
- Training programs for public officials on data governance best practices.

g) Modernize Public Sector Big-Data Infrastructure

Public sector agencies are increasingly challenged by massive, complex datasets that overwhelm traditional data management systems. The exponential growth of digital information requires sophisticated, scalable technological solutions that can process terabyte-scale data efficiently, enabling more intelligent decision-making, operational transparency, and strategic insights across government organizations.

- **Strategic Platform Selection:** Evaluate and select enterprise-grade cloud-based big data platforms such as Databricks, Google BigQuery, Snowflake, Microsoft Azure Synapse Analytics, or AWS Analytics Suite, prioritizing scalability, security, and advanced analytics capabilities tailored to public sector requirements.
- **Phased Migration Approach:** Implement a structured, incremental migration strategy beginning with a high-impact pilot project, allowing agencies to validate platform performance, assess data integration challenges, and minimize operational disruptions during technological transformation.

3. Cybersecurity Enhancement

a) Enhancing and Modernizing Thailand's Cybersecurity Framework

As Thailand accelerates its digital transformation, cybersecurity resilience must evolve to match the growing complexity of cyber threats. The country has already established key regulatory frameworks, including the CSA, the PDPA, and sector-specific regulations, but fragmentation and overlapping mandates present challenges. To address these issues, Thailand should focus on strengthening coordination, streamlining regulatory implementation, and aligning with international best practices while maintaining regulatory clarity and efficiency. A more cohesive, risk-based cybersecurity approach will enhance national security, business continuity, and public trust in Thailand's digital infrastructure.

To achieve this, the following measures should be prioritized:

- Strengthen Coordination among Existing Regulatory Bodies: Rather than creating a new unified framework, improve inter-agency collaboration by designating the NCSC as the central coordinating authority, ensuring that existing regulatory bodies maintain their specialized functions while aligning efforts.
- Establish a Clear Cybersecurity Governance Hierarchy: Define a structured governance model where
    - The National Cybersecurity Strategy serves as the overarching policy framework,
    - The NCSC acts as the primary authority overseeing coordination and enforcement, and
    - Individual regulations (for example, CSA, PDPA) retain their specific functions but follow harmonized implementation guidelines to ensure consistency.

- Develop Unified Implementation Guidelines: Create comprehensive cross-framework implementation guidelines that
  - Clearly define how different regulations interact to eliminate confusion,
  - Establish standardized compliance processes where regulatory requirements overlap, and
  - Implement centralized reporting mechanisms to improve response coordination.
- Align with International Cybersecurity Standards: Selectively integrate best practices from international frameworks such as the NIST CSF, GDPR, and the NIS Directive, ensuring compatibility with ASEAN regional cybersecurity frameworks while adapting them to Thailand's specific national security and economic needs.

b) **Building Cybersecurity Human Capacity and Enhancing Cyber Literacy**

Thailand has taken significant steps to build a skilled cybersecurity workforce and improve cyber literacy across various sectors. The ISC2-NCSA partnership aims to provide 10,000 cybersecurity professionals with training and certification by 2026, while the Cyberwarrior Training Program focuses on preparing government personnel for cyber defense roles. Additionally, Thailand has integrated cybersecurity curricula into university programs, established a 10-year Cybersecurity Personnel Development Master Plan, and fostered public-private partnerships to enhance cybersecurity education. However, challenges persist, including keeping pace with evolving threats, ensuring specialized sector-specific training, and expanding cyber literacy initiatives beyond urban centers. Addressing these gaps will be critical to strengthening Thailand's long-term cybersecurity resilience.

To further enhance cybersecurity workforce development and public cyber awareness, the following actions should be prioritized:

- Develop sector-specific cybersecurity training modules for industries such as finance, healthcare, energy, and telecommunications to address unique cyber threats in each sector.
- Increase cyber range simulations, penetration testing exercises, and real-world incident response training to equip professionals with applied cybersecurity skills.
- Partner with ASEAN, international cybersecurity agencies, and leading global organizations to align training programs with international standards and best practices.
- Launch public awareness campaigns, digital safety workshops, and cybersecurity education programs in schools and rural areas to ensure broader cyber literacy adoption.
- Introduce scholarship programs, government-backed cybersecurity fellowships, and industry-sponsored training grants to attract and retain top talent in the cybersecurity field.
- Strengthen partnerships with private sector entities to develop industry-driven cybersecurity training programs, facilitate knowledge sharing, and create

internship and apprenticeship opportunities that provide hands-on experience for cybersecurity professionals.

