KDI School of Public Policy and Management

The Asia Foundation

2019 Asian Approaches to Development Cooperation

The Fourth Industrial Revolution and the Future of Work:

Implications for Asian Development Cooperation

Edited by
Anthea Mulakala

KDI SCHOOL
KDI School of Public Policy and Management

The Asia Foundation

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Anthea Mulakala

Throughout Asia in recent decades, automation, digitalization, the Internet, and advanced technologies have utterly transformed economies, livelihoods, labor markets, and workplaces. Hundreds of millions of laborers were lifted out of poverty as new technology applications created new jobs and industries, driving global integration and prosperity. At the same time, millions were left behind. Without access to vital technologies and infrastructure, without support for up-to-date skills training and education, without equitable social protections and pro-labor regulations, millions experienced precarity, not prosperity.

Those left-behind multiplied a thousand-fold as the COVID-19 pandemic suspended livelihoods that require human contact even as the crisis enhanced employment for workers who use mobile communications, computers, and Internet technologies. The pandemic revealed long-standing deficiencies in industrial, labor, fiscal, and social policies. These have allowed vast gaps in digital technology access and deployment to be created between Asian nations and workers. These inequities show that the future of work already exists, albeit in an unevenly distributed form. The on-going shift away from physical work toward virtual services also heralds the advent of the Fourth Industrial Revolution. Reliant on current technologies and infrastructure, its deployment of artificial intelligence, machine learning, large-scale machine-to-machine communication, the Internet of Things (IoT), and cyber-physical systems will further transform work in the future.

To recover from the current economic crisis and to create a viable future for millions of workers, Asian countries must move quickly. They must face up to deep structural changes in their economies. As Asian governments and business leaders endeavor to manage and maximize technological advancements, they must also make it easier for workers to transition to new or modified jobs. Governments must also rethink fiscal, labor, social, and regulatory policies to promote better pay and conditions in non-technological yet in-demand industries that employ lots of people but poorly reward them such as construction, personal services, hospitality, healthcare, and education. Regional, national, and international bodies, including the Association of Southeast Asian Nations (ASEAN), Asian governments, business leaders, international development practitioners, and other stakeholders need to work together to ready Asian economies and create more equitable and widely-distributed work.

In this spirit, in 2019 the Asian Approaches to Development Cooperation (AADC) series — jointly hosted by KDI School of Public Policy and Management (KDI School) and The Asia Foundation — focused on the challenges posed to Asian workers and economies by the Fourth Industrial Revolution and the new practices transforming the workplace, workers, and work. Since 2010, AADC has provided a forum for Asian officials, experts, policymakers, and practitioners of development and South-South cooperation to explore and debate ways of confronting the challenges and opportunities that the region faces. In annual dialogues and resulting publications, participants from Asia

and beyond have shared their experiences, strategies, and actions in addressing contemporary concerns, ranging from gender-inclusive growth to climate-change mitigation.

During the 2019 AADC dialogue in Seoul, participants from the Asian Development Bank, Bangladesh, Cambodia, China, India, Japan, Thailand, Republic of Korea, and United Nations agencies shared their knowledge about the increasing technological transformation of the workplace and labor market. This volume captures their rich experience and the implications for Asian countries and workers, offering lessons for policymakers, business leaders, and development practitioners.

The collaboration between KDI School and The Asia Foundation rests largely on the vision and leadership of KDI School's Associate Dean and Professor Wook Sohn and of The Asia Foundation representatives, Senior Vice President Dr. Gordon Hein and Senior Director of International Development Cooperation Ms. Anthea Mulakala, this volume's editor. We acknowledge their ongoing support and commitment to the partnership. We would also like to thank individuals working at KDI School, The Asia Foundation, and Gyeongnam National University of Science and Technology (GNTECH), who provided invaluable assistance: Ms. Seyeong An from KDI School; Mr. Kwang Kim, Ms. Kyung-sook Lee, and Ms. Kyoungsun Lee of The Asia Foundation; and Ms. Nuri Kim, KOICA Young Professional; and Dr Randy Green from GNTECH for providing their skills in coordination, research, editing, and logistics in support of the dialogue participants,

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Abbreviations

ABAC	APEC Business Advisory Council
AVG	APEC Vision Group
APIs	Application Programming Interfaces
AI	Artificial Intelligence
AHEAD	ASEAN Horizons and Emerging Areas Department
ADB	Asia Development Bank
APEC	Asia-Pacific Economic Cooperation
ASEAN	Association of Southeast Asian Nations
BRI	Belt and Road Initiative
BOI Thailand	Board of Investment
BIM	Building Information Systems
BPO	Business Process Outsourcing
B2C	Business-to-Consumer
CEO	Chief Executive Officers
CCCC	China Communications Construction Company
CPEC	China-Pakistan Economic Corridor
CERT	Computer Emergency Response Team
CAD	Computer-Assisted Design
CSR	Corporate Social Responsibility
CBPRS	Cross-Border Privacy Rules System
Data4JOBS	Data for Jobs, Occupations, Businesses, and Skills
DFID United Kingdom	Department for International Development
DFAT Australia	Department of Foreign Affairs and Trade
DAI	Digital Adoption Index
DSR	Digital Silk Road

EEC	Eastern Economic Corridor
eWTP	Electronic World Trade Platform
EXSCALATE	EXaSCale smArt pLatform Against paThogEns
E4C	EXSCALATE4COV
fintech	Financial Technology
FDI	Foreign Direct Investment
4IR	Fourth Industrial Revolution
FCN	Future Class Network
GPT3	Generative Pre-trained Transformer 3
GLG	Gerson Lehrman Group
Govtech Singapore	Government Technology Agency
GNI	Gross National Income
G-20	Group of 20
i3S the Philippines	Inclusive Innovation Industrial Strategy
ITIs	Industrial Training Institutes
I4.0	Industry 4.0
IMDA	Infocomm Media Development Authority
ICT	Information and Communication Technology
III	Institute for Information Industry
ITE	Institute of Technician Education
IFC	International Finance Cooperation
ILO	International Labour Organization
IOT	Internet of Things
JICA	Japan International Cooperation Agency
JPY Currency	Japanese Yen

KMITL	King Mongkut's Institute of Technology Ladkrabang
KMUTNB	King Mongkut's University of Technology North Bangkok
KMUTT	King Mongkut's University of Technology Thonburi
College of Technology KOSEN	Koku-ritsu-kou-gyou-KOU-tou-SEN-mon-gak-kou
KISTEP	Korea Institute of Science and Technology Evaluation and Planning
KOICA	Korea International Cooperation Agency
KOSEN-KMITL	KOSEN-King Mongkut's Institute of Technology Ladkrabang
KOSEN-KMUTT	KOSEN-King Mongkut's University of Technology Thonburi
Lao PDR	Lao People's Democratic Republic
LASI	Lean Automation System Integrator
LDCs	Least-Developed Countries
MI4.0	Making Indonesia 4.0
MRT	Mass Rapid Transit
MoU	Memorandum of Understanding
MPP	Microsoft Professional Program
MCI Singapore	Ministry of Communications and Information
METI Japan	Ministry of Economy, Trade and Industry
MOI Thailand	Ministry of Industry
MIIT China	Ministry of Industry and Information Technology
Industry4WRD Malaysia	National Policy on Industry 4.0
NTUC	National Trades Union Congress
OHCHR	Office of the UN High Commissioner for Human Rights
ODA	Official Development Assistance
OECD	Organization for Economic Cooperation and Development

ODI	Overseas Direct Investment
PECC	Pacific Economic Cooperation Council
P2P	Peer-to-Peer
PPSTI	Policy Partnership on Science, Technology and Innovation
PPWE	Policy Partnership on Women in the Economy
PIAIC	Presidential Initiative for Artificial Intelligence & Computing
PSOL	Problem Solving Oriented Learning
PMETs	Professionals, Managers, Executives, and Technicians
PISA	Program for International Student Assessment
PPP	Purchasing Power Parity
RCEP	Regional Comprehensive Economic Partnership
R&D	Research and Development
RAND	Research and Development Corporation
RAHS	Risk Assessment and Horizon Scanning
STEM	Science, Technology, Engineering, and Mathematics
SCARA	Selective Compliance Articulated Robot Arms
SEWA	Self-Employed Women's Association
SGD Currency	Singapore Dollar
SMEs	Small and Medium-sized Enterprises
SOC	Social Overhead Capital
SAARC	South Asian Association for Regional Cooperation
SEA	Southeast Asia
SIMTEC	Sumipol Institute of Manufacturing Technology
SDG	Sustainable Development Goal
SIs	System Integrators
TVET	Technical Vocational Education and Training

TeSA	TechSkills Accelerator
TBH Currency	Thai Baht
TDRI	Thailand Development Research Institute
UPI	Unified Payment Interface
UNCTAD	United Nations Conference on Trade and Development
USD Currency	United States Dollar
UBI	Universal Basic Income
WFP	World Food Programme

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Which Future of Work Will Asia Create?

Anthea Mulakala

Over the past 70 years, automation and other forms of digitalization have changed the nature of work in Asia and elsewhere. Since 2000, this so-called "Third Industrial Revolution" of computers, Internet communications, robotics, and other digital technologies has enabled globalization and created new wealth by shifting the places, processes, and performers of jobs. Now we see the advent of the "Fourth Industrial Revolution" (4IR), a continuation of the automation of traditional manufacturing and industrial practices that integrates machine learning, artificial intelligence (AI), large-scale machine-to-machine communication, the Internet of Things (IoT), and cyber-physical systems (Schwab 2016). The widespread adoption of big data analytics, real-time and predictive analytics, and cloud technology (Karr et al. 2020) underpin 4IR advancements that will again disrupt industries and change the way people live, think, and work.

Like previous industrial revolutions, the technological innovations of the 4IR will transform economies and increase productivity. They

will also create employment and alter occupations. Asia, home to some of the latest labor-changing innovations, already counts four of the 10 most automated countries in the world: South Korea, Singapore, Taiwan, and Japan, with China close behind (International Federation of Robotics 2020).

Online market and labor platforms are creating new opportunities for commerce and employment. Rising consumer demand for consumer goods and technology products have stimulated productivity gains by creating new jobs and offsetting those lost (African Development Bank et al. 2018). These transformations, however, are uneven and can exacerbate existing income, gender, social, and regional inequalities. Technologies that have driven innovation and economic growth in Asia have improved productivity, but "they have also affected income distribution by altering the rate of return on assets, favoring capital over labor, as well as skilled labor over unskilled labor" (Acemoglu 1998).

Automation can remove the need for low-skilled workers who perform repetitive tasks, and technological progress can increase the need for highly skilled labor, widening the skills gap between workers and reducing opportunities for the less-skilled. Thus, the rapid pace of technological change may leave some countries and some large segments of the Asian workforce behind. When more than 50 percent of work activities in Malaysia, Indonesia, India, and Thailand have the potential for automation (Chui et al. 2017), a question arises: What to do about the displaced workers who are least equipped to seize the new opportunities that technology brings? As desirable workforce skills further evolve, away from coding, systems integration, engineering, and software design toward leading remote teams, creatively solving more complex problems, and performing ethical, intellectual, and analytical thinking, even many nominally

well-educated Asian workers will see their career prospects fade and their incomes decline. Furthermore, modified global and regional value chains may cause companies to relocate their geographical base of production, threatening many Asian economies and undermining their competitiveness.

Although Asia's more than 1 billion strong "youth bulge" (World Economic Forum 2019; van Fleet 2019) has enormous potential for stimulating economic growth through productive employment, most of these youth do not or will not have the requisite skills to thrive in the 21st century workplace. Women remain particularly vulnerable as they comprise a large proportion or Asia's low-skilled labor force, such as in the garment sector. Women also predominate in the informal economy, which is not considered gainful or productive work (McKinsey Global Institute 2018).

At present, the COVID-19 pandemic is accelerating and exaggerating the impact of the 41R in Asia. The pandemic has crushed economic activity and jobs. It has also accelerated the adoption of automated technologies and services that minimize human contact. COVID-19 has caused widespread disruption of existing systems, exacerbated deep inequities, and pushed millions into the future of work sooner. It has also revealed unexpected interdependencies between industries, exposed infrastructure gaps between countries, and exposed life-threatening gaps in digital access and fluency.

Within this context of significant opportunities and worrisome lacks, South-South, Asian, and triangular development cooperation can play a pivotal role. Asian cooperation programs have a long history of human capital development and skills training including technical and vocational education and training (TVET) programs, education-reform initiatives, and support for the emergence of innovative

societies. These efforts provide a solid foundation for Asian countries to build on existing partnerships in order to respond to future of work challenges.

In October 2019, The Asia Foundation and the KDI School of Public Policy and Management hosted experts from India, Bangladesh, Cambodia, Japan, Korea, Singapore, Thailand, United Nations Development Programme (UNDP), United Nations Economic and Social Commission for Asia and the Pacific (ESCAP), Asian Development Bank (ADB), and private sector partners, such as Microsoft and IBM. The idea was to share perspectives, approaches, and priorities for development cooperation in addressing the 4IR and future of work challenges. The chapters in this volume present the key issues, arguments, and recommendations emanating from that dialogue. The first two chapters impart some of the challenges and risks of the 4IR. In Chapter 1, Sabina Dewan focuses on the ASEAN region and examines how automation, labor platforms, and the emergence of a so-called "knowledge economy" may expose ill-prepared workers to exploitation and threaten the region's low-value-added labor pool. She encourages ASEAN to provide the necessary regulatory frameworks, standards, and leadership to ensure these innovations deliver positive impacts for the region's workforce. In Chapter 2, Zothan Mawii engages with problems associated with the gender digital divide. She bemoans that only 27 percent of women in South Asia can access mobile phone technologies, including the Internet; without broad access, aspirations of equal female digital literacy and fluency remain mere fantasy. She addresses the imperatives of access and targeted skills development for all workers, particularly women. By advocating for digital fluency, which goes beyond simply operating digital devices (digital literacy) to performing higher levels of technology navigation and exploitation,

she raises the bar for digital training and education programs.

In Chapter 3, Saowaruj Rattanakhamfu offers analysis and insight about the situation in Thailand. She reflects on Thailand's workforce, surmising that it lacks the skills necessary to transition to 4IR. She blames this largely on Thailand's current information and communications technology (ICT) education system, which maintains out-of-date curricula and limited practice-based experience. However, she sees promise in a strategic Thailand-Japan government partnership that produces practical and innovative Thai engineers to meet future-of-work challenges.

Chapter 4, by Randeep Sudan, expands the palette of government-led solutions to workforce deficiencies. After assessing the uneven skills deficit across Southeast Asia, Sudan urges Asian governments to establish national credentials databases that list the skills, qualifications, and interests of all workers in order to match them to prospective jobs and/or determine specific training needs. He lauds Singapore's Center for Strategic Futures and supports the establishment of a similar regional capacity-building program within ASEAN.

In Chapter 5, Zhou Taidong and Xue Qi extol China's Digital Silk Road (DSR) as a platform for regional skill and soft-infrastructure development. They describe how Chinese companies participating in the DSR facilitate technology and knowledge transfers from China to Southeast Asian nations in areas such as online commerce, telecommunications, and financial services (fintech). Taidong and Qi propose that in addition to sharing and enabling new technologies, the DSR can be used as a vehicle for on-the-job workforce training and upskilling, thus lessening some of the gaps between workers, companies, and countries in the region. Taidong and Qi also present

the DSR's role as a driver of formalized cooperation, regulation, and shared standards between China and its Southeast Asian partners.

Several authors advocate for formalized cooperation and agreement amongst Asian digital economies. They call for jointly determined regulations for labor, technical standards, and data-sharing, and guidelines for social-welfare systems, education reform, and skills acquisition. In Chapter 6, Benjamin Lokshin sees opportunities for the Asia-Pacific Economic Cooperation (APEC) multilateral framework to help Asian economies capitalize on emerging technologies, devise effective labor regulations, and navigate shifts toward a new industrial paradigm. He encourages diverse regional stakeholders, such as the new generation of business leaders, start-up founders, venture capitalists, and software developers, to use the APEC platform to share good practice with Asian policymakers.

Viewing 4IR challenges through the lens of regional and international cooperation, in Chapter 7 Artemy Izmestiev and Julie Adiwal worry that technological development has been more competitive than cooperative among nations. They reference Sustainable Development Goal (SDG) 17, which calls for enhancing cooperation modalities to improve developing countries' access to technology and capacity building. They discuss how several multilateral platforms, such as the United Nations High-Level Panel on Digital Cooperation, and the ADB's Strengthening Knowledge Alliance for Innovation, Technology, and Regional Cooperation, have been launched to advance this goal in practice.

In the final chapter, Jai-Joon Hur flips the discussion to assert that despite specific job losses due to automation and 4IR innovations, overall employment will continue to grow. Using historical data from past industrial revolutions, Hur asserts that technology is not

ultimately destroying employment but changing the nature of certain jobs. Therefore, the challenge lies in workers adapting to changes and seizing new opportunities. He suggests that development cooperation can play a role in facilitating this adaptation through education, regulation, social protection, and industrial strategy.

While the authors are realistic about the challenges and risks of the 4IR, they are also confident about Asia's resources and capabilities and hopeful that with strategic forward thinking, collaborative planning, and targeted actions, the region's workers will survive and thrive in the decades to come. All agree that technological advances in AI and automation will have an enormous impact on the Asian workforce. Informed by history and the present, they argue that governments and firms should be preparing for AI to substitute for existing work, to complement it, and to create entirely new work for humans. As with previous industrial revolutions, it may take decades for the effects of the 4IR to be fully felt. That gives Asian business leaders and politicians, and local, regional, and international nongovernmental organizations a chance to change labor, trade, competition, social protection, and education policies that have left too many workers behind. Through these efforts, an utterly new future of work can be created, one better than the future we have now.

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Chapter

1

Harnessing the Potential of ASEAN's Digital Transformation Through Regional Cooperation

Sabina Dewan

The first two decades of the twenty-first century have witnessed rapid and significant technological change. This technological change has profoundly impacted the world of work through the automation of routine-intensive work, the emergence of the knowledge economy, and the rise of labor platforms that link an independent contractor providing a service to a business or consumer seeking a service. Technology's effect on employment is partly contingent on the structure of the economy and on a state's capacity to help labor markets adjust to the changes that technology brings.

Despite recent global volatility, Southeast Asia[1] continues to

1 Southeast Asia refers to the 10 member-states of the Association of Southeast Asian Nations (ASEAN): Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Vietnam, plus Timor-Leste.

be one of the most economically dynamic regions in the world. Between 2009 and 2018, the region's real economic growth rate was consistently higher than the global average. The region's dynamism is not only marked by its strong growth rate, but also by its competitive integration into global value chains and markets for goods, services, and investment. Continued economic progress in Southeast Asia, however, depends on how the region adjusts to the technological changes sweeping Asia and the globe, including the restructuring of labor markets.

The 10 countries that make up the Association of Southeast Asian Nations (ASEAN) vary from one another in terms of development, demographic profiles, and stages of structural transformation. These characteristics impact the diffusion of technology and a population's ability to access and participate in a technologically driven economy. However, these characteristics also provide fertile ground for regional cooperation through which countries can learn from each other's experiences and trajectories. This experience sharing helps countries manage technological change to reap its benefits and minimize its costs. As the new digital economy emerges through technological advances in automation, artificial intelligence, robotics, networks, analytics, and digitalization, ASEAN can serve as a platform for countries to share best practices and set normative labor standards. Cooperation between nations brokered through membership in ASEAN can help ensure that a rising tide lifts all boats.

The first section of this chapter examines how key economic, demographic, and technological trends in ASEAN interact with one another. The second section delves into how evolving digital trends impact labor markets in ASEAN — specifically automation, labor platforms, and the emergence of a knowledge economy in which the

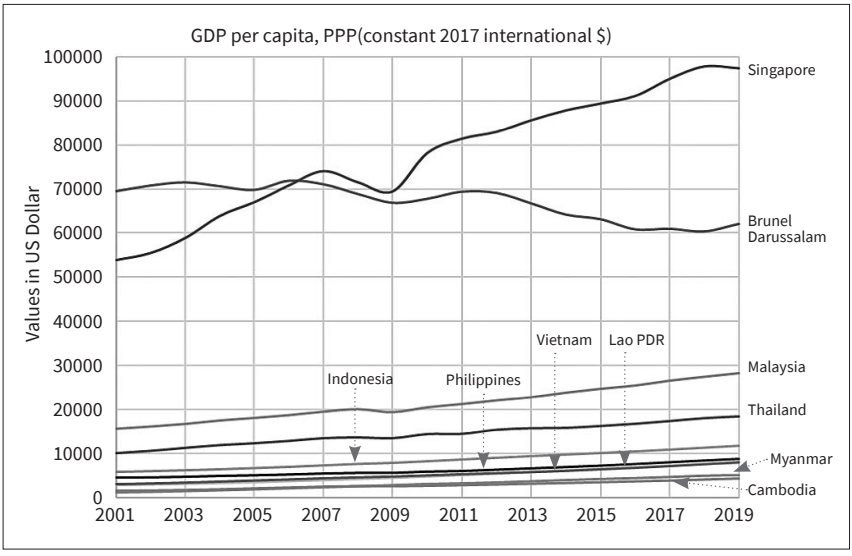
quantity, quality, and accessibility of information, rather than the traditional production of goods, drives growth. Section three suggests how ASEAN can maintain its economic dynamism by serving as a platform for sharing labor market information, establishing collective frameworks, and providing guidance for its members. The chapter concludes with a brief note about how ASEAN can foster regional cooperation to manage the region's digital transformation of work.

Economic Structure, Demographics, and Technology Diffusion

ASEAN's real gross domestic product (GDP) growth, service-orientation, strong consumption and investment, growing middle class, and young population are all conducive to the proliferation of technology in the region. These factors will also likely propel an expansion of Southeast Asia's digital economy, including automation, greater participation in the knowledge economy, and labor platforms. This section explores how ASEAN's economic and demographic trends relate to the region's emerging digital trends.

ASEAN economies show significant differences in output levels; however, all but Brunei Darussalam have seen per capita GDP rise since 2001, with technologically advanced Singapore far outpacing its neighbors (Figure 1.1). Despite a slowdown in GDP growth over the past few years, ASEAN continues to be a dynamic region; before the COVID-19 pandemic shock, average real GDP growth was forecasted to be 4.7 percent in 2020, well above the 3.4 percent pre-pandemic global average (Association of Southeast Asian Nations 2019). Economists lowered recent growth forecasts because of trade tensions between

Figure 1.1 ASEAN per Capita GDP (2001-2019)



Source: World Development Indicators, World Bank(2019)

the United States and China (Association of Southeast Asian Nations 2019). Nonetheless, forecasts still predict strong domestic demand, investment, and expenditure on social services, transfers, and infrastructure that will stimulate several of the region's economies (Association of Southeast Asian Nations 2019).

Southeast Asia constitutes the world's seventh largest market and the world's third largest labor force, preceded by China and India (Gnanasagaran 2018; ASEAN Secretariat 2017; Santoso 2018). By 2030, ASEAN is expected to be the fourth-largest economy in the world (Organization for Economic Cooperation and Development 2018). Between 2002 and 2015, Southeast Asia's consumption class (the economically secure middle and upper classes) has grown substantially, although at varying rates across member states (World Bank 2018). ASEAN's predicted growth foreshadows an increase in technology consumption, especially in

the manufacturing and service sectors, to meet the demands of its growing middle class.

In all ASEAN countries, except Brunei Darussalam,[2] the value-added by services as a share of GDP is higher than the value-added by industry, manufacturing, or agriculture. The highest proportion of the employed are also in services in all ASEAN countries, except Lao PDR, Myanmar, and Vietnam, where a higher share of the employed are working in agriculture (Table 1.1). Growth of trade in services outpaced growth in manufacturing in the region, doubling from 2006 to 2016 (World Bank 2019).

Services-led economies are fertile ground for service-delivery platforms, ranging from logistics and transport, to cloud-based labor platforms. For more-developed ASEAN countries, such as Singapore and Malaysia, a services-led model offers greater potential for knowledge economy participation. However, despite the growing dominance of services in the region, manufacturing remains a significant driver of economic growth.

Given that the majority of global trade takes place through complex and fragmented value chains, several Southeast Asian countries have worked hard to capture a share of the production process. Manufacturing value chains are an important link between ASEAN countries and the global economy. Today, ASEAN is the world's fifth-largest manufacturing economy; it is a hub for the production of textiles, vehicles, hard-disk drives, other consumer goods, and intermediate inputs in global value chains (World Economic Forum & Kearney 2018; Reuters 2016).

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2 Brunei Darussalam's oil and gas sectors make industry's value addition to GDP greater than that of agriculture or services.

Table 1.1 ASEAN Value Added by Sector as a Share of GDP (2019)

Country Name	GDP growth (annual %)	Manufacturing, value added (% of GDP)	Industry, value added (% of GDP)	Services, value added (% of GDP)	Agriculture, forestry, and fishing, value added (% of GDP)
Brunei Darussalam	3.9	13.6	62.5	38.2	1.0
Cambodia	7.1	16.3	34.2	38.8	20.7
Indonesia	5.0	19.7	38.9	44.2	12.7
Lao PDR	4.7	7.5	30.9	42.7	15.3
Malaysia	4.3	21.5	37.4	54.2	7.3
Myanmar	2.9	24.8	38.0	40.7	21.4
Philippines	6.0	18.5	30.2	61.0	8.8
Singapore	0.7	19.8	24.5	70.4	0.0
Thailand	2.4	25.3	33.4	58.6	8.0
Vietnam	7.0	16.5	34.5	41.6	14.0

Note: Myanmar data is for the year 2018
Source: World Bank (2019)

As manufacturing becomes more susceptible to automation, however, the traditional path of leveraging labor-intensive production for economic growth, as modeled in Europe and the United States after the industrial revolution and in China after its accession to the World Trade Organization, may not be as available to ASEAN nations. ASEAN businesses may choose to replace workers with machines because the cost of deploying technology is low and there is the potential for higher production rates and volume (Manyika et al. 2017). As of 2019, labor-intensive manufacturing in Thailand and Malaysia deployed more robots than in Indonesia and the Philippines. Singapore deployed more than 10 times the number of robots per 10,000 workers compared to other countries in the region (International Federation of Robotics 2019).

ASEAN's economic trends coincide with a growing youth population. Except for Thailand and Singapore, all ASEAN countries have a demographic bulge with a rising working-age population and a relatively smaller dependent population (United Nations 2019). A greater proportion of young people, relative to an ageing population, provides certain advantages, namely productive potential, improved technology-adoption prospects, and a lighter strain on health and pension systems. But these advantages can only be realized if economies make necessary investments in human capital and cultivate enough labor-market demand for a growing labor force. Moreover, the emergence of a knowledge economy and platforms provide opportunities to absorb labor, but these also require a requisite level of education and transferable skills, including job-relevant training and digital literacy, which ranges from the basic ability to use and interact with technology, to effectively finding, identifying, evaluating, and using information from the Internet, smartphones, and other nontraditional media.

Three Digital Trends and Their Impact on Employment

Like workers around the world, the ASEAN workforce needs assistance from their governments to adjust to the challenges and share in the benefits of automation, the knowledge economy, and the rise of labor platforms. We will examine the implications of each major trend before discussing how ASEAN regional cooperation can be leveraged to moderate these trends' undesirable effects and fully take economic advantage of the benefits that digital technologies have to offer.

Automation

Many countries in ASEAN rely on a large pool of surplus labor to attract investment and drive manufacturing. Automation technologies can raise productivity to drive economic growth, but they also disrupt the traditional advantages of labor-intensive, low-value-added manufacturing, and they displace workers. A study by the International Labour Organization found that, over the next 10 to 20 years, nearly 56 percent of all employment in five ASEAN member countries (Cambodia, Indonesia, the Philippines, Thailand, and Vietnam) could be at high risk of job displacement because of automation (Chang, Rynhart & Phu 2016). For example, approximately two-thirds of Indonesian wage workers in the garment sector and over four-fifths of Cambodian wage workers in the garment sector could lose their jobs because of automation (Chang, Rynhart & Phu 2016). This would disproportionately affect female workers because women constitute a major share of the workforce in these nation's garment industries. Jobs in the electronics sector, food and beverage sector, and business process outsourcing (BPO) fields, such as call centers, human resources, accounting, and payroll administration, are also vulnerable to automation (Chang, Rynhart & Phu 2016).

The threat of automation adds to the downward pressure on wages and working conditions in manufacturing. Countries that depend on low-cost, surplus labor worry that firms may choose to replace workers with machines when the cost of deploying technology becomes lower than the cost of human labor. Automation also promises higher production rates and volumes (Manyika et al. 2017). When low-cost labor is no longer an incentive to locate production in the Global South, some firms may move production back to the Global North; this phenomenon

is called re-shoring. Technology, therefore, facilitates a new form of geographic arbitrage between nations on the basis of labor cost.

Although technology, such as robots or advances in artificial intelligence, threatens to displace workers, it also has the potential to augment human effort. Technology can increase output in a way that encourages labor demand (Autor 2015). This underscores the need for policy frameworks that support the deployment of technology in a way that augments human effort and economic activity instead of labor-displacing automation.

The potential for job displacement due to automation in manufacturing, on the one hand, and the growth of aggregate productivity on the other hand, raises questions about what the distributional impact of technological change in Southeast Asia will ultimately be (Dewan, Randolph & Tripathi 2020). Will the gains from greater productivity be reinvested in the economy to create jobs that offset labor displacement from automation? Will the additional gains be taxed to fund public benefits that help workers adjust to the changes in the labor market through unemployment insurance, pensions, education, skills, and apprenticeship grants? What form of taxation would help generate revenue to this end? For example, policymakers should consider measures, such as an increase in the corporate tax rate or a "robot tax" imposed specifically on manufacturers that deploy robots. Such measures, with guidance from regional cooperation between ASEAN member-states, could help counter companies' tendency toward rent seeking and retention of all surplus value.

Knowledge Economy

If the conventional trajectory of leveraging labor-intensive

production for economic growth becomes less available to developing ASEAN countries, then what alternatives are available for these countries? Some experts speculate that cultivating a knowledge economy in developing countries that rely on services may yield new jobs. For example, although some scholars believe that BPO work is at risk from automation, others believe that cultivating a knowledge economy could open up new opportunities for developing countries to capture BPO work that is off-shored from the Global North (Galperin & Greppi 2014).

A knowledge economy, as opposed to one that relies on manual labor, depends on the use of technology to derive value from ideas, data, and information. Knowledge economies call for a high level of literacy or high levels of education and skills acquired through experience and training. They are generally characterized by a large, tradable services sector comprised of a range of activities, such as high-skilled and high-wage jobs in finance, banking, and consulting. High-skilled and high-wage jobs are generally more tradable across borders than low-skilled and low-wage jobs. For this reason, high-skilled and high paying jobs can drive economic growth underpinned by specialization and innovation (Dewan, Randolph & Tripathi 2020).

The World Bank has established a four-pillar framework outlining the prerequisites for a knowledge economy: (1) an appropriate education system, including life-long learning systems; (2) information communication technology (ICT) infrastructure for widespread access to technology and the Internet; (3) an innovation system for the diffusion of technology; and (4) an institutional regime for the creation and use of knowledge products (World Bank Institute 2007).

Among ASEAN nations, Singapore has best met these prerequisites and has most successfully leveraged technology for a knowledge

economy, which has helped the country achieve one of the world's highest per-capita incomes.[3] At just under 38 percent in 2017, Singapore had the highest share of workers with a tertiary education in Southeast Asia (International Labour Organization 2020). Among employed residents in Singapore, the share of professionals, managers, executives, and technicians (PMETs) reached 57 percent in 2018 (Manpower Research and Statistics Department 2018). In 2016, Singapore ranked first of 139 countries on the World Economic Forum's Networked Readiness Index (World Economic Forum 2016).

