

VIETNAM'S FUTURE DIGITAL ECONOMY TOWARDS 2030 AND 2045

Summary report



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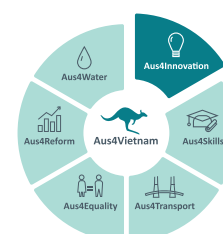
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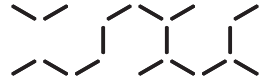
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FOREWORD



Over the last four decades Vietnam has experienced rapid industrialisation, modernisation and international integration. In the new Vietnam, science, technology and innovation, have a critical role to play in furthering Vietnam's development: improving manufacturing capacity and competitiveness in product value chains, revolutionising business models, and attracting new sources of investment in the information and communications technology (ICT) sector.

Cooperation between Vietnam and Australia has developed strongly over the forty five years since the formal establishment of diplomatic relations in 1973. The relationship today rests on three pillars of cooperation: security, economic and innovation. The Australia-Vietnam Innovation Partnership was launched at the APEC Summit in November 2017 in Da Nang. This partnership has been given life by Aus4Innovation, a AU\$10 million program of cooperation between the Australian Department of Foreign Affairs and Trade and CSIRO and Vietnam's Ministry of Science and Technology on science, technology and innovation.

This report on **Vietnam's Future Digital Economy** represents the first project undertaken under the Aus4Innovation program. CSIRO and the Ministry of

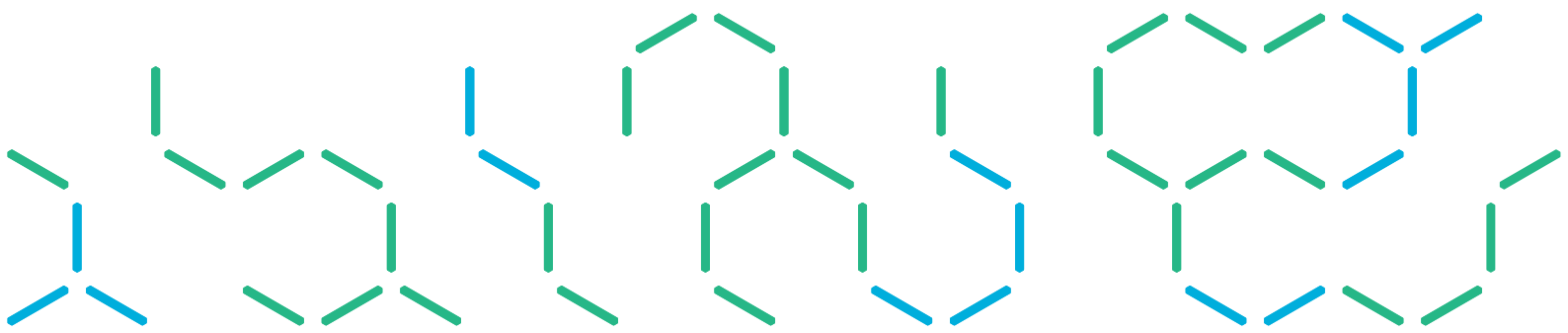
Science and Technology have worked together to deliver this report. Several of the project's early findings were discussed in the thematic workshop on *Industry 4.0 megatrends – identification of impacts and incentives for Vietnam* hosted by the Ministry of Science and Technology on 13 July 2018 under the *Industry 4.0 Summit 2018* organised by the Central Economic Commission and Vietnam Government. The results were greatly appreciated by ministries, sectors and participants. At the launch of Aus4Innovation in January 2019, the project's results were once again presented and acknowledged by international partners and communities such as the World Bank and Asian Development Bank.

We greatly appreciate the collaborative efforts made by both the Ministry of Science and Technology and CSIRO in completing this report. We strongly believe the analysis, findings and recommendations contained in the report will have implications for the development of Vietnam's economy and society over the next 25 years.

On behalf of the Ministry of Science and Technology of Vietnam and the Department of Foreign Affairs and Trade of Australia, we pledge to continue promoting further cooperation in science, technology, research and innovation between our two countries.

Minister of Ministry of Science and Technology
Chu Ngoc Anh

Department of Foreign Affairs and Trade
Ambassador to Vietnam
Craig Chittick



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GLOSSARY

TERM	DEFINITION
3D printing	Also called additive manufacturing, 3D printing is a method of manufacturing which adds physical materials layer-by-layer until a product is complete. ¹
Artificial Intelligence	“A collection of interrelated technologies used to autonomously solve problems and perform tasks to achieve defined objectives without explicit guidance from a human being.” ²
Augmented reality	A situation where digital technology is used to overlay the physical ‘real’ world with context-sensitive virtual information in real-time. ³
Big data analytics	“A new generation of technologies and architectures, designed to economically extract value from very large volumes of a wide variety of data, by enabling the high velocity capture, discovery, and/or analysis.” ⁴
Cloud computing	Cloud computing allows businesses to access data storage and computing power over the Internet. Cloud services can either be private (where the necessary IT infrastructure is owned and operated by the user or business) or public (where users or businesses pay a fee to an external business to use the cloud).
Cryptocurrency	A type of digital currency that is built with distributed ledger technology (see below for definition of distributed ledger technology) and secured through encryption/cryptographic technology. ⁵
Cyber-physical systems	According to the National Institute of Standards and Technology, “cyber-physical systems integrate computation, communication, sensing, and actuation with physical systems to fulfil time-sensitive functions with varying degrees of interaction with the environment, including human interaction.” ⁶
Blockchain	A type of distributed ledger technology (see below for definition of distributed ledger technology), where transactions are organised sequentially into groups (‘blocks’) before being added to the ledger (‘chain’). ⁷ These blocks must be validated by the majority of players before they can join the chain.
Digital currency	According to the World Bank, digital currencies are “digital representations of value that are denominated in their own unit of account, distinct from e-money, which is simply a digital payment mechanism, representing and denominated in fiat money.” ⁵
Digital economy	All businesses and services that have a business model based primarily on selling or servicing digital goods and services or their supporting equipment and infrastructure.
Digitalisation	“Encompasses a wide range of new applications of information technology in business models and products that are transforming the economy and social interactions.” ⁸
Digital platform	Websites or apps through which an ecosystem of actors (i.e. users, peers, businesses, providers) engage in various activities – where the ecosystem provides strong potential for value creation or capture. ^{9,10} There are several types of digital platforms, such as marketplace platforms (e.g. Ebay, Amazon), social media (e.g. Facebook, Twitter) and labour market platforms (e.g. freelancer.com, TaskRabbit). ¹⁰
Distributed ledger technology	Digitally stored records of transactions that can be accessed and altered by multiple actors at multiple places at any time. ⁷
E-commerce	Sale or purchase of goods or services, conducted over computer networks by methods specifically designed for the purpose of receiving or placing of orders. ¹¹
E-government	The utilization of new information and communication technologies (ICTs) by governments as applied to the full range of government functions. ¹¹
Gig economy	An economy in which digital platforms are used to connect projects with individual workers or teams of workers. The platforms also facilitate payment between buyers and workers. ¹²
Industry 4.0	The next wave of digital and online transformation which will change the structure and dynamics of many industries. These changes will be driven by cutting-edge technologies such as Artificial Intelligence, big data analytics, Internet of Things, sensor networks and cyber-physical systems.
Internet of Things	A network of physical objects which collect data and/or act upon their surrounding environment. As these objects are embedded in a digital network, the objects are able to communicate with each other, as well as other machines and computers. ¹³
Megatrend	A deep-set and gradual pattern of change building with increasing momentum to eventually alter the economy. Megatrends occur at the intersection of multiple trends which are more specific to a place and point in time.
Scenarios	Scenarios are plausible, evidence-based narratives about the future at a set point in time.
Sharing economy	The sharing economy refers to a wide range of digital platforms that facilitate the exchange of goods and services between players (e.g. people, businesses) through a range of interaction modalities (e.g. keyboard typing, swiping smartphone screen, scanning a QR code). ¹⁴
Smart city	A city where digital technological solutions are used to improve the management and efficiency of the urban environment, for the benefit of its habitants and business. ¹⁵
Social media	Online technologies and practices to share content, opinions and information, promote discussion and build relationships. Social media services and tools involve a combination of technology, telecommunications and social interaction. They can use a variety of formats, including text, pictures, audio and video. ¹⁶

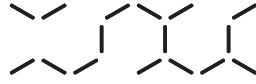
TERM	DEFINITION
Strategic foresight	The practice of systematically analysing trends and plausible futures to inform present-day planning and strategy.
Platform economy	The portion of the economy composed of digital platforms enabling users to share, lend, rent or purchase goods and services. ¹⁷
Virtual Reality	A 3D environment in which a person can become immersed, using a dedicated headset, powered by a computer, game console or a smartphone. The VR experience can be enhanced thanks to 3D audio sounds and by using haptic devices that use sensors to transfer body movement into the virtual space. ¹⁸

ACRONYMS AND ABBREVIATIONS

TERM	DEFINITION
AI	Artificial Intelligence
AR	Augmented Reality
ASEAN	Association of South East Asian Nations
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DAI	Digital Adoption Index
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
ICT	Information and Communications Technology
IoT	Internet of Things
IP	Intellectual Property
IT	Information Technology
ITU	International Telecommunications Union
MOST	Ministry of Science and Technology
P2P	Peer-to-peer
PPP	Purchasing Power Parity
R&D	Research and development
STEM	Science, Technology, Engineering and Mathematics
TFP	Total Factor Productivity
US	United States
VR	Virtual Reality



EXECUTIVE SUMMARY



The next wave of digital technologies has the potential to transform Vietnam into Asia's next high-performing economy, and to bring up the living standards of all Vietnam's citizens over the coming decades.

There is good reason to believe that this transformation will occur: there has been a recent boom in both digital hardware and software exports, Vietnam's young population is rapidly taking-up new mobile internet services, and the Vietnam Government is implementing wide-reaching Industry 4.0 policies to jump start the modernisation of Vietnam's major industries and grow new industries.

But to sustain high growth, Vietnam will need to overcome substantial challenges. The population is ageing, climate change and rapid development is straining the environment and food production, and the nation is rapidly urbanising. The workforce needs to upskill – especially as jobs are automated across the agriculture and manufacturing sectors. All of these factors will test Vietnam heading into the future but the primary challenge for policy makers will be to allocate resources efficiently to ensure low debt, as well as inclusive and sustained growth.

The year 2019 signals a new era of policy and strategic direction in Vietnam. This report aims to serve as a strategic decision-making tool for leaders in government and business negotiating the new wave digital innovation and the next phase of economic development.

“Mastering the digital economy creates an opportunity for Vietnam to maintain rapid and sustainable growth through the next phase of development. Strong leadership and institutions will be key in Vietnam’s development across all economic sectors including the private sector. Digital transformation resulting from this strong leadership will unblock bottlenecks to promote further economic development.”

Dr Nguyen Van Binh, Politburo Member, Secretary of Party Central Committee, Chairman of the Central Economic Commission

“The next 25 years represents a decisive window of opportunity for Vietnam to transition to a more digitalised economy and escape the middle income trap. The success and speed of that transition depends greatly on the profile of the workforce of today, and the workforce is ageing rapidly. Strong national leadership, institutions and policies are needed now to create collective upskilling – across the workforce and society – and enable a successful digital transformation.”

Mr Nguyen The Trung, Managing Director of DTT Group



Innovative joint project methodology

The **Vietnam’s Future Digital Economy Project** is an innovative joint venture between Vietnam’s Ministry of Science and Technology and CSIRO’s Data61 from Australia. This venture aims to identify significant trends, drivers of change (‘megatrends’), future scenarios and helpful actions to guide Vietnam’s decision makers through the next wave of digital innovation and industrial transformation.

The present report begins by examining the state of Vietnam’s macroeconomy and digital economy in early 2019 – with a particular focus on Vietnam’s agriculture and manufacturing sectors. It also examines the trends that

will affect digital economy development in Vietnam up to the year 2045. The report then explores how different rates of digital transformation could create four possible and plausible futures for Vietnam’s digital economy. From these analyses, the research team have created a broad roadmap to inform how the Vietnam Government can mitigate risks and grow the digital economy under all scenarios.

The content of this report comes from the field experts of Vietnam: those who participated in workshops, interviews and surveys, and those who provided detailed comment on our analyses.

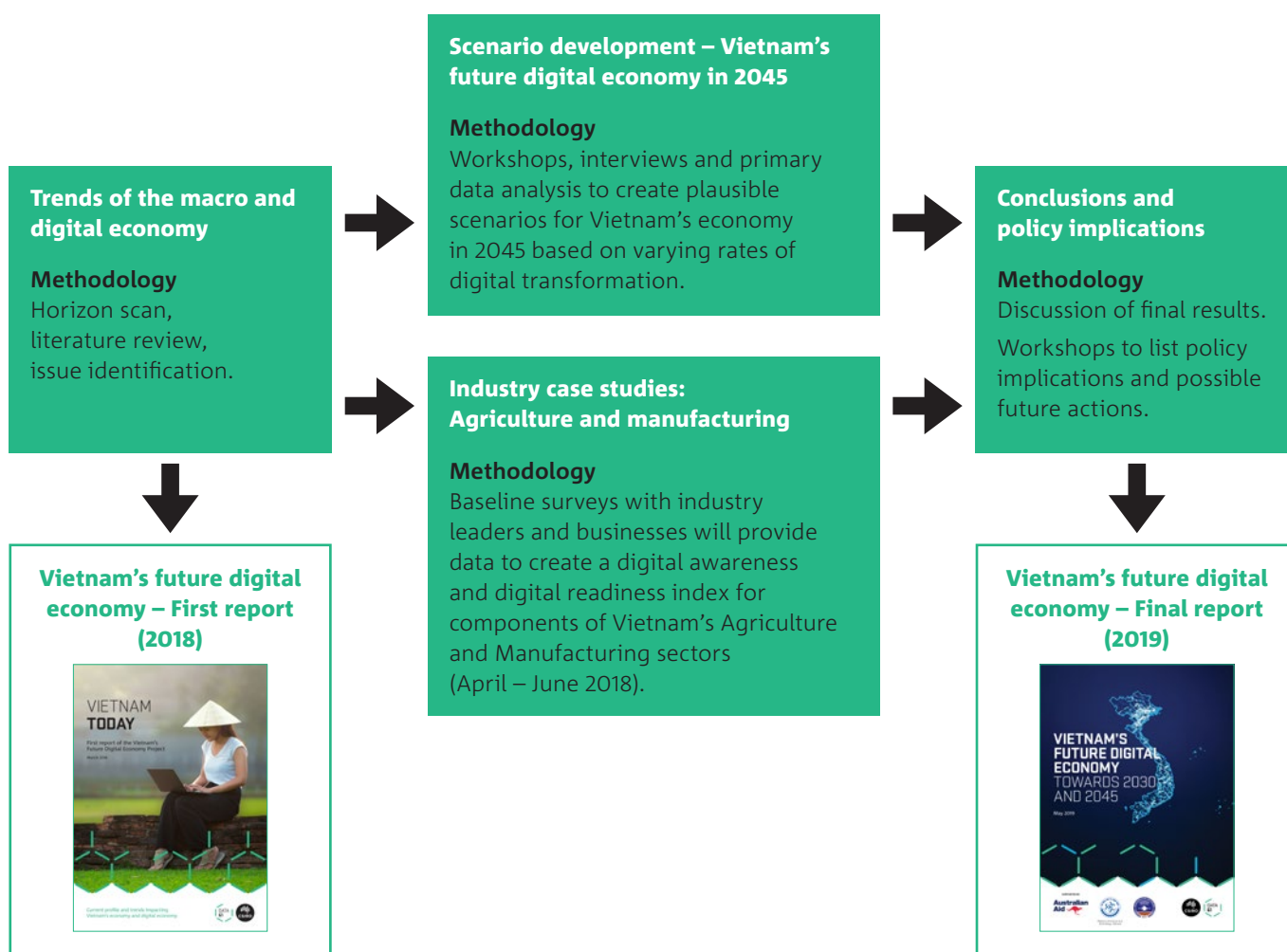
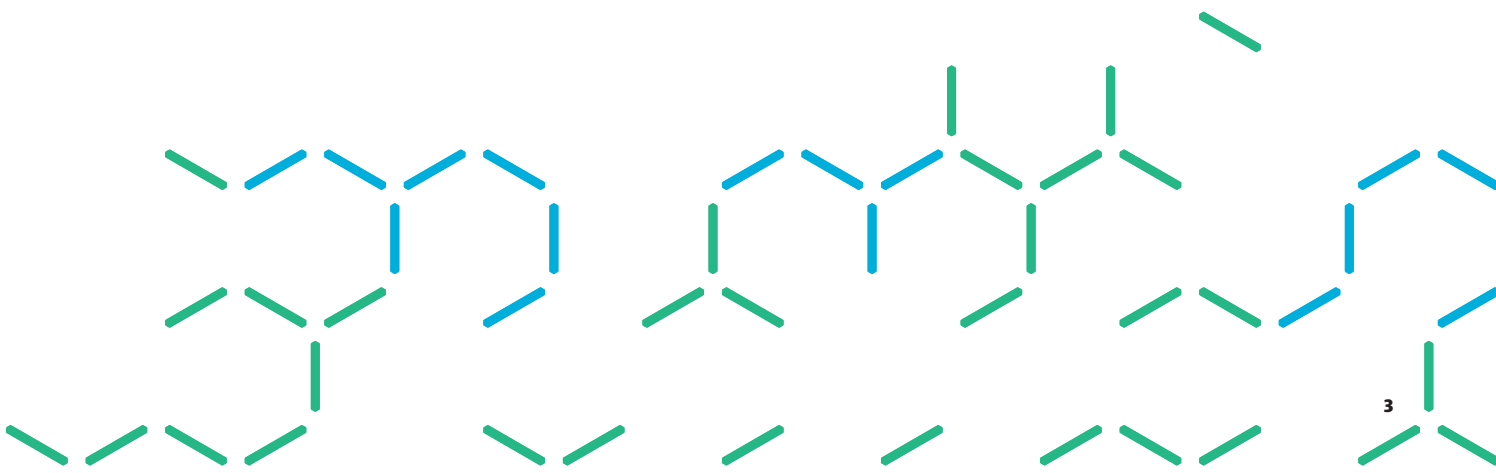


Figure 1 Methodology of the Vietnam’s Future Digital Economy Project

Megatrends

















Seven megatrends are expected to drive the development of Vietnam's future digital economy, leading to the four potential future scenarios described in this report.