By scaling up cybersecurity education, enhancing sector-specific training, and improving public awareness, Thailand can build a resilient digital workforce and strengthen its overall cybersecurity posture in the face of evolving cyber threats.

4. Expand Data Collection and Encourage Data Utilization

a) **Enhance Public Engagement and Transparency**

Thailand has developed digital platforms like LawPortal and 'Where Do Our Taxes Go?' to promote public participation and transparency. These platforms aim to provide citizens with accessible information on government activities and spending. However, to maximize their effectiveness and foster greater civic engagement, further enhancements are necessary.

- Implement automated language translation, mobile-friendly surveys, and voice-based feedback options to lower entry barriers and make citizen engagement platforms more user-friendly.
- Introduce gamification elements and incentives to encourage sustained citizen engagement and make participation more interactive and enjoyable.
- Offer real-time updates and interactive data visualization tools to deepen citizen understanding of government spending and build trust.

By enhancing these digital platforms, Thailand can foster greater public participation, improve transparency, and strengthen trust between the government and its citizens.

b) **Promote Open Data Utilization and Economic Impact**

Thailand's open data platform, DATA.GO.TH, offers a repository of over 11,000 datasets [104] covering a wide range of sectors, including agriculture, transportation, education, health, and more. These datasets are publicly available for access and use by individuals, businesses, and researchers. By making this wealth of data accessible, the platform offers significant potential to drive innovation, improve decision-making, and unlock new economic opportunities. Open data can enable businesses to develop new products and services, academic institutions to carry out in-depth research, and government agencies to make more informed policy decisions.

Leveraging this open data resource can stimulate innovation by encouraging entrepreneurs to create applications that address societal challenges, such as smart city solutions, public health analytics, or sustainable resource management. Furthermore, providing access to reliable, up-to-date data can empower local businesses to make data-driven decisions, optimize operations, and discover new market opportunities. The public and private sectors can collaborate through this resource to develop data-driven solutions that enhance Thailand's global competitiveness. To fully realize the economic potential

[104] Empowering Thailand's digital government with open data

of the DATA.GO.TH platform, Thailand should take active steps to encourage its utilization such as the following:

- **Creating Collaborative Innovation Spaces**: Collaborate with tech startups, universities, and international organizations to build ecosystems around data innovation. These partnerships can focus on co-developing solutions for pressing social issues using the wealth of available datasets.
- **Organizing Hackathons and Challenges:** Host hackathons, innovation competitions, and data challenges to encourage the creation of new apps and tools from the open data. These events can help identify talented innovators and foster a culture of problem solving within the tech community.
- **Providing Capacity-Building Workshops:** Offer training on how to effectively use open data for business, research, and governance. Workshops focusing on data analytics, visualization techniques, and machine learning can enable companies and research institutions to better harness the potential of open data.
- **Building Data-Driven Industry Applications:** Encourage private sector companies to leverage the platform's data to develop industry-specific solutions. For example, data on traffic patterns and road conditions can be used to improve logistics and transportation services, while agricultural data can support smart farming initiatives.

5. AI Strategy Implementation

- Refer to **Suggested KPIs**
    1. **Number of inter-agency data exchanges processed monthly**
    2. **Percentage of workflows automated through smart contracts**