However, ICT infrastructure and investments in human capital vary across ASEAN nations. Some Southeast Asian countries have further to go than others in leveraging the benefits of a knowledge economy and tradeable services. Less-developed ASEAN countries will likely focus on the provision of location-based services, or low-end micro-tasking, rather than high-end knowledge products that demand greater innovation, education, and skills.

For example, Malaysia is second only to Singapore among Southeast Asian countries on various measures of digital strength. According to Global Finance, Malaysia ranks 31 among 67 countries worldwide in terms of national tech strength. Malaysia also ranks 41, again second to Singapore in the ASEAN region, on the World Bank's Digital Adoption Index (DAI).[4] The Philippines' BPO sector is built on a robust ICT infrastructure. However, to reap the benefits of a knowledge economy,

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3 In terms of purchasing power parity (PPP) (current USD), in 2018, Singapore had the 4th highest per capita income after Qatar, Macao, and Luxembourg (World Bank national accounts data, and OECD National Accounts data files).

4 The DAI is a global index measuring digital adoption across three dimensions of the economy: people, government, and business (World Bank 2016).

such digital infrastructure must be accompanied by digital literacy, among other skills, for the productive use of digital technologies. Singapore has already implemented structures to increase digital literacy; for example, Singapore's SkillsFuture, initiated in 2015, is a program that helps Singaporeans upgrade skills at any point in their careers, regardless of education or employment status (Ministry of Manpower Singapore 2018).

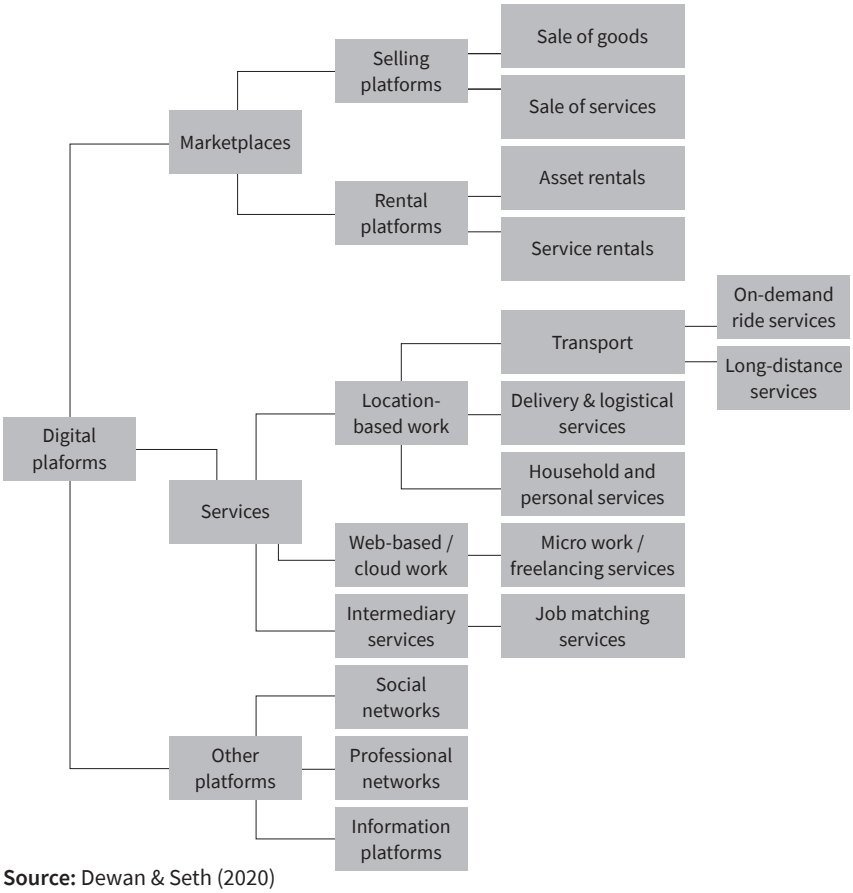
Countries such as Myanmar, Cambodia, and Lao PDR, however, have lower levels of technology penetration, platform proliferation, and skills-training systems. The lack of available skilled workers to operate new technologies is one of the largest barriers to technological uptake cited by enterprises in many ASEAN nations, second to the high costs of technology (Chang, Greene & Orozco 2016). These nations lag in both the development of digital infrastructure and the skills needed to build a knowledge economy.

Labor Platforms

In addition to technological changes that automate manufacturing jobs and call for advanced skills, another major technological trend in ASEAN is the growth of the platform economy (Figure 1.2). A platform is a digital interface that connects consumers to providers of goods, services, or information. Platform firms take several forms. For example, Amazon is a goods-marketplace platform; AirBnB is a rental platform; Twitter is a social-media platform; Wikipedia is an information platform; and Uber and Upwork are examples of labor platforms.

In labor platforms, labor generates most of the value. By linking an independent contractor providing a service to a business or consumer

Figure 1.2 A Typology for the Platform Economy



Source: Dewan & Seth (2020)

seeking a service, labor platforms have given rise to a new form of work that existing policy frameworks are not equipped to appropriately govern or regulate. Platform work entails self-employment, but it also involves elements of traditional, regular wage employment. In legal terms, there is ambiguity about whether labor platforms merely license software that acts as an intermediary between service providers and customers or whether they act as employers and should, therefore, be obligated to provide benefits to

service providers associated with their platforms.

Labor platforms introduce a new, trilateral relationship to the work environment. The traditional bilateral relationship between an employer and an employee, or a service provider and a client, now has a third constituent: the platform. In such arrangements, regulations become ambiguous: what is the role of the platform; how much control does the platform exert; what are the platform's obligations toward affiliated service providers? Most workers that provide services through labor platforms are considered to be self-employed, but not all self-employed workers are entrepreneurs, and not all platform workers enjoy the autonomy that comes from entrepreneurship. Labor platforms frequently exercise significant control over price-setting, and, in some cases, workers have limited flexibility in accepting or declining work. The platform may require workers to wear branded clothing, use certain products, or maintain specific standards. Labor platforms sometimes rely on performance-review systems in which workers are rated by customers, which can influence the frequency of workers' jobs and the income, bonuses, and incentives they earn. These ratings can also be the basis for excluding workers from the platform, without recourse for the worker. These practices resemble the control that traditional firms exercise over wage employees (Dewan, Randolph & Tripathi 2020).

Additionally, because they are considered self-employed or contract workers, labor-platform workers seldom enjoy benefits and protections that legal frameworks afford traditional employees, such as health insurance, paid sick leave, and pensions. Although platform workers enjoy some additional benefits, such as flexibility, they must accept other risks related gig (temporary) work, such as the use of their own fixed assets, including vehicles, cleaning equipment, or salon

equipment, to deliver services (Dewan, Randolph & Tripathi 2020).

Notably, the platform economy, specifically labor platforms, online marketplaces, and social media, has created new work and entrepreneurship opportunities for women. Whether by choice or by compulsion, women often prefer to work from home and value flexibility in work that allows them to balance domestic responsibilities and income generation (Betcherman & Haque 2017; Hewlett & Luce 2005). This is also because women often carry a disproportionate burden of domestic work and responsibilities. The platform economy offers multiple flexible work opportunities to women, but the concern remains that patriarchal societies use home-based work as a means of limiting the kinds of activities that women participate in and where they participate in them from.

Leveraging ASEAN for Cooperation

ASEAN's growing market is one of the region's largest assets. Rising living standards create new markets for products and services, which, in turn, makes the region an attractive location for investment and for locating production. The region's growing number of consumers will likely dampen the effect of multinational companies' moves toward re-shoring their operations; even if companies find it worthwhile to transfer their operations back to the Global North, they may leave other production operations in place to serve the Asian market (Groom 2018). However, rising living standards and a strong consumer base in Asia depend on robust regulatory frameworks that pre-emptively support workers through enforcing the provision of good wages, providing appropriate welfare benefits, and investing in human capital

to ensure that workers can participate in an evolving digital economy.

Even with a strong consumer market, manufacturing workers are vulnerable to automation. The fear of automation and technology replacing workers in factories is genuine, although the pace at which automation becomes a problem in developing countries with stores of surplus labor will vary. ASEAN countries must harness the potential of their service sectors and higher value-added activities, including participating in the knowledge economy. Therefore, countries must invest in education, skills training, and life-long learning to help workers adjust to this changing labor market.

In a world of labor platforms, governments must also establish definitions for what it means to be an employer and a worker in a gig economy, because labor platforms are a small but rapidly growing source of employment in all Southeast Asian countries. Nations need to provide livelihood opportunities for their rising youth populations and other new labor-market entrants, so labor platforms gain traction in part because they provide access to employment opportunities for workers with varying skill-levels. The growing supply of workers, however, is not always matched by an increased demand for their services (Graham et al. 2017). According to a study of crowd-work platform workers in the Philippines, Malaysia, and Vietnam, there is an oversupply of labor, which exerts downward pressure on wages and working conditions (Graham et al. 2017).

In addition to labor platforms providing more transparency about earnings potential, labor platforms should be held accountable for fair compensation and either providing benefits or contributing through taxation to help fund public provision. Additionally, welfare benefits — whether a combination of passive measures, including healthcare, pensions, and unemployment insurance, or active measures,

such as job-search assistance, subsidized training, internships, and apprenticeships — are crucial for managing the changes that technology brings. Such measures also help smooth consumption. However, they also add to a state's fiscal burden. Given that ASEAN countries have varying fiscal space for the provision of welfare, some ASEAN economies may have to adopt hybrid strategies that entail public provision of some benefits but hold employers, labor platforms, and workers accountable for others. If ASEAN wants to take advantage of its favorable demographics, expanding middle class, and attractiveness to investors, it should harness digital technology to improve economic opportunities while helping its member-states support workers and businesses through ensuing changes.

ASEAN can:

i **Build a repository of draft and enacted regulations from around the world that manage new and emergent forms of work, particularly in the gig economy. Such a repository will help establish legal guidelines for definitional ambiguities.**

ASEAN should provide legal guidelines for gig workers engaged in different categories of platform work, ranging from home-based work to transport and delivery services. The heterogeneity of labor platforms and variations in the control they exercise over different aspects of service and goods delivery make it difficult to find a one-size-fits-all definition for the legal relationship between platforms and workers. Nonetheless, delineating the various kinds of platform work and developing a better understanding of working conditions and employment relationships between platforms and their service providers will clarify the obligations of platform companies, governments, and workers.

ii Establish frameworks for workers' remuneration.

There is a lack of regulation on how much gig workers get paid for their work. For example, a JustJobs Network study on ride-hailing platform drivers in Indonesia found that the most popular reason drivers joined the platform was to increase their income. However, 55 percent of respondents in Jakarta earned below the minimum wage of USD 235 per month (Fanggidae, Sagala & Ningrum 2016).

Regulating wages on platforms, especially for cloud-based platforms where the commissioning entity could be in a different geographic location or legal jurisdiction, is difficult. ASEAN, however, could develop common guidance on wages for self-employed and contractual workers, especially those engaged in platform work. Several ASEAN nations have national minimum wage laws. Labor platforms should be made to comply with these laws so that gig workers receive at least the minimum wage for their services, exclusive of any bonuses or incentives.

iii Institute guidelines on how to develop a welfare system.

Through ASEAN's implementation of the ASEAN Declaration for Strengthening Social Protection, ASEAN should develop a framework that maps which benefits are available to which type of workers. Doing so would be the first step toward understanding which workers are outside the purview of benefits and regulations and then adopting policies to ensure coverage. Furthermore, when a particular group of workers do not receive benefits, the framework should identify the entity that should be responsible for providing them because ensuring worker welfare in an era of growing self-employment, contractualization, and precaritization, entails deciding who funds these benefits. With a growing pool

of self-employed workers, social protection funding is becoming delinked from traditional employers; a problem arises when self-employed workers do not have sufficient income or affordable options to buy insurance.

iv **Design guidelines for taxation to help governments finance appropriate welfare systems and investments in human capital.** To achieve affordable social protection, government provisions for pensions, and death, disability, health, and maternity care may be partly financed through taxation, including that of labor platforms. ASEAN should also provide guidance on which occupational health and safety factors each category of labor platform is responsible for. The question of tax obligations for platform companies, workers, and users is crucial for financing the expansion of social expenditures to cover self-employed workers. Certain governments have examined how tax structures should change because of emergent work forms. For example, Belgium developed a tax system for platform workers and is considering providing social protections (Gurumurthy, Bharthur & Nandini 2018). India determined that Uber is liable for service taxes, although arrangements to facilitate tax payments are not yet in place (Deepshikha 2018). The Organization for Economic Cooperation and Development (OECD) and Group of 20 (G-20) are also exploring ways for governments to effectively tax platform work.

v **Share best practices for how to institute education reform, build systems for skills provision and acquisition, and determine appropriate education and skills for the digital era.** ASEAN should prioritize adapting education and skills-

development curricula to the changing needs of a technologically driven economy. ASEAN's 2016 Vientiane Declaration commits to strengthening the development of human resource polices "to promote access to quality technical vocational education and training (TVET), skills development, and lifelong learning" (Association of Southeast Asian Nations 2016, art. 6). The Core Values on Digital Literacy for ASEAN also serves as a guide for online etiquette to promote socially responsible online behavior and ensure a safe online environment for users (Association of Southeast Asian Nations 2018).

However, it is important that policymakers pay attention to equitable access to technology and quality education as a foundation for skills training; otherwise, workers can get caught in a low-level equilibrium trap with limited economic mobility (Nelson 1956). To enhance policy design, ASEAN should collect information and case studies to discover best practices across its member-states.

Conclusion

In addition to drastically altering the way people live and work, technological change over the past two decades has facilitated greater global integration. The pace and scale of change, however, has exceeded the ability of global institutions to adapt governance. Regional blocs, such as ASEAN, which exist between large-scale multilateral institutions and individual nation-states, can help fill this gap in governance. As the digital economy emerges, ASEAN can serve as a platform for sharing best practices and for setting normative standards to avoid firms' rent seeking and geographic arbitrage based

on labor cost in Southeast Asia.

ASEAN continues to be one of the world's more dynamic regions with a growing middle class and demographic advantages. These trends will likely fuel technology demand and adoption on part of consumers and businesses. In 9 out of 10 ASEAN countries, services contribute more to GDP than other sectors of the economy, but a transition out of agriculture into services can only count as a structural transformation if the jobs in the service sector are more productive than those in agriculture. Southeast Asian countries can transition from being resource-and investment-based to being knowledge- and innovation-based economies, but harnessing technology to move to higher value-added activities and raise productivity requires investments in human capacity, including appropriate life-long education and skills-training systems, and the certainty that workers receive social protection (Powell & Snellman 2004). Assuring sustainable consumer demand also depends on ensuring that wages rise alongside productivity. These measures become even more important as technology upends traditional employment models, such as automation disrupting manufacturing and new forms of work emerging in the platform economy.

In the face of these significant, rapid, and unprecedented changes, ASEAN nations have an opportunity to work together to mold the region's digital transformation to their mutual benefit. This should not only call for collaboration between ASEAN nations, but it should also encourage Southeast Asian countries to set aside competitive concerns and establish objective, legal guidelines for what defines an employer and a worker in the gig economy, frameworks for remuneration and appropriate social-welfare systems, taxation guidelines, and a roadmap for delivering suitable education and digital skills in the region.

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Chapter

2

Digital Fluency Needed to Increase Women's Access to Jobs in Asia

Zothan Mawii

The world of work in Asia continues to be transformed by rapidly changing labor markets, employment relations, business models, and digital technology developments, including automation, artificial intelligence, and robotics. Some of these developments create new opportunities, and other developments make old jobs redundant. Countries hope to respond to these changes through a digital economy that encourages economic growth and new employment opportunities.

To access the opportunities of a digital economy, workers will need to acquire new skills to work in increasingly technologically advanced workplaces. Skilling and re-skilling initiatives should especially focus on women workers. Digital access and basic digital literacy are both important skillsets, but they are not enough for women to sufficiently leverage new opportunities. Therefore, Asian policymakers, educators,

and human resources managers across the region should encourage digital fluency in the workforce through national efforts, public-private partnerships, and South-South cooperation. Digital fluency reaches beyond digital literacy, which focuses simply on the ability to operate digital devices; instead, digital fluency is the ability to effectively use digital technologies for communication, accessing knowledge, constructing meaning, and other purposes.

Labor markets in Asia vary markedly between regions: East Asian labor markets in Japan and South Korea, bolstered by manufacturing advances in the 1980s and typically organized and industrialized, enjoy high economic growth. However, some still-developing Southeast and South Asian labor markets, such as in Cambodia or Bangladesh, are highly informal, with a large proportion of the workforce in unorganized sectors. While female labor force participation varies across the region, women tend to be disproportionately represented in informal sectors of work (International Labour Organization 2017). Asian policymakers, therefore, should also address the digital gender divide, which exacerbates existing gender inequities in the labor market, especially within informal labor markets.

This chapter focusses on how developing Asian countries must increase women's digital fluency and examines India's efforts to encourage the participation of women in its labor force. The first section observes how work in developing Asia is uniquely affected by digital technology, using India as an example. Second, the chapter addresses the digital gender divide in India that exacerbates existing inequities in the labor market. The third section explains the difference between digital literacy and digital fluency, emphasizing India's digital literacy efforts and the need to scale them up to digital fluency initiatives. Fourth, the chapter underlines the need for

consolidated regulations and partnerships between the public and private sectors across India and developing Asia that can improve women's access to workforce opportunities. The chapter concludes by emphasizing the importance of South-South cooperation for the technological advancement and digital fluency of the workforce across developing Asia, for men and women alike.

Work is increasingly mediated by digital technologies

Information and communication technologies (ICTs), digital platforms, and changing business models have reshaped working arrangements and the nature of work itself within industrialized and developing Asia. Digital platforms for online work enable a "planetary labor market"[5] and a wide range of jobs, from low-wage work, including content moderation, data labelling, and other tasks necessary for technology development in industrialized countries, to higher wage work, such as writing, editing, tutoring, design, or programming (Graham & Anwar 2019). Workers are no longer confined by geographic limitations; instead, they can work online across the global labor market. While it is generally easier for higher wage workers to take advantage of remote employment opportunities, digital labor platforms, such as on-demand or location-based services for ride-hailing, hyper-local delivery, and care work, have also created additional work opportunities for lower wage workers (Tandem Research 2020).

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5 An "interplanetary labor market' is unbound by space limitations and proximity between workers, employers, and other actors. It takes into account the way work is performed through global networks of human and non-human objects (Graham & Anwar 2019).

Alternative job opportunities grow scarcer as jobs in the manufacturing sector shift or disappear in the wake of digital advancements. This has been the case in India and elsewhere in recent years. In some sectors, such as automobile manufacturing, automation has displaced low wage workers who once performed non-cognitive, rule-based tasks. In the absence of alternatives, some workers have turned to the platform economy. In India, for example, the number of workers enrolled as partners in ride-hailing services, food delivery platforms, home and personal care services, and concierge services has increased. New Delhi added 560,600 gig workers in six months in the last half of the 2018-2019 fiscal year, an 88 percent jump from the first half (Salman & Bansal 2019). Most of these jobs are male-dominated, but there has also been a significant uptick in jobs that target women workers, such as beauty services, domestic services, and care work. For instance, Urban Company and Housejoy, two primarily women-staffed in-home services platforms, have responded well to increased demand (Teamlease 2018). Other types of gig work found online have also emerged as viable employment alternatives. One survey found that at least 70 percent of Indian companies hired gig workers in 2018 in order to supplement the skills of the existing workforce, reduce costs, or fill temporary vacancies (Salman & Bansal 2019; Noble House 2019). Negative perceptions surrounding online work continue to recede as workers and employers recognize the flexibility and autonomy it enables. Although men currently make up the majority of online and remote workers in India (74 percent), policymakers hope that online work will encourage women to stay in the labor force by enabling a better paid-work and household-work balance (Kathuria et al. 2018).

The impacts of the COVID-19 pandemic on the labor market have also caused workplace transformations, and online work and

labor platforms have become even more attractive for employers. Employers may turn to freelance or contract workers to cut costs and, with an increased demand for highly skilled work, workers may turn to independent, contract-based gig work. In India, there are reports of the business process outsourcing (BPO) sector and IT companies shifting to gig-based models to absorb the shock to the economy caused by COVID-19 (Mendonca 2020).

The e-commerce sector, including social media, is a hybrid labor market of alternative and traditional jobs, and it is one of the fastest growing sectors and job creators in South and Southeast Asia (Google, Temasek, Bain & Company 2019). The e-commerce sector provides online platforms for entrepreneurial start-ups and large companies alike and creates jobs in Internet site development, design, and maintenance. The sector also creates jobs in allied offline sectors, including logistics and delivery, warehousing, and supply chain management (KPMG 2016). Despite India's economic slowdown, for example, e-commerce will likely continue to create more job opportunities across skill levels and roles (Rakshit 2019). Social-media and e-commerce platforms lower entry barriers and create avenues for micro-entrepreneurship (Aneja, Mawii & Ghildiyal 2020). Additionally, the financial investment for startup ventures via digital platforms is significantly lower than for traditional brick and mortar establishments, allowing previously excluded entrepreneurs to participate in the labor market. India is also experiencing a boom in financial technology (fintech) solutions. These data-driven technologies can deliver financial services to underserved populations, including those who lack access to banks.

For example, prior to the pandemic, GIGI, an "insuretech"[6] company, provided affordable health and life insurance policies to non-standard employees, including freelancers, domestic workers, gig workers, and other blue-collar workers;[7] Policy Bazaar allows workers to compare different insurance policies; and Lending Kart disburses loans to small businesses that may not be able to access loans from traditional institutions (Sahni 2019). The Indian government's Unified Payment Interface (UPI) has encouraged digital payments through digital wallet apps, such as Freecharge, GPay, and PayTM.

Digital labor platforms present opportunities for work, but the working conditions they engender remain far from ideal: workers must contend with fluctuating wages, opaque algorithm management systems, stringent algorithms, and fewer social protections and safety nets. Worker wellbeing on digital platforms has been criticized in recent years as workers protest their treatment through lawsuits. In India, the workers at Ola Cabs, a ride-hailing company, and its American homologue Uber, have protested decreasing wages as the companies repeatedly shift incentive models and wage structures (Aneja, Shridhar & Sawhney 2019). Food delivery workers in India have also protested against similar issues (The Wire 2020). India and other countries have attempted to regulate platforms and introduce legal protections for gig workers, but these measures fall short. Although online labor platforms create opportunities for work, these jobs often

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6 Insuretech or insurance technology is the use of innovative technology to deliver insurance coverage. In emerging economies, like India's, insuretech can reach sections of society that do not have access to existing formal financial and insurance institutions.

7 The COVID-19 pandemic forced GIGI to pivot from health and life insurance to other products

do not fulfil the International Labour Organization's (ILO) standards for decent work and should not serve as models for the future digital labor market. Instead, these jobs are only part of a trajectory in which longstanding wage repression and exploitation will hopefully be replaced by a more equitable future labor market (Taylor & Omer 2020).

Recruiters' growing reliance on online job portals, digital applications, and social media also affects the digital labor force. For instance, worker rating systems on digital platforms can determine a worker's access to earning opportunities and employee visibility. However, rather than evaluating the service they received, clients often rate workers based on their emotional labor, including friendliness or helpfulness, and reviews can be influenced by arbitrary elements, including the client's mood (Ticona & Mateescu 2018). Emotional labor especially applies to work performed primarily by women, including care work or domestic work. Ratings place additional pressure on an employee's emotional labor and ability to interact with others, and these work aspects become codified through the digitalization of work. Additionally, workers' ability to craft favorable profiles and maintain high ratings requires an understanding of online trust systems, technical skills, and communication skills (Ticona & Mateescu 2018), which puts those who lack digital fluency, digital literacy, and/or education at a disadvantage.

The digital gender divide in India could exacerbate existing inequities in the labor market

The labor market in India, like many countries in Southeast and South Asia, is marked by a high degree of informality: over 81 percent of

the workforce is in the informal sector, which is disproportionately represented by woman workers (International Labour Organization 2018). Overall, female labor force participation in India was 23.3 percent in 2017-2018, a drop from 31 percent in 2013-2014 (National Sample Survey Organization 2019). In 2017—2018, the informal sector was composed of 59.3 percent of rural women and 51 percent of urban women (National Sample Survey Organization 2019). During the same period, 6.8 percent of rural women and 11.4 percent of urban women were employed in regular salaried positions (National Sample Survey Organization 2019).

Caste and class also play a part in the gender divide of India's labor market. Women from lower socioeconomic populations work primarily in agriculture, textile, and manufacturing. In urban areas, lower socioeconomic women work largely in the construction and domestic sectors. Lower caste women are commonly forced into low-wage, and socially unrecognized jobs, especially leather tanning, midwifery, and domestic work, childcare, and eldercare. Upper-caste and upper-class women often have higher education levels and more varied job opportunities (Mondal et al. 2018; Gopal 2013). Additionally, there is a gender wage-gap: on average, women receive only two-thirds of what men typically earn (Mondal et al. 2018).

These inequities in the labor market hinder women's economic agency and uphold patriarchal structures, further restricting women's social and economic mobility. The inequalities also directly hamper women's access to digital technologies. For example, women may not be able to afford mobile devices, phone plans, or Internet access, despite some companies' efforts to decrease the price of data plans (Ghosh 2019). Also, although Internet use and digital devices are becoming more affordable, Indian households often share one device, which is primarily used by the male head of the family. Second, it is

still common to morally police women's behavior in India, especially in more traditional areas: mobile phones and Internet usage are considered corrupting forces that women must be protected from (Kovacs, Kaul-Padte & S.V. 2013).

Mobile phone usage has mirrored previous technological developments in terms of gains, which are not equitably distributed among genders. In 2019, women accounted for only 27 percent of mobile phone users in South Asia (GSMA 2019). In 2018, women were 26 percent less likely than men to own a mobile phone and 70 percent less likely to use mobile Internet (GSMA 2018). Although Internet usage in India has increased exponentially in recent years, only 16 percent of women have access to mobile Internet (GSMA 2019).

The low rate of mobile Internet uptake among women is especially concerning considering the job opportunities that now exist in the mobile ecosystem. In 2018, mobile ecosystems directly supported 10 million jobs in the South Asian region and indirectly supported another 8 million jobs (GSMA 2018). Productivity gains due to the mobile ecosystem will likely increase in the coming years as Internet connectivity and technological services improve. If women's limited access to digital technology and lower Internet literacy and fluency persist, women will be unable to leverage new opportunities in the digital economy.

The ubiquity of mobile technologies should allow women in poorer and underdeveloped regions to make up for missed technological opportunities. The mobile revolution in India has already made some progress in terms of reaching underserved women through the acquisition of mobile devices without prior access to landline telephones (Kathuria & Uppal 2009). However, these technological developments have not resulted in widespread development or

employment opportunities because new technological benefits primarily serve educated, middle-, and upper-middle-class and -caste populations. For this reason, India and other developing Asian countries must do more to address asymmetries in access and opportunities in online spaces in order to ensure labor force equality.

From digital literacy to digital fluency

The past decade has seen a rapid digitalization of services and shift to a digital economy in India and elsewhere. Jobs in manufacturing have decreased while jobs in the service sector have steadily increased. The e-commerce sector experienced a swift increase of job opportunities. Increasing automation and investments in the digital economy will likely increase efficiency and productivity. Increasing automation, however, has shifted the global labor market, which has led to a defeminization of the workplace because of the decrease in low-wage, manual-labor jobs (primarily jobs held by women) (Arora 2019). In the garment manufacturing sector, for example, the increase of precision sewing machines replaced a large part of the mainly female workforce. As automation and other technological advancements overtake various industries, the Indian government must provide its workforce with new skills; however, digital literacy alone is not sufficient in an increasingly sophisticated digital economy.

Technology companies, development agencies, and governments hope to increase Internet connectivity within impoverished populations, which will improve access to online educational content, employment opportunities, and other earning opportunities (Arora 2019). Improving Internet connectivity also increases technology companies' user base

and provides government and aid agencies with new technological solutions to developmental issues. Post-colonial countries are especially eager to adopt technological solutions to developmental issues because these measures can help countries circumvent current development agenda shortcomings (Arora 2019). For example, the Indian government has supported the digitization of several public services, such as the implementation of a biometric identity system, Aadhaar; financial inclusion through direct benefit transfers; and digital applications for services, including the Right to Information Act, as part of the Digital India program. Although this government program aims to transition the country to a digital economy, these initiatives have seen only varying degrees of success (Digital India 2020). Success varies, in part, because introducing technological interventions without addressing systemic, structural barriers can impede long-term results. In a rapidly changing world of digitalized work and public services, both workers and non-working citizens require different cognitive skills, including communication skills, high emotional intelligence, adaptability, decision-making skills, and risk analysis. These are skills that are not included traditional training or educational programs, but, instead, are often acquired through socialization. In the absence of robust public education system, these skills become accessible to only a privileged few.

This is yet another reason why the distinction between digital literacy and digital fluency is important; digital fluency lies in a user's ability to access digital tools and assess the risks associated with them, while digital literacy may equip users with basic skills, but it does not address the critical thinking or decision-making processes that both citizens and workers need to navigate digital technologies. As a first step in this direction, India has dedicated efforts to developing

digital literacy among its population. Additionally, rampant cyber-crime requires a greater consumer awareness of data privacy and digital safety, which should also be addressed through digital literacy training.

Digital literacy equips users with basic online tools. Digital literacy programs targeting women in India have focused on using mobile phones rather than laptops or desktops. Users are trained to use various social media sites and applications, browse for information on the Internet, and establish basic privacy and security settings. The objective of these trainings, especially for trainees in lower socioeconomic populations, is to provide the skills needed to navigate the online space for education, job hunting, information gathering, the use of applications, and digital services. Through media information literacy training, educators have also tried to teach users to critically process information found on the Internet.

Digital fluency involves a broader set of skills than digital literacy, including a more holistic understanding of online spaces and their underlying structures. Digital fluency is the ability to navigate, select, and create in online spaces. As described above, digital literacy is the first step toward digital fluency, which requires the knowledge, skills, and understanding of digital tools and online behavior, including digital security, data protection, and online safety. A second aspect is media literacy, including critical thinking, decision-making, and problem solving. Third, digital fluency requires social competence for effective online communication, which enables users to quickly adapt to new technological advances.

This level of digital fluency is needed because, with the emergence of new technologies such as artificial intelligence and quantum computing, labor market changes will likely occur at an exponentially more rapid rate than previous advancements. These swift changes

precipitate a need for a nimble workforce that can adapt to a dynamic labor market without the need for skilling and re-skilling initiatives or heavy investments in workforce preparedness. The ability to navigate and make informed decisions around data privacy, surveillance technology, and security is a crucial skillset for individuals. However, before achieving digital fluency, a base level of digital literacy is needed among the workforce.

In developing Asian countries, digital literacy trainings are important components of corporate social responsibility (CSR) initiatives. India has conducted multiple digital literacy initiatives, mostly funded by technology companies, telecom operators, or other private players and non-governmental organizations. India recently launched a digital literacy program with Facebook to train 100,000 women in India (PTI 2020; Digital Voices 2020).

In addition, Tata Trust and Google's Internet Saathi program in India aimed to provide women with digital literacy training in order to bridge the digital gender divide. The initiative includes training women to use digital tools and access online information for education, livelihood, and government funding opportunities. The trainees went on to train others in their community. 2.8 million women across 289,000 villages benefitted from the program. Some of the women have successfully transformed their new skills into monthly micro-businesses earnings of approximately USD 4 to USD 6, which paves the way for increased economic agency among Indian women (Internet Saathi 2020).