1. **Emerging digital technologies:** Emerging digital technologies such as blockchain, Artificial Intelligence, big data analytics and the Internet of Things can leapfrog industry infrastructure upgrades, simplify supply chains and logistics and help businesses operate more efficiently.
2. **A smaller world – internationalisation:** The digital economy can benefit from international integration – by opening Vietnam to new export markets, knowledge and skills transfer, and greater levels of foreign investment.
3. **Increasing need for cybersecurity and privacy:** There is greater need for cybersecurity and privacy as more businesses and consumers engage in the digital economy, and as critical systems such as finance and government are increasingly digitalised.
4. **Modern digital infrastructure:** A strong digital economy requires reliable digital and energy infrastructure – especially for power-intensive technologies such as IoT or AI. New telecommunications networks are also needed to ensure broadband is available to carry the large amounts of digital data needed for new applications.
5. **The push to smart cities:** In a rapidly urbanising and ageing nation, smart cities provide opportunities to use infrastructure and resources more efficiently, as well as reduce waste, pollution and traffic congestion.
6. **Rise of digital skills, services, gigs and the entrepreneur:** Increasing demand for the services sector as well as digital products and services mean there is a need to invest further in higher education, digital skills, entrepreneurial skills and Vietnam's innovation ecosystem. Platforms and the trend away from secure, structured and long-term work is also driving the use of labour and product platforms for income generation and creative avenues for industrial transitions in labour markets.
7. **Changing consumer behaviours – digital tribes, influencers, higher value consumption:** Consumer behaviours are changing as the Asian middle classes emerge and orient to higher-value goods and services, including those from the digital economy. At the same time, higher digital adoption among consumers increases the influence of digital tribes and influencers – both on suppliers and consumer behaviour.



Scenarios

From these megatrends we created four future scenarios for Vietnam's digital economy in 2045. For each scenario, we employed economic modelling to estimate the impact of digital technology on GDP and job automation.

SCENARIO	INDICATORS		
HERITAGE  <i>Low levels of digital transformation and small ICT industry.</i>	 ACCUMULATED ADDITIONAL GDP US\$60.9 billion <small>over 27 years</small>	 IMPACT ON ANNUAL GROWTH 0.38%	 CURRENT JOBS AT RISK OF TRANSFORMATION OR DISRUPTION 18.4%
DIGITALLY TRANSFORMED  <i>Major digital transformation across all industries and government services. Growth in exports of ICT products and services.</i>	 ACCUMULATED ADDITIONAL GDP US\$168.6 billion <small>over 27 years</small>	 IMPACT ON ANNUAL GROWTH 1.1%	 CURRENT JOBS AT RISK OF TRANSFORMATION OR DISRUPTION 38.1%
DIGITAL EXPORTER  <i>Slow industrial transformation but fast growing pockets of ICT industry. Overseas companies use Vietnam ICT workers due to their low-cost labour.</i>	 ACCUMULATED ADDITIONAL GDP US\$66.9 billion <small>over 27 years</small>	 IMPACT ON ANNUAL GROWTH 0.45%	 CURRENT JOBS AT RISK OF TRANSFORMATION OR DISRUPTION 19.1%
DIGITAL CONSUMER  <i>Broad industrial transformation across Vietnamese industry, but ICT industry has struggled and ICT exports are not a significant component of Vietnam's exports.</i>	 ACCUMULATED ADDITIONAL GDP US\$102.8 billion <small>over 27 years</small>	 IMPACT ON ANNUAL GROWTH 0.63%	 CURRENT JOBS AT RISK OF TRANSFORMATION OR DISRUPTION 28.9%

Source: Data61 analysis
 Note: GDP measured in real US\$, 2005 prices.

Ways forward

The Vietnam of 2045 may contain elements described in all scenarios. Visualising the developments and mitigating risks will ensure the country is stronger and more resilient as it moves through the latest wave of digital innovation.

To mitigate risks and grow the digital economy under all scenarios, a number of actions have been proposed under six broad areas.

The size, focus and distribution of Vietnam's future digital economy in 2045 will depend on, to some extent, the

investment, regulatory and reform decisions that are made today by both the Government and private sector. The country is at a crucial point in economic strategy and development.

By navigating the opportunities, risks and potential outcomes, we are optimistic that Vietnam's current focus on Industry 4.0, the development of the ICT sector, and broader social and economic reform will continue the trend towards a more stable and prosperous Vietnam over the next 25 years.

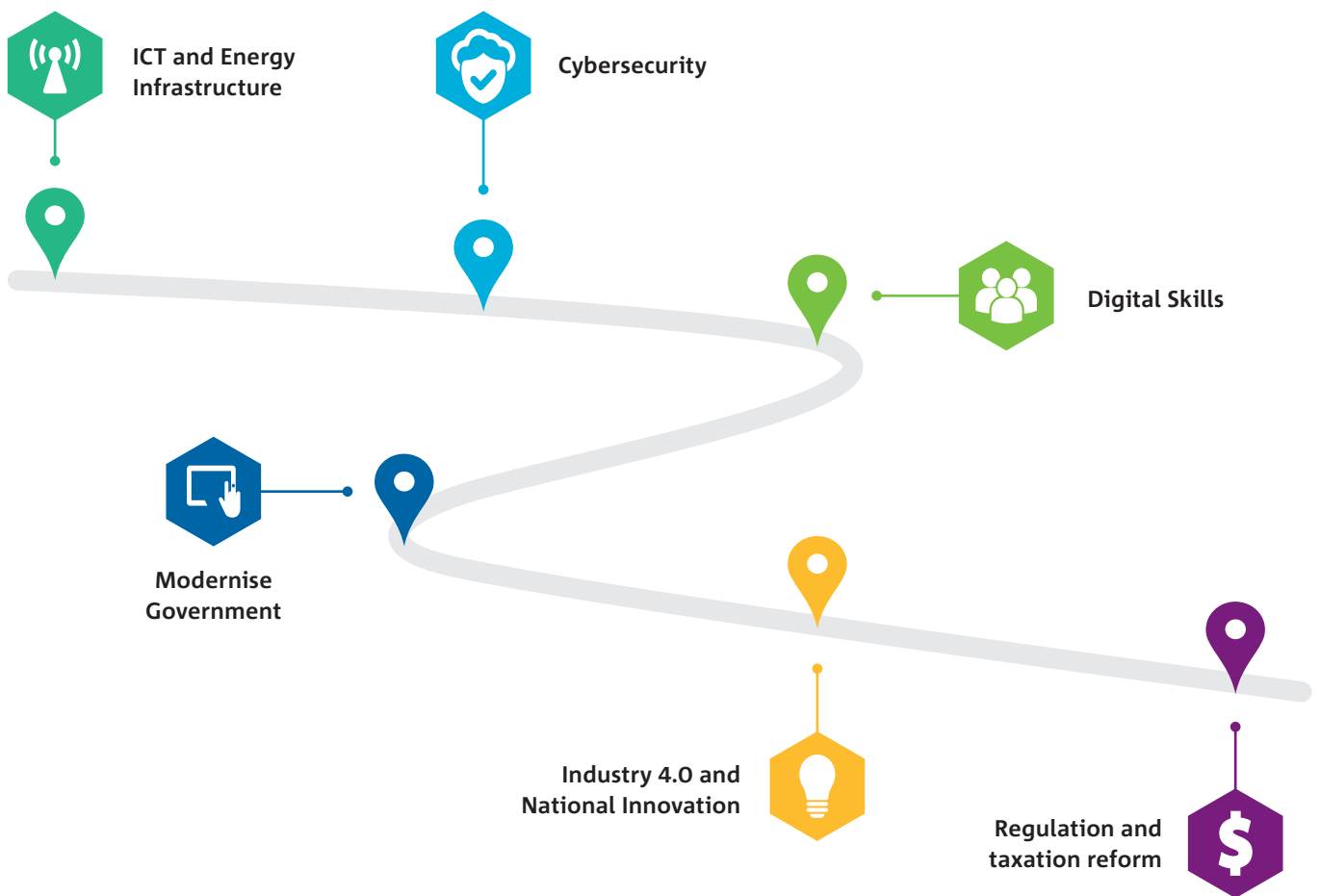


Figure 2 Priority areas for development of Vietnam's future digital economy

Source: Data61 analysis

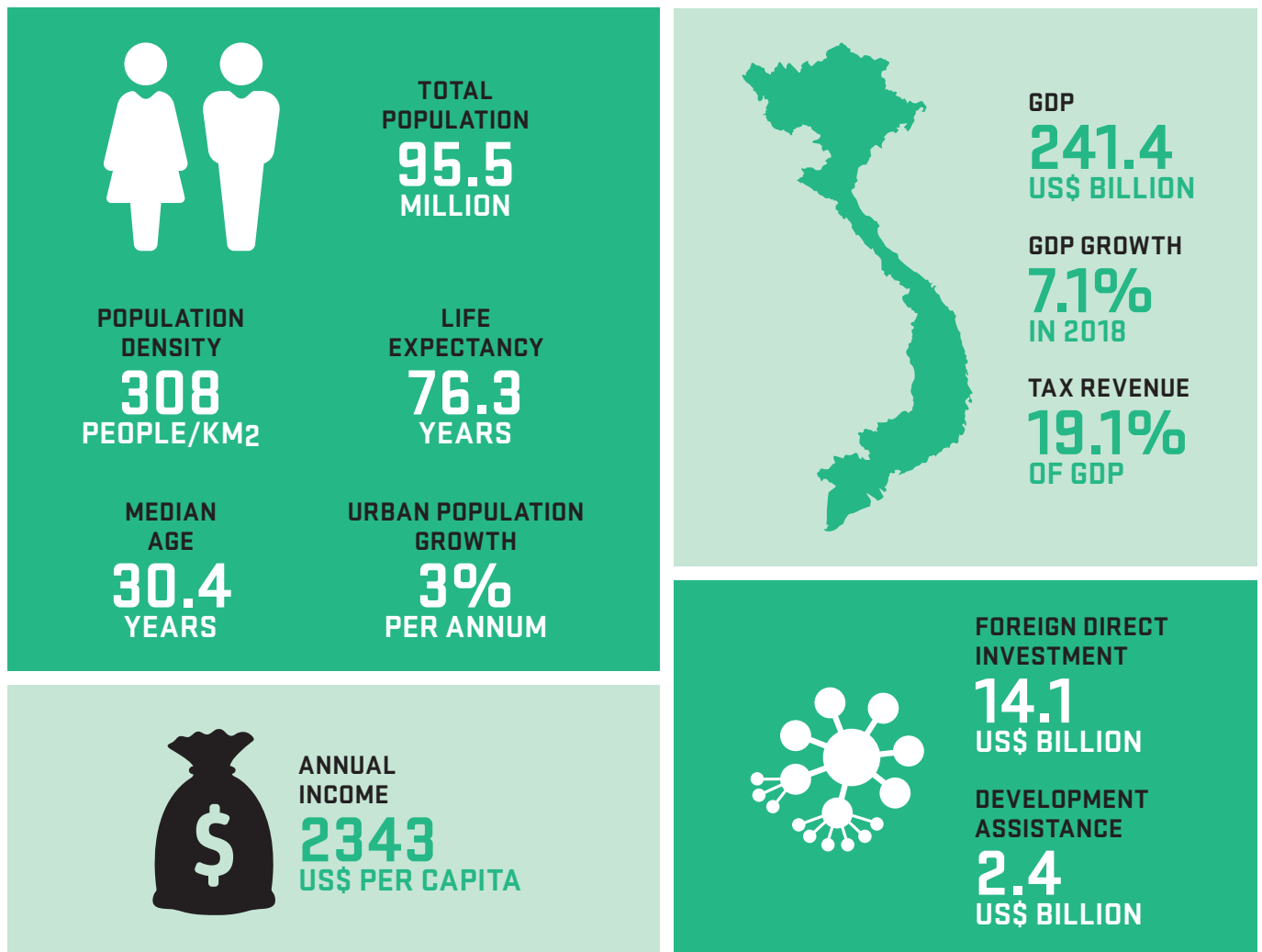


1 VIETNAM TODAY AND THE DIGITAL ECONOMY

Vietnam's transformation from one of the world's poorest countries in the 1980s to middle income status by 2010 is celebrated as an economic success. In 1986, the Doi Moi reforms opened the economy and attracted high levels of foreign investment into the country. The direct impacts of the reforms lifted Vietnam's GDP by 42% by 1998.¹⁹ Since the 1990s, these reforms have enabled remarkable levels of inclusive growth benefiting all sectors of society.²⁰

In 2011 Vietnam renewed its commitment to market-led development and modernisation through the *Socio-economic development strategy 2011-2020*. To achieve further investment and market development, the national government is focusing on innovation and promoting skills, improving market institutions and maintaining infrastructure investment.

VIETNAM TODAY: ECONOMY AT A GLANCE



Source: UN World Population Prospects, World Bank Development Indicators, IMF World Economic Outlook database.

1.1 Vietnam economic overview

The most prominent feature of Vietnam’s economy since the 1990s is its astonishing economic growth. In this time, Vietnam saw nearly the world’s fastest growth rates in GDP and GDP per capita.^{21,22} This growth has risen from a low base, however, and Vietnam’s GDP per capita remains relatively low (see Figure 4).

Several trends have driven this astonishing growth, and can be considered strengths of the Vietnam economy today. At the same time, this rapid growth has overcome various threats to the macroeconomy.

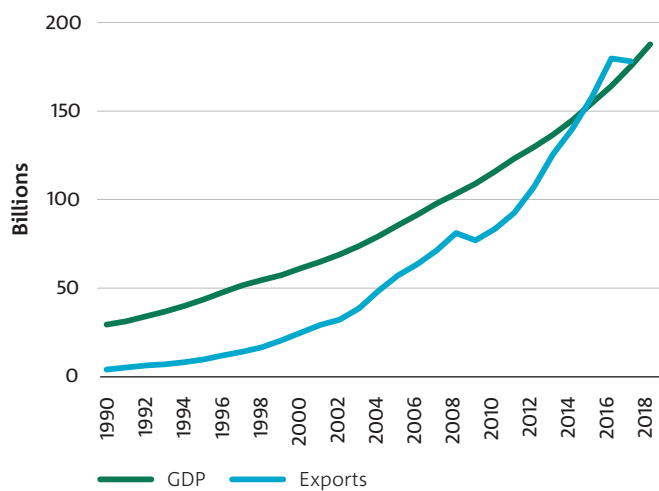


Figure 3 Vietnam GDP and exports (constant 2010 US\$), 1990-2018

Source: World Bank,²² General Statistics Office,²³ Data61 analysis

As Vietnam promotes growth into the future, the nation will need to continue to keep the macroeconomy strong, and rapidly increase productivity for the nation to remain internationally competitive. Therefore, the Vietnam Government is looking to new models of growth – through the digital economy – to maintain this growth. So far efforts from the Vietnam Government and private sector have created a promising start for Vietnam’s digital economy.

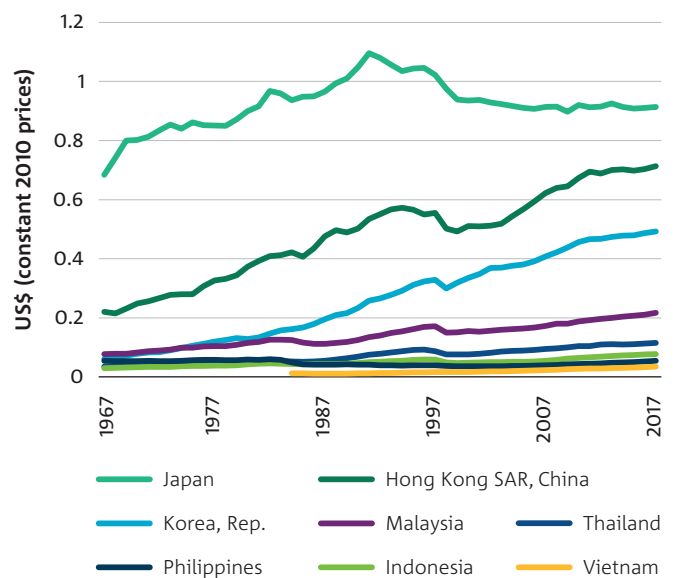
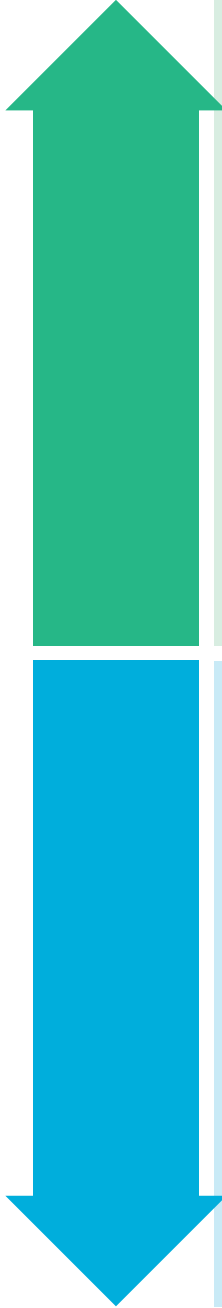


Figure 4 Real GDP per capita relative to US\$ at constant 2010 prices, 1967-2017

Source: World Bank,²² Data61 Analysis



DRIVERS OF ECONOMIC GROWTH IN VIETNAM

An increasing non-state sector. Over the past three decades the Vietnam Government has privatised thousands of state-owned enterprises. In the same period the private sector has grown to represent the bulk of the nation's labour force and over 95% of Vietnam's more than 560,000 enterprises.²⁷

A shift from agriculture to industry and services. Since 1990 agricultural production has contributed steadily less as a proportion of GDP, while services and industry grew over the same period.