AI Strategy and Implementation

C. Key Data Privacy Laws and Regulations in Thailand

1. The Personal Data Protection Act B.E. 2562 (2019)
2. Royal Decree Prescribing Characteristics, Businesses, or Organizations which are Exempted from the Personal Data Protection Act B.E. 2562 (2019) B.E.2566 (2023)
3. Notification of the PDPC re: Exemption from Maintenance of Records Obligation of the Data Controller Which Is a Small Organization B.E. 2565 (2022)
4. Notification of the PDPC re: Rules and Methods for Preparation and Maintenance of Records of Personal Data Processing Activities for the Data Processor B.E. 2565 (2022)
5. Notification of the PDPC re: Security Measures of the Data Controller B.E. 2565 (2022)
6. Notification of the PDPC on Rules and Methods of Personal Data Breach Notification B.E. 2565
7. Notification of the PDPC re: Rules for Issuance of Orders of Expert Committee under the Personal Data Protection Act B.E. 2562 B.E. 2566
8. Notification of the PDPC Re: the Data Controller and the Data Processor that Are Public Authorities Required to Appoint a Data Protection Officer B.E. 2566 (2023)
9. Notification of the Personal Data Protection Committee Re: Personal Data Protection Officers under Art.41(2) of the Personal Data Protection Act B.E. 2562 (2019) B.E. 2566 (2023)
10. Notification of the Personal Data Protection Committee Re: Security Measures of Personal Data for the Data Controller exempted from the Personal Data Protection Act B.E. 2562 (2019)B.E. 2566 (2023)
11. Notification of the Personal Data Protection Committee Re: Suitable Measures for Collection of Personal Data for the Achievement of the Purpose relating to Historical Documents or Archives
12. Notification of the Personal Data Protection Committee Re: Criteria for Protection of Personal Data for Cross-border Transfer under Art.28 of the Personal Data Protection Act B.E. 2562 (2019) B.E. 2566 (2023)
13. Notification of the Personal Data Protection Committee Re: Criteria for Protection of Personal Data for Cross-border Transfer under Art.29 of the Personal Data Protection Act B.E. 2562 (2019) B.E. 2566 (2023)
14. Notification of the Personal Data Protection Committee Re: Criteria on the Protection Measures for the Collection of Personal Data relating to Criminal Records which is not carried out under Control of Authorized Official Authority under the Law B.E. 2566
15. Notification of the Personal Data Protection Committee Re: Appropriate Measures for the Collection of Personal Data for the Achievement of the Purpose relating to

Research or Statistics under Section 24 (1) and the Scientific, Historical, or Statistic Research Purposes, or other

16. Public Interests under Section 26 (5) (d) of the Personal Data Protection Act B.E. 2562 (2019) B.E. 2566 (2023)
17. Rules of the PDPC re: the Filing, Refusal of Acceptance, Dismissal, Consideration, and Timeframe for the Consideration of the Complaints B.E. 2565
18. Operational Guideline Re: Obtaining Consent from Data Subjects under the PDPA
19. Operational Guideline re: the Notification of the Purposes and Details of Collection of Personal Data from the Data Subjects under the PDPA
20. Guideline for Data Controllers and Data Processors: Case Studies from Consultation Concerning Enforcement of the Personal Data Protection Act B.E. 2562
21. The Notification of the National Telecommunications Commission Re: Measures to Protect Telecommunications Users, Data Privacy, Privacy Rights and Freedom of Communications
22. The Credit Information Business Operation Act B.E. 2545 (2002)
23. The Child Protection Act B.E. 2546 (2003)
24. The National Health Act B.E. 2550 (2007)
25. The Payment System Act B.E. 2560 (2017)
26. The Notification of the Bank of Thailand SorGorSor2. 4/2563 re: Market Conduct Rules
27. The Notification of the Office of Insurance Commission Re: Rules, Methods for Issuing and Offering of Non-life Insurance Policy for Sale and the Performing of Duty of Non-life Insurance Agent, Broker and Bank B.E. 2563 (2020)
28. The Notification of the Office of Insurance Commission Re: Rules, Methods for Issuing and Offering of Life Insurance Policy for Sale and the Performing of Duty of Life Insurance Agent, Broker and Bank B.E. 2563 (2020)
29. The Notification of the Office of Insurance Commission Re: Personal Data Protection Guideline for Life Insurance Business B.E. 2564 (2021)
30. The Notification of the Office of Insurance Commission Re: Personal Data Protection Guideline for Non-life Insurance Business B.E. 2564 (2021)
31. The Notification of the Office of Insurance Commission Re: Personal Data Protection Guideline for Loss Adjuster Business B.E. 2564 (2021)
32. The Official Information Act B.E. 2540 (1997)