Other initiatives, including the Digital Empowerment Foundation's Chanderiyaan initiative, trained members of India's weaving community to use digital tools to design textile products and create e-commerce portals to sell their products (Chanderiyaan 2019). Selling online increases

the weavers' profit margins on their products. The crafts industry in India (traditionally a male-dominated space) has steadily decreased in recent years as younger generations reject the tedious work involved in crafting, yet new technologies and marketplaces attempt to revive the industry. This revival encourages the involvement of women who were previously excluded. Programs that focus on women's empowerment and livelihood through the textile industry, such as the Chanderiyaan initiative, have been successful in recent years.

Women's digital literacy training in India also focuses on online harassment, abuse, and the spread of misinformation. In online spaces, women are subjected to abuse, bullying, harassment, and, in extreme cases, revenge pornography. The anonymity of online spaces and disciplinary inaction on social media allows harassment to occur with few repercussions. Digital literacy trainings teach women about security features on their devices, applications with protective measures, and device hygiene, including strong passwords, location trackers, application interfaces, and platforms' terms of use to sanction online harassment.[8]

These initiatives are the first step for equipping women workers with the digital literacy skills needed in a digital economy. Efforts by the Self-Employed Women's Association (SEWA) are also examples of initiatives that integrate women in the digital economy. SEWA is a trade union that focuses on the rights of low income women in India. The SEWA Cooperative Federation has been testing initiatives to help women leverage opportunities presented by the digital economy. It is in the process of designing a cooperatively-owned digital platform for

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8 The Centre for Social Research, Delhi, India has a comprehensive programme for online safety training (Centre for Social Research 2018).

domestic services as an alternative to corporate-owned platforms. As a cooperative, workers will have a say in setting their terms of work and the growth of the platform. SEWA is also looking at a similar model to connect farmers directly with buyers via a digital platform. SEWA women are involved in the planning and design of these cooperative platforms and receive trainings on digital skills and marketing.[9]

Prioritize public-private partnerships across Asia Pacific to improve women's access to opportunities

Digital labor and online work have enabled a planetary labor force where geographic restrictions are irrelevant. However, many Asian workers, especially women, cannot fully participate because they lack online access, digital literacy skills, digital fluency, or all three. In this context, rather than leaving efforts to each nation individually, Asian countries can create cross-regional public-private partnerships to equip workers, especially women and other marginalized populations, to leverage digital economy opportunities. While the labor market across Asia is varied, a number of factors consistently shape women's access to work, such as prevailing social hierarchies and norms, class, and in South Asia, caste. Just as for women, online work may also offer unique opportunities for other marginalized populations, including those who cannot participate in traditional work, such as persons with disabilities or illnesses; enabling the digital fluency of these populations, too, is crucial as well as calling for a united, rather than

9 Author telephone interview with Salonie Muralidhara Hiriyur, Senior Coordinator, SEWA, 29 September 2020

atomized, effort across the region (Tandem Research 2020).

One step toward promoting women's digital fluency across Asia is to establish public-private partnerships throughout the region. For example, Asia has a growing number of digital work platforms that provide livelihoods for millions of workers, and global players, such as Uber, compete with local companies for market shares as Asian-based platforms, such as GoJek and Grab, expand to other Southeast Asian countries (Pham 2018; Ghoshal 2018). Asian governments could enlist these companies in actively training their unskilled or non-digitally-fluent workers, possibly as a condition for entering and operating in their markets.

Private-public partnership should focus on short-term training programs for digital fluency and plan for the long-term impact on workers in a digital economy by instilling lifelong learning capabilities in their workforce. For example, private companies can establish training hubs at public institutions, which would help alleviate stress on public systems and give private companies a steady stream of trained workers. Such programs require cross-regional partnerships between governments and technology companies.

India in particular should focus on public-private digital fluency partnerships. 4.75 million young people join the workforce every year in India (Dewan 2020). To take advantage of this demographic, it is imperative that India equip its workers with the required technological skillset. However, public infrastructure to address digital literacy training in India lacks sufficient investment. Although India has established the Industrial Training Institutes (ITIs) to train students in vocational skills for low- to mid-level jobs in a range of occupations, including electronic technicians, automobile technicians, and manufacturing industry technicians, carpenters, beauty workers,

and care workers, bureaucracy, outdated syllabi, and increasing contractualization have undermined the efficacy of ITI training. ITI graduates either cannot find jobs or cannot find secure positions (Aneja, Mawii & Ghildiyal 2020). To combat these issues, one ITI center in the southern Indian city of Bengaluru partnered with the electronics firm Bosch to establish a training hub. Bosch designed the training hub's courses to mold trainings to its factories' requirements. Students who perform well in the training hub were offered jobs at Bosch facilities. A public-private model like the training hub between Bosch and the Bengaluru ITI is an ideal example of the public-private models India should replicate to improve the employment opportunities of India's youth (Aneja, Mawii & Ghildiyal 2020).

South-South cooperation for digital fluency

Knowledge sharing and consolidated regulations across Asian regions are equally important for increasing digital fluency. As workforce skills and competencies change with the uptake of emergent technologies, governments, and companies adopt different approaches to address these changes. The effects of different digital fluency initiatives across Asian regions, including the successes and failures of such initiatives, should be shared across Asia so countries can adapt initiatives to suit the needs of each country's context.

Most countries have a separate committee or department that focuses on digital transformation, and knowledge transfer between these committees is an ideal opportunity for South-South cooperation. Another way to encourage knowledge sharing is through exchange between universities and researchers. India has existing knowledge-

sharing memorandums of understanding with several countries, including an agriculture and defense knowledge-sharing program with Israel and several similar initiatives with members of the South Asian Association for Regional Cooperation (SAARC) (Afghanistan, Bangladesh, Bhutan, India, the Maldives, Nepal, Pakistan, and Sri Lanka).

Compared to digital literacy, digital fluency is a more intangible concept; therefore, it requires a longer time to develop digital fluency initiatives. In the meantime, countries should introduce newer pedagogy and learning tools to address students' needs. For example, a recruitment agency for blue collar workers in India uses virtual reality and augmented reality to create learning modules for new recruits.[10] Additionally, public institutions have announced plans to invest in blended learning capabilities, including artificial intelligence and virtual learning, to aid students (Ministry of Human Resource Development 2020).

If developing Asian countries hope to provide both men and women with equal access to work opportunities, it is especially important to consolidate platform regulations across Asian regions, especially in terms of job availability and worker treatment on platforms. Technology platforms, especially the global giants, are notoriously difficult to regulate. Policies have not kept up with technological advances and, because of the novelty of technology platforms, existing regulations are not adequate. Additionally, jurisdiction and misclassification contribute to the complexity of platforms. Some global giants operate across the world with regional or country offices; they largely influence local economies and often use their limitless

10 Author telephone interview with the Chief Operating Officer of BetterPlace, December 2019

resources to circumvent existing regulations and litigation. On-demand service platforms classify themselves as technology companies that offer technological services, but in doing so, these companies can deny responsibility for workers and accept limited liability. For example, Uber can deny that it is a transportation company that hires workers to drive cars by classifying itself as a technology platform that merely connects drivers to passengers; this limits Uber's responsibility for its employees and customers (Rosenblat 2019). Currently, multiple cases in various countries deliberate this very issue of platform liability. It will take a collective effort from governments across Asia, however, to force platforms to adhere to non-exclusionary regulations that promote worker wellbeing. Multilateral cooperation should make regulating technology platforms a priority because, in the absence of a concerted effort, conditions for workers and consumers alike will further deteriorate.

The regulation of platforms will be more urgent in a post-COVID-19 world. The pandemic has revealed gig worker vulnerabilities; most work with few or no social protections and safety nets. Often essential workers, gig workers continued to work at great risk to their health and safety during the height of the pandemic. Although some platforms announced increased health insurance cover, paid time off, and financial relief, companies made it extremely difficult for workers to access these protections. Some companies even asked their customers to make donations to fund relief for their workers, shifting the cost to customers instead of providing assistance directly; it remains unclear if all qualifying workers received such funds (Mawii & Eckstein 2020). The effect of COVID-19 on labor markets and the economy will continue to unfold in the next several months, but it is already clear that the impacts on workers' rights and wellbeing will be severe. The pandemic,

however, has spurred workers to organize and demand action collectively, mostly through digital platforms. This is another instance that demonstrates how digital fluency is crucial for workers if they are to exert agency and establish autonomy in a post-pandemic world.

Conclusion

National government efforts combined with public-private partnerships and South-South cooperation for digital fluency across Asian countries are critical for the survival, adaptation, and progress of a technologically advanced workforce. Women are especially at risk within the rapid development of the digital labor market due to the digital gender divide and their lack of skills needed to thrive in a technologically advanced workplace. In order to access shifting labor market opportunities in Asia, women and other disadvantaged populations should receive proper digital literacy and digital fluency training.

Knowledge sharing is a crucial aspect of these initiatives. Additionally, to create decent jobs that are accessible to all communities, it is paramount that governments regulate platforms to ensure equitable access and fair remuneration and working conditions. Digital literacy training initiatives may help in the short-term, but only tackling the digital gender divide and providing digital fluency for the entirety of the Asian labor market will ultimately benefit the technological advancement and digital economy across Asia.

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Chapter

3

Upgrading the Thai Workforce for "Industry 4.0" Through Strategic Education and Training Partnerships and Emulation

Saowaruj Rattanakhamfu[11]

Introduction

Industry 4.0 is an industry structure built on new digital technologies, including robotics, automation, the Internet of Things (IOT), and a digitally skilled workforce. Industry 4.0 is also an indicator of a developed and high-income country. In 2019, Thailand's gross national income (GNI) per capita was approximately USD 7,260; according to the

11 The author, a senior research fellow at Thailand Development Research Institute (TDRI), would like to thank Dr. Somkiat Tangkitvanich of TDRI and Anthea Mulakala of The Asia Foundation for their valuable advice and comments, and Suzan Nolan and Laura Pierson for their great editing job.

World Bank, this makes Thailand an upper-middle-income country[12] (World Bank 2019). To transform itself into a high-income country and improve the living standards of its population, Thailand must transform its current industry structure into an Industry 4.0.

The first step to building an Industry 4.0 in Thailand is to transition into a knowledge-based economy, which concentrates on technological developments, innovation, and human capital. Creating a knowledge-based economy and the digitally skilled workforce needed for an Industry 4.0 requires high-quality education. Thailand's current education system, however, cannot adequately train and educate such a workforce. The Organization for Economic Cooperation and Development (OECD) Program for International Student Assessment (PISA) 2018 ranking ranks Thailand (out of 78 economies) 57th in mathematics, 54th in science, and 66th in reading (Organization for Economic Cooperation and Development 2019). Thailand's education suffers largely from outdated curricula that no longer meets the industry's demand.

The Thai government and several high-technology companies have formed strategic local and international partnerships to produce an improved digital workforce in Thailand. It is too early to assess the success of these partnerships, but lessons learned from the case studies below demonstrate how shared elements, including a demand orientation led by business, continuous cooperation, and visionary leadership, contribute to a promising future. Lessons from these case studies and good practices from several East Asian economies, particularly Taiwan and Singapore, form the basis of several policy

12 Upper middle-income economies are those with a 2019 GNI per capita between USD 4,046 and USD 12,535 (World Bank 2020a).

recommendations for the Thai government. The recommendations include strengthening Thailand's basic science, technology, engineering, and mathematics (STEM) education; cooperating with the private sector to improve Thai vocational and higher education; up-skilling and reskilling Thailand's digital workforce; and setting clear targets, such as the quantity of system integrators[13] needed for a success Industry 4.0 transition.

The first section provides an overview of the current Thai industry, describing how Thailand's workforce lacks the necessary skills to transform into an Industry 4.0. The second section describes the current state of Thailand's digital workforce. The third section outlines the emerging trend of strategic partnerships between the Thai and Japanese governments, and how partnerships between the public and private sectors can further develop the country's digital workforce. The fourth section describes how Thailand can learn from the good practices of other Asian economies, including Singapore and Taiwan. The paper concludes with policy recommendations for the Thai government.

Overview of Thai Industry and Industry 4.0

A transformation from an upper-middle-income country to a high-income economy requires transitioning from a heavy-industry-based economy to a knowledge-based economy. In order to accomplish this and attract foreign and domestic investment, Thailand adopted 12

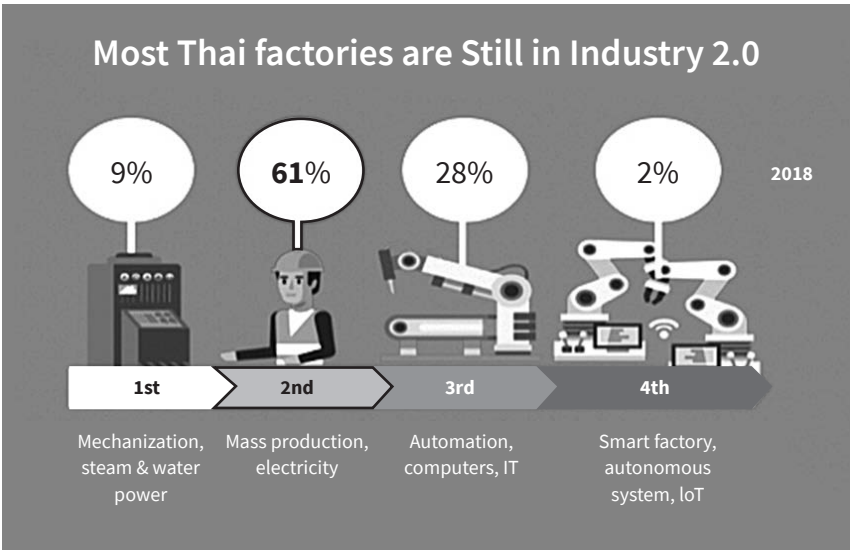
13 A system integrator is an individual or organization that builds systems from a variety of information, communications, technology hardware, and software components.

"S-Curved" industries: next-generation automotive, smart electronics, agriculture and biotechnology, food for the future, affluent wellness and medical tourism, biofuels and biochemicals, digital economy, medical hub, automation and robotics, aviation and logistics, national defense, and education and human resource development (Ministry of Foreign Affairs 2018). Generous tax incentives and one-stop service business facilitation made the Eastern Economic Corridor (EEC) Thailand's main investment attraction. The EEC covers three eastern provinces: Chachoengsao, Chonburi, and Rayong.

Thailand's industries currently lag in terms of production. Most Thai factories are stuck in the era of Industry 2.0, which depends on labor-intensive methods for mass production, rather than Industry 4.0, which builds on Industry 3.0 computerization, robots, and automation through the adoption of autonomous systems and cloud-based data integration (Figure 3.1). Thailand's automation and robotics adoption rate is lower than many countries across the world (Figure 3.2).

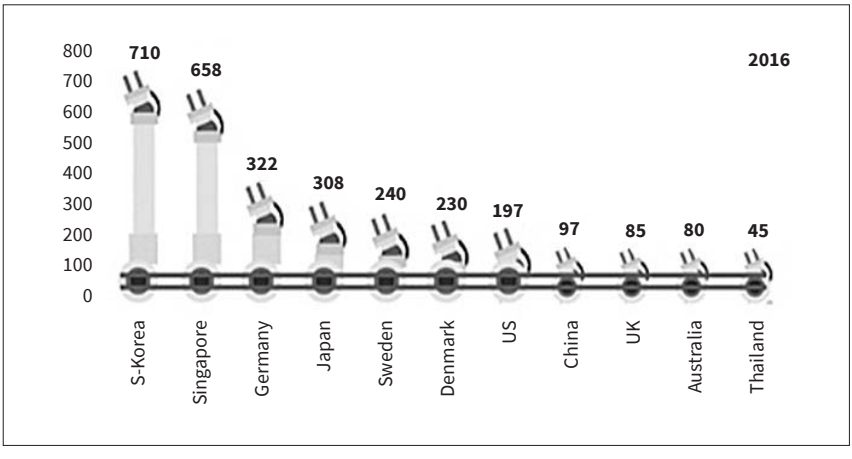
Although the promotion of S-curved industries and their implementation in the EEC enhances Thailand's competitiveness, improves productivity, and adds value to Industry 4.0 industries, Thailand still faces multiple challenges, especially in terms of small and medium-sized enterprises (SMEs). Challenges include access to capital, access to technology, and building awareness for Industry 4.0. Additionally, because Thailand's education system is supply-driven rather than demand-driven, the country's workers are insufficiently skilled, which prevents the country from engaging in higher value-added activities.

Figure 3.1 Factories in Thailand in Different Stages of Industrialization (2018)



Source: Department of Industrial Promotion & Federation of Thai Industries (2018)

Figure 3.2 Number of Robots per 10,000 Workers in 2016



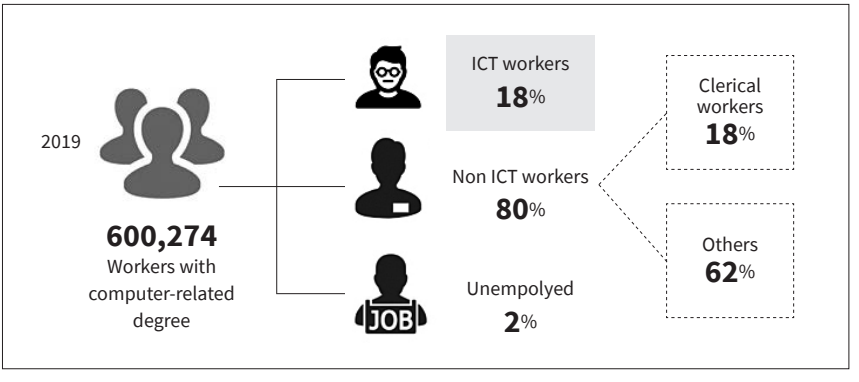
Source: International Federation of Robotics (2018)

Digital workforce in Thailand

Thailand has a sizable pool of information and communication technology (ICT) graduates, but most graduates lack the specific digital skills necessary for Industry 4.0. This is largely due to out-of-date curricula, specifically courses without essential and up-to-date ICT content, including integrated-systems technology, platform technologies, system paradigms, and user experience design, and in-demand supplemental ICT domains, such as artificial intelligence (AI), big data, and IOTs (Rattanakhamfu 2018). Thailand's ICT education also provides limited practice-based experiences. Additionally, according to a 2018 Thailand Development Institute (TDRI) focus group, despite the fact that there are multiple computer-related courses in universities, many courses are obsolete because they cannot keep up with advancing technologies.

Consequently, Thailand has many ICT graduates, but only a small proportion work in ICT occupations. In 2019, there were 600,274 workers with computer-related degrees; only 18 percent of

Figure 3.3 Workers with Computer-related Degrees, Classified by Types of Jobs



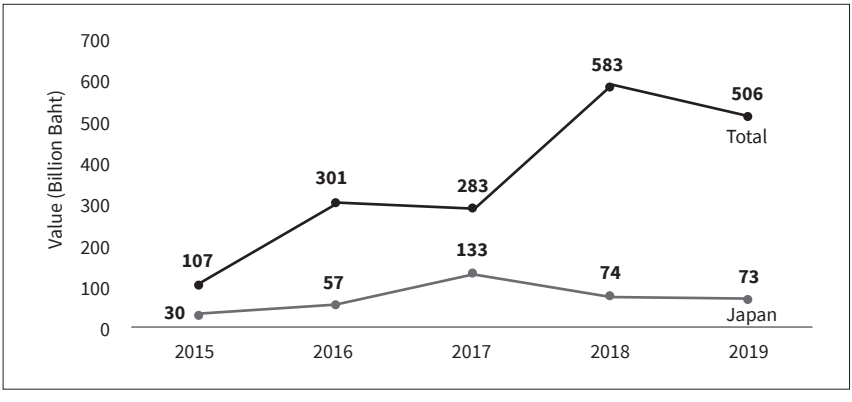
Source: National Statistics Office (2019)

these workers worked in ICT fields, and 80 percent worked in other industries (Figure 3.3). If Thailand's educational quality met industry requirements, the percentage of ICT graduates working in ICT occupations would increase.

Partnerships between Thai and foreign governments

Japan is Thailand's largest foreign direct investor. In 2019, the value of foreign direct investment (FDI) from Japan to Thailand was USD 9,135,150, accounting for 16 percent of Thailand's total FDI that year (Bank of Thailand 2019). There were 5,444 Japanese companies operating in Thailand in 2017 (Japan External Trade Organization 2017). Japanese companies play an important role in developing the Thai industry. For example, from 2015 to 2019, Japanese investors submitted applications to the Thai Board of Investment (BOI) for TBH 367 billion in investment projects (Figure 3.4).

Figure 3.4 Total Foreign and Japanese Applications for Investments in Thailand (2015-2019)



Source: Board of Investment of Thailand 2015-2019

One of Japanese manufacturing companies' most critical concerns in Thailand is the shortage of skilled workers. A biannual survey for Japanese corporations in Thailand, conducted by the Japanese Chamber of Commerce in Bangkok, repeatedly addressed this concern, and a report from the Japan International Cooperation Agency (JICA) on industrial human resource development in Thailand reflected similar concerns (Japan International Cooperation Agency 2018). Based on an online survey of 138 companies, 29 percent of Japanese companies and 83 percent of Thai companies were satisfied with the quality of design and development engineers, whereas 44 percent of Japanese companies and 86 percent of Thai companies were satisfied with the quality of production engineers. Japanese companies' dissatisfaction is largely due to Thai workers' weaknesses in mathematics and science and inadequate practical skills in design and development. Japanese companies also complained about the lack of discipline and career ambitions in Thai workers and insufficient management, communication, and problem-solving abilities.

The case study of Thai KOSEN

To tackle these challenges, the Thai and Japanese governments jointly established the Thai KOSEN[14] initiative for the production of practical and innovative engineers. A Japanese official development assistance (ODA) loan to the Thai government under the Industrial Human Resource Development Project supported this project (Japan International Cooperation Agency 2020). The loan provides up to JPY 9.434

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14 "KOSEN" is the short name for "Koku-ritsu-kou-gyou-KOU-tou-SEN-mon-gak-kou" or College of Technology in Japan.

billion with an annual interest rate of 0.5 percent for the project and 0.01 percent for consulting services.

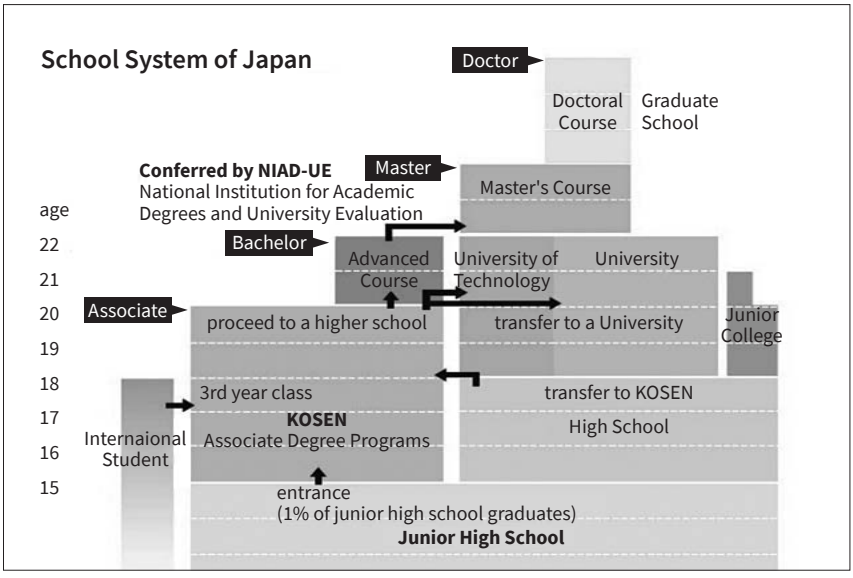
KOSEN, or the College of Technology, is a tertiary education system that fosters practical engineers through a five-year intensive engineering program (Figure 3.5). KOSEN is known internationally for nurturing practical engineers through its "spiral curriculum," which consists of a lecture phase, an experiment phase that builds practical skills, and a practice phase that focuses on real-world skills through close industry cooperation (Figure 3.6).

The Thai KOSEN project promotes the production of practical and innovative engineers. This project will establish two new Thai KOSEN colleges in Bangkok. It will also offer Thai students scholarships and study opportunities in KOSEN in Japan. This is the first time Japan has established KOSEN colleges outside Japan. The project will hopefully be a model for the expansion of KOSEN education in other countries.

The two Thai KOSEN institutes cooperate with local and Japanese industries in the EEC and other Thailand regions. The first Thai KOSEN is the KOSEN-King Mongkut's Institute of Technology Ladkrabang (KOSEN-KMITL), established in 2019 to provide education for three major academic fields: mechatronic engineering, computer engineering, and electrical and electronic engineering. KOSEN-KMITL's first academic year began in 2019 with a cohort of 24 students. The second Thai KOSEN institute is the KOSEN-King Mongkut's University of Technology Thonburi (KOSEN-KMUTT), established in 2020 for the three academic fields of automation engineering, bio engineering, and agricultural engineering. KOSEN-KMUTT's first academic year will begin in 2020 with a cohort of 24 students.

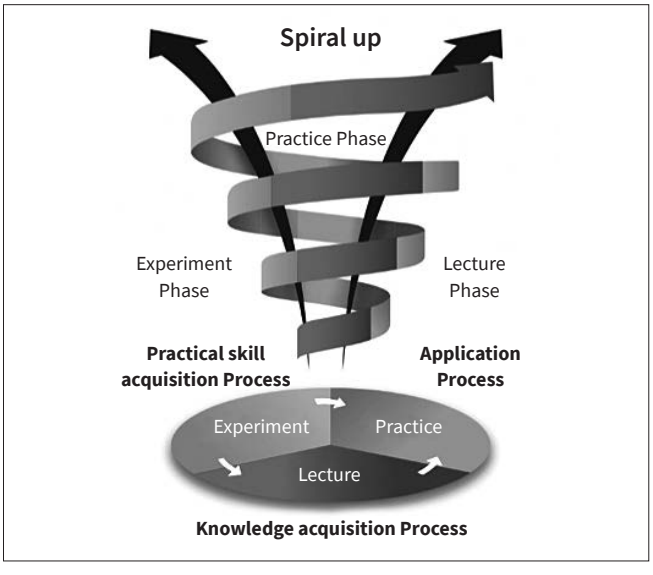
To ensure a high-quality education, Thai KOSEN engineering graduates will receive strong educations in mathematics and science,

Figure 3.5 KOSEN Education System



Source: National Institute of Technology (KOSEN) (2013)

Figure 3.6 KOSEN's "Spiral-up" Knowledge Acquisition Process



Source: National Institute of Technology (KOSEN) (2013)

following Japanese KOSEN curriculum. While most Thai engineering curriculum focuses heavily on hard skills, KOSEN curriculum also focuses on developing both hard and soft skills:

- basic competency in mathematics, physics, chemistry, and basic engineering
- engineering competency in mechatronics engineering, electric and electronic engineering, and mechanical engineering
- cross-area competency in morality and ethics, intellectual and analytical thinking, responsibility, communication, design and creativity, and integrated knowledge
- soft skills in social and emotional behaviors, including social perceptiveness, adaptability, communication, teamwork, and complex problem-solving.

This combination of hard and soft skills becomes increasingly necessary as new technologies driven by AI change traditional industrial and service processes. While the need for hard STEM skills is well recognized, the demand for soft skills will also grow across all job sectors (Pistrui 2018). For workers who have well-developed critical thinking skills (an ability to reason and analyze), are creative (an ability to invent or create something new), and are comfortable analyzing and framing complex problems, AI-enabled technology will be an asset. For workers who primarily focus on technical execution and need detailed instructions to perform their tasks, AI-enabled technology will be a detriment. For these reasons, the Thai KOSEN engineering curriculum expands Thailand's standard engineering education, which heavily focuses on hard skills.

Thai KOSEN courses are taught in Thai, Japanese, and English.

Engineering competency courses, such as computer architecture, network security, and data communication and networking, are usually taught in English; Japanese language courses are taught in Japanese; and Thai culture/social study and Thai language courses are taught in Thai (KOSEN-KMITL 2019). To become practical and innovative engineers, students collaborate on projects with the industrial sector through short-term and long-term internships in related industries, especially S-Curved industries in the EEC. To ensure KOSEN quality, teachers are trained in Japan and Thailand. Similar to Japanese KOSENs, Thai KOSEN institutes offer associate's degrees for a 5-year regular course and bachelor's degrees for an additional 2-year advanced course.

Thai KOSEN institutes aim to produce 1,080 graduates by 2031. Among them, 900 students will take a 5-year course program in Thailand, and 180 students will study the first two years in Thailand and then transfer to Japanese KOSENs. After receiving associate's degrees from a five-year program, 328 students will be offered scholarships for a two-year advanced course in Thailand and an opportunity to study in Japan for two semesters. In addition to the 1,080 graduates, the Thai KOSEN initiative will provide scholarships to 72 students from 2020 to 2023 to study at Japanese KOSENs for seven years, with the condition that, after graduation, they will work in targeted Thailand industries or government organizations, including Thai KOSEN institutes, for seven years. The project also closely collaborates with industries to bridge the skills gap to meet industry demand. Additionally, all Thai KOSEN students are offered scholarships during their five-year academic calendar, and students are required to work as engineers in Thailand for five years. Ultimately, Thai KOSEN graduates will play an important role in the response to Thai industry needs and will help move Thai industry toward Industry 4.0. The commitment of Thai and Japanese

governments to share resources, and the KOSEN model's international reputation for high-quality training and responsiveness, promises success (Organization for Economic Cooperation and Development 2009).

The case study of DENSO's LASI Project

The Lean Automation System Integrator (LASI) project is an inter-governmental collaboration between Japan's Ministry of Economy, Trade and Industry (METI) and Thailand's Ministry of Industry (MOI) to develop engineers specialized in robotics and automation as system integrators for "Lean Automaton." The concept of lean automation was developed by DENSO, a Japanese leading supplier of advanced automotive technology, systems, and components. Lean automation aims to eliminate all waste in the production process and to increase efficiency through gradually adding automation to the production line.

The LASI project specifically aims to address Thailand's lack of robotics and automation technology, skills, and knowledge. To deal with the robotics and automation technology shortage, the Japanese government provided financial support for the LASI project's machines and tools. To solve the skills and knowledge shortages, JETRO, an organization under METI, assigned DENSO (Thailand), a subsidiary of DENSO, to implement a showcase production line that demonstrates lean automation.

DENSO (Thailand) leads the LASI project. Established in 2017, the project focuses on expanding and developing lean automation through four tracks: training local system integrators (SIs) in automated manufacturing technology and next-generation information technology, partnering with local universities to modify curriculum and provide DENSO internship positions, providing introduction courses in

automation to engineers from SMEs, and developing SI trainers.

The LASI project set up four milestones from 2018 to 2020: training 43 local SI trainees by 2018, 90 trainees by 2019, and 90 trainees by 2020; training 227 engineers for automation SMEs by 2018, 400 trainees by 2019, and 400 trainees by 2020; offering 18 LASI university students DENSO internships each year from 2018 to 2020; and developing LASI curriculum with an academic and SI consortium in 2019.