Increasing foreign direct investment (FDI) into Vietnam. In the last three decades Vietnam has disbursed US\$154.5 billion (about 50% of total FDI-registered capital), accounting for approximately 20% of total investment in Vietnamese industry).²⁶

Increasing value of Vietnamese exports. Vietnamese exports have grown rapidly since 1990 (see Figure 3). By 2014 Vietnam had become the 26th largest exporter of merchandise in the world.²²

Rapid productivity gains. Over the last 30 years Vietnam has seen the highest labour productivity growth rate among ASEAN nations.²⁹

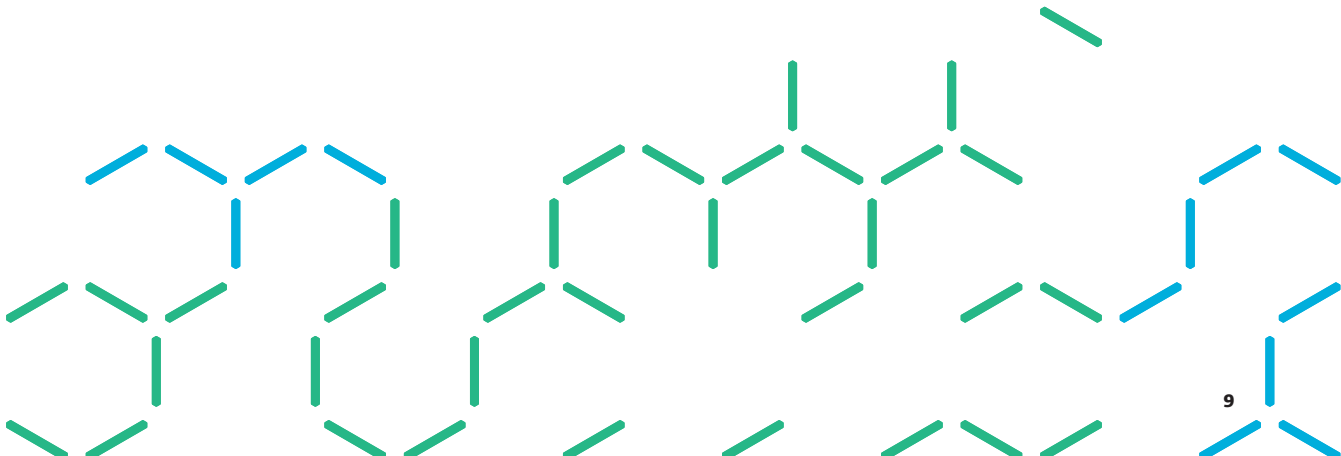
THREATS TO ECONOMIC GROWTH IN VIETNAM

Cheap labour trap. Vietnam's comparative advantage as an exporter is mostly based on labour costs. This has created a cheap labour trap, with Vietnam mostly doing outsourced work with little value-added.

Increasing productivity gap. While labour productivity in Vietnam has grown rapidly in the past three decades, it remains lower than that of other ASEAN nations.²⁶ Moreover, the productivity gap has widened in the past ten years.²⁶

Rising public and private debt levels. Public sector debt levels were 61.3% of GDP at the end of 2017, up from 45.8% in 2011.³⁰ Private sector debt has also grown rapidly, with total debt (public and private) reaching 124% of GDP by the end of 2016.³¹

Volatile inflation. Inflation (measured by the consumer price index) was above 20% in 2008, and just over 18% in 2011. However the Vietnam Government has committed to keeping inflation low, and has managed it well since 2015.



1.2 Conceptualising the digital economy

Before discussing the premise for digital economy development in Vietnam, this section will define concepts related to the digital economy.

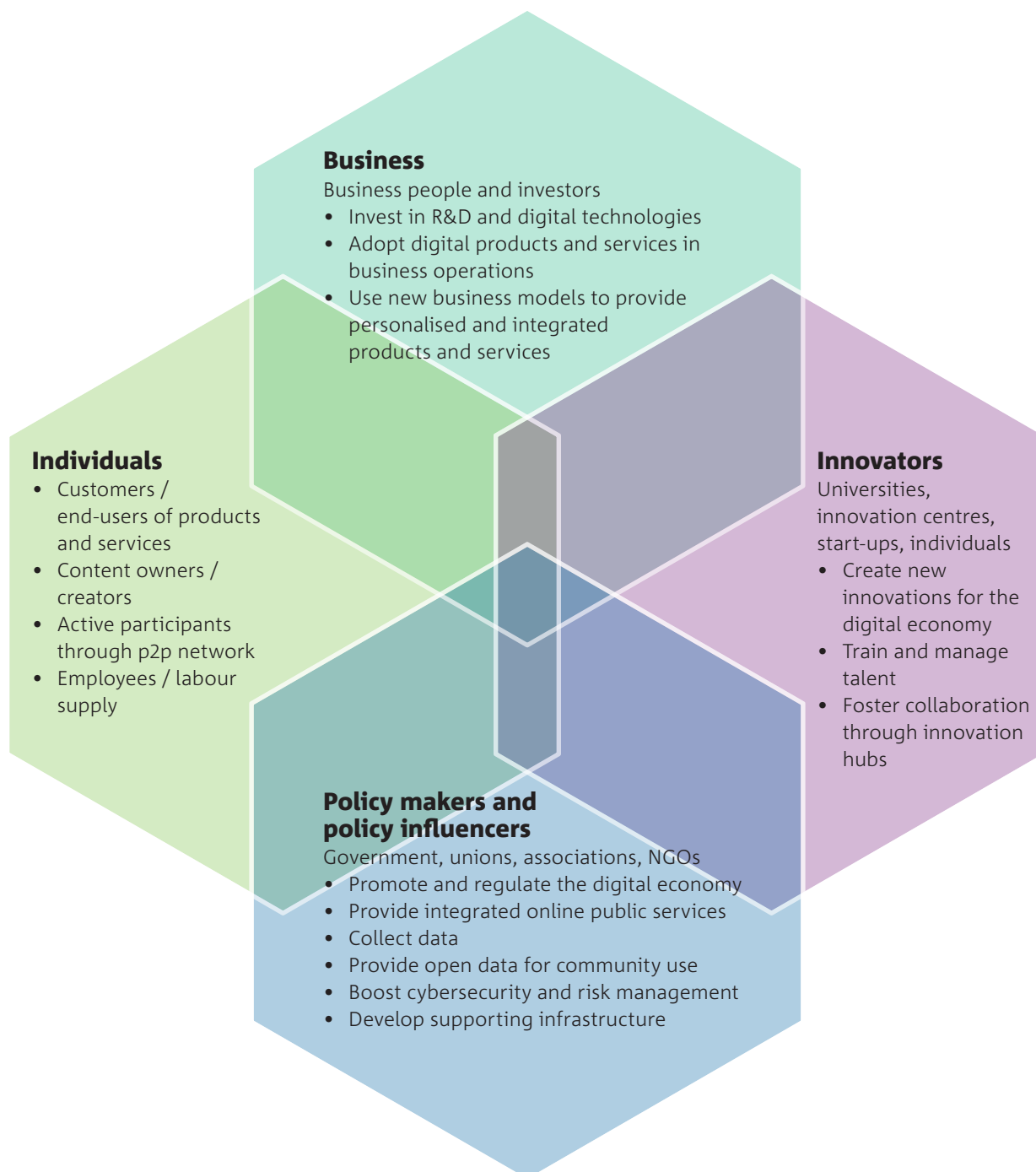


Figure 5 Digital economy stakeholders

Source: Data61 analysis

WHAT IS THE DIGITAL ECONOMY?

This study adopts a broad definition of the digital economy:

All businesses and services that have a business model based primarily on selling or servicing digital goods and services or their supporting equipment and infrastructure.

Compared to the traditional economy, there are several novel features of the digital economy:^{24,25}

- **Data as the source of value in the digital economy:** The increase of digital technologies means data can now be collected from many sources: from smartphones to millions of sensors in factories, traffic vehicles and individuals. These massive data flows, together with big data analytics, can generate value in all private and public activities.
- **The advance of ICT hardware and software:** The digital economy is the result of new digital technologies that have transformational effects beyond the ICT sector into all other sectors.
- **New business models that both enable and disrupt businesses:** Businesses models based on digital platforms allow various groups of people to interact, thereby creating network effects and increasing efficiency due to reduced transaction costs.
- **New role of consumers:** Digital technology has put consumers on the centre stage. The ability to communicate and share reviews with others not only changes the purchasing experiences of customers, but also significantly affects business reputations. The Internet also empowers consumers with a new way of creating and sharing ideas.

1.3 The premise for developing Vietnam's digital economy

The digital economy is an opportunity for developing countries, including Vietnam, to shorten their development gap with rich countries. While there are many challenges, Vietnam has many comparative advantages to foster the digital economy.

BENCHMARKING VIETNAM IN THE INTERNATIONAL ECONOMY

In some areas relevant to the digital economy, Vietnam is leading the world:

- **5G networks** – Vietnam is one of the first countries in the world to trial 5G, with a commercial launch scheduled for 2021.
- **High school student performance** – international rankings place Vietnamese students on par with or above high income nations in science, reading and maths.²⁶
- **Affordable Internet** – Vietnam offers the lowest fixed broadband prices (PPP\$) in the Asia Pacific.²⁷

A regional comparison of performance in business and innovation, human development, digital infrastructure and digital economy can be found in Table 1. Relative to other nations, Vietnam's strongest areas are high technology exports and performance on the Global Innovation Index. In many other respects, it appears Thailand is leading the pack. This is consistent with Thailand's income status (upper-middle) which is higher than the three other nations (lower-middle).





Table 1 Benchmarking Vietnam's digital economy with comparable ASEAN nations

	INDICATORS	DATA YEAR	VIETNAM	INDONESIA	THAILAND	PHILIPPINES
Business and Innovation	Ease of Doing Business Index (out of 190 nations) ²⁸ <i>Measures how easily the regulatory environment allows for starting and operating a local firm.</i>	2019	69 th	73 rd	27 th	124 th
	Global Competitiveness Report (out of 140 nations) ²⁹ <i>Measures how well productivity is enabled by: the macroeconomic environment, infrastructure, institutions, population health, education, labour market efficiency, financial market development, technological readiness, market size, business sophistication, and innovation.</i>	2018	77 th	45 th	38 th	56 th
	Global Innovation Index (out of 126 nations) ³⁰ <i>Measures how well innovation is enabled by a nation's: institutions, human capital, infrastructure, market sophistication and business sophistication. Also measures innovation outputs.</i>	2018	45 th	85 th	44 th	73 rd
	Nation Brand Rankings (out of 100 nations; current US\$ billion) ³¹ <i>Measures the value of a nation's brand.</i>	2018	43 rd \$235	16 th \$848	31 st \$509	29 th \$524
	Logistics Performance Index (out of 160 nations) ³² <i>Measures national performance in customs, infrastructure quality and timeliness of shipments.</i>	2018	39 th	46 th	32 nd	60 th
Human Resources	Global Talent Competitiveness Index (out of 125 nations) ³³ <i>Measures ability to enable, attract, grow, and retain talent. Also measures the level of vocational skills, technical skills and global knowledge skills (i.e. knowledge, problem-solving, creativity).</i>	2019	92 nd	67 th	66 th	58 th
	English Language Proficiency Index (out of 88 nations) ³⁴ <i>Measures the English proficiency of people (mostly young adults aged 18+) who are actively studying the English language.</i>	2018	41 st	51 st	64 th	14 th
	Workers at High Risk of Job Automation by 2025 (%) ³⁵	2016	70%	56%	44%	49%
Digital Infrastructure	ICT Development Index (out of 176 nations) ²⁷ <i>Measures ICT access, ICT skills, and ICT adoption.</i>	2017	108 th	111 th	78 th	101 st
	Global Cybersecurity Index (out of 193 nations) ³⁶ <i>Measures commitments and progress in cybersecurity across five areas (legal, technical, organisational, capacity building and cooperation).</i>	2017	101 st	70 th	20 th	37 th
	Average Download Speeds (out of 200 nations; Mbps) ³⁷	2018	75 th 6.7 Mbps	83 rd 5.8 Mbps	40 th 17.1 Mbps	89 th 5.2 Mbps
	Inclusive Internet Index (out of 86 nations) ³⁸ <i>Measures inclusiveness of the Internet based on infrastructure, affordability, capability (e.g. skills) and relevance of content to users.</i>	2018	43 rd	49 th	31 st	54 th
	Population with Internet Access (% of population) ²²	2016	46.5%	32.3%	52.9%	55.5%
	Households with a Computer (% of total households) ³⁹	2016	20.5%	17.8%	33.9%	20.5%
Digital Economy	Number of Internet Users (millions) ⁴⁰	2018	64	132.7	57	67
	E-commerce market size (US\$ billions at 2015 prices) ⁴¹	2015	\$0.8	\$1.3	\$0.9	\$1
	High Technology Exports (current \$US billions) ²²	2016	\$43.6	\$3.9	\$34.7	\$26.1
	E-Government Index (out of 193 nations) ⁴² <i>Measures e-government development based on three indices: telecommunications infrastructure, human capital and online services.</i>	2018	88 th	107 th	73 rd	75 th

Legend: ■ Relatively Ahead, ■ Relatively Behind

POLICIES SUPPORTING THE DIGITAL ECONOMY IN VIETNAM

Vietnam’s commitment to digitalisation is seen in the number of policies, master plans and directives published over the last 30 years (see Figure 7). The main focus of these is to develop critical infrastructure, build the ICT industry, promote e-commerce and adopt technology as a means of lifting productivity. Multiple agencies are charged with supporting and regulating different aspects of the digital economy in Vietnam (see Figure 6).

The main document guiding the development of digital economy policies and strategies is *Directive 16/CT-TTg*, where Prime Minister Nguyen Xuan Phuc instructed the Government to support technological modernisation of industry by:

- **Focusing on developing new digital infrastructure and networks**
- **Speeding up reform to encourage businesses to adopt new technology** – including implementing e-government across agencies and reviewing related regulation and services
- **Prioritising the development of the Vietnamese ICT industry** in government policy and reform, and **promoting the take-up of smart technologies across all industries**
- **Building the innovation ecosystem** through further funding for scientific and research infrastructure and institutions, creating international relationships and promoting tech start-ups
- **Building technological skills** through a focus on STEM education and training from early childhood through to adult education
- **Raising awareness at all levels, and in all sectors, of the opportunities and challenges of Industry 4.0**, ensuring all areas of Vietnam’s society and industry are prepared for the changes ahead.

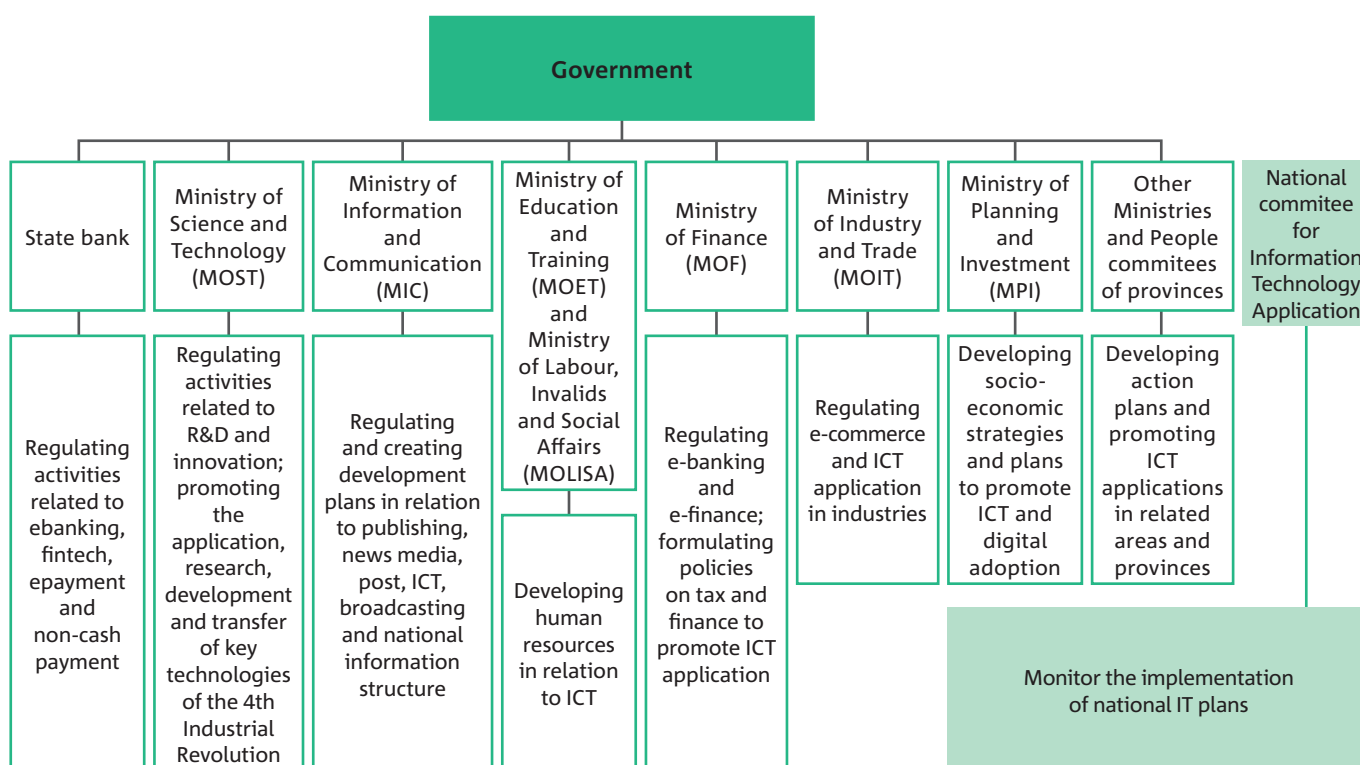


Figure 6 Main regulators of the digital economy in Vietnam

Source: Data61 analysis

Main Laws									
Law on Telecommunication 2009	Law on Information Technology 2006	Law on Radio Frequency 2009	Law on Cybersecurity 2018	Law on E-transaction 2005	Law on High Technology 2008	Law on Intellectual Property 2005	Law on Technology Transfer 2018	Law on Cybersecurity 2018	Law on Cybersecurity 2018

Main Decrees and Decisions												
Decision 418/2012/QĐ-TTg on approving the science and technology development plan 2011-2020 with emphasis on digital technologies	Decision 418/2012/QĐ-TTg on approving the science and technology development plan 2011-2020 with emphasis on digital technologies	Decision No.1072/2018/QĐ-TTg, on establishing the national e-government committee	Decision 154/2013/ND-CP, on concentrated information technology park	Decision 26/2007/ND-CP, detailing the E-transaction Law	Decree No. 71/2007/ND-CP, detailing the Law on Information Technology	Directive No. 16/CT-TTg strengthening the ability to access Industry 4.0	Decree No. 35/2007/ND-CP and No. 27/2007/ND-CP on e-banking and e-finance	Decree No. 52/2013/ND-CP on e-commerce	Decree No. 97/2008/NĐ-CP on internet services and electronic information on the internet	Decision No.1563/2017/QĐ-TTg, on approving the overall plan for e-commerce development 2016-2020	Resolution No.1/2019/NQ-CP, on implementing the socio-economic plan and budget estimates for 2019, to issue the National strategy on implementing Industry 4.0; Resolution on improving capacity to approach Industry 4.0 toward 2025; and Solution to develop national human resources to meet the requirements of Industry 4.0	Resolution No.2/2019/NQ-CP, on improving the business environment and national competitiveness in 2019 toward 2021; to develop the scheme for the National Innovation Center; to develop solutions to master key technologies especially AI; and to deploy the scheme “Developing the Digitalised Knowledge System” and promote e-payment

Main Strategies, Master Plans, Initiatives			
Vietnam post, telecommunications and information technology strategy until 2010 and orientations toward 2020	Master plan on Vietnam’s electronics industry up to 2010, with a vision toward 2020	National planning on development of IT security through 2020	The target program on IT development through 2020, with a vision toward 2025
		The program on development of broadband telecommunications infrastructure through 2020	Scheme to support the national innovative startup ecosystem through 2025
			Vietnam strategy on ICT development till 2010 and orientations toward 2020

Figure 7 Update on major regulations relating to the digital economy

Source: Data61 analysis



2 VIETNAM'S CURRENT STATUS AND POTENTIAL FOR DIGITAL ECONOMY DEVELOPMENT

The digital economy is booming in Vietnam, as evidenced by the following trends on digital transformation in Vietnam.