D. Key Cybersecurity Laws and Regulations Thailand

1. The Cybersecurity Act B.E. 2562 (2019)
2. The National Cybersecurity Committee Notification re: Policy and Plan on Maintaining Cybersecurity (B.E. 2565-2570) (2022-2027)
3. The Cybersecurity Regulating Committee Regulation re: Delegation of Power to Critical Cyber Threat Committee B.E. 2565 (2022)
4. Office of the Prime Minister Notification re: Appointment of Competent Officials Under CSA B.E. 2566 (2023)
5. The National Cybersecurity Committee Notification re: Establishment, Duties, and Authority of National Computer System Security Coordination Center B.E. 2564 (2021)
6. The National Cybersecurity Committee Notification re: Characteristic, Duties, Responsibilities of the Computer System Security Coordination Center for Critical Information Infrastructure Organizations and Relevant Tasks of Services B.E. 2564 (2021)
7. The National Cybersecurity Committee Notification re: Prescribing Criteria and Types of Organizations with Tasks or Services as Critical Information Infrastructure Organizations and Assigning Control and Regulation B.E. 2564 (2021)
8. The Cybersecurity Regulating Committee Notification re: Code of Practice and Standard Framework for Maintaining Cybersecurity for Government Agency and CII B.E. 2564 (2021)
9. The National Cyber Security Committee Notification re: Characteristics of the Cyber Threats, the Measures to Prevent, Cope with, Assess, Suppress, and Suspend the Cyber Threats in Each Level B.E. 2564 (2021)
10. The Cybersecurity Regulating Committee Notification re: Rules and Procedures for Reporting Cyber Threats B.E. 2566 (2023)
11. The National Cybersecurity Agency Notification re: Criteria and Rates of Fees, Maintenance Fees, Remuneration, and Service Fees for Operations B.E.2566 (2023)

E. List of Stakeholders Interviewed

Mission Dates: October 8–18, 2024

Date	Interviewees (In-Person)	Interviewees (Online)
Tuesday, October 8, 9.00–12.00	Electronic Transaction Development Agency	
Wednesday, October 9, 9.00–12.00		The Bureau of Registration Administration
Friday, October 11, 9.00–12.00	1. Big Data Institute (Public Organization) 2. Comptroller General's Department 3. Department of Labor Protection and Welfare 4. Department of Social Development and Welfare	5. Fiscal Policy Office 6. Department of Local Administration
Tuesday, October 15, 9.00–10.30	National Statistical Office	
Tuesday, October 15, 14.00–17.00	National Institute of Development Administration	Thammasat University
Wednesday, October 16, 8.00–12.00	1. Electronic Transaction Development Agency 2. National Credit Bureau Co., Ltd. 3. The Thai Bankers' Association 4. iAPP Technology Co., Ltd. 5. Grab Thailand 6. National Digital ID Company Limited (NDID) 7. LINE Company (Thailand) 8. Huawei Cloud 9. Amazon Web Services 10. Lazada 11. Thai Fintech Association 12. True Corporation	
Wednesday, October 16, 13.30–15.00 (Joint interview with TDRI)		Bank of Thailand
Thursday, October 17, 9.00–10.30		Office of the National Economic and Social Development Council
Thursday, October 17, 10.30-12.00	Revenue Department	
Thursday, October 17, 14.00–15.30		Office of Small and Medium Enterprises Promotion

Date	Interviewees (In-Person)	Interviewees (Online)
Thursday, October 17, 15.30–16.30		Office of The National Broadcasting and Telecommunications Commission

Additional Online Interviews: November 1–8, 2024

Date	Agencies
Friday, November 1, 8.00–9.00	National Electronics and Computer Technology Center
Tuesday, November 5, 8.30–9.30	Office of the Official Information Commission
Tuesday, November 5, 13.30–14.30	Office of the Public Sector Development Commission
Tuesday, November 5, 15.00–16.00	Department of Business Development

Mission Dates: January 20-28, 2025

Date	Agencies
Monday, January 20, 9.00–12.00	ETDA
Monday, January 20, 13.00–15.00	Digital Government Agency (Online)
Monday, January 20, 15.00–16.30	Office of the Personal Data Protection Commission
Tuesday, January 21, 10.30–12.00	Office of the Public Sector Development Commission
Wednesday, January 22, 9.00–11.00	National Electronics and Computer Technology Center (Online)
Wednesday, January 22, 14.30–16.00	Digital Economy Promotion Agency
Thursday, January 23, 15.00–16.00	Thailand Development Research Institute (Online)
Monday, January 27, 9.00–11.00	Big Data Institute (Online)
Tuesday, January 28, 10.00–11.00	Digital Government Development Agency (Online)