From 2018 to 2019, DENSO trained 133 local SIs, 622 engineers for SMEs, and 36 interns from universities. Additionally, DENSO successfully collaborated with local universities and local system integration companies to design LASI's curricula and training courses.[15]

In addition to the number of trainees, the training also boasts promising quality. One engineer from an SME said that she could apply knowledge and techniques on automated manufacturing technology and next-generation information technology to her job at a food-processing factory. The LASI training helped her factory become automated quickly and smoothly and enabled her to expand its production capacity to meet increased purchasing orders from foreign markets.[16] Furthermore, trained engineers from more than 20 firms have equipped their production lines with IOT and made their production processes semi-automated or fully automated.[17] LASI's 2018-2019 milestones were met, and its 2020 milestones will also likely be met. However, the continuity and the goals of this partnership

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15 Interview with Mr. Thavorn Chalassathien, Senior Advisor of DENSO (Thailand), Bangkok, January 2020

16 Interview with an executive of a food factory, Bangkok, March 2019

17 Interview with Mr. Thavorn Chalassathien, Senior Advisor of DENSO (Thailand), Bangkok, April 2020

beyond 2020 will depend on financial support from the Japanese and Thai governments.

Partnerships between the public and private sectors

To solve the problem of digital knowledge and skills shortages in Thailand, Thailand has established partnerships between the public and private sectors to support the adjustment of academic curriculum, specifically regarding how students can solve real world problems.

The case study of SIMTEC

The Sumipol Institute of Manufacturing Technology (SIMTEC) is led by Sumipol Corporation Limited, a leading Thai distributor of imported industrial tools and machines. SIMTEC has a technical academy in Rayong, which is in the center of the EEC. The academy equips trainees with advanced manufacturing knowledge and skills, especially in digital technologies, automation, and IOT. Their target students are engineers, technicians, trainers, and university students.

The establishment of the SIMTEC institute in 2019 was supported by 14 government agencies and 18 private companies. Among the private companies were Japan's leading machine tool and robotic manufacturers, including Fanuc, Omron, DENSO, and Nachi. These manufacturers provided advanced machine tools and robots for SIMTEC.[18] To deal with the shortages of automation knowledge

18 Interview with Mr. Thongpol Oulapathorn, Executive Director of Sumipol, Chonburi, December 2019

and skills in Thai industry, the institute acts as a technical learning academy by providing practical training and demonstration through various short courses. It hopes to meet the industry demand through co-development with leading manufacturing technology owners. SIMTEC provides 15 courses on machining strategy, measuring innovation, and factory automation, such as industrial robot operation and programming, controlling selective compliance assembly robot arms and selective compliance articulated robot arms (SCARA), IOT usage, and additive manufacturing technologies (such as 3D printing) in design and prototyping (Sumipol Institute of Manufacturing Technology 2019). Trainees will be equipped with automation knowledge and skills to help Thai companies adopt automation. There are 10 to 30 trainees in each course. The cost ranges from THB 4,500 to THB 9,500 (approximately USD 150-300).

Due to the SIMTEC's location in the EEC, the Department of Industrial Promotion, DENSO, and SIMTEC jointly established the second LASI Center at SIMTEC in 2019 to equip workers with Industry 4.0 skills. Under this initiative, Thailand's Department of Industrial Promotion, as SIMTEC's main financial supporter, determines training milestones, including the number of trainees.

The case study of Delta Automation Academy

To address Thailand's labor shortage in automation technology, the Delta Automation Academy was set up by DELTA Electronics (Thailand) Public Limited, a subsidiary of a major Taiwanese power supplies and electronic components manufacturer. The Delta Automation Academy provides theoretic and practical training in advanced industrial automation, such as using SCARA and automation products,

to students at the Delta Industrial Automation Labs located in six local universities, including King Mongkut's Institute of Technology Ladkrabang (KMITL), King Mongkut's University of Technology North Bangkok (KMUTNB), King Mongkut's University of Technology Thonburi (KMUTT), Chulalongkorn University, Kasetsart University, and Burapha University. The Academy aims to train 200 to 300 Thai engineering students every year. Since 2016, more than 1,000 trainees have graduated from the Academy.[19]

The Academy's partnership with DELTA Electronics contributes to Thailand businesses, universities, and students. DELTA Electronics and other companies recruit trainees with skills that match the industry demand, which saves companies time and money; after graduation, these trainees are well-equipped with theoretic and practical knowledge and skills and can start working on automation immediately, whereas newly recruited workers require an average of two years of on-the-job training.

The six local universities that collaborate with DELTA Electronics offer curriculum on modern technology and automation and updated automation and robotics labs. University staff are also provided with training from DELTA Electronics engineers. Students of these six universities are able to take courses on modern automation technology and have internship opportunities through DELTA Electronics. Furthermore, some trainees receive jobs at DELTA Electronics immediately after graduation, and their starting salary is more than 25 percent higher than the average starting salary of workers without DELTA Electronics internship experience.

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19 Interview with Mr. Youngyut Pakduangchan, Human Resource Development Director of Delta (Thailand), Samut Prakarn, July 2020.

Lessons learned from case studies

The above case studies exemplify two models of collaboration. The first model is an intergovernmental (public-public) collaboration, represented by the cases of Thai KOSEN and LASI, which also includes a national level public and private collaboration. Public-public projects can have larger impacts because of their size and financial resources. The second model is a public-private collaboration, represented by the SIMTEC and Delta Automation Academy cases. These public-private project sizes are relatively smaller, and their impact is also smaller; however, due to less bureaucracy, the collaboration can begin more rapidly.

Although these case studies differ in terms of collaboration models and levels of impact, they share similar positive factors. First, they are all driven by private sector demand for quality technicians and engineers and the need to collaborate with strategic partners. Second, the collaboration model sets clear targets and implements continuous development. For example, the LASI project focuses on Thailand's knowledge, skills, and technology shortages in automation. Its main actions include modifying existing curricula and developing new SIs. Close collaboration among partners through the entire process is critical to its success. Third, collaboration models require visionary leaders. The project leaders are prominent industry figures who focus on long-term mutual benefits rather than short-term benefits.

These case studies demonstrate how Thailand can upgrade its digital workforce through strategic partnerships. Thailand's government can support these partnerships and the significant positive spillovers to the Thai economy, through additional resources, including financial incentives.

Thailand should emulate other good practices

There are multiple good practices in digital workforce collaboration across East Asian economies that Thailand should also emulate. For instance, the Taiwanese government provides a business-friendly environment and a wide talent pool to attract foreign investment from leading high-tech companies (Yang 2019). According to the World Bank's 2019 Ease of Doing Business report, Taiwan ranked 15 out of 190 economies (World Bank 2020b). Taiwan's education system also ranks among the top STEM performers. Based on its score in the OECD 2018 PISA test, Taiwan ranked 5th in mathematics and 10th in science out of 78 nations (Organization for Economic Cooperation and Development 2019).

Due to the Taiwanese government's efforts, multiple leading companies, such as Google and Microsoft, have established research and development (R&D) hubs in Taiwan. These companies also helped develop a skilled workforce in Taiwan. For example, Google plans to train more than 5,000 Taiwanese students in AI programming and more than 50,000 businesspeople and students in digital marketing (Chien 2018). Along with an AI R&D center, Microsoft also built a strategic partnership with the Taipei Medical University for an AI Talent Cultivation Project. Additionally, Microsoft partnered with the Institute for Information Industry (III) for the Microsoft Professional Program (MPP) for data scientists (Microsoft Asia News Center 2018). In addition to its general support, the Taiwanese government will invest USD 540 million over five years in AI research to develop an AI ecosystem for Taiwanese industries. These efforts demonstrate that the Taiwanese government is committed to attracting leading high-tech firms to R&D hubs in Taiwan, growing a large pool of STEM experts, and partnering with high-growth technology firms to enhance

the skills of its local workforce.

Thailand should emulate the strategies Taiwan has put into place in order to attract foreign tech companies to its country. These companies can have a tremendously positive impact on Thailand's economy, which, in turn, will continue to grow Thailand's STEM human resources. However, if Thailand wants to attract high-growth tech foreign companies to perform value-added activities domestically and partner with these companies to enhance its local workforce capabilities, Thailand should focus on improving the quality of its basic STEM education. The Thai KOSEN initiative is a good starting point for the improvement of Thailand's STEM education.

Another leading example of public-private partnership in digital talent development is Singapore's TechSkills Accelerator (TeSA) program, which is a tripartite initiative between Singapore's government, the industry, and the National Trades Union Congress (NTUC). The initiative aims to promote ICT professional development and train Singaporean workers to meet market demand (Infocomm Media Development Authority 2020a). The Infocomm Media Development Authority (IMDA), the lead government agency to implement TeSA, collaborates closely with private companies, including ThoughtWorks, a global software consultancy company, to design upskill and reskill training programs for local workers (Thoughtworks 2019).

Singapore, like Taiwan, is a leading attraction for foreign high-tech companies. Singapore was ranked 2nd in Ease of Doing Business in 2019 and 2nd in mathematics, science, and reading in PISA 2018. The Singaporean government collaborates with multinational companies to develop its digital workforce. To demonstrate the priority of digital talent development, the Ministry of Communications and Information (MCI) invested SGD 120 million over three years to train its ICT

workforce to meet the industry's demand of 30,000 new jobs by 2020 (EDB Singapore 2017).

Through various programs under TeSA, the Singaporean government also provides financial and other benefits, such as monthly stipends, training course fees, and overseas attachments, to Singaporean trainees through on-the-job and in-depth training. It also provides grants of up to SGD 15,000 per individual for ICT employers to cover the cost of on-the-job training for fresh polytechnic and Institute of Technician Education (ITE) graduates in its SkillsFuture Work-Study Programs (Infocomm Media Development Authority 2020b).

There are tremendous benefits to interactions between a country's government and private sector, and Thailand should use Singapore's example to build government support for private public-private partnerships in technological industries. Lessons from Singapore demonstrate to Thailand that a government's strong and continuous commitment, reflected in financial and human resources, and the strong linkages with the private sector are key factors of digital talent development. In the case of Thailand, the Thai government should replicate the Singaporean government's working style, which heavily focuses on reaching goals through strong commitment and continuous support. The collaboration between the Thai government and SIMTEC is an example of a partnership between the government and the private sector, but this partnership is still in its early stages and it requires stronger and continuous support to excel.

Policy Recommendations

Based on the lessons learned from the case studies above and good

practices from other East Asian economies, Thailand should not undervalue the importance of public-public and public-private partnerships, the establishment of clear targets, and the significance of visionary leadership. These case studies and additional East Asian experiences demonstrate how Thailand, with government support, can transition to a knowledge-based economy and Industry 4.0. The Thai government should promote partnerships to develop a qualified Thai digital workforce through the following policy recommendations.

Strengthen Thailand's basic STEM education.

The Thai government should strengthen Thailand's STEM education system because it is a prerequisite to the production of technicians, engineers, and scientists. Low competence in science, mathematics, and reading in the Thai workforce inevitably discourages the private sector from investing in high-technology industries and prevents Thailand from upgrading its technological capabilities. Specifically, the Ministry of Education should revamp its basic education curricula. Rather than overemphasizing rote memorization, the curricula should promote more active learning, which includes project-based learning, problem-based learning, and experimentation.

Work with the private sector to improve vocational and higher education.

In addition to strengthening basic STEM education, the Thai government should work with the private sector to improve vocational and higher education systems. Specifically, Thailand should ensure that university and vocational school curricula is regularly revised

to keep up with rapidly changing technology. Additionally, curricula should promote work-integrated learning to ensure that students' skills are practically useful and meet market demand. Vocational colleges and engineering schools should also require lecturers to have industrial experiences, which will help educators better understand industry needs. To this end, the partnership between the Thai and Japanese governments regarding the Thai-KOSEN institutes is particularly important because it incorporates work-integrated learning and close collaboration between universities and industries.

Support the up-skilling and reskilling of the digital workforce.

The Thai government should also invest in the up-skilling and reskilling of the Thai digital workforce. Demand orientation is a key element for successful training, and the government should encourage the business sector to lead up-skilling and reskilling programs that will ensure its workforce meets market demand. The government should facilitate and provide financial support to the private sector for the implementation of such programs. This support can be modeled after Singapore's successful programs, including TeSA. To ensure the effectiveness of these programs, Thailand should also establish a monitoring and evaluation system.

Set clear targets for developing system integrators.

The demand for robotics, automation, and IOT is growing in Thailand, but the country still lacks the system integrators needed for these technologies. Currently, there are approximately 200 system integrators in the country. Thailand should expand local robotics, automation, and

the IOT market to groom a larger pool of local system integrators and expand the system integration business to other ASEAN countries. To achieve this goal, the Thai government should continuously support related training programs, such as the LASI project, closely evaluating the processes to ensure continuous improvement.

Conclusion

To transform itself into a knowledge-based economy, Thailand should focus more on technology upgrading and knowledge creation through Industry 4.0 technologies. Thai companies must adopt more labor-saving technologies, including robotics, automation, and IOT, and engage in R&D.

To perform these challenging transformations, Thailand should develop a skilled digital workforce. The current education system in Thailand focuses more on quantity rather than the quality of ICT graduates. Therefore, Thailand is unable to supply a digitally skilled workforce that supports industry demand. The Thai government and high-technology companies have begun to form local and international partnerships to produce the necessary workforce. Although it is too early to assess the success of these partnerships, the partnerships all share key positive elements, including business-led demand orientation, continuous cooperation, and visionary leadership. All of these elements have alleviated existing education issues, such as supply-sided-oriented teaching and training, changeable development policy, and limited state capacities.

If Thailand continues to invest time and finances into public-public and public-private partnerships, and if its government focuses on

growing a digitally skilled workforce, the country will make progress toward its transition to Industry 4.0 and a knowledge-based economy.

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Chapter

4

Southeast Asian Perspectives on Preparing for the Future of Work

Randeep Sudan

Rapid changes, whether in technology, business models, or business conditions, can cause significant labor market disruptions. Digitalization, automation, including artificial intelligence (AI) and robotics, combined with COVID-19, present looming challenges for many Southeast Asian[20] workers. Before the COVID-19 pandemic struck, it was estimated that automation could put 56 percent of all employment in Cambodia, Indonesia, the Philippines, Thailand, and Vietnam at a high risk of displacement (Chang & Huynh 2016, p.4). Digitalization, automation, and robotics can eliminate some jobs and change others. For example, robotic lawnmowers can reduce the

20 References to Southeast Asia in this chapter refer to the ten member countries of the Association of Southeast Asian Nations (ASEAN): Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Vietnam.

demand for gardeners, or robotic "sewbots" could reduce sewing jobs. Robotics, however, might also increase jobs, such as for maintaining machines and equipment. More recently, COVID-19 has caused significant economic hardships and upended millions of workers in Asia and across the world, particularly those whose jobs were not digitalized or could not be performed at home during lockdowns.

This chapter explains how Southeast Asian countries can mitigate risks and optimize benefits from labor market disruptions by expanding policy, regulatory, and digital capabilities through regional cooperation. The first section explores how automation and COVID-19 will affect jobs. The second section explains the importance of building strategic foresight capabilities within governments and the region to deal with an increasingly uncertain future. The third section describes how the systematic collection and analysis of data on labor markets, including credentialing systems that track workers' skills, is necessary for addressing the future of work. In the fourth section, the chapter explains how technological advances, including digital twinning and data collection, can modernize workforce skills and help small and medium-sized enterprises (SMEs) thrive in an increasingly automated, AI-enabled, and digitalized economy.

Global forces — automation and the pandemic — upend employment in Asia

The McKinsey Global Institute estimates that 400 million to 800 million jobs will be displaced by 2030 worldwide because of global automation, and 590 million to 890 million new jobs will be created (McKinsey Global Institute 2017). The Organization for Economic Cooperation and

Development (OECD) estimates that 14 percent of existing jobs (or about 460 million out of a global workforce of 3.3 billion) will become redundant as a result of automation in the next 15-20 years. Another 32 percent (about a billion jobs) will change in response to automation (Organization for Economic Cooperation and Development 2019). By 2028, in six of the ten Association of Southeast Asian Nations (ASEAN) member countries, approximately 28 million fewer workers will be needed to produce the 2018 level of output: Indonesia (9.5 million fewer workers), Vietnam (7.5 million), Thailand (4.9 million), Philippines (4.5 million), Malaysia (1.2 million), and Singapore (0.5 million) (Oxford Economics & Cisco 2018).

Additionally, unprecedented shutdowns in reaction to the COVID-19 pandemic have resulted in the unemployment of millions of Southeast Asian workers. The loss of employment largely occurred in manufacturing and the services sector, creating a domino effect in multiple Southeast Asian industries. The World Travel and Tourism Council projects the loss of 63.4 million jobs in Asia in 2020 in the travel and tourism sector due to COVID-19 (World Travel and Tourism Council 2020). There have also been adverse impacts on employment in restaurants, cafes, bars, beauty salons, gyms, retail shops, transportation, and other crowd-oriented businesses because of COVID-19 movement restrictions. Women have been significantly affected because they dominate the recreation, hospitality, and retail sectors. The Asian Development Bank estimates that COVID-19 will decrease employment by 109 million to 167 million jobs in Asia in 2020, which is approximately 70 percent of global employment losses (Asian Development Bank 2020).

In the face of these predictions, most Southeast Asian governments have pursued strategies to address new technologies as part of national development plans to protect their labor force (Table 4.1). These

Table 4.1 National Industry 4.0 (I4.0) Strategic Plans in ASEAN

Country	I4.0 strategy	Other recent strategies and policies addressing adaptation to new technologies
Brunei Darussalam	No distinct plan	• Brunei Vision 2035 (*Wawasan* 2035)
Cambodia	No distinct plan	• Rectangular Strategy for Growth, Employment, Equity and Efficiency, Phase IV (September 2018) • National Science and Technology Master Plan 2014—2020 • ICT Masterplan 2020
Indonesia	Making Indonesia 4.0 (MI4.0)	• National Long-Term Development Plan 2005—2025 • National Medium-Term Development Plan 2015—2019 • Master Plan of National Industry Development 2015—2035
Lao PDR	No distinct plan	• Ten-year Socio-economic Development Strategy 2016—2025 • 8th Five-year National Social and Economic Development Plan 2016-2020
Malaysia	National Policy on Industry 4.0 (Industry4WRD)	• Eleventh Malaysia Plan 2016—2020
Myanmar	No distinct plan	• Myanmar Sustainable Development Plan 2018—2030 • Industrial Policy (2016)
Philippines	Inclusive Innovation Industrial Strategy(i3S)	• Philippine Development Plan 2017—2022
Singapore	No distinct plan	• Industry Transformation Programme • Smart Nation • Future of Manufacturing Initiative • Digital Economy Framework for Action
Thailand	Thailand 4.0	• Twelfth National Economic and Social Development Plan 2017—2021 • Twenty-year National Strategy 2018—2037
Viet Nam	National Industrial Development Policy until 2030 with a vision toward 2045	• Directive No. 16 (Ct-Ttg) on Strengthening Vietnam's capacity to leverage the 4th Industrial Revolution (2017) • Socio-economic Development Plan 2016—2020 • Strategy for Science and Technology Development 2011— 2020 • Plan on economic restructuring in association with the conversion of the growth model towards improving quality, efficiency, and competitiveness 2016—2020

approaches continue to be relevant, but governments may also need to strengthen regional cooperation to tackle the current turbulence in labor markets.

Developing regional capabilities in strategic futures thinking, risk assessment, and horizon scanning

The most important capability for leaders today is to be able to adroitly deal with increasing uncertainty and complexity, a virtue made more necessary by the COVID-19 pandemic. To effectively respond to labor market disruptions, national leaders must foster three capacities: one, they must encourage policymakers to think strategically about the long-term. Two, they must establish systems to monitor their external environment for opportunities and risks. Three, they must manage labor markets through a data-driven approach.

Most successful companies and governments adopt "strategic futures thinking" for their long-term strategies. They use scenario planning to better anticipate and prepare for what lies ahead. The methodology of scenario planning originated at the Research and Development (RAND) Corporation, where Herman Kahn and his colleagues developed scenarios for the United States' military in the 1950s and 1960s. These scenarios helped the United States' military better understand the consequences of future thermonuclear war (Ghamari-Tabrizi 2000).

In Southeast Asia, Singapore represents an excellent role model for embedding strategic futures capabilities across its government. The Singaporean Ministry of Defense began scenario planning exercises

in the 1980s.[21] By 1991, the government began experimenting with scenario planning as a tool for long-term national development. In 1995, Singapore established the Scenario Planning Office as part of the Prime Minister's Office, which became the Strategic Policy Office in 2003. In 2004, the country launched its Risk Assessment and Horizon Scanning Program and, in 2009, established a Center for Strategic Futures within the Prime Minister's Office. The Center serves as a think tank and is an integral part of the civil service. Strategic foresight is now an essential part of how Singapore prepares for the future. The Singapore Civil Services College runs a highly regarded program for civil servants on Future Craft, which helps prepare them for a rapidly changing global environment.

Three aspects distinguish Singapore's approach to strategic futures from other countries. One, Singapore embedded its Center for Strategic Futures in the Prime Minister's Office. This decision ensured that long term thinking resides at the highest decision-making levels in the government, and it is granted the focus and visibility it deserves. Secondly, by systematically training its policymakers and leaders across the board through a series of workshops called FutureCraft, Singapore developed deep expertise in strategic forecasting and

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21 Singapore modeled its strategic futures thinking after several experts, including Peter Schwartz, who was part of the Royal Dutch Shell company's scenarios team; John Petersen, President of the Arlington Institute, who wrote about strategic surprises and developed the Arlington Index; Jeff Jonas, Chief Scientist of IBM's Entity Analytics Group, who studied complexity theory and developed Non-Obvious Relationship Analysis (NORA); John Poindexter of the Defense Advanced Research Projects Agency (DARPA), who headed the agency's Total Information Awareness Office; Dave Snowden, the founder of Cognitive Edge, who developed the Cynfin concept, which divides environments into simple, complicated, complex, and chaotic spaces; and Gary Klein, who developed the approach of Management by Discovery, rather than Management by Objectives.

planning. Third, Singapore invested in a risk assessment and horizon scanning (RAHS) software platform that identifies emerging strategic issues every three months, so that policymakers can continually prepare for the future (Centre for Strategic Futures 2020).

Several other Asian countries also have national foresight institutions. These include the Center for Technology Foresight at the Korea Institute of Science and Technology Evaluation and Planning (KISTEP), the Center for Philippine Futuristics Studies and Management, the Malaysia Foresight Institute, Malaysia's Industry-Government Group for High Technology Foresight and Innovation, and the Asia-Pacific Economic Cooperation (APEC) Center for Technology Foresight based in Bangkok. However, barring countries such as Singapore, most governments lack the capability to systematically anticipate and plan for the future, and many foresight institutions are not well integrated with government decision making processes.

Regional cooperation on building capacity for strategic futures thinking in governments

Just as digital competencies have become essential requirements for most occupations in the public and private sectors, strategic futures thinking skills have become indispensable for all policy and leadership positions in the government. Therefore, ASEAN members must consider establishing a regional capacity building program on strategic futures thinking to develop deep forecasting and planning capabilities across all governments. ASEAN members should first consider setting up a strategic futures department within ASEAN's organizational structure. The European Commission, for example, has a Vice President for Inter-institutional Relations and Foresight. Similarly, an

"ASEAN Horizons and Emerging Areas Department" (AHEAD) could coordinate a strategic-futures-thinking program in the region. The program could train civil servants in governments and help establish a governance architecture for strategic futures thinking. The program could benefit from the expertise of Singapore's Center for Strategic Futures and Singapore's Civil Services College. Initially, the capacity building program could focus on the future of work, leveraging the expertise of the existing national foresight institutions in the region. ASEAN members could also catalyze a community of interest around the future of work to exchange ideas and develop awareness across the region.

The ability to systematically anticipate and plan for future labor-market needs depends on having powerful tools to continuously collect and analyze a wide range of data in order to understand foundational shifts and drivers of change. Among the data that could be collected, 25 potential drivers of change across seven dimensions that have global application should be included: (1) Economic (macroeconomic trends, wealth distribution, business models, financing methods), (2) Human (demographics, labor markets, education, public health), (3) Social (society, culture, ethics, values), (4) Environmental (climate change, geopolitics, regulation, risks), (5) Organizational (governments, companies, non-profits, collective intelligence), (6) Infrastructure (media, telecom, logistics, energy), and (7) Technology. The technology dimension influences every other factor.

Singapore's Centre for Strategic Futures uses a RAHS software platform with capabilities for data collection, analytics, visualization, insight generation, and modeling. Such tools are crucial for identifying emerging risks and opportunities. Computers can scan millions of scientific articles, reports, blogs, news stories, expert forums, and

social media posts. AI and text analytics can then identify emerging topics from this scanned data. AI can also connect diverse trends, including emerging technologies, social tensions, and political shifts, which might otherwise be unrecognized by human eyes. In the future, AI may also be able to automate consultation with domain experts to validate insights.

However, advanced horizon scanning tools can be expensive. For example, OpenAI, an AI research and deployment company based in San Francisco, California, has developed Generative Pre-trained Transformer 3 (GPT3), a predictive text analytics tool. Training the GPT3 AI costs between USD 4.6 million and USD 12 million (Huston 2020). Continuously refining and building new algorithms for horizon scanning also requires expensive data science engineers. The cost of storage and computation for large volumes of data is an additional expense.

Regional cooperation on a risk assessment and horizon scanning online platform

Given the significant costs involved, it would be useful to regionally share costs for a risk assessment and horizon scanning platform. A unit such as the proposed ASEAN Horizons and Emerging Areas Department (AHEAD) could anchor this initiative and launch a tender for the RAHS platform. A contemporary example of such an approach is the European Commission's EXSCALATE4COV (E4C) project, a public-private consortium funded by a European Commission tender for projects to counter the COVID-19 pandemic. The project involves a partnership between 18 research institutions (research centers, universities, institutes, and companies) coordinated by a pharmaceutical

company to serve seven European countries. It includes access to EXSCALATE (EXaSCale smArt pLatform Against paThogEns), a network of supercomputers located in Bologna, Italy; Barcelona, Spain; and Jülich, Germany (Dompé Farmaceutici 2020).

The importance of labor market data analysis and credentialing systems

High-quality data on labor markets is essential for evidence-based policymaking. Governments periodically collect data on employment according to industries, occupations, education, and demographics. Such data helps policymakers and others understand the economy's structure better and track trends in jobs and wages. Traditional data on the labor market has several limitations, however. These include (1) slow refresh cycles because data is often based on surveys, (2) varying accuracy due to potential sampling biases, (3) lack of government analytics capabilities, (4) lack of integration because data often resides in departmental silos, and (5) high costs of data acquisition. For example, the United States government spends almost USD 1 billion annually to run its Labor Management Information System (Johnson 2016).

There are multiple non-traditional ways to obtain online data about the labor market. Job posting sites, such as Indeed, Monster, and others, hold valuable data on job openings and the curriculum vitae/resumes of candidates. Burning Glass, a Boston-based company, is an example of a firm that collects such data from over 40,000 job posting websites and analyzes it using a skills topology (Burning Glass 2020). The analysis yields useful insights about the demand for skills, classified by industry, sector, and geography. Similarly, Microsoft's LinkedIn, the

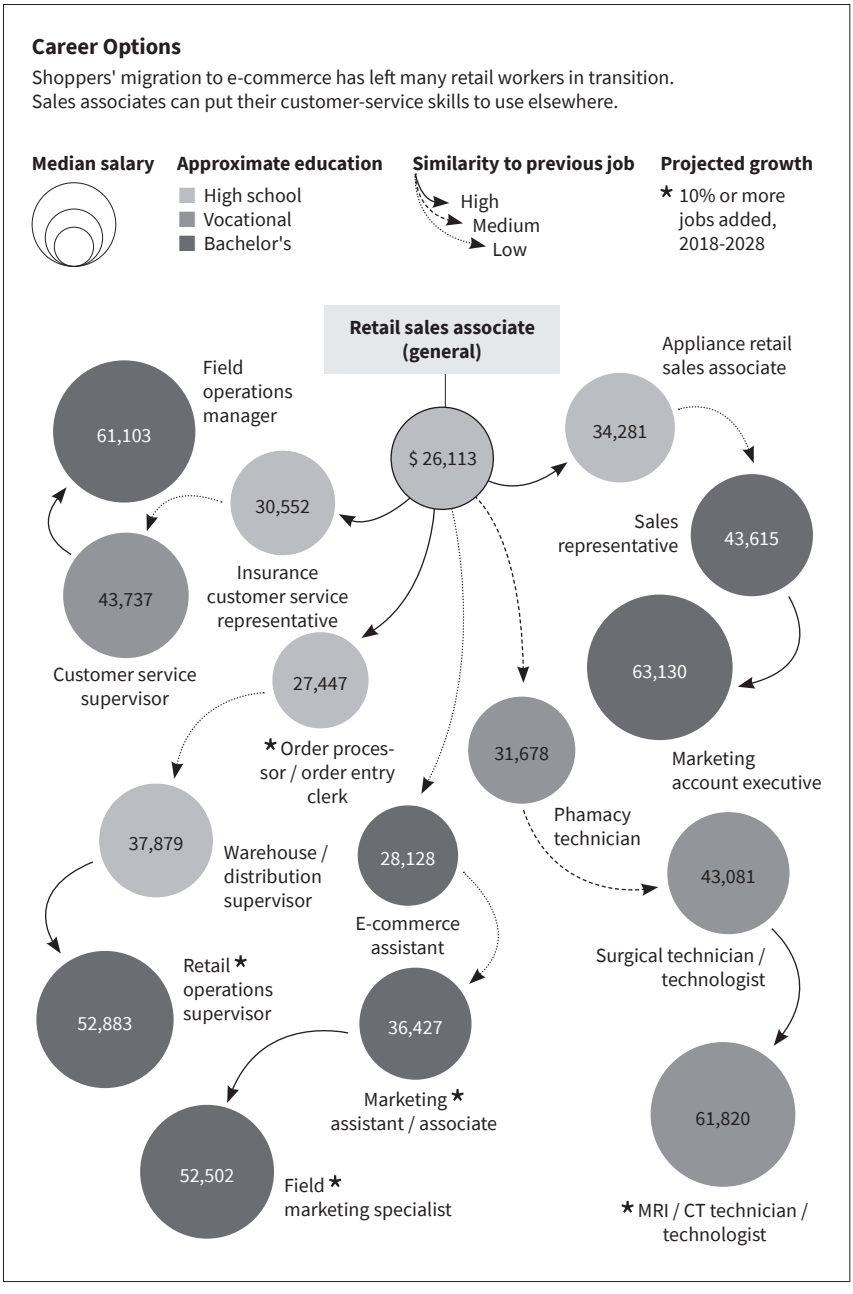
Sunnyvale, California-based professional-networking unit, established a Talent Insights Platform. The platform aggregates data from individuals using LinkedIn to offer insights relevant to careers and professions.

Finely-grained data on salaries for various positions is also valuable. Glassdoor, a company ratings site based in Mill Valley, California, collects data on salaries based on company reviews submitted by employees. There are also gig-labor platforms, such as Upwork, Fiverr, Amazon Mechanical Turk, Taskrabbit, and Topcoder, that own valuable data on gigs and gig workers. Social media platforms, such as Facebook and Twitter, also offer rich data on labor markets.

Using the vast data available in the private sector can provide policymakers and others with a more holistic understanding of the labor market. This data is useful to a range of organizations and individuals. For example, academic institutions can design education programs for trending skills; businesses can build better talent strategies and benchmark their hiring strategies against those of competitors; governments can offer incentives for developing in-demand skills and attract businesses by marketing available talent; and individuals can be better informed about different career paths and skills. To illustrate how this data can be used in a changing job market, Figure 4.1 presents a diagram of skill adjacencies and career pathways for displaced bricks-and-mortar retail sales associates in the United States; alternative occupations were generated using job postings and salaries data.