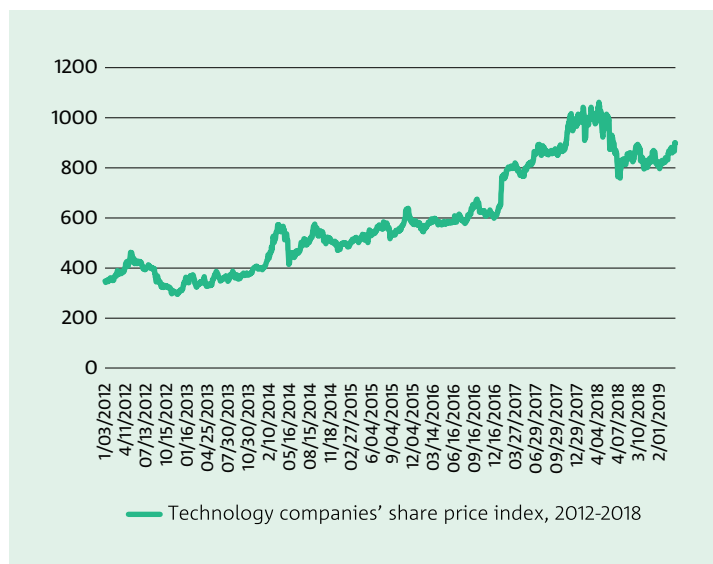
2.1 Digital transformation trends in Vietnam

ICT – THE BOOMING BASE OF VIETNAM'S DIGITAL ECONOMY

ICT is one of the fastest-growing sectors in Vietnam. In 2018 the total ICT industry revenue was US\$98.9 billion, 13 times that in 2010 (US\$7.6 billion).⁴³ The hardware industry is the largest subsector of Vietnam's ICT industry, contributing 89% of total revenue in 2018. Much of this revenue comes from ICT equipment exports, which is the country's largest export sector.⁴⁴

The local software industry is growing steadily and starting to attract global attention as a significant regional hub.⁴⁵ Within the Information and Communications Technology (ICT) sector, the fast growing segments include hardware and software manufacturing and ICT services. IT outsourcing service are of particular demand, with revenues reaching US\$3 billion in 2016.⁴⁶

VIETNAM'S ICT SECTOR AT A GLANCE



BUSINESSES IN THE ICT SECTOR
30,000

EMPLOYED IN IT
955,000

IT GRADUATES PER YEAR
80,000

IT INDUSTRY REVENUES
\$US 98.9 BILLION

TOTAL IT EXPORTS
\$US 83.3 BILLION

TARGET TELECOMS INDUSTRY REVENUE IN 2018
\$US 19.74 BILLION

Source: Ministry of Information and Communications, stockbiz.vn

DIGITAL TRANSFORMATION BEYOND THE ICT SECTOR

Vietnam's digital economy is growing rapidly and transforming many sectors, from manufacturing and agriculture to trade, payment, transportation, finance and education. See Table 2 for a summary.

Table 2 Digital transformation beyond the ICT sector

SECTOR	TRENDS
e-commerce 	<p>E-commerce is one of the fastest-growing segments of Vietnam's digital economy. According to the Vietnam E-commerce and Information Technology Agency (VECITA), the nation's e-commerce market is growing by 35% per year – 2.5 times faster, for example, than Japan.⁴⁷</p> <p>E-commerce within Vietnam and around the world is evolving with the rapid development of mobile payment applications (e.g. WePay) and the emergence of global cryptocurrencies that can use digital wallets to allow people to both transfer funds peer-to-peer across the Internet, as well as pay for goods and services locally.</p>
Smart health 	<p>Vietnam's health sector is developing the smart health system. In 2018 the health sector set plans to adopt digital technologies in three main pillars: smart disease prevention, smart examination and treatment, and smart medical administration.⁴⁸ Major hospitals in Vietnam have already begun to build and implement a model of Smart Medical Clinics.</p> <p>Information management systems are being digitalised. The Ministry of Health is extending its Electronic Medical Records (EMR) plan to its subordinate units over the country after a successful pilot under <i>Circular No. 46/2018/TT-BYT</i>. This EMR system enables medical facilities to record, display and store medical data of each citizen digitally. Vietnam Social Insurance is also actively researching and drafting an electronic health insurance card form. These steps will help Vietnam's health sector save management costs and create conditions for visitors to experience more convenient healthcare.</p>
e-government 	<p>Vietnam is growing capability in e-government. Between 2014 and 2017, Vietnam rose 10 places to rank 88th out of 193 countries and territories on the United Nations' E-Government Development Index (EGDI).⁴⁹ E-government will continue to be a priority, with plans to develop and support underlying platforms and infrastructure including for IoT and Smart City development, Open Data and Right to Information portals, and inter-agency communication.⁵⁰ By 2020 Vietnam aims to integrate information systems and databases between agencies at all levels of government, with 20% of users authenticated and unified across all systems.</p>
Platform economy 	<p>The sharing economy has been facilitated by cloud computing platforms, the high rate of adoption of smartphones and Vietnamese consumer preferences for low personal asset ownership. For example, in the last five years, ride-sharing platforms have created competition for traditional taxi businesses. Vietnam was the first country in Asia to attract Uber, and, excluding China, was Uber's fastest-growing market globally in 2015.⁵¹ In 2018, Grab acquired Uber's operations in the ASEAN region, but Go-Jek's entry into Vietnam in September 2018 is set to increase competition. Traditional taxi services are increasingly developing their own platforms and mobile apps to compete. Meanwhile, court proceedings are determining whether ride-sharing platforms will need to follow the same regulations as traditional taxis – which may reduce their competitive edge.</p>
Financial technology (fintech) 	<p>Vietnam is a rising star in the global fintech industry.⁵² The number of incubators, accelerators and innovation labs in Vietnam is 42 – above Indonesia (20), Malaysia (10) and Thailand (5) and only below Singapore (52).⁵³ In 2017, Vietnam had 48 fintech firms providing services from payment to remittances and cryptocurrency.⁵⁴ The composition of fintech firms is changing, however. Payments still account for a large proportion of fintech start-ups, emerging segments such as insurtech (insurance), wealthtech (wealth) and regtech (regulation) are attracting interest from investors around the world. At the same time, fintech firms involved with cryptocurrencies are decreasing their presence in Vietnam due to a high level of regulatory uncertainty over the use and mining of cryptocurrencies in the nation.</p>

2.2 Case studies – Awareness and readiness for digital transformation of manufacturing and agriculture sectors

The agriculture and manufacturing sectors were surveyed to provide an in-depth examination of the current state of technology adoption, and the intended speed of future adoption of Industry 4.0 technologies and systems. A separate survey assessed consumer interest in digital products and services.

The agriculture and manufacturing sectors were selected for in-depth examination for the following reasons:

- **They are largest contributors to the overall economy:** In 2017 the two sectors combined contributed more than 30% of total GDP in Vietnam.²¹
- **There is a high risk of labour displacement through Industry 4.0:** Industry 4.0 and the introduction of sector-wide automation will create significant labour displacement, especially in routine-task jobs which make up a high proportion of employment in these two sectors.
- **They are the sectors likely to see the highest gains from Industry 4.0:** Within Vietnam, the agriculture sector performs the most poorly in productivity among all sectors, and manufacturing does not perform much better.⁵⁵ Hence, these sectors are where digitalisation could have the highest gains for productivity.
- **Data constraints:** An examination of the databases of the General Statistics Office showed there is lack of enterprise-level data about digital transformation in the agriculture and manufacturing sectors, whereas this data is relatively available in other industries such as e-commerce, finance, tourism and logistics.

SURVEY METHODOLOGY

A series of surveys investigated the level of digital awareness and adoption across consumers and businesses in agriculture and selected manufacturing subsectors in Vietnam (see Appendix B for detailed methodology).

From the survey results, a Digital Adoption Index was created to measure representative companies' state-of-development in relation to the application of digital technology in agriculture and manufacturing. Enterprises were assessed across six dimensions: strategy, finance, infrastructure, human resources, smart production and logistics.

SURVEY RESULTS

Across both sectors, most businesses surveyed have applied information technologies in their production. The main applications include everyday business management as well as customer and supplier contact through email and websites. However, the adoption rate is much lower for agriculture households (around 25% compared to 70-85% of formal firms in both sectors).

In addition, most businesses in the two sectors are relatively new to the concept of Industry 4.0. The surveyed enterprises have examined options for further digitalisation, but only a negligible proportion have developed detailed plans or allocated funds for digital

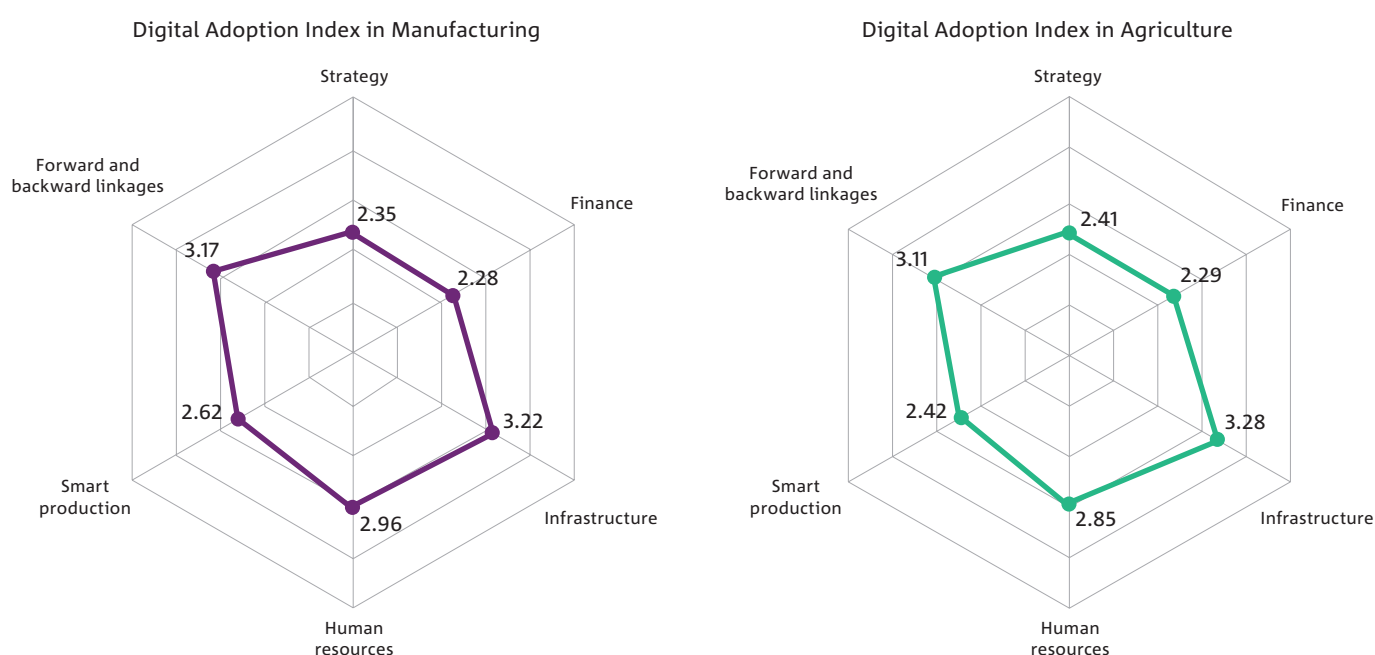


Figure 8 Digital adoption levels across dimensions in Vietnam's leading companies

Note: Adoption level: Level 1 – Outsider; Level 2 – Beginner; Level 3 – Intermediate; Level 4 – Experienced; Level 5 – Pioneer/Expert.
Source: Ministry of Science and Technology analysis

adoption. Approximately 35% of formalised agriculture enterprises and about 25% manufacturing enterprises plan to invest in Industry 4.0 technologies in the coming year.

Lack of finance and insufficient information were found to be the main barriers to further digitalisation at an enterprise level in the two sectors. In particular, unclear economic benefits and uncertain impacts of technology adoption, and prohibitively high investments are the most important challenges for digitalisation in Vietnam, especially for small and medium enterprises.

To further understand the level of digital adoption in Vietnam, a detailed survey was conducted with selected businesses in the agriculture and manufacturing sectors. The selected firms were considered pioneers in digital adoption in the two sectors. Their levels of digital adoption are summarised in the Digital Adoption Index (DAI). Overall these companies were found to be at the beginner or intermediate level of digital adoption on the DAI. Among the six dimensions, *Strategy* and *Finance* were the largest barriers to digital adoption, while *Infrastructure* and *Forward and backward linkages* were the least significant barriers.

The last survey focused on Vietnamese consumer views on digitalisation. Most respondents (92%) reported shopping for fashion goods, clothes, footwear and cosmetics online. The surveyed consumers were also familiar with taxi services using mobile apps or websites (91%). About 70-80% of respondents stated they had used the sharing economy. The survey results also showed citizens had relatively positive perceptions towards e-government services. The majority of people (60-70%) stated that e-government services help boost the efficiency of public services by reducing processing time and costs, and increasing accountability and transparency. These results represent a strong demand for digital services in Vietnam.

IMPLICATIONS FOR DIGITAL DEVELOPMENT IN VIETNAM

Industry 4.0 shows a promising start in Vietnam in the agriculture and manufacturing sectors. With the exception of agriculture households, the majority of survey respondents had integrated digital technologies into their production processes. The average Digital Adoption Index of agriculture and manufacturing sectors stands at 2.7. Overall firms showed the highest digital adoption readiness in infrastructure and logistics. However firms were less prepared in terms of finance, strategy and smart production. The Digital Adoption Index shows better than expected results considering Vietnam's level of development in agriculture and manufacturing.

The importance and impact of using digital technologies is recognised across the two sectors. Incentives to incorporate digital technologies and processes into production for enterprises included productivity improvement through reducing costs, increasing outputs and enhancing business management.

Selling to international markets often requires higher standards of production and record-keeping. Exporting firms have a greater incentive to apply digital technologies to promote environmental benefits and risk management, as part of overall production quality and standards.

Diverse views on emerging digital technologies. Different sectors held distinct views for which digital technologies will have the greatest impact on their business operations. Agriculture enterprises prioritised automation, machinery, sensors and data collection. Meanwhile, household agriculture businesses prioritised technologies to support real-time decision making and daily management issues. In the manufacturing sector, firms prioritised technologies to enable production, such as process monitoring and control, robots and automation. Very few manufacturing firms were interested in technologies for big data analysis, marketing or research and development.

Digital transformation faces many challenges. Investment in digital technology is still considered high-risk by many enterprises, because of its prohibitively high costs and the fact that long-term efficiency of the technologies has not yet been measured. Most of the challenges to undertake digital transformation are shared among both industries, including:

- Access to finance, especially among micro and small to medium enterprises (MSMEs)
- Lack of information on new digital technologies and services, especially for household businesses
- Determining which technologies to adopt and adequate technology suppliers
- Available skills and capabilities for implementation and management of Industry 4.0 systems and technologies.

2.3 Conclusions

Vietnam's economy is changing dramatically through the application of new digital technologies. Some industries are digitalising rapidly, including e-commerce, tourism, digital content and fintech. These industries show high potential for Vietnam's digital economy in the coming years.

Case studies in the fields of agriculture and manufacturing, however, show a moderate level of readiness for digital transformation. While firms in these sectors are well aware of the importance of digital technologies in production, they have trouble adopting new technologies due to financial and technical issues. However, given Vietnam's context and position in 2019, there remains a high potential return for Vietnam's digital economy – both in traditional and emerging industries.

Overall these trends and findings lay the foundation for identifying megatrends affecting Vietnam's current digital economy, and how they may impact the development of Vietnam's digital economy in 2045, as described later in this report.