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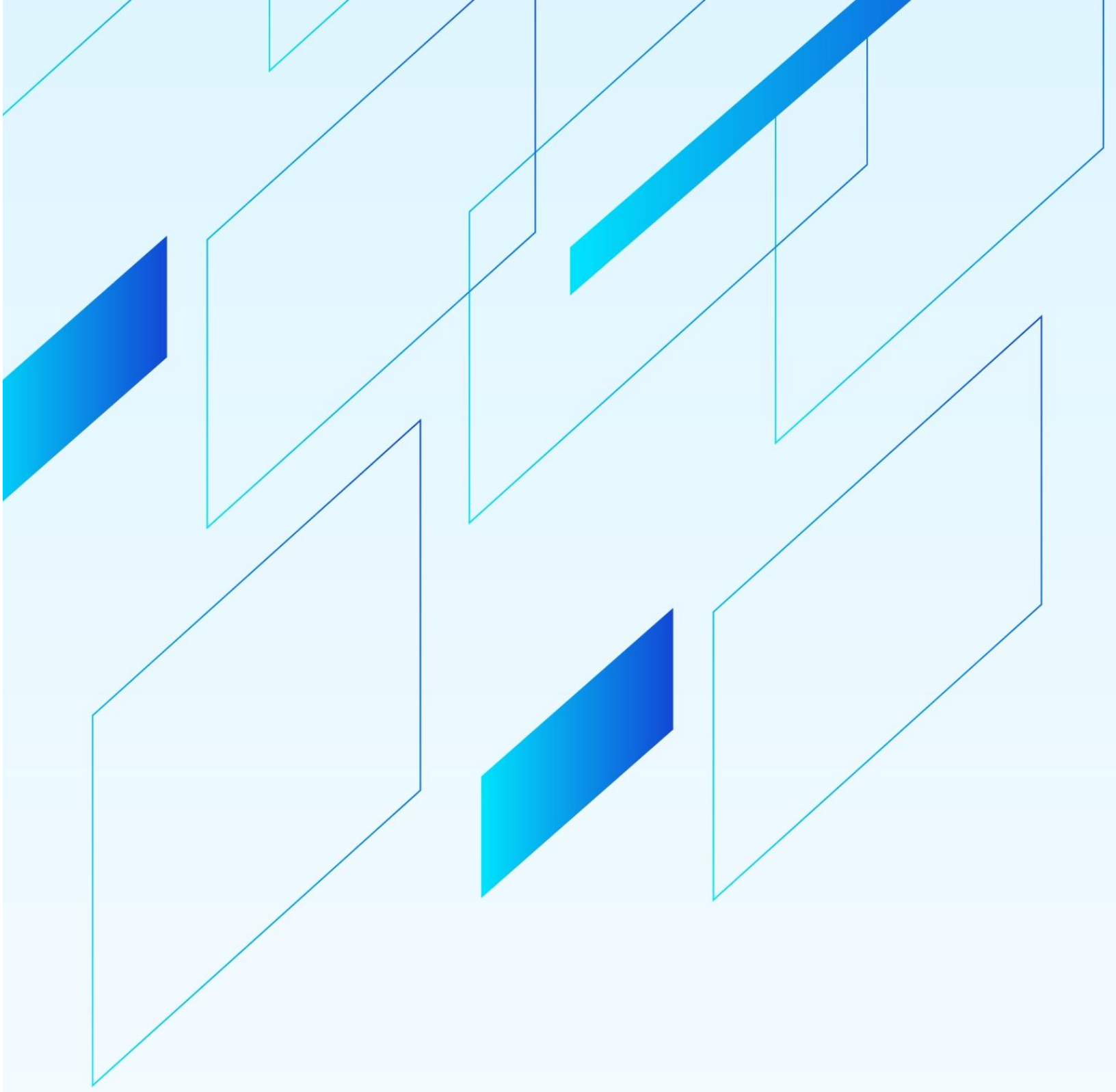

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