Some of the datasets for understanding shifts in labor markets are free and open to the public, including data on macroeconomic trends, demographics, education, and public health that is available through national statistical agencies and various multilateral institutions, such

Figure 4.1 Analytics for Career Pathing (United States)



Source: Weber (2019)

as the World Bank and the International Monetary Fund. However, companies, such as Burning Glass, LinkedIn, and Glassdoor, charge for their data.

Regional initiative for a Data for Jobs, Occupations, Businesses, and Skills (Data4JOBS) platform

It would be valuable for ASEAN member states to establish a regional data repository that aggregates public and private data on labor markets. A regional approach would add to the volume of data, which is an advantage when developing AI applications, and reduces individual member's costs involved with acquiring privately held data. Easy access to data also allows multiple users to create innovative services and products.

One of the most significant barriers to data sharing is the high cost of data. For example, companies like LinkedIn are monopolistic data suppliers and price their data high. Acquiring social media data can also be expensive. One way to overcome this barrier is to use regulatory instruments for access. For example, in China, automakers have to share data generated by electric vehicles with a government research institute because mandatory data sharing is essential for public safety and planning battery-recharging stations.

Additionally, the Australian government has proposed "designated datasets" that can generate significant community benefits (Department of the Prime Minister and Cabinet 2018). These datasets will primarily be publicly generated, but they may also include private-sector data that must be shared with the government. Also, France's Law for a Digital Republic (*Loi pour une République numérique*) defines certain categories of private-sector data as data of general interest (*données d'intérêt*

general) that must be shared (Republic of France 2020).

Southeast Asian governments should similarly require job posting platforms and networking platforms, such as LinkedIn and Glassdoor, to share data by providing application programming interfaces (APIs) to government computers. Governments could compensate for the marginal costs of data with a fair rate of return (European Commission 2020a). A "Data4JOBS" (Data for Jobs, Occupations, Businesses, and Skills) platform could then make this data available as a public good.

Common credentialing systems

Data availability can be especially useful for adapting to the talent requirements of new labor markets. For example, jobs in hospitality might shrink during and after the COVID-19 pandemic, but the demand for healthcare personnel will likely increase. Government agencies, private sector job analysts, and recruitment companies can use data related to individuals (training, qualifications, experience, and interests) to prepare them for the new occupations. Currently, most governments do not systematically collect such granular data. If a national database were available with updated data on the qualifications and experience of each person, it would be relatively easy to map individuals to job opportunities. It would also be easy to determine the training needs of each person to prepare for higher-skilled jobs.

Digital credentialing systems can make it easier to track credentials, qualifications, and experience, and accelerate the hiring process for employees. They can also help develop AI/analytics-based solutions that use data to generate personalized insights and recommendations on skilling, up-skilling, and reskilling workers.

Regional working groups for a standard credentialing system

Southeast Asian governments should adopt a standard credentialing system that collects the educational qualifications and work experience of employees for deployment on an ongoing and as-needed basis. For example, COVID-19 has revealed the importance for hospitals to rapidly onboard health workers. This process can be delayed in the absence of proper credentialing systems. Several such systems exist in Asia and elsewhere. Private-sector blockchain-based platforms, such as Dock.io, ProCredEx.com, and Zinc.work, offer credentialing services, including for health workers. Singapore's Government Technology Agency (Govtech) has developed OpenCerts as a credentialing solution for verifying educational certificates issued by Singaporean academic institutions (OpenCerts 2020).

ASEAN members states should follow the example of the Australian government, which established a collaborative working group on credentialing in July 2020 (Australian Government 2020). A working group from the Australian blockchain community will prepare a report on the way forward for credentialing by early 2021.

How to help SMEs thrive

SMEs[22] form the backbone of Asian economies, constituting more than 96 percent of all businesses and two-thirds of all private-sector jobs on the continent (Yoshino & Taghizadeh-Hesary 2018). Addressing

22 SMEs are variously defined by different countries. The figures relate to SMEs as defined by each country.

under-employment and unemployment in Asia, therefore, requires focusing attention on the needs of existing SMEs while fostering new entrepreneurs and businesses.

Modernizing SMEs requires expert help in various domains, including technology, business models, and finance. Expertise can consist of approved lists of experts validated by qualifications, recognition, or seniority. A more creative and innovative approach might be to develop communities of practice and business-related social networks. Existing expertise networks, however, are insufficient for many SMEs because smaller companies do not have the resources for expensive consultants. The world's largest private-sector expert network, the Gerson Lehrman Group (GLG), has 700,000 experts in multiple fields, including technology consultants, physicians, scientists, engineers, lawyers, senior current and former C-level executives, and former government members. However, each consultation can cost nearly USD 1,500 for an hour, and there are currently no affordable and high-quality networks of expertise for SMEs in the ASEAN region.

Development of a regional network of experts and resources to help modernize SMEs

ASEAN should launch an online platform for SMEs in all sectors that includes a regional network of specialized public and private consultants, service providers, and communities of practice. The initiative could benefit from the design of the 2018 French program, France Num, with similar aims (Organization for Economic Cooperation and Development 2020). The online platform could modernize SMEs and help them benchmark themselves against regional (or international)

peers. For example, a United Kingdom charity, Be the Business, adopted a benchmarking model, which uses a self-assessment approach that helps all SMEs improve their performance (Be the Business 2020). Additionally, given the importance of analytics and AI for SMEs, a regional program that provides SMEs with expertise in these areas would be invaluable. An excellent example of such support is the Finnish innovation fund, Sitra's IHAN-business program, which offers expertise to select SMEs in the areas of AI, service design, business models, technology architecture, legal and contractual affairs, and finance (Sitra 2020).

Regional program on digital twins

Given the scarcity of AI and analytics expertise in Southeast Asia, regional collaboration is vital. One area of collaboration would be the adoption of a digital twinning program for the region. Economist Dani Rodrik explains that there are two strategies to closing the gap between skills and technology: one, increasing education to match the demands of new technologies, and two, redirecting innovation to match the skills of the current and prospective labor force (Rodrik 2020). The latter is a more obvious and possibly more effective approach. Digital twinning technology is an excellent way to cater to such a labor-friendly strategy.

A digital twin is a digital replica of something in the physical world, be it a person, place, material object, or process. When machinery and equipment have digital twins, it is easier to train workers through simulation technologies. Digitalization can also help a skilled supervisor remotely assist workers through augmented reality/virtual reality technologies, whether for routine maintenance activities or

other uses.

Some countries have begun using digital twin technology as part of their digital strategies. For example, Singapore created a 3D model of the city, Virtual Singapore, which helps city planners lay out infrastructure through simulations. The model allows for the simulated placement of solar panels over buildings to assess potential electricity generation. The same model can be used for designing transportation systems that improve accessibility for aging people or people with disabilities (Smart Nation Singapore 2020).

A regional approach to adopting standards for digital twins

Adopting common standards and principles for digital twins can better manage their complexity. For example, the United Kingdom has established a Digital Framework Task Group to coordinate standards and principles across government, industry, and academic institutions, including the Alan Turing Institute and the Open Data Institute, for their digital twin initiative. Southeast Asian countries should also agree on the principles and standards for developing digital twins. ASEAN member states could facilitate such a project through a task force akin to the United Kingdom's. The development of standards could be done in partnership with private sector initiatives, including the Digital Twin Consortium, which was formed by the Object Management Group, (a non-profit trade association), Ansys, Dell Technologies, Lendlease, and Microsoft. The Consortium gathers industry, governments, and academia to develop consistent vocabulary, architecture, security, and interoperability in digital twin technology.

Providing SMEs with accessible data

Along with digital twin technologies, another way to modernize SMEs is by providing them with access to data. Data is the primary driver of growth and development in the digital world, and the use of data-driven AI is fast expanding in the digital economy. Companies that adopt AI are likely to do better than companies that do not. For example, Ant Financial is the world's highest-valued financial-technology (fintech) company at USD 150 billion. The company employs less than ten thousand people and leverages AI to serve more than 700 million customers with a broad range of financial services. One of Ant Financial's brands, MYBank, uses proprietary risk management technologies to provide collateral-free business loans to SMEs. MYBank has developed a 3—1—0 model to help borrowers complete online loan applications in three minutes and obtain approval in one second with zero human intervention. In contrast to Ant Financial, the Bank of America, which has not leveraged AI as much, employs 209,000 people to serve 67 million customers and offers a limited range of services (Iansiti & Lakhani 2020).

The development of AI depends on the availability of data. The larger and more diverse the data, the more insights can be derived using AI. Thus, access to data is critical for the development of AI solutions. Moreover, data attracts more data — the "network effect" of ever-increasing data in turn attracts new applications for the data, a phenomenon referred to as "data gravity" (Economist 2020). For example, since Google can search large data sets, it attracts more users to its search engine. As more people use the search engine, Google collects more user data and creates more customized search results, exploiting network effects generated by ever more users. With this

mass of data and its knowledge of users key search subjects, Google can create new applications, such as Google Maps, which integrates common searches, such as restaurants and other points of interests, with maps and other location data for use online and through smartphones.

Based on the ideas of network effects and data gravity, to help SMEs create innovative products and services, expand employment, and compete with companies across the world, Southeast Asian countries should provide SMEs with better access to a broader range of data sourced from the public and the private sectors. Businesses can design improved AI-based products, applications, and services if they have access to more data.

Most ASEAN countries currently support opening up government-held data to the public. Open data is data that can be freely accessed, used, modified, and shared for any purpose. However, ASEAN member countries have experienced various levels of success in making government-held data available to all, as shown by their rankings in the Open Data Index, which range from Singapore (17 out of 94) to Myanmar (94) and include Thailand (51), Philippines (53), Indonesia (61), Cambodia (74) and Malaysia (87). The Open Data Index ranks all countries based on a composite score that takes into account the opening up of data on budgets, national statistics, procurement, national laws, land ownership, election results, and nine other areas (Open Knowledge Foundation 2017).

Regional initiative to help SMEs access data

In 2018, ASEAN adopted the ASEAN Framework on Digital Data Governance (Association of Southeast Asian Nations 2018). The Framework

establishes strategic priorities, principles, and initiatives to guide ASEAN Member States in their policy and regulatory approaches towards digital data governance (which includes personal and non-personal data). This is a crucial step, but ASEAN needs to provide more access to data, especially for SMEs.

ASEAN could adopt Europe's data sharing strategy. The European strategy for data sharing involves creating data spaces for nine key domains: manufacturing, environment, mobility, health, finance, energy, agriculture, public administration, and skills. A data space consists of three elements: (1) pooling public and private data; (2) infrastructure to store, analyze, and share data; and (3) the application of clearly defined governance mechanisms (European Commission 2020b). Additionally, the European Union established a Support Center for Data Sharing. The Center collects, develops, and disseminates tools and technical and legal expertise that supports data sharing between public and private entities (European Union 2020). ASEAN should emulate these initiatives and develop a strategy for expanding SME access to data to help them become more active players in the data economy.

Conclusion

In Southeast Asia, as in the rest of the world, there have been significant labor market disruptions because of the impacts of digitalization, automation, AI, and COVID-19. In the face of economic slowdowns, rising unemployment, and social discord, governments need to proactively introduce policies and initiatives that expand job opportunities and mitigate risks. Regional policies promise to prepare

for the labor market's uncertain future. The diverse perspectives provided by a regional approach help policymakers meet the challenges of labor market disruptions with creativity, dedication, and harmony.

It is essential that policymakers develop expertise to better anticipate and prepare for the future. Strategic futures thinking has become a crucial tool to confront a world marked by volatility, complexity, and ambiguity. Tools that leverage the power of AI, including horizon scanning and the collection and analysis of new data sources, can provide a deeper and more timely understanding of labor markets. These efforts will help modernize SMEs, which, in turn, expand employment opportunities and develop resilience against future shifts in the labor market.

ASEAN represents one of the most dynamic regions in the world, and it holds significant influence over the future of work across the globe. A proactive and enlightened approach, underscored by regional cooperation, will help propel ASEAN toward a successful future labor market, which provides critical support to the people in the region.

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Chapter

5

The Digital Silk Road and Southeast Asian Countries

Zhou Taidong and Xue Qi

Introduction

A vital component of Chinese President Xi's vision for Eurasian connectivity and cooperation is the emerging Digital Silk Road (DSR), which is the technological arm of the Belt and Road Initiative (BRI) (Xi 2014). Also known as the New Silk Road, the Chinese government announced the BRI in 2013 (Tow 2017). It includes a series of international economic development projects, primarily financed through low-interest loans from China's policy banks, state-owned banks, and sovereign wealth funds (Belt & Road News 2019). The BRI and its massive infrastructure projects in Southeast Asia (SEA),[23] such

23 Southeast Asia, a subregion of Asia, consists of 11 countries geographically located south of China, east of the Indian subcontinent, and north-west of Australia: Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, the Philippines, Singapore, Thailand, Timor-Leste, and Vietnam.

as the Kyaukpyu port in Myanmar, the East Coast Rail Link project in Malaysia, and the China-Lao PDR Railway, have drawn widespread attention, but China's involvement in the region's "hard" and "soft" digital infrastructure[24] and the implications of the DSR for regional economies have been given less interest. The DSR aims to supplement BRI terrestrial and undersea or submarine infrastructure by linking countries through fiber-optic cables, cellular towers, and widespread Internet and telecommunications connections. The DSR also comprises soft digital infrastructure projects, such as the promulgation of common technical standards among participating countries and associated investments in "smart-city" development, e-commerce platforms, cloud-computing services, artificial intelligence (AI), the Internet of Things (IOT), 5G cellular technologies, mobile-payment systems, and other digital-economy applications. Chinese technology companies have joined Chinese government efforts to shape region-wide standards, connect markets, and finance DSR projects. Chinese technology companies also play an important role in bolstering technology skills in some SEA countries and fostering connections between technology professionals and policymakers.

The DSR could have enormous economic, technological, and social implications, and it is likely to have far-reaching impacts on SEA economies and workers. This chapter discusses the cross-

24 Hard digital infrastructure includes transport and connectivity structures and facilities, such as optical fiber networks, satellites, cellular towers, and processing and storage facilities, such as data centers, cloud computing providers, and content delivery network providers. Soft digital infrastructure includes services and applications, such as building information systems (BIM), computer emergency response team (CERT), and technology services, such as fintech, digital identity, and e-platforms. Soft infrastructure also includes terminals and devices, such as sensors, smart grids, smart meters, cellphones, and computers (Asia Infrastructure Investment Bank 2020).

country, bi- and multi-lateral collaboration taking place between China, Chinese technology companies, and SEA countries under the DSR framework and the potential opportunities and challenges that rapid digitalization poses, especially regarding the future of work. Despite the fact that the DSR is in its early stages and limited in size and scope, the DSR will likely reduce the number of low-skill jobs as it creates new or altered jobs that require new digital skills, specifically jobs in the technology sector, virtual reality design and development field, and in the newly developed online "gig" platform-labor market. Consequently, China and participating countries must develop a DSR economic and social policy roadmap to bridge the region's digital divides and mitigate tensions that will likely arise between the adoption of digital technologies and the displacement of less digitally-literate workers. The first section of this chapter outlines the current state of the digital economy in the region. The second section describes the genesis of the DSR and provides an overview of DSR cooperation between China, Chinese companies, and SEA countries. The third section describes how the DSR connectivity facilitates digital applications, trade, and financial integration across the region. The final section discusses China's opportunities to create closer ties with its neighbors through Chinese technology companies' social responsibility, policy, and outreach initiatives. The conclusion highlights challenges presented by the DSR and recommends how China, Chinese companies, and SEA countries can jointly improve SEA workforces through the DSR, including through the enhancement of human capital across the region.

A snapshot of the digital economy in Southeast Asia

The "digital economy" refers to economic activities that use digitalized information and knowledge as key factors of production, transnational data networks, and information and communication technology (ICT) to drive efficient and optimized economies (G20China.org 2016a). With 640 million consumers, a growing middle class, and deepening smartphone penetration, the digitalization of SEA economies presents huge opportunities for technology and ancillary companies. The number of SEA Internet users has tripled over the past five years, from 127 million in 2011 to 390 million by the end of 2017 (World Bank 2019a), amounting to half of the population in the region.

Beyond the breadth of Internet connectivity, digitalization has transformed business practices and shaped consumer habits. In the Philippines, Indonesia, and Malaysia, those who were connected to the Internet via their mobile phones in 2019 spent an average of four hours per day online. Thai mobile phone users reached five hours and 13 minutes of Internet use per day. The global average is roughly three hours daily (Google et al. 2020). Online activities have generated billions of dollars. The gross value of the Internet economy in SEA, including online travel, e-commerce, online media, and ride-hailing services, accounted for 3.7 percent of 2019 GDP and is expected to rise to 8 percent by 2025 (Google et al. 2020). A recent study estimates that digitalization will contribute to USD 1 trillion of GDP to Association of Southeast Asian Nations (ASEAN) member-countries by 2025, which is a 20-30 percent increase over the region's current output (Kearney 2019). The total gross merchandise value of e-commerce sales in the region is expected to rise from USD 20.5 billion in 2017 to USD 65.5 billion in 2021 (Cadell & Aravindan 2018).

All Southeast Asian countries, except Cambodia and Timor-Leste, have formulated stand-alone national digital connectivity broadband plans. All but four countries have also issued national ICT and/or digital strategies with targets and agendas in their national policies. Table 5.1 provides a glimpse of the principal digital policy frameworks in the region.

However, significant differences divide SEA countries' ability to exploit the digital economy, and the region has not yet been able

Table 5.1 SEA National Broadband Plans and ICT/Digital Agendas

Country	National Broadband Plan	Development/ICT/Digital Strategy
Brunei Darussalam	National Broadband Policy (2014-2017)	Digital Government Strategy (2016-2020)
Cambodia	N/A	Telecommunication and ICT Development Policy (2016-2020)
Indonesia	Indonesia Broadband Plan (2014-2019)	N/A
Lao PDR	Draft of National Broadband Plan (2015-2025)	N/A
Malaysia	National Fiberization and Connectivity Plan (2019-2023)	11th Malaysia Development Plan (2016-2020)
Myanmar	Telecommunications Masterplan (2017-2020)	N/A
Philippines	National Broadband Plan (2017-2020)	N/A
Singapore	Next Gen NBN (2015-2025)	Smart Nation (2014-2020)
Thailand	National Broadband Policy (2014-2020)	National Digital Economy Policy and Plan (2016-2020)
Timor-Leste	N/A	National Policy for ICT (2017-2019)
Vietnam	Development of Broadband Telecommunications Infrastructure through 2020 Wireless Broadband Master Plan (2016)	Strategy on ICT Development till 2010 and Orientations toward 2020

Source: Organization for Economic Cooperation and Development (2019); United Nations Economic and Social Commission for Asia and the Pacific (2019)

to create a digital equivalent of the ASEAN Economic Community. Among ASEAN countries, Singapore stands out as the global leader in digital development, ranking top in numerous indicators, such as digital readiness, 4G speed, and economic innovation (Infocomm Media Development Authority 2020). Singapore's Development/ICT/Digital strategy, The Smart Nation Initiative, is a comprehensive national plan to transform Singapore's digital government (using data, connectivity, and computing to serve citizens and businesses and to enable public officers to work more efficiently), digital economy (digitalizing industries to increase business efficacy and create new jobs and opportunities), and digital society (ensuring inclusive access to technology and equipping people with the skills and knowledge to use technology) (Govtech 2019).

Furthermore, while the digital economy in the SEA region has seen an average growth rate of 33 percent annually since 2015, Indonesia and Vietnam have seen the fastest growth. With both the largest and quickest growing digital economy in the region, Indonesia has more than quadrupled its digital economy since 2015, growing an average of 49 percent annually (Google et al. 2020, p.18). Vietnam's digital economy reached USD 12 billion in 2019 after growing 38 percent annually since 2015 (Google et al. 2020, p.18). Vietnam is emerging as the most digital economy in the region; it intends to increase the digital share of its GDP to 20 percent by 2025 and 30 percent by 2030 (Dione 2020). Other SEA countries, including Malaysia, the Philippines, and Thailand, also outperform many other countries across the globe, with annual digital-economy growth rates averaging between 20 and 30 percent since 2015 (Google et al. 2020).

Obstacles to a common digital market and economic growth, such as a lack of digital skills and broadband Internet access, must be overcome by suitable policies and adequate financing. Notably,

in Malaysia, one of the high-performing countries, the Ministry of Education in 2017 integrated coding and other digital skills into national primary and secondary school curricula. This focus on digital skills manifests in computer-science classes and in teaching pedagogy, especially in science and math classes. The Malaysian education ministry also hopes to introduce courses on AI, robotics, and computer programming (Aizyl 2016; Sharon 2019).

However, before learning to code, populations need to have access to ICT; inadequate Internet connectivity currently constitutes a barrier to digital transformation in many SEA countries. Although Internet-access infrastructure has increased dramatically and covers half the population, rural and remote areas are more likely to lack connectivity infrastructure, such as fixed lines, fiber optic cables, and cellular or satellite coverage (Facebook 2016). For example, Lao PDR and Myanmar have the fewest urban residents in SEA, accounting for 35 percent and 30.58 percent, respectively, in their total populations (Statista 2019). Compared to their counterparts in the region, Lao PDR and Myanmar perform least well in terms of digital connections when measured by, for example, fixed telephone and broadband coverage per 100 inhabitants or Internet coverage for households that own a computer (International Telecommunication Union 2018). This indicates that workers in these and other agriculture-dominated regions might have less access to digitalized labor markets.

Geographical divides impede SEA from integrating into a common digital market for investments, goods, or labor. Although the region has "the most engaged mobile Internet users in the world," each country's capacity to compete in the digital economy varies greatly in terms of technology, people, governance, and impact (Google et al. 2020). According to the 2019 Network Readiness Index, which

measures how well countries exploit ICT to boost competitiveness and well-being, Singapore led all SEA and most other countries, ranking second globally, and Malaysia followed, ranking third. In the second tier of SEA countries, Thailand (56th) slightly outperformed Vietnam (63rd) and Indonesia (76th), while Cambodia (107th), Lao PDR (108th) and Myanmar (138th) ranked at the bottom of the global and SEA list (World Economic Forum 2019).

Geographic divides also appear in terms of each SEA country's attractiveness for private sector investment. The majority of e-commerce investment, dominated by Internet-based retail platforms, such as online travel, online media, business-to-consumer (B2C) retail e-commerce, and ride-hailing, went to firms based in Singapore and Indonesia; they attracted 58 percent and 34 percent of recent investment deals, respectively, while Malaysia, Thailand, and Vietnam collectively captured less than 10 percent of the investment flow (World Bank 2019a, p.30). Overcoming these divides and creating a common digital market requires ubiquitous Internet and affordable digital tools, additional seamless cross-border payment options, and consistent digital regulations across the region's countries (Hoppe, May & Lin 2018).

Universal Internet access and affordable ICT devices and applications alone will not allow SEA to realize the full extent of the digital economy's added value unless the population is equipped with adequate digital skills. Although SEA citizens enjoy a generally high standard of education, with the exception of countries like Malaysia, the teaching of digital skills and other "soft skills," such as interpersonal communication and cooperation, remains limited and insufficiently diffused, especially given the levels needed to respond to rapid digital changes. The World Bank's Human Capital Index, which quantifies the potential contribution of an individual's human capital — the health, resilience,

knowledge, and skills he or she can expect to accumulate during the first 18 years of life — to their productivity as workers, shows tremendous variations among SEA countries (Table 5.2).

Correspondingly, more than 40 percent of small-and-medium sized enterprises (SMEs) in the region see gaps in workforce digital skills (Hoppe, May & Lin 2018). Furthermore, in Cambodia, Lao PDR, and Malaysia, where ITC access and use lags, or in fast-growing digital economies like the Philippines and Vietnam, more than half of all firms report shortages of workers with specific socio-behavioral skills, such as a commitment to work (World Bank 2019b). This means that some lagging countries, such as Cambodia, will find it hard to capture

Table 5.2 Human Capital Index Ranking of SEA Countries and China

World Rank	Economy	HCI Score*
1	Singapore	0.88
46	China	0.67
48	Vietnam	0.67
55	Malaysia	0.62
65	Thailand	0.60
84	Philippines	0.55
87	Indonesia	0.53
100	Cambodia	0.49
107	Myanmar	0.47
111	Lao PDR	0.45

* The HCI score ranges between 0 and 1. A country in which a child born today can expect to achieve both full health (no stunting and 100 percent adult survival) and full education potential (14 years of high-quality school by age 18) will score a value of 1 on the index. If a country has a score of 0.50, then the gross domestic product (GDP) per worker could be twice as high if the country reached the benchmark of complete education and full health.

Source: World Bank (2019b)

a large share of the digital economy's value added and will have more difficulty integrating into a common digital market. It also means that almost all SEA countries' labor markets remain unprepared to absorb the potentially destabilizing impact of new technologies due to insufficiently digital education systems and limited opportunities for workers to improve their skills (The Asia Foundation 2020).

The Digital Silk Road and its development in SEA

The DSR conceptualization began in March 2015, when the Chinese government published *Vision and Actions on Jointly Building Silk Road Economic Belt and 21st-Century Maritime Silk Road* (National Development and Reform Commission et al. 2015). In this document, China proposed an Information Silk Road to spur the construction of cross-border fiber-optic cables, other communications trunks, and satellite networks that would improve international communications connectivity. The proposed agenda for what would later become known as the Digital Silk Road included strengthening Internet infrastructure, deepening space cooperation, and developing common technology standards. China's President Xi Jinping emphasized what he then termed the "Silk Road Economic Belt and the 21st Century Maritime Silk Road" during his speech at the 2015 Hangzhou G20 Summit, where the Group of 20 members agreed that the digital economy had great potential for delivering positive development outcomes (G20China.org 2016b). China's 13th Five Year Plan included a section on improving Internet and telecommunications links across BRI countries; the Plan included the construction of terrestrial and submarine cables and the creation of a China-ASEAN "Information

Harbor" (National Development and Reform Commission 2016). The moniker "Digital Silk Road," first coined at the first BRI Forum, was picked up at other China-hosted international conferences, such as the second BRI Forum and the 4th and the 5th World Internet Conference at Wuzhen, China (Xi 2017). These events helped bring the DSR concept into the mainstream and gain buy-in from companies and interested countries along the BRI.

The Chinese government played a pivotal role in forming the DSR initiative and Chinese technology companies have played the major role in shaping its contours. The great achievements of the digital economy in China, which accounted for 34.8 percent of the country's GDP in 2018, inspired the Chinese government to promote international cooperation in this field (China Daily 2019). As the world's second largest digital economy after the United States, China benefited greatly from its advanced digital infrastructure during its own rise, especially the development of inland and impoverished regions (Turvey & Xiong 2017). As is the case for traditional sectors, the maturation of China's domestic digital economy resulted in stiffer competition, and many Chinese companies will likely see a declining market share in domestic demand in the future. Therefore, China-based ICT companies see the DSR as an opportunity to seek financial and political support from the Chinese government to enter new markets in order to continue their sales and profit growth. They have a strong interest in pushing forward the DSR agenda to secure access to untapped markets abroad. Moreover, in contrast with the BRI's large-scale physical infrastructure, which China and partner countries tend to find expensive, long-term, and disruptive, DSR projects remain feasible in a resource-constrained environment because they are lower cost, easier to deliver, and more environmentally-friendly. As a result,

the less risky DSR projects attract majority financing from Chinese private sector ICT companies. Additionally, SEA countries have a strong demand and large potential for improved digital infrastructure, including digital economy support, Internet connectivity expansion, and geographical divides reduction. Since its conception, the DSR has gained great momentum in terms of the BRI's five pillars: policy coordination, infrastructure connectivity, unimpeded trade, financial integration, and people-to-people bonds.

DSR bi- and multi-lateral policy coordination

To facilitate policy coordination regarding the DSR, China and SEA partner countries, in consultation with ICT companies, are working on multilateral, regional, and bilateral cooperation mechanisms through meetings, memorandum of understandings (MoU), and advocating for a shared digital framework. In 2014, China's Ministry of Industry and Information Technology (MIIT) promulgated the Infrastructure Construction Plan for Neighboring Countries, which proposed standards for information highways between China and SEA (The State Council Information Office 2015). In 2016, the Chinese central government approved The Construction Plan of China-ASEAN Information Harbor, followed in 2019 by The Masterplan of China-ASEAN Information Harbor (China-ASEAN Free Trade Area 2019). The Information Harbor aims to become a pivotal hub that enhances SEA's Internet network and information interconnection and includes five cooperation platforms that mirror the BRI's five pillars (China-ASEAN Free Trade Area 2019).

Recently, the DSR has almost been completely mainstreamed

into ASEAN-China dialogues. At an ASEAN-China Foreign Ministers' Meeting in July 2019, the participants discussed and agreed that digital economy cooperation should be a new focus for both China and ASEAN. At the subsequent 22nd ASEAN-China Summit, China and ASEAN discussed issues affecting standards, key fields of application, and integrated solutions for smart city[25] technologies (Xinhua 2019). The ongoing China-ASEAN Strategic Partnership Vision 2030 also prioritized digital connectivity (China-ASEAN Free Trade Area 2019).

Additionally, China led bilateral initiatives for coordination and cooperation on taxation, goods inspection and quarantine, logistics, network security, and data storage and transmission (Ministry of Commerce 2019). China and Cambodia signed an MoU on advancing the DSR across Cambodia (Cyberspace Administration of China 2019). China and Thailand established a Ministerial-level Dialogue for Digital Economic Cooperation; its first meeting occurred in March 2019 to discuss smart cities, 5G technology, Internet security, and AI (Ministry of Commerce 2019). China and Myanmar held an initial science and technology cooperation meeting in Yangon in late 2018, where the two countries established a joint radar and satellite communications laboratory. China also signed MoUs with multiple ASEAN member states, including Vietnam, Cambodia, and Malaysia, to facilitate cross-border e-commerce cooperation. As a pan-regional effort, in May 2018 in Jakarta, China hosted The Silk Road E-commerce Cooperation Dialogues with ASEAN countries.

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25 A "smart city" usually refers to a municipality that uses ICT and data analysis to increase operational efficiency, share information with the public, and improve the quality of government services and citizen welfare. Smart city industries include traffic management, energy efficiency, and pollution prevention and control, etc.

Currently, however, policy coordination largely occurs bilaterally and regionally at the national-government level, and private sector involvement and input remains limited. Many transnational companies still encounter significant obstacles when navigating foreign business ecosystems in the digital age, from the difficulty of starting a business to complying with digital regulations. In the future, governments committed to the DSR should encourage more dialogues and knowledge-sharing about what companies need to perform digital business.

Expanding DSR connectivity

The DSR prioritizes hard infrastructure such as cables and communication networks, but also soft infrastructure such as AI-enabled traffic-management solutions, drawing on the expertise and financing of the Chinese government and technology giants.

The Chinese government has financed and launched several notable cross-border and multilateral hard digital infrastructure projects under the DSR. China facilitated the construction of more than 30 cross-border land cables and over ten international submarine cables (The Economist Corporate Network 2019). The government contracted Huawei Marine to complete over a dozen undersea cable projects, with 20 more projects ongoing in SEA (Harding 2019). These submarine cable projects, located in the Philippines and Indonesia, aim to integrate these geographically divided islands through enhanced digital connections. A China-Myanmar cross-border fiber-optic cable for data transmission projects has also achieved significant progress (Office of the Leading Group for the BRI 2019). Although lagging behind China's public and private sector spending on BRI energy projects, total Chinese foreign direct investment

(FDI) and loans from the public sector for the DSR have grown quickly (Eder, Rebecca & Jacob 2019). From 2013-2017, Chinese overseas direct investment (ODI) flows to ASEAN for data transmission, software, and information-technology services registered an average annual growth of 70 percent (Ministry of Commerce 2019).