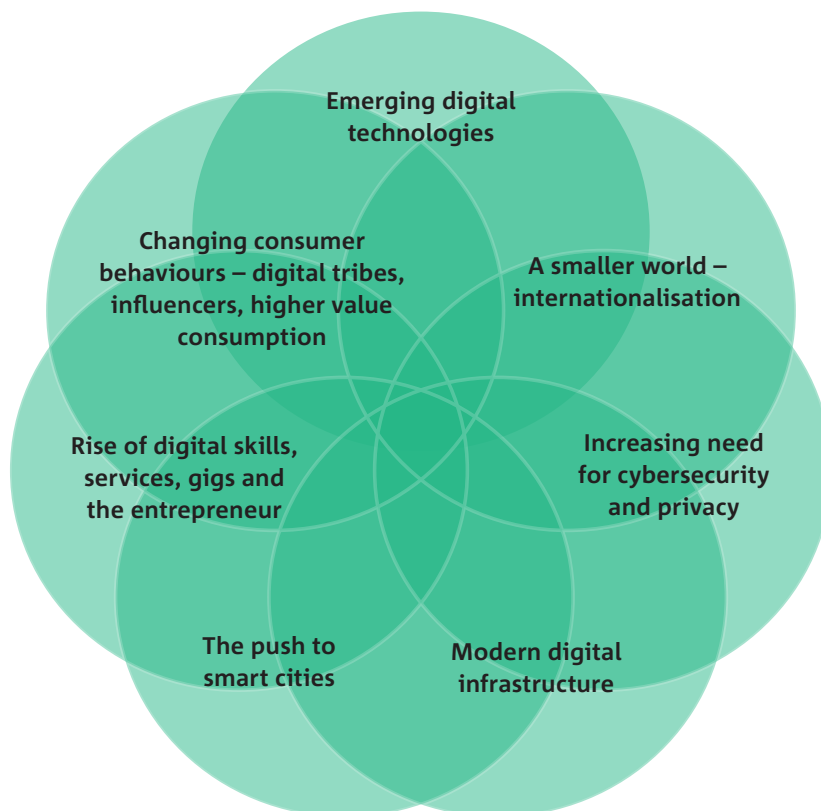
3 MEGATRENDS

A megatrend is a deep-set and gradual pattern of change building with increasing momentum to change the economy. Megatrends occur at the intersection of multiple trends more specific to a time and place.

The megatrends analysis involved a horizon scanning process which identified economic, technological, social, geopolitical, legal and environmental trends likely to impact Vietnam’s future economy. Individual trends were then qualitatively grouped together into draft megatrends. These were reviewed by digital economy stakeholders via workshops and interviews at Hanoi (82 participants), Ho Chi Minh City (98 participants) and Da Nang (52 participants). Stakeholders included those from

various sectors including government, business, start-ups, media, academia and development organisations.

With advice from the digital economy stakeholders in Hanoi, Da Nang and Ho Chi Minh City, the research team identified seven megatrends likely to drive Vietnam’s future digital economy to 2045. The year 2045 was selected to approximate a 25-year span, while aligning with strategic timelines in the public and private sectors.





3.1 Emerging digital technologies

Emerging digital technologies such as blockchain, Artificial Intelligence, big data analytics and the Internet of Things can leapfrog industry infrastructure upgrades, simplify supply chains and logistics, and help businesses operate more efficiently.

SUPPORTING TRENDS

Wider adoption of Internet of Things (IoT): Around 75% of global Internet connections by the year 2020 are expected to come from machine-to-machine devices connected via short-range wireless.⁵⁶ In Vietnam, IoT adoption is largely driven by large investments in IoT Smart City infrastructure from governments and businesses in Vietnam and around the world.^{57,58,59,60,61,62}

More use cases for big data: A tsunami of data is being created by the digital economy. Firms will increasingly exploit opportunities to monetise this data, or use data insights to create organisational efficiencies, predictive customer services or expanded markets. Global big data revenues are expected to quadruple from US\$18.3 billion in 2013 to US\$88.5 billion in 2025.⁶³

Local ICT companies entering the Artificial Intelligence (AI) market: The global AI market is predicted to be worth US\$8.3 trillion (gross value added) by 2035.⁶⁴ Vietnam ICT company CMC states there is a high demand for locally-developed AI, since much of the technology developed in other countries is not compatible with Vietnamese policies and ways of doing business.⁶⁵

Increasing interest in blockchain development: The global blockchain market is predicted to grow to US\$10.6 billion by 2023.^{66,67} Vietnam has shown substantial interest in blockchain, with several blockchain pilots underway in 2018.⁶⁸⁻⁷³ *Forbes* magazine suggests Vietnam

will soon become South East Asia’s innovation hub for blockchain development.⁷⁴

Virtual Reality (VR) and Augmented Reality (AR) on the rise: VR and AR development is predicted to soar globally, particularly in the health, training, digital games and tourism sectors. Predictions suggest the global market for AR/VR will reach US\$94.4 billion by 2023, with the Asia Pacific being the primary centre of growth.^{75,76} Leading IT companies in Vietnam such as FPT, Viettel and VNG showcased VR travel and entertainment at conferences in 2017 and 2018.⁷⁷⁻⁷⁹

3D printing is likely to revolutionise manufacturing and supply chain logistics: For now, global adoption of 3D printing is mainly limited to prototyping,⁸⁰ with Vietnam identified as a third-wave adopter.⁸¹ As 3D printing becomes cheaper and faster, business leaders across ASEAN nations expect it to eventually become key to the manufacturing industry – perhaps as soon as 2025.⁸²

Cloud computing increasingly embedded in ICT systems: Global annual revenues from public cloud computing services is forecasted by analyst firm Gartner to increase to US\$278.3 billion by 2021.⁸³ Vietnam is relatively behind other nations in cloud computing adoption,⁸⁴ but local adoption is rising faster than in other ASEAN nations.⁸⁵ According to the Lee Kuan Yew School of Public Policy, Vietnam revenue on cloud services grew 64.4% between 2010 and 2016.⁸⁵

RISKS AND OPPORTUNITIES

OPPORTUNITIES	RISKS
<ul style="list-style-type: none"> • Higher productivity, especially labour productivity, across all sectors including public services.^{86,87} • Transition the economy into new business models and new markets, with less and less time and financial investment required as digital technologies are further developed.⁸⁷ This will be particularly helpful for digitalising micro and small to medium businesses in the nation. • Greater transparency and trust in public and private sector organisations.⁸⁸ • Opportunity to leapfrog industrial phases and transition from manual to automated processes.⁸⁸ 	<ul style="list-style-type: none"> • Job automation: Up to 38.1% of Vietnam’s current jobs can be transformed or displaced due to automation by 2045.* A more moderate estimate suggests around 15% of total jobs in Vietnam will be automated by 2033.⁸⁹ • Skills shortages: For example, Vietnam is projected to be short 500,000 data scientists, and up to 1 million ICT workers by 2020.^{43,90} • Unfair algorithms: AI can create opacity and discrimination in life-affecting judgements and processes. For example, proxies for discrimination can be used to assess financial loans, education admissions, insurance or other life-affecting processes, and could potentially discriminate against certain social groups.⁹¹⁻⁹³ • Digitalisation could deepen inequality: A 2016 World Bank report shows that digital technologies deliver fewer benefits to the poor, and higher potential benefits for those who are not poor.⁹⁴

*Data61 analysis. See Appendix C for methodology.



3.2 A smaller world – internationalisation

The digital economy can benefit from international integration – by opening Vietnam to new export markets, knowledge and skills transfer, and greater levels of foreign investment.

SUPPORTING TRENDS

Increasing financial flows: FDI into Vietnam has grown each year since 2011, rising to US\$14.1 billion in 2017.²² Financial flows also come from family and friends, with remittances into Vietnam growing ten-fold between 2000 and 2017 to US\$13.8 billion.⁹⁵

From aid recipient to aid partner: Now that Vietnam is a middle income country, it is playing an increasing role as an aid partner.⁹⁶ ODA peaked in 2011 at US\$6.9 billion and lowered to US\$2.8 billion by 2015.⁹⁶ ODA will continue to decline and new loans will have less favourable terms.⁹⁶ Therefore, Vietnam will have to more efficiently target their investments of ODA.

Mobilising workforce: The Ministry of Labour, Invalids and Social Affairs reports that 134,750 Vietnamese workers were sent abroad in 2017 – an increase from 80,320 in 2012.⁹⁷

Rising tourism destination: Rising middle classes in Asia, along with Vietnam’s natural beauty, has led to a booming tourism industry in Vietnam. Vietnam saw a predicted 9 million international tourists in 2018, and the nation is expected to see 13.7 million visitors in 2028.⁹⁸

Cultural globalisation: Global influence on culture is rising as more people engage with foreign cultures online.⁹⁹ Scholars have argued that language itself is changing in Vietnam.¹⁰⁰ In the coming decades English may become common and sometimes even preferred among Vietnamese locals – for example in technical domains.

RISKS AND OPPORTUNITIES

OPPORTUNITIES	RISKS
<ul style="list-style-type: none"> • Increased capital into Vietnam through FDI, official development assistance, loans via Fintech platforms, venture capital—especially venture capital from China.^{87,96} • Increased exports/new markets,⁸⁷ including for tourism. • More knowledge and technology transfer/jobs and skills – these are especially beneficial for developing digital skills and international-level entrepreneurial and innovative skills.⁸⁷ 	<ul style="list-style-type: none"> • Vulnerable to global economic destabilisation: Shocks are being felt from US and retaliatory trade tariffs. While in the short-run Vietnam has benefitted by the relocation of manufacturing into Vietnam, it is unclear what the long-term effects will be. • Meeting increasing regulatory standards: Exports to international markets need to comply with new regulations set out in newer Free Trade Agreements, and meet the high standards of international economies. • Exploitation and dominance by international companies: Large international firms in Vietnam could avoid their social and environmental obligations.¹⁰¹ These firms also make it more difficult for local firms to join the value chain.⁸⁸ • Local talent drained and demand filled by foreign workers: Many skilled workers are migrating overseas,¹⁰² worsening local skills shortages. Skills demands may remain unfilled, or be filled by skilled international workers if the local education system remains unable to sufficiently upskill the local population.



3.3 Increasing need for cybersecurity and privacy

There is greater need for cybersecurity and privacy as more businesses and consumers engage in the digital economy, and as critical systems such as finance and government are increasingly digitalised.

SUPPORTING TRENDS

Data – on the rise and flowing across borders: Between 2005 and 2014 global data flows increased by a factor of 45.¹⁰³ This increases vulnerability, especially as more people and more critical systems (e.g. smart city infrastructure, defence and banking) go online.

Evolving nature of cyber attacks: According to the BKAV Corporation – an IT company and network security experts – the cost of cyber attacks in Vietnam increased by 15% to US\$540 million between 2016 and 2017.¹⁰⁴ BKAV analysis suggests IoT devices are especially vulnerable, while cryptocurrency-related attacks are another emerging threat.

Privacy, identity, data breaches – increased vulnerability in a connected world: Concerns have been raised about online monitoring, data breaches and identity theft.^{105,106}

Advancing cybersecurity: Between 2015 and 2025, cybersecurity spending in Vietnam is forecast to increase from US\$67 to US\$327 million.¹⁰⁵

Building the local cybersecurity industry: Cybersecurity training programs are becoming increasingly available with the opening of 10 national cybersecurity training centres and new elective courses in tertiary education centres. Local companies have successfully serviced the Vietnamese market, including BKAV Corporation and CMC which sell antivirus software for the home, business and smartphones.

RISKS AND OPPORTUNITIES

OPPORTUNITIES	RISKS
<ul style="list-style-type: none"> • Increased uptake of digital goods and services – especially antivirus software, e-government and digital banking.^{105,107,108} • Continued opportunities for Vietnam’s local cybersecurity businesses.¹⁰⁹ • Cybersecurity to ensure trust in platform technology and boost the digital economy.^{105,108} AI can boost cybersecurity by automating the search, detection and removal of threats.¹⁰⁵ • Regional cooperation and e-learning platforms to boost cybersecurity skills and capability.¹⁰⁵ 	<ul style="list-style-type: none"> • Higher vulnerability with globally integrated data: As countries increasingly digitalise and internationalise, data also becomes more globally integrated. Cyber attacks on foreign nations could compromise Vietnamese data.¹⁰⁵ • Threats to national security and economic growth: Without adequate cybersecurity, Vietnam risks losing sensitive data from government, businesses and consumers. • Lower consumer trust: Breaches threaten consumer privacy, identity and trust, which could lower adoption of Vietnamese digital goods and services.¹¹⁰ • Loss of international competitiveness: Vietnam may not be able to retain and attract the cybersecurity talent necessary for digital transformation.¹⁰⁵ Consumers and international investors may look to products and services from other economies due a perceived lack of security in Vietnam.



3.4 Modern digital infrastructure

A strong digital economy requires reliable digital and energy infrastructure – especially for power-intensive technologies such as IoT or AI. New telecommunications networks are also needed to ensure broadband is available to carry the large amounts of digital data needed for new applications.

SUPPORTING TRENDS

Higher energy demand filled by coal: Urbanisation and middle class consumption will continue to drive energy demand across the Asia Pacific, potentially reducing international energy security.¹¹¹ With local energy resources depleting, forecasts suggest imports will comprise 58.5% of Vietnam’s primary energy supply by 2035.¹¹² The economy will likely become dependent on coal, especially since plans for nuclear power were halted in 2016.^{112,113}

The increase of renewable energy: Incentives appear to have successfully boosted renewable energy investment in Vietnam – with investments in 2018 alone aiming to contribute a total 10,000MW.¹¹⁴

Mobile networks – 5G changing the game: Mobile subscriptions in Vietnam have grown by 2 million per year since 2012, and millions of new services are predicted to come online over the next decade.¹¹⁵ It is highly likely that most Internet-connected people in the future in Vietnam will be connected through mobile devices alone. With Vietnam implementing 5G networks by 2020, many areas may not need to install costly fibre-to-the-premises infrastructure.

RISKS AND OPPORTUNITIES

OPPORTUNITIES	RISKS
<ul style="list-style-type: none"> • 5G to support a new generation of Internet of Things, with applications in connected healthcare, smart cities, autonomous vehicles, factories and fixed wireless connections.¹¹⁶ • Growth in renewable energy, energy storage technology and P2P energy sharing platforms.¹¹⁷ • Better monitoring and more efficient use of resources through big data and sensor networks (including electricity via smart grids).⁸⁸ 	<ul style="list-style-type: none"> • Low energy security: Energy infrastructure and imports may not be able to keep pace with energy demand, making it less reliable.¹¹¹ • Climate change and pollution: High-carbon energy sources, and increased energy demand caused by a growing digital economy, could contribute to climate change and pollution.¹¹⁸ • Infrastructural damage: Rising sea levels could submerge Internet and energy infrastructure.¹¹⁹



3.5 The push to smart cities

In a rapidly urbanising and ageing nation, smart cities provide opportunities to use infrastructure and resources more efficiently, as well as reduce waste, pollution and traffic congestion.

SUPPORTING TRENDS

Urbanisation: In 2016 about a third of the Vietnamese population lived in urban areas.¹²⁰ By 2045 this is predicted to jump to nearly 55% of the population.¹²⁰ This rapid urbanisation is predicted to need US\$565 billion of infrastructure investment by 2040.¹²¹ However limited resources mean the Government is likely to prioritise strategic and cost-efficient infrastructure, including smart city infrastructure.

Ageing population: Vietnam has a comparatively young population but it is ageing rapidly.⁴⁹ As the proportion of the population over 65 years old increases, the proportion of working-age people in the population will decrease, and costs associated with age and healthcare will grow. These new challenges may increase smart city infrastructure for healthcare.

Straining transport infrastructure: Traffic congestion in Ho Chi Minh City and Hanoi is higher than in other Asian cities,¹²² and this impacts liveability through increased traffic accidents and pollution. Smart city infrastructure may help address these issues.

Climate change: As climate change increases in the coming decades,^{123,124} urban development will need to take extra measures to prevent flooding and minimise damage from extreme weather (e.g. through prediction and warning services).

Increasing pollution: Poor transport, energy and waste infrastructure has led to high levels of water, soil and air pollution.^{123,124} Smart city infrastructure for environmental sustainability can help counter issues related to pollution.

Growth of mobiles, apps, IoT and the gig economy: Consumer demand for digital products and services in Vietnam is very high and growing quickly.¹²⁵ By servicing this demand, the private sector is already influencing how cities operate. For example, gig economy smartphone apps such as Grab are creating employment opportunities and changing city traffic flows.¹²²

RISKS AND OPPORTUNITIES

OPPORTUNITIES	RISKS
<ul style="list-style-type: none"> • Smart city infrastructure to help urban environments cater for larger populations – to reduce traffic congestion and pollution, as well as optimise energy use and healthcare.⁸⁸ • E-government services to be made more efficient and convenient by assigning unique codes to citizens, which they can use across all public services (e.g. ID, social insurance, pensions). • Opportunities for public-private partnerships for smart city infrastructure. 	<ul style="list-style-type: none"> • Cybersecurity: As more critical systems (e.g. defence, health, banking) go online, there is greater risk from data breaches and cyber attacks.¹⁰⁵ • Smart cities a zero-sum game: Smart cities may lead to higher energy use, and require proper management of e-waste. These issues may lead to a zero-sum game for environmental sustainability. • Infrastructural damage: Rising sea levels could submerge homes and smart city infrastructure.^{119,126}



3.6 Rise of digital skills, services, gigs and the entrepreneur

Increasing demand for the services sector as well as digital products and services mean there is a need to invest further in higher education, digital skills, entrepreneurial skills and Vietnam’s innovation ecosystem. Platforms and the trend away from secure, structured and long-term work is also driving the use of labour and product platforms for income generation and creative avenues for industrial transitions in labour markets.

SUPPORTING TRENDS

Improving education, but slower progress in higher education: Vietnam has seen rapid improvements in primary and secondary education,^{127,128} but progress has been slow in higher education. Low tertiary education quality has led to, despite high demand for high-skills, more tertiary graduates working in secondary level jobs or lower (15.4% in 2012 vs. 22.2% in 2017).⁹⁷

Increase of self-learning: Several e-learning platforms have launched in Vietnam in recent years. For example, HocMai – an e-learning website for school students – launched in 2007 and gained 3 million users by 2018.¹²⁹ At the same time, the number of practical learners at community learning centres grew from 6.3 million to 10 million between 2006 and 2015.^{130,131}

More platform-based systems: The platform economy is also reshaping labour patterns, global markets and supply chains.¹³²

Rise of services: From 1988 to 2018 the GDP share of services increased from 29.7% to 40.9%.²¹ As the demand for services increases, there will be more opportunities for sharing economy platforms, gig economy workers and ICT services.

Growth of start-ups: Vietnam’s start-up scene is growing – up from 400 start-ups in 2012 to 3,000 in 2017.¹³³ A growing local entrepreneurial scene makes it more likely that Vietnam will digitalise and reap the benefits of digitalisation.

RISKS AND OPPORTUNITIES

OPPORTUNITIES	RISKS
<ul style="list-style-type: none"> • Greater flexibility in determining Vietnam’s own digital pathways.⁸⁶ • E-learning and cooperation from international teaching agencies can help upskill the population, especially in high-demand areas currently lacking in the workforce.¹³⁴ • Digital skills to enable growth in Industry 4.0 and smart agriculture.⁸⁸ • A shift to service-based industries will be facilitated by larger urban environments able to cater for better training facilities and large organisations.¹³⁴ 	<ul style="list-style-type: none"> • Low accessibility of education: Rural students may have lower employment and life outcomes, because of limited access to tertiary and digital skills education.¹³⁵ • Irrelevant skills: Training institutions report a mismatch between curricula and skills required on the job.^{136,137} • Digital disruption could outpace upskilling: Vietnam is predicted to require millions of job transitions by 2040.^{82,138} • Gig economy – unregulated: The gig economy has risks such as unregulated minimum wage and worker protections.¹³⁹ • Entrepreneurialism restricted by an underdeveloped innovation system: One issue is there is a lack of venture capital funds to support start-ups.¹¹³ Those who can access finance are reluctant to patent their ideas due to a concern their ideas will be stolen rather than protected.¹¹³



3.7 Changing consumer behaviours – digital tribes, influencers, higher value consumption

Consumer behaviours are changing as the Asian middle classes emerge and orient to higher-value goods and services, including those from the digital economy. At the same time, higher digital adoption among consumers increases the influence of digital tribes and influencers – both on suppliers and consumer behaviour.

SUPPORTING TRENDS

Rising Asian middle classes: Forecasts to 2030 suggest the global middle class is expanding rapidly, with Asia representing 88% of the next billion new entrants between 2010 and 2020.¹⁴⁰ Within Vietnam, the middle class is forecast to increase from 11% of the population in 2015 to over 50% by 2035.¹¹³

Higher value consumption: As the middle classes emerge there is greater demand for high-value products. Within Vietnam, high-value consumption is driven by emerging consumer preferences, especially those of the younger urban generation. These preferences include individualisation,^{141,142} sustainability,^{143,144} as well as prestige and brand value.¹⁴⁵ Higher-value consumption will likely push further adoption of digital goods and services.

Rise of digital tribes: Digital tribes are online communities which interact via social media or video games. Youths seem to be driving the rise of digital tribes around the world, especially since they are far more likely to use social media.¹⁴⁶ These tribes are increasingly utilised by digital marketing campaigns,¹⁴⁷ and are exerting pressure on businesses to align business operations and products with their preferences (e.g. through online reviews).

Influencers as drivers of consumption: Influencers are consumers who have reached celebrity status by growing large audiences on social media.¹⁴⁸ Their large audiences make them a powerful driver of consumer behaviour, now contracted by many of the major international brands and marketing companies.¹⁴⁹

RISKS AND OPPORTUNITIES

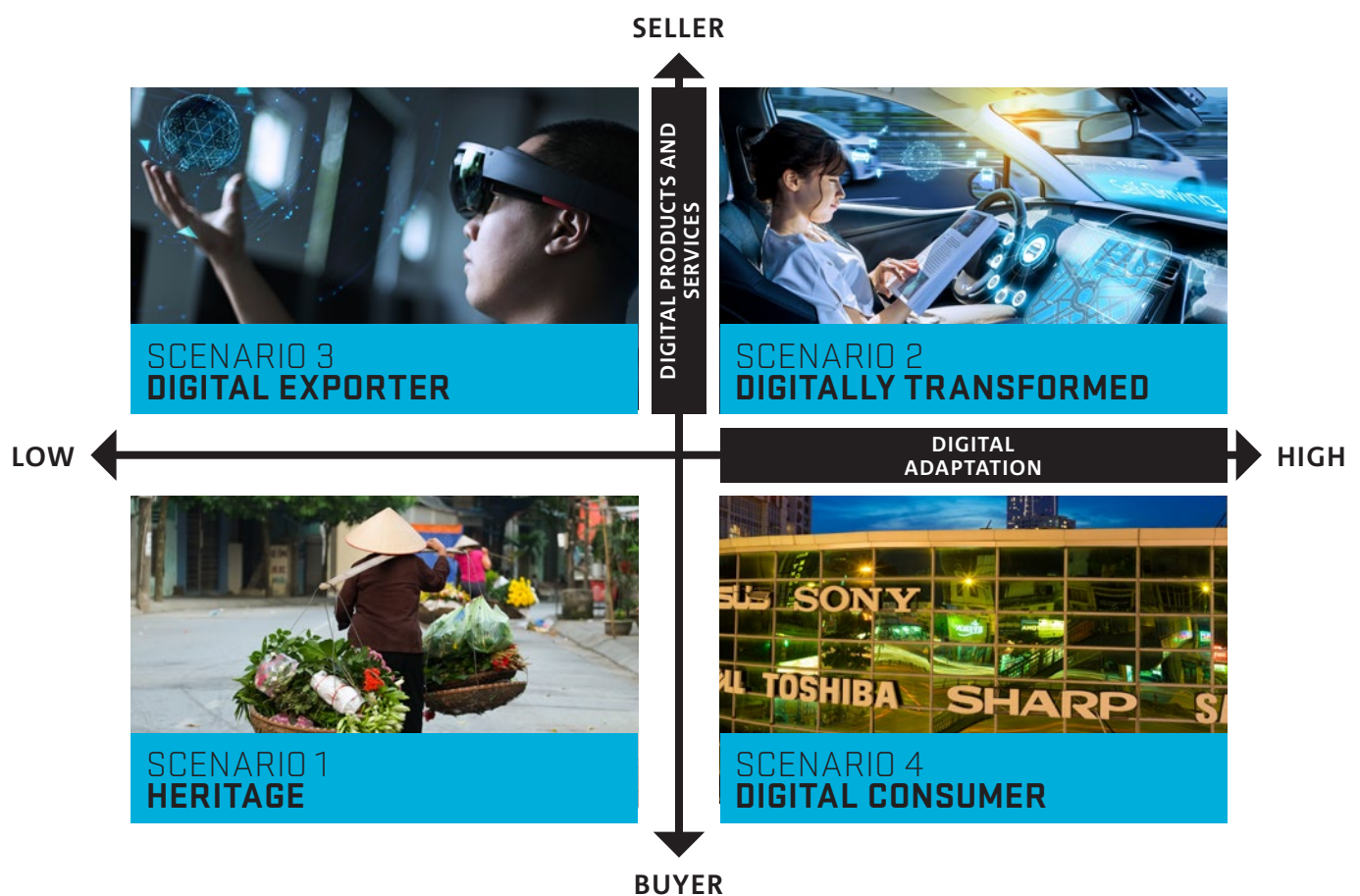
OPPORTUNITIES	RISKS
<ul style="list-style-type: none"> • Increased purchasing power creating new demand from the region, creating larger export markets particularly for high-value foods and tourism in Vietnam.^{117,140} • Less dependence on exports as a driver of growth, due to higher purchasing power in Vietnam.¹¹³ • Ability to assure consumers of high-value – and therefore increase prices – through blockchain or similar technology for product provenance.^{117,143} 	<ul style="list-style-type: none"> • Increased competition: Since the middle class in Vietnam prefer products from foreign brands,¹⁴⁵ domestic companies may need to adapt to remain competitive. • Greater risks from brand mismanagement: High-value products and services benefit strongly from positive brand value. But this requires careful brand management, especially as consumers are increasingly influenced by digital tribes and influencers.¹⁵⁰

4 SCENARIOS

Scenarios are plausible, evidence-based narratives about the future at a set point in time. They can be identified by extending trends and megatrends into the future, and creating axes of greatest impact and greatest uncertainty.

From these megatrends we have created four future scenarios based along two axes:

- Whether or not Vietnam is a net buyer or seller of digital products and services
- Level of adaptation to new digital products and services across government, the community and industry



SCENARIO 1

HERITAGE

Digital adoption is relatively low and labour productivity has stalled. The economy is still largely reliant on traditional commodities exports (agricultural, fishing and mining products) and a growing tourism sector. There has been low and patchy adoption of ICT products across Vietnam’s industry, and no breakthrough global technologies. The ICT industry is based in a few urban centres and struggles to keep highly skilled developers within Vietnam.

Main exports: Tourism, mineral ores, petro-chemicals, and agricultural products



Note: GDP in real US\$, 2005 prices.

CRITICAL DEVELOPMENTS FOR THE SCENARIO TO OCCUR	CRITICAL RISKS FOR THE SCENARIO
<ul style="list-style-type: none"> • A growth in the price and value of unrefined exports – such as mineral ores, petro-chemicals and agricultural products. • Low investments in both ICT and new energy infrastructure, and digital skills and capabilities from government and industry. • A lack of regulatory reform in areas such as taxation, business incentives, land use, IP protections, innovation systems, use of digital products and services. • Community resistance to change in traditional practices and values, and an increase in the labour intensive niche production methods – such as artisan products and services. • Possible external economic factors that inhibit the growth and transformation of the Vietnam economy – such as a global or regional economic slowdowns or crises. • Slow transformation within the Vietnam government to e-government services and products. 	<ul style="list-style-type: none"> • Vietnam would be caught in the middle income trap, and slip in competitiveness compared to other low and middle income countries. • Many Vietnamese people would miss out on the opportunity and freedoms of developing businesses and wealth on global markets. • Vietnam would experience greater impacts from climate change due to lack of monitoring and planning for change. Natural disasters would not be mitigated by digital warning systems or predictive software. • Many natural resources would be depleted as there is still a dependence on commodities, particularly agricultural and mining commodities, and there may be an emerging energy crisis. • Vietnam may lose some of its sovereignty due to data harvesting and control of systems by large multinational firms, restrictive or completely unprotected IP systems. Vietnam would also not reap the development benefits of using data flows in the ASEAN region.

Priority areas for action: Investment in digital and energy infrastructure, digital skills, institutional change and regulation reform and development.

SCENARIO 2

DIGITALLY TRANSFORMED

Digital adoption is widespread across the population and industrial sectors, resulting in inclusive growth. This Scenario increases income, global competitiveness, ability to invest in innovation to solve national problems, and exports of higher-value products and services. However this Scenario will also see the highest level of job disruption of all the scenarios. As well, lower fertility rates resulting from long working hours or higher workforce participation – especially by women – may lead to a rapidly ageing population, or the need to increase skilled immigration.

Main exports: Knowledge-based services – particularly in design, digital services, agricultural technology and advanced manufacturing – and tourism



ACCUMULATED ADDITIONAL GDP
US\$168.6 billion
over 27 years



IMPACT ON ANNUAL GROWTH
1.1%



CURRENT JOBS AT RISK OF TRANSFORMATION OR DISRUPTION
38.1%

Note: GDP in real US\$, 2005 prices.

CRITICAL DEVELOPMENTS THE SCENARIO TO OCCUR

- Continuation of global growth, particularly growth in the Asia Pacific region.
- Investments in education, new energy sources, a national innovation network and safe and secure communications networks.
- Broad regulatory reform in e-government, taxation, business incentives, IP protections and reform, and ease of doing business.
- A focus on cybersecurity and the widespread deployment of new trusted networks for IoT.
- Building broad proficiency in ICT and STEM skills (from school to the workplace) as well as centres of excellence in ICT growth industries.
- Introduction of blockchain-based distribution and other systems such as digital currency for services.

CRITICAL RISKS FOR THE SCENARIO

- With a far greater proportion of the economy reliant on online networks, Vietnam is vulnerable to cyber attacks.
- Distrust in electronic networks impacts on property, or invasions of privacy and personal freedoms and safety.
- Crime networks and tax-avoidance schemes flourish through technologies that can quickly and anonymously move value from person-to-person or offshore.
- Vietnam loses its uniqueness with a loss of cultural diversity in practices, social structures, languages, history and beliefs.
- There is a risk of growing inequality, particularly between urban and rural areas.
- Automation causes mass unemployment in certain areas, and a need for rapid transformation.
- Over extension of loans to modernise industry too rapidly increases public debt to unsustainable levels.

Priority areas for action: Cybersecurity, labour market transformation, regulation and taxation reform, improved rule of law and reduction of systemic corruption, and broad skills programs. Innovation and investment will also be required for infrastructure funding, technology transfer, taxation, international partnerships and government modernisation.

SCENARIO 3

DIGITAL EXPORTER

Digital adoption across all industry sectors is low, but the ICT industry is booming as Vietnam has become a low-cost labour centre for coding and the production of ICT hardware. Legacy systems and infrastructure, and finance available for investment hold back the broad industrial and societal transformation across Vietnam. There is growing patchiness of development and increased inequality across Vietnam. This has created a *two-speed economy* – with a few booming urban centres and large areas outside the cities still depending on labour intensive production.

Main exports: ICT products and services commissioned by external companies, mining and petrol products, agriculture, low-cost tourism



ACCUMULATED ADDITIONAL GDP
US\$66.9 billion
over 27 years



IMPACT ON ANNUAL GROWTH
0.45%



CURRENT JOBS AT RISK OF TRANSFORMATION OR DISRUPTION
19.1%

Note: GDP in real US\$, 2005 prices.

CRITICAL DEVELOPMENTS FOR THE SCENARIO TO OCCUR

- Investments in reliable energy and ICT infrastructure for critical tech hubs, but not across the broader industry.
- Take-up of the use of global labour market platforms to sell ICT goods and services.
- Structural and regulatory reform across sectors, including government, to prioritise growth in the local ICT industry.
- Low availability of finance for transitional investment in industrial infrastructure, equipment and skills.
- Inaccessible education, particularly for workers needing to transition from unskilled work to service-driven jobs.
- Low cybersecurity leading to low trust and take-up of e-government, online banking and other data platforms.
- Increased use of the informal and cash-driven economy to earn incomes within areas impacted by automation or poorer urban environments.

CRITICAL RISKS FOR THE SCENARIO

- Inequality and the development of a two-speed economy. There is the risk of distinct areas of advantage and disadvantage developing, causing social instability and the further development of the informal economy.
- Lack of investment and the country missing out on the broad productivity gains, market expansion, and market development offered by digital transformation across industries, leaving Vietnam in the middle income trap for most of this century.
- Exploitation of Vietnam labour, resources and industry: Vietnam is targeted by international firms for low labour costs and cheap inputs, and not value-added products and services. There is little technology transfer that accompanies investment in Vietnam.
- Loss of intellectual capacity to more developed nations that can provide greater opportunities and higher wages.

Priority areas for action: Broad skills and education programs across the economy through schools, online learning and adult learning centres. A focus on cheap, affordable technology equipment and training. Local support for digital entrepreneurialism. Promotion of platform-mediated trade for products and services as a transition tool. Government investment in local digital industry through contracts for work, technology targets, missions and trade.

SCENARIO 4

DIGITAL CONSUMER

Digital adaptation across all industry sectors is high, and this has had positive impacts on labour productivity nationwide. Unemployment is high in particular areas – due to the rapid automation of many industries. Industrial transformation is broad but expensive due to the import of external technology and platforms. External multinationals dominate the ICT products and services sector, and the Vietnamese ICT sector is small by comparison.

Main exports: High-value agriculture, minerals, manufacturing, tourism, services



Note: GDP in real US\$, 2005 prices.

CRITICAL DEVELOPMENTS FOR THE SCENARIO TO OCCUR	CRITICAL RISKS FOR THE SCENARIO
<ul style="list-style-type: none"> Broad investment in industry modernisation with Industry 4.0 policies. Investments in secure and reliable ICT and energy infrastructure. Regulatory reform to allow digital adoption and the implementation of new technology, and incentivise industrial transformation. Taxation reform to derive more taxes from the productivity gains from digital transformation. Investments in ports and smart city infrastructure, and e-government services. Less investment/growth in education and ICT sector leading to the shortage of ICT skills to leverage the maximum benefit from digitalisation 	<ul style="list-style-type: none"> Vietnam misses out on developing new export markets in high technology fields through the ownership of IP, digital platforms, assets and services. Digital systems created within Vietnam are not customised to local conditions, they are more expensive in the long run due to subscription costs and external influences on policy and local labour. The taxation system does not reform to allow for the taxation benefits from companies profiting from increasing trade and productivity within Vietnam. Base tax may be eroded. Vietnam is subject to greater levels of data-harvesting from foreign companies operating within the country and/or policy interference from multinational companies with increasing leverage on labour markets and distribution systems. Over extension of loans and borrowings to modernise industry too rapidly increases public debt to unsustainable levels.

Priority areas for action: Support and encouragement of the local ICT industry through attraction and creation of venture capital, curation of start-up communities, regulation reform on privacy and consumer data rights, government contracts for local industry, Open Data and the creation of Vietnamese platforms for trade and social media.



5 ACHIEVING DIGITAL TRANSFORMATION FOR ECONOMIC GROWTH IN VIETNAM 2019-2045

You can't choose which scenario will occur, but you may change their probability of occurring.

The scenarios describe plausible futures that can occur over the next 25 years due to **external** factors acting on Vietnam's digital economy. These may include global economic slow-downs impacting on Vietnam's rate of internationalisation and trade, low adaption to emerging digital technologies (local or global), or GDP shocks due to extreme weather or international cyber attacks. These are drivers of change that are out of the control of policy makers and leaders of industry within Vietnam. **Vietnam should be prepared for all four scenarios.**

However, internal strategies can change the probability of which scenario will occur. Even though external factors may dictate the scenarios, which scenarios will eventuate will rely on a mix of **internal and external** factors, and actions taken internal to Vietnam may change the probability of each occurring.