Private Chinese companies, such as Huawei, Alibaba, and SenseTime, are spearheading the construction of ICT infrastructure and laying out business hubs across SEA. In Thailand, in 2017, Huawei, which manufactures telecommunications equipment and smartphones, established an OpenLab (its seventh one) at its regional headquarters in Bangkok as part of the "Thailand 4.0" initiative.[26] The OpenLab offers data-center resources for the IOT, Big Data, and cloud computing, plus an open platform to help test solutions and accelerate innovations, and provides ICT training services for customers and independent entrepreneurs in Thailand and SEA (The Nation Thailand 2017). Huawei also launched the first 5G testbed in Thailand in February 2020. Additionally, the company and other China-based ICT firms, such as Alibaba, JD.com, and Tencent, expressed a strong interest in investing in the Eastern Economic Corridor (EEC), a flagship megaproject of the Thai government that aims to turn most of the land in the Chachoengsao, Chon Buri, and Rayong Provinces into industrial zones for technological manufacturing and services (Dunseith 2018).

Alibaba Holding Ltd., a Chinese multinational technology company

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26 Thailand 4.0 is an economic model that attempts to transform the country from several economic challenges from past economic development models which emphasize agriculture (Thailand 1.0), light industry (Thailand 2.0), and advanced industry (Thailand 3.0), including "a middle income trap," "an inequality trap," and "an imbalanced trap." Thailand 4.0 intends to overcome these traps through the use of "new growth engines" (CEBIT 2020)

specializing in e-commerce, retail, and the Internet, has brought its leading-edge smart city know-how to Malaysia. Kuala Lumpur has become the first city outside of China to adopt AliCloud's smart city system, which is an integrated AI-enabled system that utilizes Alibaba's Apsara cloud-computing platform (AliCloud) to conduct real-time data collection and integration of traffic and emergency-response data from hundreds of traffic cameras and other sources. It aims to improve the efficiency of traffic flow and influences traffic-signal timing to allow for emergency vehicle passage (Szewcow & Andrews 2018). The Malaysian government plans to implement this system in other cities in the country. Huawei is also involved in developing smart city technologies and building ICT infrastructure in Malaysia; the company has signed MoUs with the Malaysian government and the Sabah State government to develop smart city solutions (Huawei 2016; Huawei 2017; Bernama 2017).

SenseTime, a Chinese AI company and "unicorn,"[27] is supporting the country's first AI industrial park with total investment of approximately USD 1 billion. SenseTime will help Malaysian technology companies to develop robots and speech-recognition systems and to foster technology talent. The park is being jointly built by G3 Global, a Malaysian tech company, and China Harbor Engineering Company, an engineering contractor and subsidiary of China Communications Construction Company (CCCC) (Wang & Lahiri 2019).

There are similar projects across the region. Myanmar's Ministry of Transport and Communications has been working with Huawei to develop 5G broadband services since 2018 (Gong, Gu. & Teng 2019). Huawei has also launched its Cloud and AI Innovation Lab in April

27 A unicorn refers to a privately held startup company valued at over USD 1 billion.

2019 in Singapore as part of Singapore's Smart Nation Strategy (Huawei 2019). Alibaba's AliCloud is involved in Singapore, providing data analysis of the EZ-Link Card, a contactless multi-purpose stored value card introduced for transit payments on public bases and on the mass rapid transit (MRT) networks (McSpadden 2017). Alibaba also has 22 data centers located outside of China, including one in Indonesia (Alibaba Cloud 2020). Notably, AliCloud does not always build its own facilities in foreign countries, preferring to collocate via partnerships with local data-center operators.

It is highly likely that Chinese technology firms' presence in the SEA region will continue to grow, and with it the amount of Chinese-built smart-cities infrastructure, 5G networks, and cross-border terrestrial and submarine cables. Overall, infrastructure connectivity under the DSR helps address gaps in access to ubiquitous Internet and affordable digital tools as well as technological innovations. This will likely encourage more SEA business entrepreneurs to begin or expand companies, creating more job opportunities, especially for young people, and should help SEA countries gain more value from the digital economy, drawing them closer to a common digital market.

Unimpeded DSR trade

Greater digital connectivity also means links within and between SEA and other BRI economies and the Chinese market. In addition to investing in network infrastructure or smart-city sensors, Alibaba and Huawei have also invested substantially in SEA startups to develop e-commerce while other Chinese companies invest in digital and physical logistics and telecommunications infrastructure and operations.

Alibaba has thrived by bringing companies into the digital world and trade. It has helped foreign companies, particularly SMEs, to tap into the vast Chinese domestic market (AliResearch 2019). Malaysia was the first country to host the Electronic World Trade Platform (eWTP), rolled out by Alibaba to help SMEs take part in global trade (Brennan 2017). The eWTP's Malaysian hub hosted 2,600 Malaysian SMEs in March 2018 and was estimated to have created 60,000 jobs and contributed billions of USD revenues in trade (Gong, Gu. & Teng 2019; Seoane 2020). Alibaba also established a smart digital hub in Thailand's EEC as an important platform to help SMEs achieve digital transformation, facilitate trade in goods and tourism, and train e-commerce talents. In February 2019, Thailand's EEC Office established agreements with Alibaba to use e-commerce and digital technology to promote Thai products to Chinese customers (Eastern Economic Corridor 2019). Even before that, a critical Chinese network for smart logistics controlled by Alibaba established a fast track for fresh agricultural products, including durian, to reach China from Thailand's production bases within 120 hours (Fu 2018). Furthermore, Alibaba introduced the Taobao Village Model[28] in Thailand to tackle poverty and raise community income via e-commerce and digital technology; the Thai government is in the process of implementing the model (Arunmas 2018).

Alibaba's AliCloud has also created private-sector synergies with its Singaporean public-transit EZ-Link card by providing timely information on card usage patterns to more than 50,000 SMEs in

28 The Taobao Village Model refers to rural e-commerce hubs that feature Alibaba's logistics, service, and training to encourage farmers to engage in online sales of farm produce and local specialties.

Singapore. Since 2016, Alibaba has been the largest shareholder in Lazada, a leading e-commerce platform in SEA that provides logistics, online-retailing and payment services for more than 400,000 SMEs in Indonesia, Malaysia, Philippines, Singapore, Thailand, and Vietnam; it more than doubled its business in 2018 (Cadell & Aravindan 2018). Alibaba also led a USD 1.1 billion investment in the Indonesian e-commerce firm, Tokopedia, in 2018 (Russell 2018).

Other Chinese technology companies have also made significant investments in SEA platform, logistics, and communications companies. Didi Chuxing, a Chinese ride-hailing platform, and Softbank, a Japanese multinational conglomerate holding company, invested USD 2 billion in the Grab ride-hailing platform in 2017. Tencent Holdings, a Chinese multinational technology company engaged in Internet-related services and products, and JD.com, China's leading transnational retail e-commerce and logistic platform, along with Google, an American multinational search and other services provider, led a new USD 1 billion investment round in Indonesia's Go-Jek ride-hailing firm in early 2019. JD.com has also built a logistics network in Indonesia for Indonesian companies and those on the JD.com platform and invested in Vietnamese online retailer Tiki.vn. In the telecommunications sector, China Mobile Communications Corporation, China Unicom, and China Telecom invested approximately USD 800 million in overseas markets and started business operations in many countries and regions, including Thailand and Singapore (China News Agency 2017). By facilitating cross-border trade and logistics, DSR-related investments and expansions by Chinese companies contribute to the SEA gig economy and the steady increase of trade between China and ASEAN member states.

DSR financial integration

High level e-payment systems penetration can greatly reduce the transaction costs and risks of digital business. Online payments account for roughly 3 percent of consumer expenditure in ASEAN, whereas digital payments account for up to 30 percent in China (Hoppe, May & Lin 2018). Given their experience with online and mobile payment systems, Chinese companies also promote their payment systems in SEA.

Alibaba has led major investments in payment companies in SEA. Its Ant Financial subsidiary, a financial technology (fintech) firm that runs China's dominant digital payment platform, targets investments in banks, insurance, and payment systems and has taken a share of foreign fintech markets through mergers, acquisitions, and partnerships (Harding 2019). For example, Ant Financial invested in Thailand's Ascend Money, a subsidiary of Thai conglomerate Charoen Pokphand, which offers e-payment services and micro-loans (Saheli 2016). Ant Financial and Emtek, an Indonesia media and diversified digital company, set up a joint venture to launch a new mobile platform for payment and other financial services (Digital News Asia 2017). In the Philippines, PayMaya, an online payment application, also received USD 120 million investment from the World Bank's private sector arm, International Finance Cooperation (IFC), the IFC Emerging Asia Fund, and Tencent Holdings in order to expand its online and mobile financial services (Ministry of Commerce 2019).

WeChat, a Chinese multi-purpose messaging, social media and mobile payment app developed by the Tencent company, is also being adopted in SEA countries. WeChat's payment system is widely used by small businesses and larger traders for domestic and international

bank transfers and credit and debit card transactions. In Myanmar, WeChat has helped establish relationships between suppliers and buyers and has proved particularly popular with people who trade agricultural products and natural resources (Oreglia 2019).

DSR promotes people-to-people bonds

Chinese companies implementing aspects of the DSR also help build connections between Chinese and other peoples through exchange programs and talent training schemes. Given their economic influence and attraction, many Chinese companies fulfill their corporate social responsibility aims by offering free talent training programs to regional youth to connect with the next generation of entrepreneurs. Alibaba has channeled its business operations experience in the Chinese market into its work throughout SEA, helping young businesses to grow and expand. In 2018, 30 Malaysian college-age students selected by the Malaysia Ministry of High Education participated in an Alibaba-sponsored Youth E-commerce Program to meet with business unit leaders at Alibaba to understand innovative strategies (Hsu 2018). Alibaba also held a "Train the Trainers" course for business college professors in Malaysia on the latest innovations and best business practices in online retail. As part of its foreign-government outreach efforts, Alibaba invited ministerial-level officials from the SEA to the company's Hangzhou headquarters to discuss how to craft sound digital policies to better accommodate and navigate the growth of e-commerce in their respective countries (Hsu 2018). Alibaba also joined with the United Nations Conference on Trade and Development (UNCTAD) to create the eFounders Fellowship, which

aims to support 1,000 entrepreneurs in developing countries and facilitates sharing first-hand experiences about the transformative impact of e-commerce and technology. The eFounders Fellowship includes a two-week stay at the Alibaba Business School campus with site visits, providing essential opportunities for the "champions for the new economy" (Alibaba 2020).

Similarly, since 2012, Huawei has established training centers abroad for young talents in the telecommunications industry. Starting in 2011, its Seeds for the Future program has invited more than 30,000 engineering students selected from over 108 countries for training in China in the telecommunication sector and in Huawei's operations (Gong, Gu. & Teng 2019). By the end of March 2018, more than 40,000 technicians and experts from SEA have participated in the program (Fu 2018).

Conclusion

The DSR has the potential to enhance connectivity and complement physical infrastructure throughout Southeast Asia. The growing acceptance of the DSR by SEA countries illustrates its potential to increase productivity and improve the delivery of public services. Alibaba's and Tencent's involvement in the ASEAN market empowers smaller e-commerce players through technological transfers, partnerships, investments, logistics value-chain integration, and e-payment systems. Smart-city programs will provide future-proofing, resilience-building, and better governance to the region's growing urban centers, especially to those at risk of overpopulation and climate change. The COVID-19 pandemic may further reinforce these trends. In fighting and containing COVID-19 and through work

resumption, China and many other countries have widely used digital technology, particularly Big Data-enabled cloud computing systems. The relative success in using AI and other technologies to identify and monitor virus carriers propels interest in deploying these and other technologies across SEA, especially in countries such as Thailand and Malaysia, where smart city initiatives are ongoing and China's technology companies are already heavily involved. The sudden dependence of so many on the ability to work remotely indicates that an inclusive expansion of Wi-Fi, broadband, and other hard and soft infrastructure is necessary to accelerate digitalized economic activity and increase employment. Therefore, SEA companies will likely express an interest in deeper and broader collaboration with Chinese technology companies around their proven technologies and business implementation models.

Although it is in early stages, limited in size and scope, and hard to quantify, the DSR has the potential to have a strong impact on the future of work in the region. For example, jobs are directly created in the technology sector because e-commerce, e-payments, and other digital operations need workers to create online interfaces and mobile applications. The DSR also facilitates the creation of jobs in virtual reality and other technology-driven design and industrial fields, while also facilitating online labor platforms and the gig labor market. More widespread access to affordable digital infrastructure will provide an enabling environment in which on-demand and other services can thrive. Additionally, by increasing proximity to markets, especially to the massive Chinese market, DSR infrastructure facilitates the creation of new and efficient value chains by creating new channels and modes for global trade and reducing cross-border logistics friction. Broad-based economic growth and employment are made

possible by the shift to digital trade for the private sector, especially for SMEs, where they can better compete and operate in niche markets (Association of Southeast Asian Nations 2020).

Nevertheless, this positive economic trajectory is not guaranteed; without properly designed policies, the forces of change could lead in the opposite direction or increase income inequality. The same efficiency gains offered by the DSR threaten to further displace workers and exacerbate inequality between high-skilled and low-skilled workers. The digital work generated by new technologies requires Internet access and is subject to education and skill biases; this may disadvantage less connected, less digitally literate, and less educated workers, often located in rural or impoverished areas (World Bank 2016; Chang & Huynh 2016). While proponents of the DSR are committed to improving digital infrastructure connectivity, participating countries will need to create a roadmap to deal with tensions between uneven technology adoption and the introduction of digital technologies in the workplace.

Many future jobs will look different from today's occupations and require specific skills, and it is important for the public and private sectors participating in the DSR to put more emphasis on human capital to address gaps in the region's educational and skilling programs. This requires the governments cooperating under the DSR and BRI to shift the policy agenda from "hardware" to "human-ware," making substantial investments in human capital and enhancing digital skills for the next generation workers (Ben et al. 2017). In addition to sharing and enabling new technologies, China can also share its experience and practices in enhancing upskilling resources for the labor force and in improving availability and accessibility of on-the-job training. Public-private partnerships should also be leveraged to

facilitate technology transfers and training, as shown by the efforts of Alibaba. Participating DSR governments and companies should also pay more attention to making access to the Internet more affordable for people who remain unconnected because they lack means. If all these recommendations can be achieved and expanded, it is possible that the DSR will be able to play a role in addressing the issue of a lack of skilled digital workers and reduce tensions between those who can take advantage of the economy's digitalization and those who cannot.

The increase of DSR activities will also bring more frequent cross-border data flows, posing new policy challenges in the fields of privacy, security, competition, and taxation. This requires collaboration between the Chinese government and SEA governments in terms of legislation concerning cross-border data transfers, dispute settlement mechanisms, risk warnings and network security, and the unification of technical standards. National and transnational regulations, tax laws, and consumer-protection laws are also necessary to keep governments and private firms in check in order to build mutual trust and share benefits, thus ensuring sustainable digital economies (World Bank 2019a). Despite these challenges, the DSR framework promises significant positive impacts for the future of work in SEA, particularly through the promotion of technologically advanced fields, and, ultimately, hopes to work toward improved international cooperation between China and SEA countries.

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Chapter

6

The Role of APEC in the Asia-Pacific Region's Fourth Industrial Revolution

Benjamin Lokshin

New technologies that emerge from the Fourth Industrial Revolution (4IR) create new opportunities for businesses and new challenges for workers and governments. As the Asia-Pacific region adapts to a digitalized economy with new stakeholders, business models, and skillsets demanded of workers, multilateral institutions will have an important role to play in supporting open, multi-faceted dialogues on 4IR challenges. This chapter discusses the opportunities for one particular economic and trade forum, the Asia-Pacific Economic Cooperation (APEC), to help Asia-Pacific economies capitalize on emerging technologies, devise effective labor regulations, and navigate their shifts toward a new industrial paradigm.

The 4IR will both positively and negatively affect Asia-Pacific

economies.[29] The region is already home to growing communities of technology entrepreneurs, startups, and venture capital investors. These emerging ecosystems contribute to growth in high value-added industries, which utilize innovative processes to drive competitiveness and generate higher economic returns. Harnessing the 4IR's potential, however, requires Asia-Pacific governments to develop new ways of working to ensure that regional economic and trade policy frameworks do not fall out of step. Without effective regional fora for sharing knowledge and experience, the rapid pace of technological advances and accompanying evolution of new business models make it difficult for the public sector to engage in timely, responsive, and forward-facing policy making.

Comprising 21 member economies in the Pacific Rim that make up about half of the global GDP, APEC has provided an important space for regional dialogue on economic issues since 1989. APEC's focus on economic issues and its history of bridging divides between policy and business communities make it well placed to support the region's adaptation to the challenges brought about by new technologies and business models. To date, APEC has responded to the 4IR by creating new inter-governmental working groups, including the Digital Economy Steering Group, research programs, capacity building workshops, and guidelines for member economies. Building on this

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29 In this chapter, "Asia-Pacific economies" refers specifically to APEC's 21 member economies: Australia, Brunei Darussalam, Canada, Chile, the People's Republic of China, Hong Kong, Indonesia, Japan, Republic of Korea, Malaysia, Mexico, New Zealand, Papua New Guinea, Peru, the Philippines, the Russian Federation, Singapore, Chinese Taipei, Thailand, the United States of America, and Vietnam. However, the spillover effects of the region's economic activities are large, and impact other economies, including those in the Pacific Islands and South Asia.

foundation, governments and institutions can act collaboratively within the APEC multilateral framework to develop new proposals that leverage data-driven indicators to track labor and skills needs, facilitate engagement with diverse stakeholders from the region's startup ecosystems, and advance labor-policy harmonization. These iterative processes can help member economies sharpen the impact of local initiatives to assist workers and make their 4IR industries more inclusive, efficient, and globally competitive.

The first section of this paper reviews how 4IR technologies have disrupted the labor market, especially how the swift advancement of these technologies may cause jobs to be redefined and skill requirements to shift. The second section describes a regional approach to 4IR transformations that can better prepare APEC member economies for the future through capacity building initiatives that break down the complexity of new technological advances, engaging new stakeholders that can pave the way for future innovations, and promoting regional policy reform.

Understanding the Fourth Industrial Revolution

The emergence of new 4IR technologies—including new applications of artificial intelligence (AI)—that are far more powerful and flexible than earlier forms of mechanical automation, has generated significant public anxiety. Although technological advances during prior industrial revolutions were significant, they did not invite the same comparisons between the machine and the human mind as AI does. For example, since many current AI systems are designed to simulate human thinking, modern computing systems now have the human-like abilities

to understand written or spoken language, autonomously navigate unfamiliar surroundings, and create new text (Radford et al. 2019).[30]

Some observers worry that the pace of these technological changes and their dramatic effects on the workplace will pose a critical challenge to governments and societies (Acemoglu & Restrepo 2019a). One specific fear surrounds job loss due to automation, particularly AI-enabled technology that allows hardware or software to perform tasks with little to no human intervention. It is estimated that, by 2028, 4IR-led productivity increases will allow industries in Cambodia, Indonesia, the Philippines, Singapore, Thailand, and Vietnam to reach the same level of productivity experienced in 2018 with 28 million fewer workers (Oxford Economics & Cisco 2018). Globally, McKinsey predicts that between 75 million and 375 million workers will need to switch occupations by 2030 because of automation, and a majority of workers will need to adapt to new job requirements demanded by automation (McKinsey Global Institute 2017).

Because of the versatility of AI and new data collection technologies, which together enable the automation of a vast range of different tasks, the impacts of technology on specific jobs and industries are hard to predict. Every job will be affected to some degree, but experts debate whether 4IR automation and AI will lead to large-scale job losses, or whether the increased efficiency and lowered costs will stimulate

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30 For example, conversational AI systems process users' inquiries through text and voice interfaces and respond in a human-like way. This technology is used in many online customer support systems and in virtual personal assistants, like Amazon's Alexa. Autonomous vehicles also use AI to process data from an array of sensors and navigate their surroundings with minimal (or zero) human input. Several companies have already created partially or fully autonomous vehicles, but it is unclear when these products will be safe and reliable enough to bring to the mass market.

the economy and create benefits for workers and consumers. For example, the World Economic Forum predicts that, while automation will displace 75 million jobs by 2022, it will also create 133 million new roles for workers—a finding that echoes broader historical arguments about the tendency of technological advancement to generate long-run gains in employment and living standards (World Economic Forum 2018). On the other hand, some economists find evidence that the nature of recent technological change and industrial automation may be contributing to slowdowns in overall employment growth and is driving troubling changes in labor markets, including the disproportionate loss of middle-income jobs that require routine skills, such as clerical work (Goos & Manning 2007; Acemoglu & Restrepo 2019b).

Balancing innovation and productivity growth against the protection of workers' jobs and livelihoods is especially pertinent for economies that have recently risen to middle-income status on the back of labor-intensive industries that are now facing drastic change as a result of technological adoption (Lee et al 2019). Fortunately, human operators remain in demand at even the most heavily automated modern factories, and the likelihood that all industry will eventually transition to robots in some form or another is exceedingly low (Weber 2019). One of the most thorough task-based studies of the application of machine learning in the workplace found that "most occupations in most industries" will have some human tasks replaced by machine learning technologies, but few industries would be entirely automated (Brynjolfsson, Mitchell & Rock 2018). Instead of widespread lay-offs, industries will likely see widespread realignment of existing jobs, as people learn to work alongside new forms of automation. Due to the nature of these changes, it is likely that the 4IR's impact on individual workers will be highly varied, with some jobs lost, but some new types

of work created in emerging, digitalized industries. Workers will need to adapt to a labor market where the demand for different skillsets changes with great speed and variability.

The Asia-Pacific region will see these effects manifest across key sectors of the economy. For example, the rise of 3D printing means that some manufacturing and assembly of goods, which are traditional mainstays of lower-middle income economies, will move to the so-called cloud, increasing the value of computer-assisted design (CAD) skills and localizing the manufacture of 3D printed components (Ben-Ner & Siemsen 2017). Another example is the increasingly advanced sewing, pattern-cutting, and quality assurance machines which, when aided by computer vision and sensor technologies, have the potential to transform the textile industry, another major sector in lower-middle income economies (Bharadwaj 2019). The Internet of Things and other forms of digitalization will also impact manufacturing and commercial agriculture jobs in terms of how firms track and control their processes (Castillo O'Sullivan & Thierer 2015). All of these changes demand a newly skilled workforce.

At the same time, the 4IR is ushering in a host of opportunities to Asia-Pacific economies. For example, high- and upper-middle economies, such as Japan, Thailand, the Republic of Korea (South Korea), Malaysia, and Hong Kong currently fill labor shortages in agriculture, nursing, caregiving, and construction with migrant workers from within the region and beyond (International Labour Organization 2018). Declining birthrates in these countries make it unlikely that domestic labor will pick up the slack in the near to long term (Vollset et al. 2020). Industrial automation technologies that reduce the need for some of this labor could thus fill in some of these labor shortages and generate a net benefit to these economies (Lee et al. 2019).

Managing regional change: potential roles for APEC

It will not be easy for governments in the Asia-Pacific region to manage transformations brought about by the 4IR. Challenges arise both domestically and regionally as new technologies create asymmetries in skills demand and supply, enable new business models that conventional regulations inadequately oversee, and allow companies to scale quickly around the world. While a single economy might struggle to manage these changes, a regional community acting together might more effectively respond to a transformation that will likely know few borders. Policy makers working together, sharing experiences on a regular basis, and reaching mutually agreed-upon goals and objectives could help the region respond more comprehensively to skills instability—that is, the tendency for rapid technological change to require workers to constantly acquire new skillsets, and to make other skillsets obsolete (World Economic Forum 2018).

As a regional trade and economic forum for economies on both sides of the Pacific Ocean, APEC has a unique position in the Asia-Pacific's economic landscape. Since 1998, the regional grouping has consisted of 21 member economies that make up more than half of the global GDP (Asia-Pacific Economic Cooperation 2020). APEC member representatives engage in ministerial-level dialogues and technical- and sectoral-level meetings throughout the year on various economic matters, such as trade and investment, mining, tourism, and telecommunications.

APEC's mission is to "build a dynamic and harmonious Asia-Pacific community by championing free and open trade and investment, promoting and accelerating regional economic integration,

encouraging economic and technical cooperation, enhancing human security, and facilitating a favorable and sustainable business environment" (APEC n.d.). APEC operates through consensus and does not require legally binding obligations, which results in a forum centered on dialogue and capacity building. The institution's most valuable function is providing a neutral space for the region's policymakers to meet and build understanding. As part of its role, APEC also often serves as a venue for signing bilateral or multilateral free trade agreements between member economies, and as a staging ground for broader multilateral efforts (Tan 2019).

Increasingly, the forum is turning its attention to the 4IR and the future of work. In 2020, APEC plans to revise its mission and vision for the region's direction, building upon its first set of targets established in the Bogor Goals. Recommendations from affiliated advisory bodies, such as the Pacific Economic Cooperation Council (PECC), the APEC Business Advisory Council (ABAC), and the APEC Vision Group (AVG) encourage the forum to focus on 4IR policy reforms (Asia-Pacific Economic Cooperation 2020). With a long history in trade liberalization, digital-economy leaders among its members—including the United States, China, and Singapore—and significant private-sector connections through the ABAC network, APEC could be a key player in the advancement of 4IR governance, policies, and regulatory frameworks.

Making sense of complexity

The intra-regional nature of APEC initiatives allows civil servants to gain a broad perspective on issues of digital economy regulation and inclusion, and the technological diversity of APEC's members

is a strength in terms of building the capacity of policymakers to understand complex new technologies and how they affect different populations. APEC's member economies already conduct joint capacity building projects across a range of topics relevant to the 4IR and the digital economy, in line with the APEC Internet and Digital Economy Roadmap adopted in 2017 and the APEC Action Agenda for the Digital Economy, and with the support of Digital Economy Steering Group (Asia-Pacific Economic Cooperation 2017a; Asia-Pacific Economic Cooperation 2018). These projects provide research and analytical support for policy makers, consultative opportunities for private sector stakeholders, and venues for the exchange of knowledge between digital trade and economic officials in the region. As technological innovation progresses and becomes integral to more sectors of the regional economy, investment and participation in these types of capacity building programs will become increasingly important for the region's policy makers to make sense of the 4IR's complexity.

APEC's 2019 Policy Report on structural reform and the digital economy highlighted the importance of statistics and data-driven indicators to support policymaking for the digital economy (Asia-Pacific Economic Cooperation 2019a). Without such indicators and clear shared definitions for the digital economy, it is very difficult to answer critically important questions about the impacts of automation and the 4IR on economies, workers, small businesses, and vulnerable groups. APEC can advance its research practice to support policymaking by partnering with member economies and the private sector to create data and market intelligence-sharing initiatives that help the region understand changing labor markets. APEC's committees, projects, working groups, and its Policy Support Unit already contribute original analysis of existing datasets from governments and the public domain.

APEC fora can also promote dialogue around a regional data-sharing initiative to inform labor ministries and departments on emerging skills demand across the region, centered around accurate, up-to-date shared metrics. With adequate donor support, APEC economies can build on the existing *StatsAPEC* open data portal to make additional data resources available for public use as well as internal analysis, enabling stronger shared understanding of 4IR challenges.

Engaging new stakeholders

The 4IR empowers new actors in the digital economy, such as startup founders and software developers, to quickly expand their businesses and pave the way for future innovations. While starting any kind of new business is difficult, businesses that rely primarily on cloud computing infrastructure and algorithm-driven services—as is the case with most modern online platform businesses—can expand much more quickly and experiment more freely than the conventional brick-and-mortar shop or factory. These businesses exist in a different milieu than conventional small and medium enterprises: "startup ecosystems" that have their own set of unique systems and players, from venture capitalists and angel investors to accelerators and coworking spaces, and their own particular challenges (Feld 2012). Due to its long-standing associations with the private sector, APEC presents an excellent platform for Asia-Pacific policymakers to engage with these emerging business leaders. But governments can work more productively with these entities in order to create forward-looking policy frameworks that expand consumer choice while preserving the safety and rights of vulnerable groups.

The creation of spaces for collaboration and experimentation helps

governments take effective actions to ensure the workforce has the skills to succeed in the new job market. For example, the Singaporean government's approach to this issue was particularly effective: it has offered space for pioneers of new and relatively untested technologies, including autonomous vehicles, fintech, and 5G, to work with the government to identify regulatory approaches for new technologies (Lago & Trueman 2019). APEC could provide a platform for these economy-level discussions to be expanded to the regional and even global level to ensure that the landscape of innovation is understood by the region's policy makers.

For APEC, the ABAC network provides an obvious point of entry for engaging with digital-economy stakeholders such as startup founders. The council has produced a number of recommendations to promote inclusive digitalization, including facilitating cross-border data flows, setting global rules for e-commerce, expanding access to Internet infrastructure, enhancing small enterprises' cybersecurity capability, and developing interoperable privacy regimes (APEC Business Advisory Council 2019). ABAC's ties to APEC policy dialogue processes, including a summit for chief executive officers (CEOs) that coincides with APEC's annual Leaders Meetings, lends further visibility to its recommendations, especially for policymakers, and helps business leaders better understand the nuances of regional and domestic policy debates. New digital economy stakeholders are very often at the forefront of innovation in these areas, and engaging directly with these communities would enable ABAC leaders and APEC policy makers to gain direct insights into the real challenges facing entrepreneurs and workers in the digitalized economy.

However, while ABAC's leadership represents a range of industries, most are executives from larger firms, such as banks, major

conglomerates, or mining companies. On the other hand, disruptive 4IR innovators often have the opposite profile: they come from loose startup networks, venture capital-supported entrepreneurship ecosystems, and informal software developer communities. Their companies may be only a few years old, and they may have brick-and-mortar offices or permanent staff in only a small fraction of the economies where they operate. Leaders in these innovation sectors may be technically skilled but less experienced in business, government relations, or public policy. APEC and ABAC could work with the region's donors to better engage these communities in relevant 4IR dialogues. New and different kinds of "dialogue" activities, such as hackathons and showcases, are often an effective way of reaching these groups. APEC and ABAC can also engage with startup incubators, venture capital firms, and leaders within software developer communities who can share a broader perspective on the industry's challenges and future directions.

Supporting regional policy reform

APEC members use the body's ongoing working groups, sub-fora, and dialogue processes to advance regional integration and respond to demands in a more effective and coordinated way—mechanisms that should also be leveraged to handle new challenges associated with the 4IR. Key areas where regional policy reform is needed include governance of cross-border data flows, TVET and education reform, advancing gender inclusivity, and labor migration governance. These are areas where APEC is engaging broadly across the region.

Enforceable and privacy-sensitive frameworks around data-sharing are very important given the broad scope of data collection by online

platforms and digital businesses, as well as the potential harms that data protectionism or inconsistent data localization rules can deal to businesses. APEC's Cross-Border Privacy Rules System (CBPRS) provides one regional model for the governance of data flows, and several member economies including Australia, Canada, Japan, the Republic of Korea, Mexico, Singapore, Chinese Taipei, and the United States of America currently participate in it (Asia-Pacific Economic Cooperation 2019b). APEC can work to expand participation in the CBPRS to all APEC economies and continue to develop and expand privacy protection frameworks in the region.

Reform of TVET and education systems will be crucial in addressing mismatches between workers' current skills and the proficiencies workers need to retain or gain jobs in the rapidly changing 4IR workplace. Through its Human Resources Development Working Group, APEC is supporting the development of shared regional educational standards and certifications and evaluating newer models of training and credentialing such as micro degrees, continuing education programs for adult learners, and online instruction.[31] The APEC Framework on Human Resources Development in the Digital Age also identifies high-level regional priority areas and joint actions for APEC economies to take to strengthen preparedness of educational and training systems for the 4IR. These include regional research activities to anticipate future skills needs, dialogues on the adaptation of training systems and implementation of TVET quality assurance, and projects to establish mutual skills recognition in sectors with high rates of migrant labor (Asia-Pacific Economic Cooperation 2017b).

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To address the 4IR, Asia-Pacific economies must also focus more attention on promoting gender inclusivity in science, technology, engineering, and math (STEM) fields. APEC's Women and the Economy Dashboard indicates that women apparently make up less than half of STEM graduates from tertiary educational institutions, and only 13 percent in some economies, although gender-disaggregated data remains unavailable for several economies in the region (Hernando & Kuriyama 2019). The low participation of women in STEM fields threatens to deepen gender inequalities and slow economic growth overall, as scientific and technical skills come into greater demand due to the 4IR. APEC's Policy Partnership on Women in the Economy (PPWE) has supported a series of important public-private dialogues and regional policy discussions on this subject, especially since 2019; APEC's Policy Partnership on Science, Technology and Innovation (PPSTI) has also created a set of "Women in STEM Principles and Actions" that highlight necessary steps for economies to take to ensure gender equity (Asia-Pacific Economic Cooperation 2019c). To ensure that gendered impacts of the 4IR are given serious attention, member economies can continue the positive steps begun in PPWE activities and other APEC programs. They can also be supported to fill gaps in current knowledge through the production and sharing of gender-disaggregated data, through campaigns to address gender discrimination and biases in STEM educational pipelines, and through greater engagement between policy makers and women technologists, digital entrepreneurs, and business leaders.

Migration issues are also an area of significance to the 4IR debate; economists attribute a fair portion of the economic gains accrued by Asia-Pacific economies over the past decades to various forms of labor mobility. Many researchers are concerned, however, that, as unskilled

and routine jobs become automated, migrant workers within the Asia-Pacific will become increasingly vulnerable to economic shocks that jeopardize their livelihoods and the stability of their employment overseas (Murison 2018). APEC, together with other regional fora and donors, can support sorely-needed research and data aggregation to track the raw numbers of migrant workers, the industries they are engaged in, and the opportunities that might exist for upskilling or retraining migrant workers in the case of displacement. With support from Australia, APEC's Human Resources Development Working Group has already provided a venue for discussion of these issues in the APEC Labor Mobility Statistics Forum in 2019 (Department of Education, Skills and Employment 2019). In the coming years, APEC economies and donors can act to develop shared data resources and standards that enable a collective response to 4IR impacts on migrant workers.

Conclusion

The 4IR promises to be an era of rapid technological change that will greatly affect workers. It requires a corresponding pace of adaptation among governments and effective cooperation at the regional level. APEC's position — as a regional trade forum with wide coverage of economic affairs, broad geographic scope, and a flexible, dialogue-focused approach — makes it an important venue for consensus-building around how its member economies can effectively manage 4IR workforce transformations. Because of APEC's role in the region, APEC members can use its processes and mechanisms to ramp up the bloc's capacity building and research activities to enhance their understanding of new technologies and their impacts on labor.

For example, APEC could build capacity through inter-economy exchanges, training, and workshops—an important area in need of donor support.

Given the importance of more dynamic, timely, and nuanced data for policymaking, APEC can also support the development of widely available data-driven indicators in order to enhance decision making and policymaking that supports industrial transformation and inclusive growth while attenuating the instability of the skills and employment landscape. This is another area where donors can play a catalyzing role. To better understand and build bridges to new and emerging sectors of the digital economy, APEC and its business advisory council, ABAC, can actively work with donors to seek out engagement opportunities with emerging stakeholders, such as entrepreneurs in startup ecosystems, software developer communities, and venture capital leaders. Finally, APEC can direct more attention toward articulating regionally harmonized policy reforms that enable an innovative, gender inclusive, and prosperous digital economy in the Asia-Pacific region. These vital activities will imbue governments, institutions, companies, and workers with greater agility and resilience —the qualities needed for the shift to the 4IR economy and its new industrial paradigm.

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Chapter

7

Addressing Future of Work Challenges through Development Cooperation

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Introduction

Technological advancements shape society. As the Fourth Industrial Revolution (4IR) shifts the boundaries between digital and physical worlds through artificial intelligence (AI), the Internet of Things, and other technologies, it also ushers in rapid and significant societal changes. The 4IR drives economic growth at the global level through industries' globalization and digitalization. The 4IR also instigates structural changes, paving the way for new economies, such as

the sharing[32] and knowledge[33] economies. The 4IR's benefits are innumerable, but it also poses tremendous threats to certain regions and sectors, including the exacerbation or creation of inequalities, especially within developing countries. The digital economy,[34] one of the primary 4IR enablers, is largely characterized by a winner-takes-all dynamic and monopolization by first movers.

Additionally, there is significant disparity within developing countries in terms of 4IR development. In middle-income countries, for example, the Internet has increased productivity by 11 percent, whereas it has only increased productivity by 3 percent in low-income countries (Banga & Velde 2018). These disparities challenge the United Nation's 2030 Agenda for Sustainable Development's promise to "leave no one behind." Instead, technological advancements will likely benefit only a select group of countries, significantly widening socio-economic inequalities. These concerns are especially prevalent in Asia, where there is a massive digital divide across the continent: in some of Asia's least-developed countries (LDCs), including Cambodia, Lao People's Democratic Republic (Lao PDR), and Myanmar, approximately 70 percent of people do not have Internet access. Internet use is particularly limited within vulnerable populations, including women.[35]

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32 The Sharing Economy is an "economic model defined as a peer-to-peer (P2P) based activity of acquiring, providing, or sharing access to goods and services that is often facilitated by a community-based on-line platform" ('Sharing Economy' 2020).

33 The Knowledge Economy is a "system of consumption and production that is based on intellectual capital" ('Knowledge Economy' 2020).

34 Defined as "the economic activity that results from billions of everyday online connections among people, businesses, devices, data, and processes" (Deloitte 2020).

35 The South Asian region boasts the highest disparity between women and men Internet users (Broom 2020).

The adjustments required to adapt to the 4IR remain a controversial topic in public debate, even in advanced Asian countries, such as the Republic of Korea (South Korea), that already have the necessary infrastructure and human resources. Most other countries will require drastic infrastructure and job market transformations, which will ultimately result in lost or shifted jobs and may lead to increased income inequality. The digital divide in Asia became especially evident during the COVID-19 pandemic; lockdowns forced many low-wage workers to stay home from work or lose their jobs because their jobs were incompatible with working remotely or because workers lacked suitable digital infrastructure.

One way to address disparities and technological inequalities is through North-South, South-South, and triangular development cooperation. Agenda 2030's Sustainable Development Goal (SDG) 17 calls for enhancing cooperation modalities to improve developing countries' access to technology and capacity building — both essential for successful 4IR adaptation. Such efforts already play an important role in filling institutional capacity gaps and managing risks; they also help optimize 4IR opportunities, such as through educating, training, and up-skilling workers. These efforts, however, primarily focus on the benefits of technology and how to use it while failing to address its challenges, including the formation of equitable and ethical regulations and policy frameworks for the new labor market, especially regarding gender equality. Development cooperation initiatives should, instead, support technological development equity through national policies that encourage greater access for vulnerable populations to finance, improved governance, capacity support, knowledge sharing, and technological advancements.

This paper addresses how national governments can mobilize

development cooperation to harness the 4IR and meet Agenda 2030's goal to leave no one and no country behind.[36] The first section addresses how development cooperation can advance the 4IR in Asia by providing countries with tools to address issues that can be difficult to tackle alone, including the impacts rapid technological change can have on the economy, gender dynamics in the workforce, and other socio-economic challenges. Secondly, the chapter examines how the effectiveness of 4IR development cooperation depends on the ability to utilize such partnerships for common strategic objectives, and how these partnerships must extend beyond pilot programs. The third section emphasizes the importance of cooperation instead of competition between different stakeholders in order to promote the full potential of 4IR development, and the fourth section explains how multilateralism and platforms can make development cooperation in this area more effective.[37]

Harnessing the 4IR in Asia: Role of development cooperation

The transformation potential of the 4IR can be harnessed by governments only through effective policies and regulations, which are often institutionalized through effective development cooperation

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36 Development partners include incorporating and implementing actors, including bilateral aid agencies, multilateral organizations, the private sector, foundations, and non-governmental organizations.

37 It should be noted that this paper does not conduct a comprehensive analysis of the development cooperation interventions throughout Asia, as data on cooperation initiatives is difficult to accumulate, largely because of the breadth of the 4IR's influence, which includes multiple sectors and categories.

initiatives. Development cooperation can help countries tackle issues unique to rapid technological advances, including uncertain economic consequences, unequal workforce gender dynamics, and other changing socio-economic conditions.

Development cooperation is integral to 4IR adaptation in developing countries because, if adaptation is left entirely to market mechanisms, the 4IR has the potential to exponentially exacerbate both domestic and international inequalities. Although market forces can spread technology to all countries of the world, other factors, including national innovation capacity, institutional structures, human resources and competitive trade, and investment incentives require partnerships with the public sector. These processes need to be managed and regulated to ensure more equitable distribution and greater access to opportunities. Also, the sheer number of technologies and upgrades require vast amounts of resources, knowledge, and technical expertise. For example, South Korea has recently allocated KRW 58.2 trillion (USD 51 billion) to its Digital New Deal, aiming to accelerate the transition towards a digital economy. Investment will focus on the integration of data, network, and AI throughout the economy (Ministry of Economy and Finance 2020). The majority of countries do not have the resources, knowledge, or technical expertise to fully utilize all the opportunities available through the 4IR. Therefore, development cooperation can provide more efficient and effective 4IR mechanisms and opportunities.

Furthermore, the 4IR is built on a foundation of disruptive technologies, which creates uncertain socio-economic consequences. Such characteristics make it difficult for individual countries to create long-term policies. Democratic policymaking tends to react to economic and social challenges rather than anticipate such transformations. For example, certain Asian LDCs, such as Nepal, have

just begun adapting their policies on education, employment, and innovation in response to technological developments, but by the time these policies have been put into place, they will already lag behind further technological development (Nankervis, Connell & Burgess 2020).

Instead of reactive approaches, countries should adopt proactive policy approaches to 4IR transformations and focus on diversifying economies, enacting protective regulations for cybercrime and privacy breaches, reforming taxation systems (including closing loopholes and enforcing progressive taxation), redistributing income (finding a balance between incentivizing innovators and investors while ensuring a standard of living for all citizens), and providing opportunities for education and re-training. A proactive approach will reduce associated risks and create an inclusive and enabling environment.

Some countries have already taken proactive steps. For example, Pakistan launched the Presidential Initiative for Artificial Intelligence & Computing (PIAIC), which aims to be a center of education and research in AI (Asghar et al. 2020). However, in most cases, Asian governments do not have clear strategies for the future of work or have not properly considered the social repercussions of technological changes.

One important social repercussion is the impact technological change has on gender dynamics in the workforce. Although the 4IR promises high-skilled, high-paying jobs that increases the economic independence among women, the 4IR can also negatively impact gender equality if women are not presented with the right opportunities. This is especially true if they are not encouraged to enter science, technology, engineering, and math (STEM)-related education and occupations. Thus, it is imperative that investments in education and training are sensitive to gender issues and ensure equitable enrollment.

Efforts to promote gender parity have become more urgent as the COVID-19 pandemic threatens the progress made in closing the gender gap. Economically, the pandemic has had a disproportionately negative impact on industries that primarily employ women, including the social sector (retail, tourism, hospitality) and the informal sector (Tavares et al. 2020). As demonstrated in Bangladesh, women in formal employment are "almost six times as likely to work fewer hours than their male counterparts since the outbreak of the virus" (UN Women 2020). Furthermore, because a higher number of women are engaged in the informal sector, they do not receive healthcare coverage. For example, in Pakistan, 13 percent of men have health insurance compared to 3 percent of women (UN Women 2020).

Other socio-economic groups also face risks due to the changes brought by the 4IR. Vulnerable groups, such as the elderly, tend to adapt to newer technologies at slower rates than young people, and will be unable to take full advantage of 4IR technologies (Vaportzis 2017). It is crucial to ensure that disadvantaged groups are not left behind by providing them with technological education and opportunities. Therefore, governments must develop coordinated, long-term policy frameworks that find a balance between regulating and enabling positive technological development impacts on various socio-economic spheres.

In the context of development cooperation, using technology to create effective public services can be a starting point for development professionals to engage with local and national governments[38] because

38 Development partners often support government processes with technological innovations at the country level, including the introduction of chat bots for handling customer complaints in the Central Bank of the Philippines (Paul, Jolley & Anthony 2018).

such engagements can be particularly effective in building trust between partners (Paul, Craig & Aubra 2018).

Developing and implementing ambitious policies can be challenging for governments to implement at the country-level because they require a high degree of knowledge, research, and expertise. In such cases, some development cooperation actors may bring a comparative advantage to policy research, implementation mechanisms, and knowledge sharing. Through their work and networks, they can provide technical expertise on a variety of topics, including income redistribution policies and economic diversification, along with appropriate practices related to anti-corruption initiatives, environmental policies, and infrastructure projects. For example, the Japan International Cooperation Agency (JICA) Research Institute collaborated with the Center for Strategic and International Studies to review the potential of selected Asian countries, such as Indonesia and the Philippines, in the context of its "Transformative Innovation" research[39] (Moser & Rice 2016). This study analyzed the "national innovation ecosystems"[40] and recommended how development cooperation actors could constructively contribute in the 4IR (Higgins 2020). For instance, a development agency could apply its expertise to mapping a national innovation ecosystem that identifies capacity gaps. In another example, the Australian Department of Foreign Affairs and Trade (DFAT) supported research on the digital transformation in Cambodia; the findings fed into a nationally-led working group

39 The project outputs are summarized in Moser and Rice (2016).

40 An innovation ecosystem can be defined as a "network of individuals, entities, resources, and structures that join forces in a way that catalyzes new products, ideas, methods, systems, and even ways of life" (Higgins 2020).

discussion between domestic stakeholders and development partners (Overseas Development Institute and Cambodia Development Research Institute 2019).

Development partners' response to the 4IR

There is tremendous potential for the success of multi- and bilateral development cooperation in supporting policy frameworks, building capacity, and sharing 4IR technology. However, the success of such cooperation depends on how development organizations and partner countries focus their partnerships toward the 4IR. Partnerships will not be successful unless governments take 4IR preparedness seriously and establish frameworks that support technological development and socio-economic success.

The current education, retraining, and technology diffusion portfolios of various development partners are important for advancing the 4IR in the region. For example, the Asian Development Bank has multiple projects that address challenges exacerbated by the 4IR. These projects focus on restructuring education systems and retraining the workforce within the context of the 4IR, as well as facilitating regional cooperation and discussion among experts and practitioners to generate "policy-relevant knowledge on the implications of innovation and technological change for regional cooperation" (Asian Development Bank 2019a). Project examples include the Preparing the Skills Development for a Modern Economy Project in Uzbekistan, which increases employment, especially for youth, by providing investment finance to teach skills demanded by the labor market to students and jobseekers (Asian Development Bank 2019b). The

technology-enabled Innovation Education in Southeast Asia identifies solutions and pilots "EdTech" interventions in five countries of the region (Asian Development Bank 2020).

Additionally, some bilateral development organizations look at the potential for harnessing new technologies for their own business processes. For example, JICA issued a comprehensive report on the use of new technologies for its own bilateral and multilateral cooperation (Japan International Cooperation Agency 2015). Furthermore, technological trends often change the way multilateral development cooperation agencies engage partner countries, diverting funds from traditional projects towards more innovative solutions. For example, the World Bank Group launched a Disruptive Technologies for Development Fund, and three regional development banks have issued a joint analytical publication on their respective perspectives and strategies (World Bank 2018; African Development Bank et al. 2018).

For development organizations, these changes are important but insufficient pre-conditions for effective support. Effective support also calls for practicable analysis. For this reason, UNDP partnered with the Economist Intelligence Unit to analyze automation's opportunities and challenges and the future of work in the Asia and Pacific region. The report estimated that "over 60 percent of salaried workers in Indonesia, the Philippines, Thailand, and Vietnam occupy positions at high risk of automation;" the potential job losses pose a significant threat to attaining the SDGs (The United Nations Development Programme 2018). The UNDP report recommended using predictive and adaptive decision making tools, such as strategic foresight, and capturing emerging growth and employment sources, such as the green economy, circular economy, or new technology fields. Technology can also enhance citizen engagement and improve public

service delivery. Successful 4IR transitions will require effective measures for social protection, including universal basic income (UBI), leveraging technology to improve social assistance, and considering innovative employment support, including flexibility career breaks and transitions between wage- and self-employment, among other solutions.

Development cooperation actors can also identify beneficial technologies within a given country and contribute infrastructure and knowledge needed for those technologies. For example, the Asian Development Bank introduced a project, Strengthening Knowledge Alliance for Innovation, Technology, and Regional Cooperation, at the end of 2019. The project gathers policy researchers in partner countries through technology workshops, networking, and dialogues. Some projects adopt a holistic perspective towards the 4IR, focusing on policy response in key areas. For example, the USAID IGNITE project supports ASEAN countries' and regional preparedness towards 4IR transformations by supporting trade facilitation, digital finance, digital economy, science, cybersecurity, other technologies, innovation, and strengthening conditions for women's economic empowerment (United States Agency for International Development 2019). Other development partners can apply a similar approach in support of the 4IR.

Multilateral development agencies also support efforts that promote gender equality within the 4IR context. For example, the UNDP, with funding from the IKEA Foundation, has implemented plastic and steel engineering training for over 100,000 Indian women (Cliff 2016). Young women were encouraged to enter male-dominated areas of engineering for the first time and many participants created successful enterprises. By encouraging girls into STEM-related education and training, developing countries can accelerate efforts

for gender equality, and economic independence achieved through higher education and well-paying jobs can facilitate necessary societal changes.

Although their application is highly context-specific, blockchain and other distributed ledger technologies can provide transparency to certain government processes where corruption is widespread. This is because blockchain technologies allow records to be published publicly and without censorship. In countries with no legacy systems, it may be easier to adopt blockchain technologh. In other countries, blockchain technology may provide a more efficient and transparent upgrade. Some international development agencies have integrated disruptive technologies into emergency responses. For example, the World Food Programme (WFP) used blockchain technology as a part of the Building Blocks pilot project in several Asian countries in order to expand choices for refugees on how they access and spend cash assistance. The transparent nature of blockchain technology makes cash transfers to refugees more efficient, secure, and transparent (United Nations World Food Programme 2020).

International development organizations can play an important role in the implementation of blockchain technologies by bringing together regulators, best practices, information technology (IT) experts, and officials. Several blockchain-related development cooperation pilot projects have already been implemented around the world. For example, the India-based graduate of the UNICEF Innovation Fund, StaTwig, piloted the use of blockchain for tracking vaccine delivery in the state of Arunachal Pradesh. Critical information, such as temperature, humidity, chain of custody, and location are recorded on a blockchain ledger. This allows for greater transparency in supply chains, increased trust among investors, and improved effectiveness

(Chakravarthy 2020).

Information on South-South and triangular cooperation in the 4IR is more difficult to obtain, but it also plays a significant role and has great potential. Some Southern countries are more advanced in various fields important to the 4IR, such as data ownership, or have stronger digital infrastructure; sharing their knowledge and experience can benefit developing countries that are preparing for the transition. Stronger ties between Southern countries can also be critical for collective action on trade, intellectual property rights, and other multi-country, multi-stakeholder issues. For example, the South China Sea Tsunami Advisory Centre, a triangular cooperation initiative between the Chinese government, a number of Asian countries, and UNESCO, use advanced technology to improve tsunami prediction modelling and helps diffuse information to professionals across the region (United Nations Office for South-South Cooperation and the Finance Centre for South-South Cooperation 2019).

Private sector partners from the North and South have also become involved in development cooperation focusing on developing countries' 4IR transition through blended finance and corporate social responsibility initiatives. Most private sector direct interventions have been relatively small scale, such as pilots of new technologies. Expanding such partnerships can help combine innovation potential of the private sector with the regulatory reforms required in the public sector. This holds true for Facebook's Disaster Maps, a relatively small-scale pilot, which shares real-time information with response teams during a disaster so that the teams can determine whether communities have been evacuated, have access to power and cellular networks, and ascertain what services and supplies they need most. In 2018, Kerala, India experienced some of the worst floods in recent

history. Facebook supported disaster response and recovery efforts by collaborating with a local humanitarian agency called SEEDS. Through Facebook Disaster Maps, SEEDS was able to access near real-time information about population movement in the affected locations. This information allowed for improved on the ground response in relief camps. Furthermore, this information was shared across India's humanitarian platform comprising over 75 prominent humanitarian agencies, which also allowed for greater coordination and a more effective response (Gupta 2018).

Development partners recognize the importance of using a multi-stakeholder approach in their own programming. The Australian DFAT has emphasized the importance of gathering a wide range of stakeholders, including governments, private sector actors, development agencies, and local actors. Each has a role to play based on their priorities and comparative strength. For example, since multinational tech companies are driving technology diffusion and are already leveraging technologies in their operations, the role of development agencies does not need to be technology diffusion; rather they should figure out how to apply emerging technologies inclusively and equitably, and involve local actors in the process (Feeny, Elson & Brown 2020).

Existing development cooperation interventions can be effective and play a catalytic role if the partner countries use them to support a broad range of efforts. However, piloting technology solutions and supporting activities, such as training, do not adequately support developing countries. Effective partnerships need to gather different stakeholders supporting the transition process to have a more effective response.

Cooperation or competition?

In order to overcome the 4IR's risks and maximize its benefits, governments, the private sector, academia, and civil society will need to work together. However, multiple countries and regions focus more on the competitive aspects of technological development than on cooperation, contesting 4IR leadership: China's advance is likely, the United States' response and looming economic turbulence is making the global situation even more unpredictable (Groom 2019). The European Union, meanwhile, has proposed a third approach to AI, one that emphasizes an ethical dimension (European Commission 2020).

Because the 4IR is a global phenomenon, developing countries will also be expected to assume a certain role in the process, in accordance with the global division of labor. However, the potential for leapfrogging (e.g. going from no Internet directly to the mobile Internet) is much greater compared to previous industrial revolutions because the open and collaborative nature of 4IR business processes provide most countries with an opportunity to become technology adopters and creators. However, if developing countries do not have such opportunities, they will remain marginal. Therefore, cooperation between more and less advanced countries becomes mutually beneficial when it encourages trust, furthers a common vision, and fosters joint contributions.

Some North-South, South-South, and public-private collaborative initiatives are underway. SDG 17 contains commitments to scale up official development assistance (ODA), technology transfers, capacity building, and trade. It also commits to "enhance the global partnership for sustainable development complemented by multi-stakeholder partnerships that mobilize and share knowledge, expertise,

technologies, and financial resources to support the achievement of sustainable development goals in all countries, particularly developing countries" (United Nations General Assembly 2015). This approach depends on understanding that achieving the goals while "leaving no one behind" requires mutual actions and a multi-stakeholder approach.

The United Nations Secretary General convened a High-Level Panel on Digital Cooperation to discuss proposals for strengthening cooperation in the digital space among governments, the private sector, civil society, international organizations, academia, the technical community, and other relevant stakeholders. At the end of 2019, the Panel issued a report "to ensure a safe and inclusive digital future for all" and outlined possible proposals for the cooperation's architecture (United Nations 2019). The Office of the United Nations' High Commissioner for Human Rights (OHCHR) also created a space where technology companies and human rights experts can discuss how human rights frameworks do and should address 4IR challenges. Additionally, a private sector organization, the World Economic Forum, established a Centre for the 4IR as a "hub for global, multi-stakeholder cooperation to develop policy frameworks and advance collaborations that accelerate the benefits of science and technology," and an intergovernmental organization of developing nations, the South Centre, suggested a Centre for the Fourth Industrial Revolution for developing countries as an international multi-stakeholder forum to support countries' capacity for identifying promising technologies, piloting projects, and promoting successful project scaling (World Economic Forum 2020; Asghar et al. 2020).

There is also growing science diplomacy and cooperation at the bilateral level, including South-South, such as between China and countries participating in the Belt and Road and Digital Silk Road

initiatives. For instance, in Pakistan, there is a flagship project of the Belt and Road Initiative (BRI), the China-Pakistan Economic Corridor (CPEC): "a major collaboration between China and Pakistan, has been rapidly progressing and the impact of the project can be seen in the lives of Pakistani people, as reflected in an improving human development index" and a growing economic growth rate of 5.8 percent (Majid 2018).

Practical recommendations

Increasing connectivity and widespread Internet access requires basic infrastructure, such as electricity and affordable Internet access. National governments play an integral role in fulfilling these basic conditions. Public officials should approach Internet access as a public good because it is necessary for economic growth, better governance, healthcare, and disaster reduction. Development partners can help in this area. For example, UNDP Philippines partners with an Australian company, SpeedCast, to increase digital inclusion across the country, investing in Internet access as a new public good (PR Newswire 2019).

Asian LDCs, such as Lao PDR and Cambodia, should identify development cooperation opportunities for labor markets that are compatible with the 4IR. For example, in Bangladesh, the World-Bank financed Leveraging ICT for Growth, Employment and Governance Project produces policy recommendations for the education and skills development sectors to transition to the 4IR. The study conducted by the project identifies strategic areas for intervention (New Age 2020).

An emerging challenge for many developing countries is identifying relevant technological solutions among the multitude available and rapidly scaling up solutions. It is important for development

cooperation agencies to support technological leapfrogging in developing countries, particularly those without legacy systems, while simultaneously recognizing that there are certain foundational technologies and infrastructure that cannot be bypassed, at least in the foreseeable future. For example, landlines can be bypassed with cellphone networks whereas systems for waste collection cannot. The Korea International Cooperation Agency's (KOICA) K-Innovation ODA program helps partner countries develop national innovation ecosystems, using South Korean experiences as a reference. National capacity for strategic innovation can help countries leapfrog beyond adaptation of new technologies and develop their own technological solutions.

Although development cooperation agencies cannot get rid of underlying physical or geopolitical concerns, they can create important platforms for governments and other stakeholders to exchange information and discuss relevant norms. Both development agencies and the partner countries should improve mechanisms and methods for data collection and centralization on development cooperation. Developing Asian countries, particularly LDCs, such as Nepal and Bangladesh, could benefit from information on various mechanisms available to them. Also, partner country governments should promote national dialogues, such as sector or thematic working groups at national forums with government and development partner participation. Emerging practices, such as Cambodia's Working Group on Digital Economy, which acted as a platform where relevant national stakeholders and development partners (such as the United Kingdom's Department for International Development [DFID]), could discuss a strategic framework, is a positive example for how development partner coordination adapts to 4IR needs.

Conclusion

Development cooperation can support developing countries through 4IR economic and social transitions, and development professionals can draw many lessons from existing frameworks. However, development cooperation that focuses solely on piloting technology solutions or training do not adequately support a successful 4IR transition. New approaches should go beyond piloting in order to support national strategies through finance, capacity support, knowledge sharing, or technology. Additionally, it is also crucial to keep socio-economic concerns at the forefront of policies and future planning, including economic diversification, cybercrime protection, tax reform, income redistribution, education and re-training, and reducing gender divides in the labor force. Furthermore, multi-stakeholder processes at the global, regional, and national levels build trust and gather stakeholders. Partnership is particularly important because it allows stakeholders to cooperate on analysis, response and mitigation strategies, and building country capacity to make the best out of 4IR transformation.

The shift to advanced technologies and the lack of adequate transition mechanisms brought about by the COVID-19 pandemic have reminded many development professionals and governments that advancements in technology should be guided by ethical standards. Accordingly, Asian governments have taken measures to protect the most vulnerable in their societies through their 4IR strategies. At the same time, development cooperation agencies revived tested policy tools, such as budget support, to protect those most affected by the crisis. They also used strategic foresight to design a new role for themselves in the changing global context, one that makes their

expertise, dialogue, and partnership more accessible than ever. At the country level, new engagement structures are needed by governments and development cooperation agencies that emphasize more distributed, locally-led, and demand-driven development cooperation. Additionally, COVID-19 highlighted the need for development cooperation agencies to integrate expertise from various stakeholders, such as ministries of health and ICT, to expand expertise in multiple complex domains.

The future of the 4IR in work calls for a coordinated, well-managed, anticipatory, multi-stakeholder response. As the countries around the world struggle to find a path towards better global cooperation, development cooperation has an important role to play in ensuring global solidarity so that no one is left behind during the 4IR.

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Chapter

8

The Changing Nature of Work and Its Implications for Development Cooperation

Jai-Joon Hur[41]

Introduction

Following a Go match in March 2016 between Alpha Go, Google's artificial intelligence-guided Go player, and Lee Se-Dol, one of the best human Go players in the world, discussions about digital transformation and the future of work exploded in South Korea and elsewhere in Asia, along with the term "the Fourth Industrial Revolution." The reason for this interest was most likely related to concerns about the worsening job market for many of today's occupations. For many, the victory of artificial intelligence (AI) over

41 Dr. Jai-Joon Hur and The Asia Foundation deeply thank Dr. Randy Green, Associate Professor at Gyeongnam National University of Science and Technology, for his work editing this chapter.

a human Go player seems to have been regarded as a threat that technology poses to employment in the near future. However, whether or not the digital transformation has a negative impact on workers' overall employment is controversial and debatable.

Traditionally, the main impact of technological progress has been thought to be a productivity increase. Recently, however, a considerable number of economic papers have expressed concerns rather than optimism about newly-developed automation and its effect on employment. Acemoglu and Restrepo (2017) reported that both employment and wages decreased as robot use increased, while Autor and Salomons (2018) confirmed that, although hourly wages increased due to productivity increases, both employment and working hours decreased. In addition, Acemoglu and Restrepo (2019a) insist that automation has caused little growth in the number of jobs or wages in the United States' labor market since 1987, especially since the 2000s.

The above studies appear to imply that automation will reduce labor demand and increase income inequality. In reality, however, it is not easy to find evidence that the number of jobs in the economy decreases as automation increases. In fact, the empirical work of Acemoglu and Restrepo (2019a) only shows that, at certain times, automation of the task content of production may tend to reduce firms' labor demand. The authors do not indicate that this is a phenomenon that persists for a sufficiently long period of time, beyond a century, for example. Nor do they confirm that increased automation will lead to weak employment growth at the global level. Long-term observations over 100 years fail to show that technological progress or past industrial revolutions reduced total employment or employment growth. Besides, if we look at countries other than Organization for Economic Cooperation and Development (OECD) countries, even

if we narrow down the scope on the manufacturing sector where technological progress is most conspicuous, we can confirm different facts from the ones Acemoglu and Restrepo found. Manufacturing employment and employment growth rates have increased in the past twenty years in the emerging countries of Southeast Asia. The average annual growth rate of manufacturing employment in Southeast Asian countries was 2.2 percent between 2000 and 2008 and 2.6 percent over the 2008-2018 period (International Labour Organization 2020a).

If technology is not ultimately destroying or creating employment but job destruction and creation are consequences of how people respond to the changing nature of jobs provoked by new technology, the challenge lies in adapting to changes. In this sense, the issue of the future of work is, in effect, calling for efforts in diverse areas such as education, regulation, social protection, and industrial strategy to enhance worker adaptability, opening a new dimension for development cooperation among Asian countries. Firms, workers, and governments need to be prepared for the changing nature of work. Entrepreneurs will need to reorganize workplaces and production processes so that they can be more productive in the new technological environment. Students and workers may need to learn how to work with new digital machines. Governments and organizations will need consensus-building skills and fora as well as new regulations and policies in many areas, including in the product market- and labor market-related arena.