As seen in Figure 9 **the scenarios should be used to filter and balance strategies.** For instance education and infrastructure spending should not exceed the ability of the country to repay it under the Heritage Scenario. To increase spending to levels above this runs the risk of rapidly increasing debt levels and causing higher inflation.

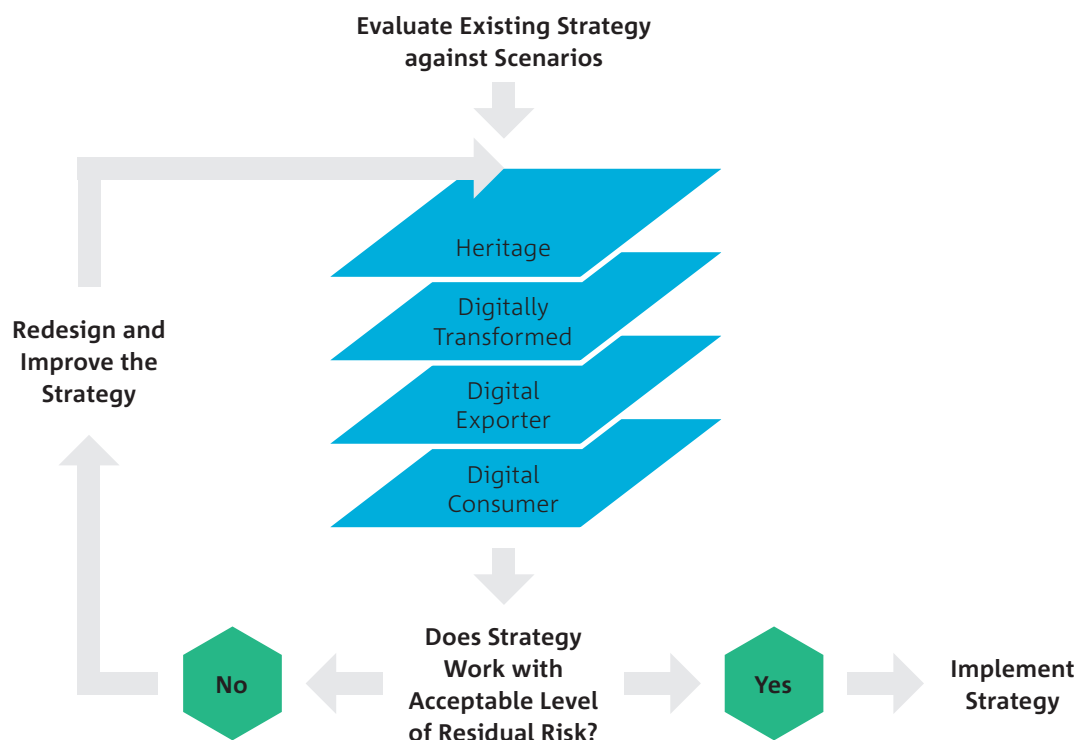


Figure 9 Using scenarios to assess strategies

5.1 Creating a roadmap for Vietnam’s future digital economy

In creating a roadmap for Vietnam’s digital economy to 2045, it is important to examine the role digital transformation could play in Vietnam’s overall economic development.

MOVING FROM MIDDLE INCOME TO HIGH INCOME – THE ROLE OF TECHNOLOGY IN ECONOMIC ADVANCEMENT

“Productivity isn’t everything, but in the long run it is almost everything. A country’s ability to improve its standard of living over time depends almost entirely on its ability to raise its output per worker.”

Paul Krugman, The Age of Diminishing Expectations (1994)

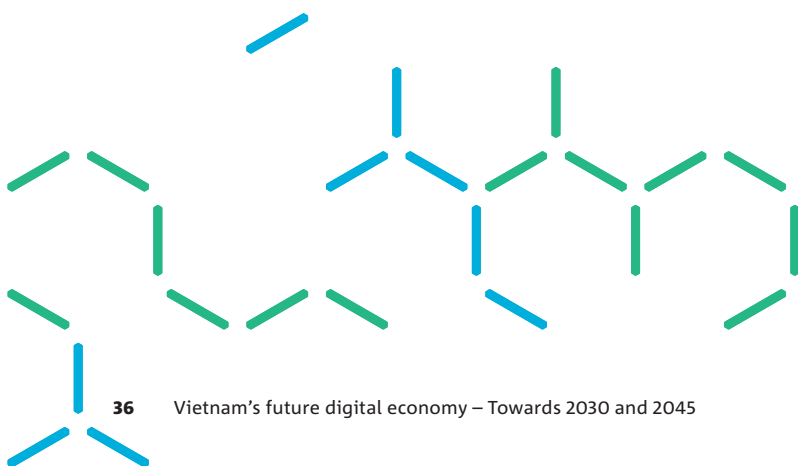
The tech start-up sector and enhancing productivity skilled labour is seen as an avenue for Vietnam to sustain high growth rates beyond the lower-middle income state and progress to high income status.^{151,152} This may only come through prudent investment in both hard and soft infrastructure creating inclusive growth and total factor productivity (TFP) across all industries.

Technology plays a crucial role in increasing total factor productivity growth.^{87,94} Low and middle income countries have often gone through a period of ‘catch-up’ to the technological best practice of higher income countries by applying and adopting existing technologies. Best practice and new technologies developed in other countries are adopted to improve productivity and profitability through the middle income phase. In the long run, however, this often results in unsustainable high growth rates from a low base, with growth dropping as the country develops.

To reach high-income status, there is a need to move beyond technology adoption to technology development. This is because determinants of growth change as countries move up the income scale. Strategies for economic growth will need to be re-evaluated at particular economic milestones to maintain fast growth.¹⁵³ For instance, there is a point at which technological ‘catch-up’ no longer provides productivity dividends and the country must invest in the more investment-intensive role of technology creation and development.¹⁵³



Figure 10 Different strategies for different stages of development



5.2 SWOT analysis of Vietnam's digital economy in 2019

To construct a roadmap with useful actions likely to improve the chances of Vietnam using technology to lift productivity and sustain higher growth over the longer term it is useful to understand the current attributes of the digital economy. Below is a Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis.

Strengths

- Location – in the heart of high-growth Asian countries
- High growth in foreign direct investment (FDI)
- Increasing investment in start-ups and skills
- Growing domestic middle classes
- Young population (77% of population are working age)
- High school student literacy, numeracy and science skills
- Government priority on digital transformation
- High levels of digital access and broadband coverage – rapidly growing 4G networks and world leading 5G trials and roll out
- High levels of digital adoption across the population, particularly smartphone adoption
- Dynamic domestic private sector and strong leadership
- Strong industry in agriculture, mining, manufacturing and tourism
- Highly ranked on Global Innovation Score
- Attractive tax incentives for ICT professionals
- High growth in the software sector
- Attraction of computer hardware manufacturing and high levels of high tech exports

Weaknesses

- Vulnerable to global economic uncertainty
- Weak national brand for goods and services
- Lack of finance for digital investment
- Depleting natural resources and growing pollution
- The large informal economy
- High numbers of workers at risk of automation
- Deficit in high levels skills and capacity in the workforce – scoring low on global talent competitiveness
- Low cybersecurity capability and skills
- Low levels of foreign language skills
- Volatile macroeconomic indicators
- Infrastructure shortages
- Inefficient State owned enterprises
- Lack of coordination between state agencies
- Lack of innovation and digital take-up monitoring
- Licencing and release of Open Data
- Patchy and immature innovation network
- Most digital enterprises are small
- Lack of data collection and storage among enterprises
- Ongoing corruption across industry

Opportunities

- Growth of the middle classes of South East Asia and Vietnam
- High growth in foreign direct investment (FDI)
- New financing options for infrastructure and development funding
- Increased participation in the platform economy and global markets
- Self-learning via digital platforms
- Untapped potential labour in non-working households in many regional and rural areas
- Growth of the domestic market in Vietnam
- Strong industry in agriculture, mining, manufacturing and tourism
- Low entry costs for new businesses
- Potential to reward quality products and good practice through blockchain and improved provenance
- More ICT manufacturing to Vietnam
- Attractive tax incentives for ICT professionals
- Formation of a national innovation network and data sciences collaboration organisation
- Opportunity for e-government reform and technology leapfrogging
- Potential for Open Data to fuel app development

Threats

- Climate change
- Depletion of natural resources
- Pandemics
- Growth in tourism and over use of iconic places
- Global or regional economic slowdown
- Regional conflicts
- Cyber attacks
- External data-harvesting on Vietnamese businesses and citizens
- Loss of global competitiveness or falling productivity
- Talent drain
- High unemployment due to rapid job disruption
- Ageing population
- Growing wealth inequality
- Rising debt levels
- Loss of taxation revenues due foreign digital platform and services providers
- Infrastructure not keeping up with rapid urbanisation
- Mistrust in e-government, e-commerce, banking and other online systems
- Impact of e-commerce on local traders and retailers
- Difficulty digitalising micro to small and medium enterprises

5.3 The roadmap

Finding the best avenues for ongoing investment for the development of the digital economy is a matter of priority, as is properly sequencing development to ensure optimal allocation of resources and maximum returns to the state for ongoing investment.

To assist policy makers and leaders of industry moving forward, Vietnam's Ministry of Science and Technology and Australia's CSIRO have created a broad roadmap with a list of possible actions. While these actions are prioritised **they are not necessarily sequential**; many will need to occur at the same time. The Government will also need to carefully balance spending with returns to reduce debt and inflation.



6 CONCLUSIONS



Vietnam at the crossroads

Vietnam in 2019 is at a particular point in its development and in technological history. As a middle-income nation at the beginning of the Fourth Industrial Revolution, Vietnam will need to make critical decisions for economic strategy and the digital economy.

Vietnam has grown rapidly and inclusively over the last 40 years. This has been done through a market-development strategy which opened the economy to international trade, attracted high levels of foreign direct investment, grew the manufacturing base, and fostered Vietnam as a competitive low-cost labour market.

Now that Vietnam has achieved middle-income status however, it will start to feel competition as a low-cost labour market from lower-income countries.

Need to shift focus on economic strategy

The economic strategy that led to Vietnam's success and high GDP growth over the last four decades will not continue to provide the same growth and prosperity into the future. To move from middle income status to high income status, Vietnam will need to go beyond being a low cost labour market with a heavy reliance on FDI for export growth, and move to increasing the capacity to use technology to increase total factor productivity growth across all industry sectors.

The way forward is through improving labour productivity and knowledge-based industries through technology adoption, structural reform, skills development and education.

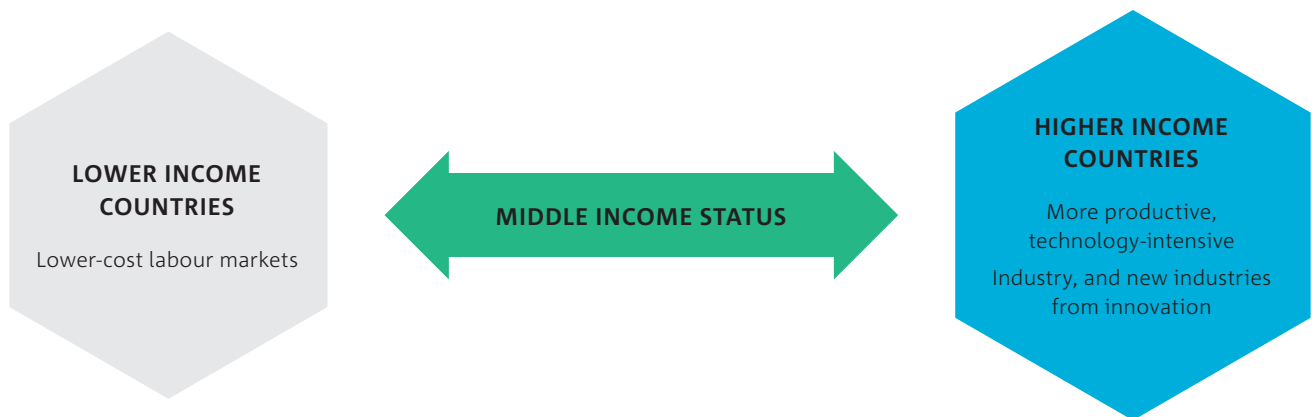


Figure 11 The competitive squeeze on economic strategy



Industry 4.0

As the industrial world modernises with a new suite of powerful digital tools – including automation, AI, blockchain, platforms and cloud services and the Internet of Things – Vietnam will benefit from a shift from relying on labour inputs, to better utilising technology, skills and creating value-added products across all industry sectors. Technology intensification through the application of this next wave of digital technology by businesses, government and industry is what many are describing as Industry 4.0.

Awareness and promotion of Industry 4.0 within Vietnam is encouraging, but technology adoption remains low. How Industry 4.0 policies and technologies will be adopted and taken up across Vietnam will determine which scenario described in this report will unfold over the next 25 years.

Scenarios and actions for resilience

This report highlights the current digital megatrends for Vietnam, and creates four potential scenarios for the digital economy in 2045. The futures of Vietnam are distinctly different, reliant on a mix of internal and external factors with varying estimated impacts on GDP and job disruption. These impacts have been estimated through long-range modelling. There are benefits and risks for each.

The decisions now are for the people of Vietnam. Many encouraging policies are in place. These will need to be translated to enthusiastic actions on the ground.

To assist policy makers and leaders of industry moving forward we have created a broad roadmap and a list a range of possible actions that can prevent critical failures

of the Vietnamese economy in all four scenarios, and that could potentially boost digital adoption, economic productivity and resilience.

The key challenge for Vietnam in this digital transition will be to keep the macroeconomy strong, and foreign debt and inflation under control, while at the same time investing efficiently in infrastructure and skills to unlock productivity growth. Control of the macroeconomic environment and efficient allocation of resources has been key in lifting other nations from low to high income status through the application of technology.

To control inflation and debt, investments will need to be carefully sequenced – focussing on high-speed ICT infrastructure to as much of the population as possible, cybersecurity to ensure trust, and broad-based digital skills unlock the productivity benefits of digital connections. To mature the economy it will also be necessary for Government and regulatory reforms to modernise government services, allow efficient resource allocation, and strengthen the innovation network.

While no-one can accurately predict the long-term future, the information in this report provides options and opportunities to guide Vietnam in the next wave of digital innovation and the Fourth Industrial Revolution.

With a young and vibrant population, high investment and a location in the heart of high-growth Asian economies, Vietnam has a good chance of surging forward with the new digital tools available, if the transition is managed well.

This transformation will not come without risk, but the biggest risk in these times of rapid change, is not transforming at all.

APPENDIX A

COMPANIES OPERATING IN THE DIGITAL ECONOMY IN VIETNAM



APPENDIX B

METHODOLOGY FOR INDUSTRY SURVEYS AND DIGITAL ADOPTION INDEX

As part of the Vietnam's Future Digital Economy Project, the research team conducted surveys to investigate the level of digital awareness and adoption across consumers and agriculture and manufacturing enterprises. From the survey data, we created a Digital Adoption Index to measure the level of digital adoption and potential for digital transformation in representative enterprises in the agriculture and manufacturing sectors.

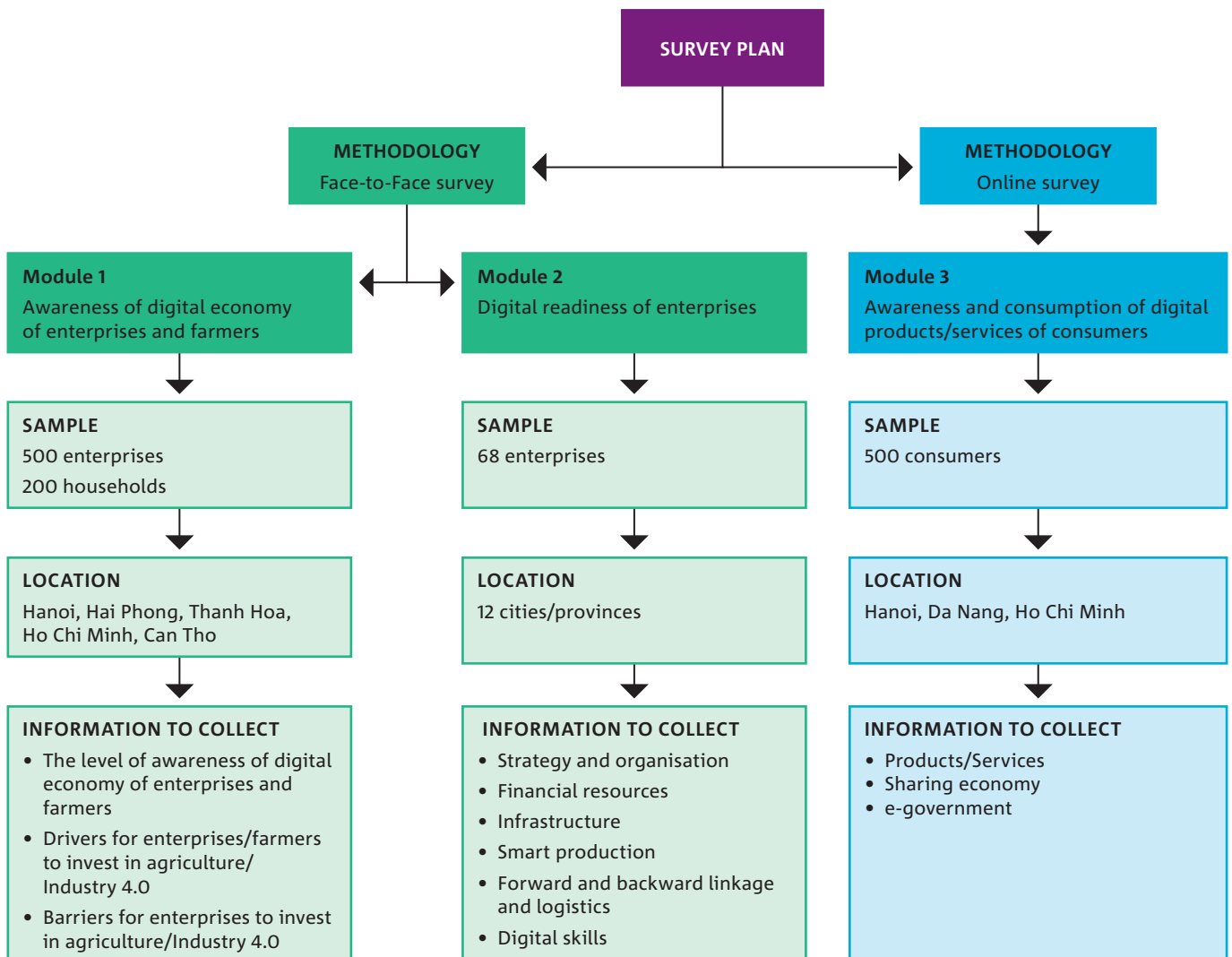


Figure 13 Survey methodology on digital awareness and digital transformation readiness

Source: Ministry of Science and Technology analysis

B.1 Survey response rates and demographics

B.1.7 MODULE 1

The survey samples (500 enterprises and 200 household businesses) were randomly selected from a list obtained from provincial statistics departments. The survey was conducted in 12 provinces and cities, including Hanoi, Thanh Hoa, Hai Phong, Ho Chi Minh City and Can Tho. These areas were chosen as they have the highest concentration of agriculture and manufacturing enterprises in Vietnam. Overall response rates were relatively high – averaging 45% across both sectors.

B.1.8 MODULE 2

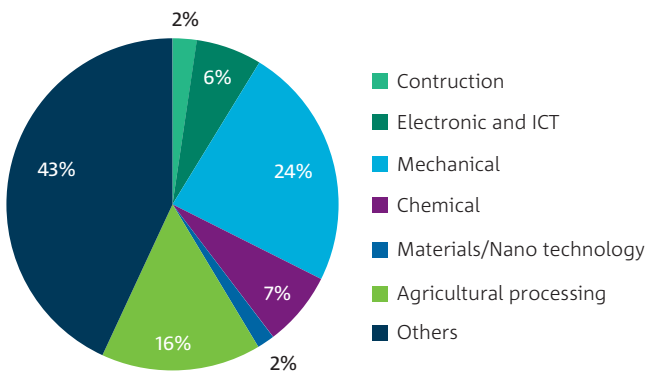
To get an overview on the level of digital readiness among the representative enterprises in the two sectors, 70 companies in both the manufacturing and agriculture

sectors were invited to participate in in-depth surveys. Respondents were considered to be leading firms in their field in terms of firm size, technology development and adoption, and enterprises who had participated or presented in seminars on the digital economy and Industry 4.0 organised by Vietnamese Ministries, and/or industrial and local organisations during the survey period.

B.1.9 MODULE 3

The consumer survey included around 500 respondents. The majority of respondents were aged between 18 and 30 years, with higher than average education levels. The respondents' level of income is quite similar to the standard distribution, with an average income of VND7.5-15 million per month.

Responses across manufacturing subsectors



Responses in agriculture sector

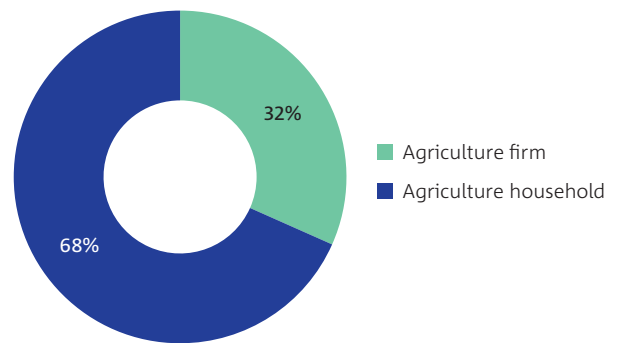


Figure 14 Enterprise survey participants by type of enterprise

Source: Ministry of Science and Technology analysis

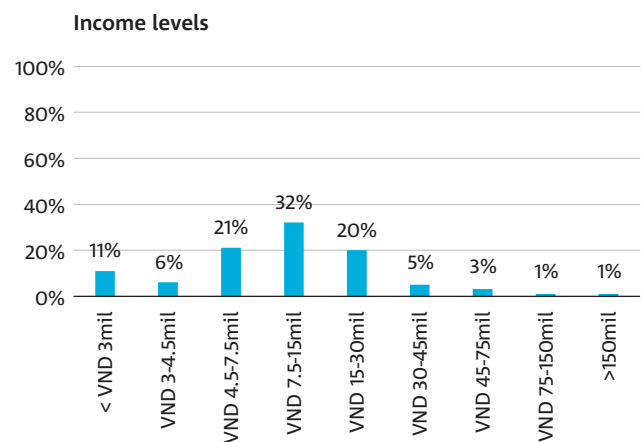
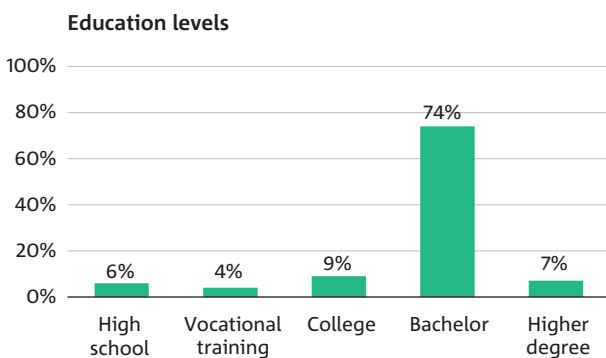


Figure 15 Customer survey participant demographics

Source: Ministry of Science and Technology analysis

B.2 Digital Adoption Index

The Digital Adoption Index (DAI) was calculated from the data of representative firms in Vietnam’s manufacturing and agriculture sectors. The objective of the DAI is to explore businesses’ current stage of digital adoption and their perceptions on digital transformation.

The DAI is expected to be a good reference to different users. These include governmental agencies and development agencies who want to better understand the current situation of digital adoption in manufacturing and agriculture in Vietnam. This understanding would help them prioritise policies and investment programs accordingly. The DAI also helps businesses identify where they are in their digital transformation journey, as well as analyse their capacity, potential and barriers to advancement.

For the purpose of our index, “Digital Adoption” represents the stage at which companies’ production is transformed to a new business model to create new customer experiences, build up new revenue/value added and utilise resources much more efficiently by leveraging opportunities offered by digital technologies. Complete digital transformation/adoption for businesses is characterised by:

- Horizontal integration through networks where the networks can be managed in real-time from the moment an order is placed right through to outbound logistics.
- Vertical integration and networked manufacturing systems where the IT systems at levels of sensor, control, production, execution and corporate planning work together. Production processes and automation will be designed and commissioned virtually in one integrated process and through the collaboration of producers and suppliers. Physical prototypes will become less important.
- End-to-end digital integration of engineering across the entire value chain ranging from design, inbound logistics to production, marketing, outbound logistics and service to after-sales services.

In this report we develop an indexing methodology to identify the level of digital adoption among agriculture and manufacturing businesses, in six dimensions:

1. Strategy and organisation
2. Finance
3. Infrastructure
4. Human resources
5. Smart production
6. Forward and backward linkages and logistics

These pillars were selected based on M. Porter’ value chain system of businesses.¹⁵⁴ Each pillar of was also factor analysed to ensure that it measures a unique aspect of the digital adoption process. For each pillar, sub-indicators are used to capture the level of digital adoption. The number of sub-indicators are selected to balance between the comprehensiveness and level of complexity of the survey. Detailed indicators for each pillar can be found in the table below.

Evaluation of adoption level through the sub-indicators within an enterprise was conducted by using a standardised questionnaire consisting of one closed-ended question per item. Each question required an answer to a Likert-scale value from 1 “not implemented/not crucial” to 5 “extensively implemented/very crucial.”

The value of each pillar was calculated using the following formula:

$$Index_p = \frac{\sum_{k=1}^n M_{pk} * g_{pk}}{\sum_{k=1}^n g_{pk}}$$

Where:

- $Index_p$ is the adoption level of Pillar p
- M_{pk} is the adoption level of the analysed indicator k of Pillar p (there are a total of n indicators to be analysed)
- g_{pk} is the weighting factor of indicator k of Pillar p

The weighting factor was determined using a Likert scale from 1 (not important) to 4 (very important). The weighting matrix was obtained by interviewing experts in the field on the importance of each sub-indicator and pillars to the digital adoption process of businesses, and then taking the average weights of the expert opinions.

The overall DAI score was calculated from the weighted average of all pillars' values.

According to value of DAI, businesses are categorised into three levels of digital adoption:

- **Newcomers** (with DAI value from 1 to 2) who have done either nothing or very little to deal with digital adoption, or those who indicated Industry 4.0 was either unknown or irrelevant

- **Learners** (with DAI value of 3) who have already taken their first steps in digitalisation
- **Experienced/top performers** (with DAI value from 4 to 5) who are already well on the way to digitalisation and are therefore far ahead of most companies in the field.

Although self-assessment of digital adoption is a valid method and easy to conduct, we are aware that most businesses in Vietnam may not have comparable knowledge about Industry 4.0 and the adoption level of their company. To ensure accuracy of results, we selected representative businesses that are either large in scale or have already been engaged in Industry 4.0 and therefore possess the required basic knowledge. Each company received a questionnaire through e-mail to allow for reflected assessment of their internal situation in their own time.

PILLAR	SUB-INDICATORS
Strategy and organisation	
	Existence of digital strategy, digital roadmaps, etc.
	Leader support
	Existence of central coordination unit for digital adoption
	The suitability of the existing business model to digital adoption
	Regulation and suitability to technological standards and IP protection
Finance	
	Level of investment in digitalisation in the last year
	Level of investment in digitalisation in the next 3 years
Infrastructure	
	The level of infrastructure to support digital adoption (energy, telecommunication, transport, etc.)
	Connectivity quality
	The competence of the existing ICT system and requirements for digital adoption
	The level of cybersecurity methods in the business
Human resources	
	ICT skills of employees
	The extent that the business applies digital technologies to daily operations
	Training and retraining in digital related areas
	Business culture in terms of knowledge sharing, open innovation, etc.
Smart production	
	Application of advanced production management techniques (autonomous production line, FMS, CIM, etc.)
	Application of other digital technologies in production (blockchain, robotics, sensors, etc.)
	Level of digitalisation of production equipment
	The level of real-time data collection and utilisation
	The extent that the business has a real-time view on production
Forward and backward linkages and logistics	
	The amount the business uses multiple integrated sale channels
	The level of multiple information channel usage
	The level of automation and digital integration in logistics (from order capture, inventory management to warehousing and transportation)
	Collaboration among different players in the value chains
	Utilisation of customer data and consumer's digital competence

APPENDIX C

SCENARIO MODELLING METHODOLOGY

In this study, the research team developed a model to examine the economic consequences of digital technologies on the future economic growth of Vietnam. In particular, our model aims to evaluate the impact of digital technologies on labour changes and productivity growth across industries in Vietnam.

C.1 Existing studies of how digital technologies impact an economy

There has been a growing literature that explores the link between digital technology, and labour, growth and productivity.

In 2013 Frey and Osborne (2013) showed that 47% of jobs in the United States were at high risk of automation by 2030.¹⁵⁵ In AlphaBeta's report on automation, machines were estimated to save over 2 hours of work per week in the most repetitive manual jobs in Australia by 2030.¹⁵⁶ In Vietnam, Faethm estimated that only around 15% of total jobs will be automated by 2033.⁸⁹

A number of studies have shown that digital technology has a positive impact on labour productivity and economic growth.^{157,158,159,160} PwC predicted that global GDP can be up to 14% higher in 2030 as a result of digital technologies.¹⁶¹ The impact of digital technologies and automation on developing countries are also expected to be significant. For example, McKinsey & Company estimated that AI can contribute around 0.6% and 1.2% to the annual GDP growth of Pakistan and Malaysia respectively by 2030.¹⁶²

C.2 Data and methodology

The data in this study are obtained from the General Statistic Office of Vietnam. The data include a range of time series variables spanning from 1995 to 2017: gross domestic product, production inputs (labour, capital, land/indwelling construction, investment), and other indicators (R&D investment, proportion of skilled labour,^a inflation, interest rate). The time series are adjusted by the GDP deflator index to obtain the real value. They are also transformed to a stationary time series for computation purposes.

The next section summarises the modelling methodology.

In this model, digital technologies have two impacts in GDP growth: (1) digital technology causes labour replacement in industries and (2) digital technology improves total factor productivity of industries.

To estimate the two impacts on GDP growth for the four scenarios, we follow a 2-step procedure:

First, to calculate the potential labour replacement in the four scenarios, we use two estimates from AlphaBeta (2017) and Frey and Osborne (2013) on the proportion of labour at risk across different occupations in Australia and the United States by 2030.^{163,155} We use these estimates to calculate the number of jobs at risk in each industry, taking into account the different occupation mix of each industry in Vietnam.

^a The proportion of skilled labour is calculated by the percentage of labour force holding bachelor degree or higher over the total number of labour in each industry.

To take into account the development gap between Vietnam and the two countries, we use the estimate to evaluate the impact in Vietnam by 2045. The Networked Readiness Index^{39,164} is also used as a discount factor to represent the capacity gap between Vietnam and the two countries in leveraging ICT technologies and innovation. In addition, we follow PwC and assume that Vietnam will obtain 70% of digital impacts by 2045 due to a range of barriers such as economic, legal or organisational constraints.¹⁶⁵

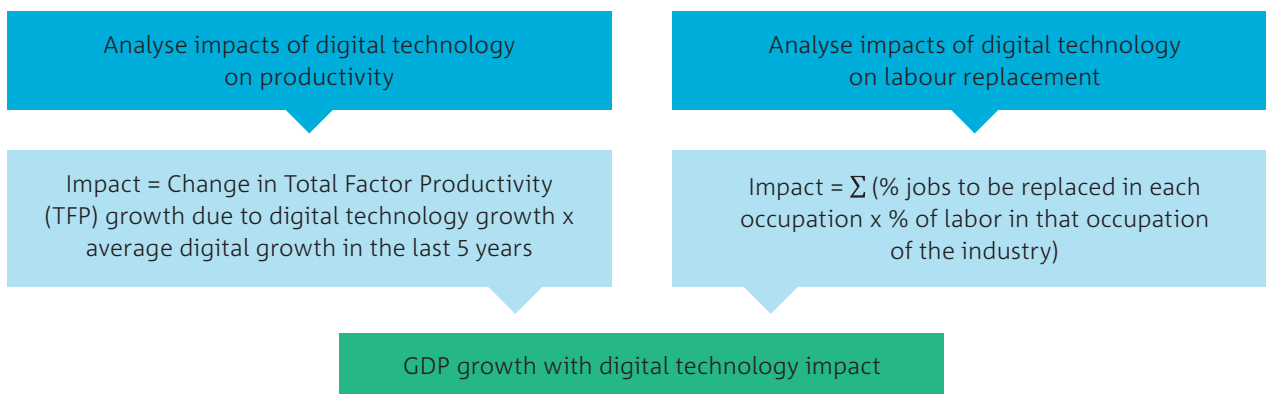
Second, to estimate the impact of digital technology on GDP development. We use a complex approach to evaluate the impact of AI on economic growth. In particular, our approach follows two main steps:

Step 1. Identify the direct impacts of digital technology to productivity and labour replacement using past data of Vietnam’s industries.

Step 2. Use the results of Step 1 as inputs to extrapolate the impact of digital technology on GDP growth across industries of Vietnam by 2045.

The impact of digital technologies is calculated by comparing the obtained GDP growth to a baseline of long-term growth.

An extended description of the scenario modelling methodology is available in the full report, and detailed results of the econometric models can be found in the research paper to be published in association with this report.



APPENDIX D

AUS4INNOVATION

In November 2017 Australia and Vietnam announced the Australia-Vietnam Innovation Partnership. **As part of this partnership, the AU\$10 million Aus4Innovation program aims to help Vietnam strengthen its innovation ecosystem, prepare for and embrace opportunities associated with Industry 4.0, and shape its innovation agenda in science and technology.**

A number of institutions and actors in the innovation ecosystem take part in the Aus4Innovation program to achieve these goals, including:

- Vietnam's Ministry of Science and Technology (MOST)
- Australia's Commonwealth Scientific and Industrial Research Organisation (CSIRO)
- Australian Embassy, Hanoi
- Australia's InnovationXchange, under the Department of Foreign Affairs and Trade
- Vietnamese and Australian research institutes
- Vietnamese and Australian private sector companies.

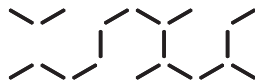
Together through the Aus4Innovation program, Australia and Vietnam are conducting activities to promote innovation in Vietnam and build Vietnamese capability in areas such as strategic foresight, scenario planning, commercialisation and innovation policy.

Between 2018 and 2021 the Aus4Innovation program will invest AU\$10 million across four complementary activities:

1. The **digital foresighting** activity – presented in the current report – explores the trends, probable impacts and implications of digitalisation on the Vietnamese economy. This activity also closely examines Vietnam's manufacturing and agriculture sectors and their readiness for digital adoption.
2. The **science commercialisation** activity will explore and pilot innovative models for brokering and building partnerships between research institutes and the private sector for science commercialisation. Partnerships between businesses and research institutes in Vietnam will be identified and built around an innovative idea and a shared R&D process.
3. A **competitive grants** mechanism will provide targeted funds to scale already tested activities to address emerging challenges or opportunities in any sector of Vietnam's innovation system. Grants will be available for existing partnerships or working relationships between Australian and Vietnamese institutions that can demonstrate an articulated pathway for scale or sustainability in Vietnam.
4. An **innovation policy** activity will address emerging challenges in the implementation of Vietnam's innovation agenda. This activity will be responsive to emerging needs, issues and opportunities of relevance to Vietnam and MOST.

Investments in future Aus4Innovation projects will be partially guided by the insights and recommendations from the *Vietnam's Future Digital Economy Project*.

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