This chapter, which discusses the above issues, is organized in the following manner: The first section investigates the relationship between technology and jobs with historical data and international comparison to show that the key challenge is not whether or not jobs are taken by robots. This is followed by a discussion of the efforts that

Asian stakeholders must make to enhance adaptability, the basis from which to develop a possible cooperation agenda in the era of changing nature of work. Finally, development cooperation areas emerging due to the future of work are discussed.

Technological progress and jobs

Historical experiences

Around the globe today, the future of work has become an important issue. Even though numerous economists and newspapers frequently write that AI-integrated robots and computers will not deprive us of jobs, many people are still concerned that robots and computers will jeopardize their jobs (World Bank 2019; Hur 2020). No matter what type of jobs they have, people continue to ask, "Will my job survive?" As in other countries, as many as 75 percent of South Koreans are concerned that AI technology will eventually take their jobs away. Even though this is the case, only 14 percent say they are more or less preparing for this digitalization (Heo 2017).

It is true that digital technology is making disruptive changes that have brought about new business models, production processes, goods, services, and so on. Schwab (2016) has labeled this current state of technological change the Fourth Industrial Revolution (4IR). However, even with this "revolution" staring them in the face, few firms are currently providing opportunities for workers to develop their careers to meet the challenges that have emerged as a result of these changes. Is this a reason for us to have a long-term pessimistic outlook?

Perhaps not. Using the long-term series of the employment rate

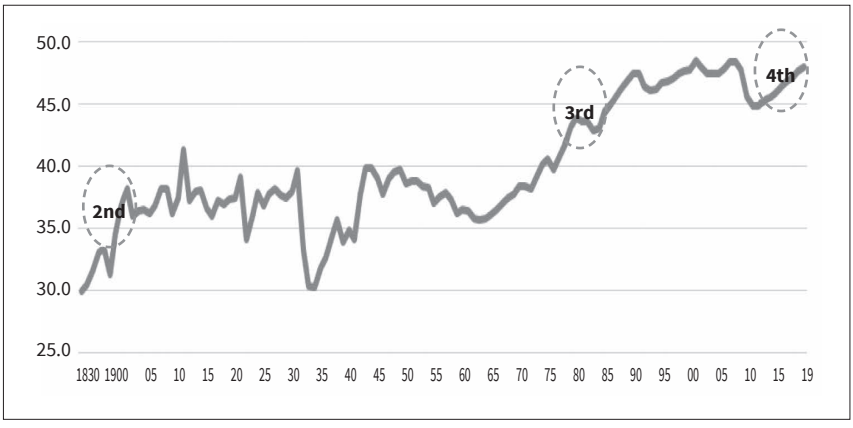
of the United States and Great Britain, it is possible to see if there is a correlation between employment deterioration indicators and industrial revolutions. The industrial revolution periods defined by Schwab are marked as red circles in Figure 8.1 and Figure 8.2. Looking at these two indicators, it is difficult to find evidence that industrial revolutions lowered overall employment in the two countries. We see employment growth over time (here we assume that the number of jobs is equal to that of people employed, i.e. workers). As can be seen, the evidence points to the fact that, historically, industrial revolutions did not lower overall employment in both countries. There were 2.9 million workers in the United States in 1820. The number of workers increased to 157.5 million in 2019. In 1855, the number of workers in the UK was 11.3 million while it increased to 32.8 million in 2019 (Figure 8.1 and Figure 8.2).

Cross-country evidence

Evidence from several cross-country studies also addresses the concerns of those worried about an upcoming reduction in employment. When individuals claim that AI-technology is destroying jobs, they are often talking about a decrease in the total number of jobs. However, they also may be talking about a decrease in the growth rate of employment. This distinction is important. The former interpretation is used when people focus on a company or occupation level while the latter interpretation is related to the macro-economic level.

As far as the growth rate of employment is concerned, it is necessary to first clarify how the proposition that "the employment growth slowdown is due to recent automation technology and the digital transformation" should be reflected in economic variables.

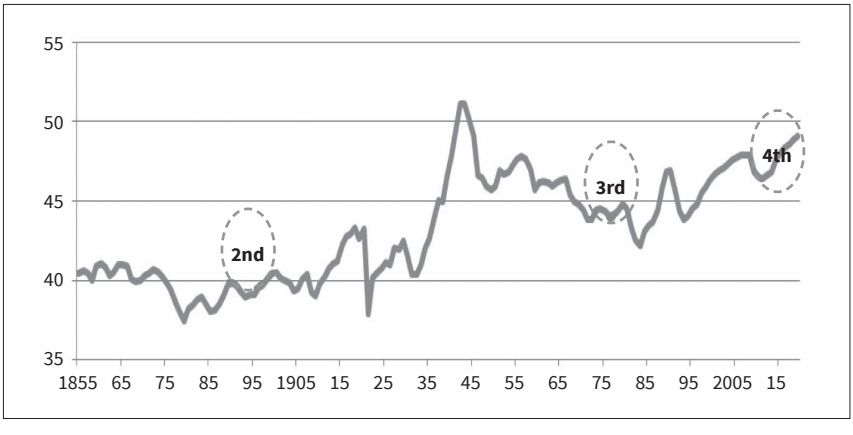
Figure 8.1 Evolution of the Employment Rate of the United States and Industrial Revolutions from 1830 to 2019



Note: Employment rate is defined here as the number of workers as a percentage of total population, not as a percentage of population aged 15 or more.

Sources: United States Census Bureau (1949); United States Census Bureau (1975); United States Bureau of Labor Statistics (2020); Federal Reserve Bank of St. Louis (2020)

Figure 8.2 Evolution of the Employment Rate of the United Kingdom and Industrial Revolutions from 1855 to 2019



Note: Employment rate is defined here as the number of workers as a percentage of total population, not as a percentage of population aged 15 or more.

Sources: Bank of England (2020); Office for National Statistics (2020a); Office for National Statistics (2020b)

If automation results from one or more firms' optimal decisions, it should be accompanied by an increase in productivity. Therefore, if the adoption of new technology lowers the employment growth rate, productivity growth is enhanced.

A look at real GDP and total employment for 31 member-countries of the Asian Development Bank (ADB) from the ADB key indicators database (2020) can be helpful in illustrating this phenomenon. Productivity is defined as real GDP divided by the number of employed workers, that is, units of real GDP per worker. Among 49 ADB member countries, 31 countries were selected based on data availability and the size of their economies.[42] For those countries where the employment observation was not available, the International Labour Organization (2020b) employment statistics for each country, extracted from employment by occupation database, were used.

Summarized below are the facts about the labor market performance of the 31 Asian countries over the 2000-2018 period. The observation period was divided into two: one covering 2000-2010 and the other 2010-2018, the latter being the beginning of period of the 4IR using available data. The labor market performance of the second period was compared with that of the first period.

- Decrease in total employment in two countries: Thailand and Armenia
- Decrease in the employment growth rate in 20 countries:

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42 The list of 31 economies is as follows: Afghanistan, Armenia, Australia, Azerbaijan, Bangladesh, Bhutan, Brunei Darussalam, Cambodia, China, Georgia, India, Indonesia, Japan, Kazakhstan, Korea, Lao PDR, Malaysia, Maldives, Mongolia, Myanmar, New Zealand, Pakistan, Papua New Guinea, Philippines, Singapore, Sri Lanka, Tajikistan, Thailand, Turkmenistan, Uzbekistan, and Vietnam.

Armenia, Australia, Bhutan, Brunei Darussalam, Cambodia, China, India, Indonesia, Kazakhstan, Lao PDR, Mongolia, Myanmar, Pakistan, Philippines, Singapore, Sri Lanka, Tajikistan, Thailand, Uzbekistan, and Vietnam.

- Increase in productivity growth and decrease in employment growth rate in seven countries: Australia, Cambodia, India, Lao PDR, Pakistan, Philippines, and Thailand.

As for total employment, it declined only in two countries during the second period. Let's see what happened to the employment growth rate instead of total employment itself. Australia, Cambodia, India, Lao PDR, Maldives, Pakistan, Philippines, Thailand, and Turkmenistan are nine countries where productivity accelerated during the 2010-2018 period compared to the first period. Of these nine countries, the employment growth rate declined in seven.

Can the slowdown in employment growth in those seven countries be a consequence of automation or new technology adoption? And will this phenomenon therefore spread to other countries? Taking a look at OECD countries can provide some insight. As OECD countries are more industrialized than ADB-only member countries (Australia, New Zealand, South Korea, and Japan are both ADB and OECD member countries), the symptom should be found more generally among OECD countries. To explore this possibility, 36 OECD country cases were investigated.[43]

Among these 36 OECD countries, there were three countries

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43 OECD member countries provide longer observations than ADB member countries. I selected a longer observation period than for ADB countries. Except for Latvia, Lithuania, Slovenia, Switzerland, and Turkey, key indicators are available from 1995. Therefore, I compared the 2010-2018 period to the 1995-2010 period.

(Ireland, Lithuania, and Spain) where productivity grew faster in the second period than in the first. However, there was no country where the employment growth rate slowed down at the same time the productivity growth rate accelerated during the second period.

As these two studies about ADB and OECD member countries illustrate, the principal impact of digital transformation on employment is not a decrease in employment. While it is true that some labor demand shrinks because of automation, many other demands for labor increase with new businesses and new occupations, as can be observed in both ADB and OECD member countries.

Preparing development cooperation in the era of the changing nature of work

Adaptability instead of accusing the wrong kind of AI

Despite the evidence pointing to the fact that the primary impact of the development of automation will be a change in the nature of jobs rather than a reduction in employment, many people's dominant concern nowadays is that job opportunities are shrinking. However, for Asian workers to find more and better jobs, the key challenge is to make them adaptable so that they are capable of working with automation machines and to promote productivity growth. This is because, in a wide range of fields, low productivity means there is little room for an employer to create new jobs and reward workers with high wages, and higher productivity leads to additional higher-quality jobs. One stylized fact in the development experience of

industrialized countries is that employment growth is high when productivity growth is high.

However, not all technological advances lead to both high productivity gains and an increase in labor demand. While 4IR technologies have been diffused rapidly in recent years, productivity growth has slowed down as well as employment growth. This paradoxical phenomenon may be because those technologies have been introduced much too competitively and in a way that is resource abusive. As a matter of fact, firms have been investing aggressively to acquire market-dominant power without corresponding profit or even with huge deficits. For example, Coupang, a Korean online shopping platform funded by Softbank Vision Fund, is competing fiercely with other players, such as Timon and Wemap in Korea, just as Uber competes with Lyft, Grab, Didi Chuxing, and other ride-hailing platforms in Asia. These firms continuously make investments in themselves solely to increase consumer satisfaction and to accumulate data before the firms' productivity shows accelerated growth.

Acemoglu and Restrepo (2019a; 2019b) insist that the automation currently in progress is different from automation in the past in the sense that labor-displacement effects exceed what they call "labor-reinstatement" effects, more commonly understood as labor demand-creation effects. According to them, various indicators, such as stagnant labor demand, reduced labor share, increased inequality, and productivity slowdown are proof that current AI and other technology advances lead to poor labor-market performance. Firms are substituting low-paid work with machines even though the automation that replaces low-paid work, that is, what standard economic textbooks call "low-productive work," has little effect on productivity (Acemoglu & Restrepo 2019a).

In this sense, the current automation is not as phenomenal as people might think. Of course, the possibility still remains that current types of automation may ultimately lead to an increase in labor demand and wages, but it is also possible that the market may fail to achieve such a state. Therefore, Acemoglu and Restrepo insist that proactive measures are necessary to prevent the introduction of the "wrong" kind of AI. However, a prime suspect for poor labor market performance may not be the wrong kind of AI but the failure of skills, way of working, regulations, and institutions to adapt to the new opportunities that technologies provide.

Changing global supply-chain and adaptation to the future of work

In many countries, productivity slowdowns limit job opportunities in the economy. In developing countries specifically, low productivity is synonymous with poverty. Also, in many Asian countries, raising the productivity of small and medium-size enterprises (SMEs) has the direct impact of narrowing the wage gap or attenuating labor market duality.[44] Thus, using the current digital transformation process as an opportunity to increase the productivity of SMEs is of particular importance. The productivity improvement of SMEs is more accelerated when many firms with high productivity using

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44 Labor market duality refers to a situation where the gap between two different markets seldom narrows because the equilibrating mechanism does not function in the economy as a whole but separately in each market. Therefore, even if a high level of wage prevails in the primary market to the extent that unemployment rate is high, increased labor supply from the secondary market does not lower the wage level in the primary market, and unemployment persists.

new technologies are started than when existing SMEs improve their traditional production facilities to improve productivity.

Together with threats and opportunities that 4IR technologies are bringing about, there is another distinct change worth our attention and which Asian developing countries can take advantage of to enhance the productivity of SMEs. Nowadays, many firms are operating globally and trying to build ecosystems which enable higher productivity and lower risk. As China emerged as the "world's factory" and absorbed production facilities, many other developing countries in Asia were deprived of opportunities to attract firms and build healthy industrial ecosystems. Recently, numerous foreign-owned factories are moving out of China to new locations in order to mitigate supply-chain-related risk (Love Money 2020; Marsman 2020; Swanson & Tankersley 2020).

Building a relevant ecosystem by inviting those firms and providing suitable infrastructure, such as social overhead capital (SOC), labor force and skills, regulations, and policies, are important for Asian developing countries so that they can provide their firms and workers with opportunities for enhancing productivity and adaptability to the future of work. Taking advantage of this occasion will become critically important in the coming years and decades for these countries to upgrade their economies.

In addition to measures to build relevant ecosystems to upgrade their industrial potential, which each country's firms and government may do on their own initiative, governments can cooperate with international development organizations to identify the most required infrastructure they need, to expand it, and to increase the capacity of their national experts. The changing nature of work, related to the issue of the future of work and the need to build an ecosystem, is

providing a new dimension for development cooperation among Asian countries. The issue of the future of work calls for attention to be paid to enhancing adaptability and consensus building of the stakeholders in myriad areas. The coming years can prove to be a positive turning point for both developing countries and development agencies acting in the region if the governments of developing countries make a sincere effort to build a new nexus in the connected world economy and if development agencies support these efforts.

Development cooperation areas emerging due to the future of work

Regulations on certification, competition, and taxes

It is said that the 4IR will bring fundamental changes to the market. If this is the case, many old regulations are no longer effective or fail to guarantee fair competition. New modes of business opportunities are bringing about conflicts among stakeholders of the market, entrants equipped with new technology, and existing players who are threatened to lose their vested rights. These are examples of conditions that both developing and developed countries are now faced with. Technical assistance given by development agencies will have to take this situation into consideration, and this may well lead to new dimensions of development cooperation. An example of this type of conflict observed in South Korea surfaced from October 2019 to April 2020 between Tada (a Korean company which adopted a Grab- or Uber-like business model) and taxi drivers and taxi company owners who ran the business with taxi business certificates under the guidelines of

transportation business regulations. One party consisted of traditional business owners and the other of new start-ups which had brought in so-called "disruptive innovations" on digital platforms.

Legal service and medical service areas can also be sources of new conflicts and serious challenges in South Korea in the future when AI robot-based legal services and medical services call into question the existing norms based on South Korea's existing Act on Lawyers and Act on Medical Services (The National Law Information Center 2020). According to these laws, only licensed lawyers as defined by the South Korean Act on Lawyers can provide legal services, and only licensed medical doctors can provide medical consultations. Now, however, an increasing number of legal services can be given by legal experts without lawyer certification, but working with AI-lawyers, machines which integrate large amounts of data and regulations using algorithms to meet the needs of clients.

Historically, the licensing systems for many businesses (transportation, legal, medical, banking services, etc.) were introduced by government regulators to ensure consumer protection and fair competition, but the digital platform now provides more effective alternatives that forego government intervention. Other sources of conflict include the fact that more loopholes around traditional regulations for controlling monopolies can be found in innovative business models such as Amazon, Google, Apple, Facebook, and other companies that cross international borders on digital platforms. It is clear there is a growing need to review and revise the standards of past regulations on fair competition and taxes. International development agencies may be of help in coordinating such discussions.

In the new environment of digital transformation, it will become more and more urgent to harmonize the interests of stakeholders and

introduce new regulations. These kinds of activities have traditionally been done by established authorities; however, issues related to the product market, labor market, tax regulation, and other areas have grown to the extent that established authorities of developing countries are not able to manage them and domestic nongovernmental organizations, if there are any, are underdeveloped, lack confidence, and/or are incapable in these domains. It is necessary for Asian development agencies, working in conjunction with international development organizations, to plan and promote the appropriate domestic policies.

Labor regulations

The challenges related to the future of work are not limited to regulations on taxes, licensing, or product market competition. In many countries, for example, labor regulations remain outdated and fail to meet the standards of new labor contract practices in the market. An increase in the number of dependent self-employed[45] as well as that of temporary "gig" and platform workers introduces a new dimension to labor policy. In South Korea, as in many other countries, contracts with self-employed or gig workers are regulated by civil law, not labor laws.

With the increase of non-traditional labor contracts and frequent labor turnover, the narrowing of loopholes of labor rights are

45 A dependent self-employed is an independent worker working on his/her own account, but economically dependent mainly on one firm or person in the sense that a dominant part of his/her business sales is from that firm or person. For more details, see International Labour Organization (2017).

hindered, and the need is growing to supplement the existing social protection floor in Asian countries. Protecting labor market participants in the blind spots of social protection by income transfer programs and finding alternative financial resources has become a common challenge to many countries.

Traditional approaches have become lethargic regarding contract diversification. Tax law clearly distinguishes between earned income and business income. Employees pay earned income tax, and the self-employed pay business tax. Present labor law in South Korea exclusively distinguishes between employee and self-employed. Employees are given the right to associate, negotiate and strike, while the self-employed have none of these rights. But in the near future, this may not be the only solution to guarantee all three labor rights, or none of these rights, to a certain group of workers in the labor market. Market norms may well have to be harmonized so that a member of any organization that has collective bargaining rights may be allowed to report his or her income as business income or may file a tax return on business income but be subject to labor law.

Players in the market and regulation designers are faced with the complex problem of guaranteeing business opportunities and at the same time providing relevant protection for workers, on which labor, competition policy, and tax experts need to collaborate to find non-traditional solution regulations. Except for minor differences, this challenging reality is common to all Asian countries, and as such, the solutions to these complex issues can be an important agenda item for discussion.

All these challenges involve conflicts related to the future of work. The other side of the current situation and its implication is that there are opportunities and needs for coordinating meaningful events,

such as discussions, on new regulations for licensing and certification systems, taxes on cross-border e-commerce, and other topics, as well as brainstorming about how governments and businesses can cope with challenges raised by the 4IR and the changing nature of work.

Education contents and system

Capturing the opportunities related to the future of work requires timely and effective initiatives and interventions to equip workers with skills to interact with new technologies, processes, and business models. In industrial countries, the training opportunities and learning processes are mainly done on-the-job in firms. With diversity of firms in those economies, the open innovation strategy[46] of private firms provides opportunities for collaboration and learning. In contrast, in many developing countries, job opportunities where workers can upgrade their skills to adapt to new technologies are rare, educational and training outcomes are not aligned with employer needs, and inactive labor or long-term unemployment is widely observed. These characteristics, coupled with the changing nature of work, exacerbate skill mismatches. Therefore, it is always important both in industrialized and developing countries to encourage entrepreneurship and revitalize business activities to provide workers with opportunities to learn and acquire new skills in their production activities. However, it is also important that schools and teachers change as the world of jobs changes before they send students to the

46 Open innovation strategy is a firm's innovation strategy which pursues innovation with strategic partners of the firm. The firm shares their patents and know-how in R&D as well as R&D outcomes if necessary.

world of jobs.

One possible means of promoting positive change is to ensure room for more activities for already motivated alternative learning organizations. In South Korea, three examples of alternative (in the sense that they are not formal schools) learning organizations and research and development (R&D) communities are Awesome School, MODULABS, and Future Class Network. Awesome School, which started its first program in 2013, provides a one-year or longer flipped-learning curriculum every Saturday called Hero School, where students find and practice what they like and discover how they can contribute to society (Awesome School 2020). In Hero School, experienced "Super Hero Youth Instructors" teach the next generation of "Heroes." These youth instructors have established a so-called mentor-mentee virtuous circle in seven regions of the country. To this date, Hero School has organized hundreds of after-school study communities in middle schools.

MODULABS is a co-research platform specialized in technology research, which has been traditionally performed only in university labs, large firms, and national institutes (MODULABS 2020). It started in 2015 with three research groups and fifteen researchers. Their representative research areas are AI, data analysis, robot engineering, Internet of Things (IOT), finance engineering, virtual reality, and biomedical engineering. In 2017, the City of Seoul selected MODULABS as an operating agency of the city's R&D innovation hub. The alternative R&D practices of MODULABS have contributed considerably to generating research communities and fostering an AI mania and pioneering experts.

The Future Class Network (FCN), aiming to bring educational and pedagogical shift through transforming the way classes are run in

Korean schools, introduced a flipped learning[47] project to motivate students (Future Class Network 2020). This was a strategic approach to create a dynamic, peer-learning environment for students to learn about different domains and build core skills necessary for the future of work. The experiment started with four teachers in their classrooms. Their story led tens of thousands of teachers to join this movement to give the initiative back to students in the classroom learning process.

FCN then developed a variety of teacher-training programs for motivated teachers so that they could learn not only how to transform their classrooms but also how to create a robust community of teachers who want to introduce this paradigm to other classrooms. As of October 2020, over 22,000 teachers were actively participating in this community all over South Korea. The community has shared over 39,000 videos and class materials, together with more than 2,100 individual content-related teaching methodologies.

FCN further developed a comprehensive problem-solving competency development program called PSOL (Problem Solving Oriented Learning), which is a practical tool for nurturing the entrepreneurial skills of the participants and is now on a mission to diffuse its innovative learning experience worldwide. The PSOL program empowers learners to create value for themselves and society while acquiring practical knowledge and skills at hand.

If many schools and classrooms are motivated to introduce

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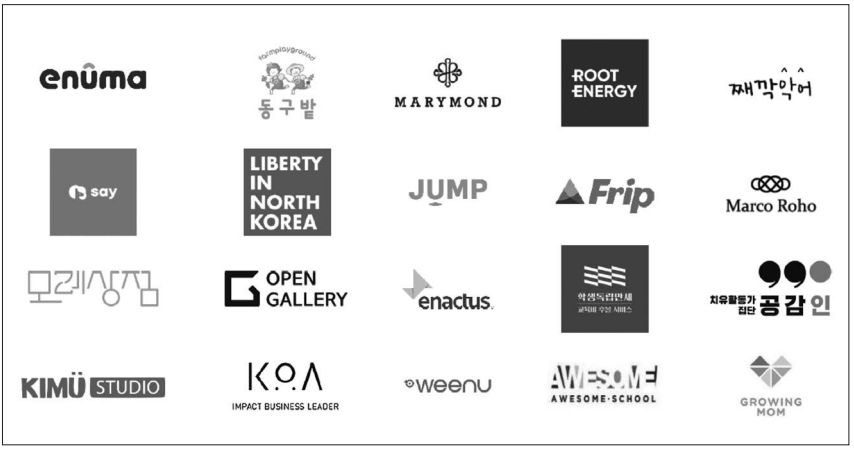
47 In the flipped classroom, students acquire knowledge before the class and use classroom time to practice and apply concepts and ideas through interaction with peers and teachers instead of acquiring knowledge in a classroom context and then leaving the classroom to synthesize, analyze, and evaluate lessons after class.

initiatives such as FCN's to compete with existing methods within the formal education system, changes for the future of work will take place in the formal education system and schools will foster more and more skills needed for the future. This entire process will accelerate future workforce development initiatives. Education authorities may, if necessary, be able to promote these initiatives by accrediting them and allowing them to grant recognized credentials and certificates.

Besides these three examples, there are also social ventures located at Heyground in the Seongsu-dong district in Seoul where many competent social ventures (Figure 8.3) have nested (Heyground 2020a). Those social ventures are agile, motivated, and ready to contribute to non-traditional environments. Enuma is one of the social ventures located at Heyground. It creates and provides self-directed learning solutions that allow all children, including those with special needs or without resources, to gain confidence and independence while building foundational skills (Enuma 2020).

Figure 8.3 Social ventures at Heyground in Seongsu-dong district, Seoul



Source: Heyground (2020b)

The above initiatives and many of their corresponding programs are expected to serve as a stimulus for those stakeholders in the existing education system. In the same manner, they can serve as examples to international development coordinators and Asian countries which are searching for alternative approaches to bring about changes to the education system. Also, they can contribute to the collaborative agenda of Asian countries when they prepare to take on the challenges related to the future of jobs in the region.

Conclusion

Recently, digital transformation is being perceived as a threat rather than an opportunity by many people, and many are concerned about the future of their jobs. This fear stems more or less from the current environment, where learning systems are not fit to respond to the challenge. Education fails to provide skills needed in the labor market, and few firms provide opportunities to acquire relevant skills to respond to this challenge.

This fear is also due to the fact that, although uncertainty is large, institutional changes and policy responses to reduce this have not been adequately implemented. In many places, entrepreneurship is not suitably encouraged, either by relevant regulations on starting and running businesses, competition policies, labor contracts, and social protections. In this context, the future of work has emerged everywhere in the world as a fundamental question that needs to be addressed, not only by workers but also by policy decision makers and business leaders.

Numerous countries have recognized the importance of innovation

and promotion of industrial competitiveness. Of course, both are important. However, the issue of the future of work goes beyond this. It requires us to make efforts to adapt traditional regulations to the changing nature of the market, to prepare for the changing nature of work, and to enhance the adaptability of students, teachers, schools, and firms. Now is the moment when a strategic approach is more important than ever. An example of a strategic approach can be to try to build up an ecosystem for a certain industry, and development cooperation can be organized in this context. There is also a social dimension in preparing for the future of work. New regulations on certification, competition, taxes, and labor standards to cope with new forms of businesses, new regulations on labor and social protection in response to the emergence of diverse labor contracts, and required changes of schools and teachers to meet new skill needs can be areas of development cooperation.

We are living in an era when more future workforce development initiatives and entities are needed as new technology is adopted and diffused around the world. Accelerating international cooperation and the exchange of knowledge are key to securing a future that works for everyone.

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Creating the Future of Work Now

Anthea Mulakala

The COVID-19 pandemic has tested Asian economies' technological agility, readiness, and response in different yet overlapping ways. The unprecedented public health crisis has pushed the digitalization of some services further, accelerating workplace transformations full tilt into the Fourth Industrial Revolution. In this "new normal," as in the old normal, individual, national, and regional economic survival rests on profitable productive work that is increasingly dependent on advanced technologies. Although many have prospered despite the disruptions, this "new normal" has revealed the precarity of workers "left behind" because they or their employers could not keep up with previous technological advancements. Further pandemic-driven and technology-enabled disruptions to work practices and processes threaten still more workers, especially youth, women, small businesses, and populations in less developed Asian countries. This volume of essays has presented expert perspectives from government, civil society, academia, policy bodies, and multilateral agencies on

how Asia's stakeholders can and should navigate the rough waters caused by disruptive change to achieve productive and inclusive work for all in the digital age. Their roadmaps include four fundamental imperatives: provide suitable skills, inclusive support, hard and soft infrastructure, and cross-border cooperation.

Narrow the skills gap

Hur is confident that more digital transformation will not cause a decrease in employment; instead, demands for labor will increase from new businesses and occupations. Worker adaptability will be key, and herein lies the challenge. All authors share the concern that much of Asia's education and learning infrastructure is not ready to foster skills that the 4IR will require. At least half of Asian workers need significant new or upgraded skills. To meet the requirements, 21st century education systems should offer continuous learning opportunities to enhance workers' digital literacy and fluency. They should also shift from teaching rote learning to enabling creativity, complex problem solving, and cognitive flexibility (Chen 2020; Belyh 2020). Although Hur, Rattanakhamfu, and Taidong and Qi provide successful examples to emulate, and support can be derived from national action and development cooperation, education reform remains an intransigent and slow process. We can hope that the COVID-19 pandemic and the economic urgency of 4IR survival will catalyze sectoral change.

Prioritize inclusive policies

Asia's citizens are driving digital industrialization and being trampled by it. For the region to survive and thrive economically and socially, those who have been crushed and left behind must instead be included. Therefore, future-of-work strategies and innovations ought to assist women, youth, and small and medium-size enterprises (SMEs). Pointing to the gender digital divide, Mawii underscores the need for women to access and control technology of their own in order to fully benefit from digital literacy and fluency skills. Pointing to under-educated youth, Rattanakhamfu makes a critical assessment of Thailand's outdated ICT education and pleas for a creative and practical pedagogy, one that prepares masses of Asian young people to fully enter the workforce. In turn, Taidong and Qi and Hur describe innovative learning platforms that can inspire and motivate those young minds. Pointing to Asian entrepreneurship, Sudan reminds us that small and medium-size enterprises constitute 96 percent of all businesses in Asia. Supporting them with technology, finance, business models, and accessible data will help safeguard Asia's economic backbone from fracture.

Humanware complements hardware

Given the stakes, clearly Internet access should be a public good. Despite the high percentage of Internet users across Asia, Izmestiev and Adiwal point out that 70 percent of people living in Asia's least developed countries have no access. These economies require drastic infrastructure and job market transformations for their workers to

participate effectively in the digital economy. Taidong and Qi explain that China's Digital Silk Road and complementary Belt and Road Initiative (BRI) endeavor to fill these essential hardware gaps through the provision of cross-border fiber-optic cables, other communications trunks, satellite networks, and terrestrial and submarine cables. Alongside this hardware, complementary investments in "humanware" — skills development, affordable and equitable access to technology, and enabling legislation — will ensure the optimization of these high-tech infrastructure investments.

Cooperation over competition

The COVID-19 pandemic has hastened the advent of the 4IR in some respects; it has also sharpened the rising nationalism and protectionism that preceded the crisis. Surviving the pandemic and creating an optimal future of work requires cross-border cooperation, not competition. It also requires shared goods and services, and collective responsibility. Izmestiev and Adiwal note that many countries focus on the competitive aspects of technological development more than on cooperative synergies. Like previous industrial revolutions, the 4IR has become yet another battleground for national technological-cum-geopolitical superiority. Regional organizations, such as ASEAN, should play a bigger role in safeguarding the needs and interests of its working population as technology becomes more political and companies compete for market share. Dewan envisages an important governance role for ASEAN to build a repository of regulations for new forms of work. ASEAN should, for example, establish frameworks for remuneration, develop guidelines for social protection and

investments in human capital, and set standards for educational best practice in the digital age. Lokshin promotes APEC as an important venue for consensus-building around how its member economies can effectively manage 4IR workforce transformations. He and Sudan echo the importance of regional cooperation to develop and share tools that leverage the power of AI, including horizon scanning and new data collection and analysis, in order to promote inclusive economic growth and employment.

This call for Asian cooperation and leadership over the region's economic future may find another response in the recently signed Regional Comprehensive Economic Partnership (RCEP). Signed by 15 Asian nations, RCEP signals a positive step toward shared Asian ownership of the region's economic future. RCEP, like ASEAN and APEC, provides another platform for Asia's governments, investors, entrepreneurs, and other stakeholders to navigate geopolitical and industrial competition and pursue the agenda laid out in this volume to create the conditions necessary for a sustainable future of work in Asia. The 4IR has an exciting, yet disturbing, inevitability. This volume shows that Asian economic survival requires immediate investments in education reform, human capital, physical infrastructure, and inclusive and fair policies along with investments in regional knowledge sharing, governance, and cooperation to deliver these priorities now and in the future.

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