

The Future of Work Across ASEAN

Policy Prerequisites for the Fourth Industrial Revolution

Recommendations and Country Studies



IN PARTNERSHIP WITH

The Future of Work Across ASEAN

Policy Prerequisites for the Fourth Industrial Revolution

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A DIGITAL ECONOMY THAT WORKS FOR EVERYONE

This white paper is the first in a series of Asia Foundation reports examining the political and economic dimensions of the region's digital transformation within the context of the Fourth Industrial Revolution. The paper outlines critical policy and institutional adjustments needed for 4IR readiness in the region.

The Asia Foundation is committed to a digital economy that delivers shared prosperity and inclusive growth at every level of society.

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Executive Summary

Is the Future to be Feared?

Most experts agree that the global economy is entering the *Fourth Industrial Revolution* (4IR) – the most recent transformative shift in the way that we create and transfer services, goods, and information among buyers and sellers. This revolution, like the three that came before it, is driven by a set of interrelated technological advancements that present the basis for new economic paradigms. The First Industrial Revolution of the late 18th and early 19th centuries was marked by the arrival of steam-powered engines and machines that allowed people to convert wool into textiles, ore into iron, and wood pulp into paper more quickly and efficiently. The Second Industrial Revolution of the 19th and early 20th centuries was characterized by the spread of electric bulbs that lit up the night, telegraphs that transferred messages in a split second, and railroads that shuttled people across continents. Later, the Third Industrial Revolution of the late 20th century saw a proliferation of digital technologies: computers powerful enough to send humans into space and back; to automate many manufacturing, banking, and communication systems; and to enable the global web of interconnected systems that we today call the internet. In the 21st century, the Fourth Industrial Revolution, also often referred to as “Industry 4.0”, is driven by technologies that mimic and transform many human and biological processes, including artificial intelligence and machine learning, “smart” systems based on the internet of things (IoT), and advanced data systems that enable real-time and predictive analytics.

In each historical era, technological innovation has disrupted, replaced, or transformed existing industries and generated intense debate around the impact of these changes on jobs. In 1589, the English inventor William Lee created the first mechanical knitting machine, but he was denied a patent by Queen Elizabeth I out of concern that his invention would make thousands of English hand-knitters unemployed. Lee promptly moved to a friendlier regulatory environment in France, where he established a workshop and continued improving a technology which is still in use today. In the mid-1800s, as



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sewing machines were introduced in Europe and the United States, numerous factory-based machines were destroyed by tailors who feared that the technology would eliminate their jobs. Stories of deep unease regarding the impact of new technologies on jobs and livelihoods can be found at every stage of each prior revolution.

This collective anxiety was not unfounded. As the First Industrial Revolution began, mechanical weaving, sewing, and other labor-saving textile production tools were employed to disrupt an array of traditional “cottage” industries which had formed around the production of clothing, shoes, and household textiles. During this period, jobs were lost and communities were reoriented towards larger-scale production efforts. However, as the widespread transformation of traditional ways of working took place, what ultimately emerged was the textile and apparel industry – a sector of the modern economy that has led to massive increases in living standards, new employment opportunities, higher productivity, and lower consumer costs worldwide. What’s more, rather than eliminating the handmade industry, mechanization instead created new markets for higher-quality, higher-value bespoke products.

In hindsight, it is clear that technological innovation has consistently generated greater productivity and more jobs for workers over the long run. But Queen Elizabeth’s concern for the hand-knitters was not entirely misplaced: for workers with outdated skills, innovation can be a cause for legitimate pain and uncertainty. As the Fourth Industrial Revolution (4IR) unfolds, new and emerging technologies are expected to, again, drastically alter the economic landscape and the ways that workers navigate it.

These incipient technologies will help many companies reach higher levels of productivity at lower input costs by capitalizing on an era in which markets are increasingly unconstrained by borders. At the same time, it is possible that entire industries may be transformed beyond recognition, their workforces replaced or substantially augmented by software and machines. ASEAN market and labor forces – already evolving rapidly in response to the trends in the region’s economic, political, and environmental landscape – are also in flux thanks to the changes brought about by 4IR technologies.

Preparing for the Future of Work

Undoubtedly, ASEAN’s future jobs will look quite different from those we know today. We cannot predict the direction or scope of the transformation before us, but we can take lessons from the past and knowledge of our current capabilities to understand shifting labor markets, help workers adapt, and set a policy agenda for a future of work that is productive and rewarding for the region’s people.

This paper examines the challenges confronting ASEAN policymakers in the face of the Fourth Industrial Revolution and how they can work together with other stakeholders to promote prosperity, jobs, and inclusive growth. Drawing on interviews and research conducted by The Asia Foundation’s in-country teams in Cambodia, Indonesia, Malaysia, the Philippines, Singapore, Thailand, and Vietnam, this paper describes some of the key hurdles facing ASEAN economies as well as recent and ongoing efforts by both the public and private sectors to address them.

The paper also suggests a set of practical steps that can be taken now to benefit the region’s economies and make them more resilient to uncertainty and change.



POLICY PARTNERSHIPS TO IMPROVE LABOR MARKET DASHBOARDS

Building better “dashboards” that enable the region’s policymakers to identify, track, share, and interpret labor market trends will lead to an enhanced capacity to formulate effective policy responses to the Fourth Industrial Revolution.

While we cannot predict the precise impacts the Fourth Industrial Revolution will bring to the region, history suggests that we can expect an increase in the variability and rate of change in skills demand, as new job categories appear that break conventional molds and sectoral distinctions. What it means to be an assembly worker in an Indonesian automobile factory today may be very different than in ten or twenty years, when basic

assembly processes will have been mostly automated and vehicle technology itself may have changed dramatically. Unless policymakers and governments enhance their capacity to monitor these changes, shifts in skills demand will occur at a rate that outpaces the ability of governments to track and understand these trends.

At a basic level, better data is needed for policymakers to strengthen their understanding of the challenges ahead. More specifically, policymakers need to mine data from previously untapped resources and partnerships that can help them anticipate future trends in the labor market and gaps in their workforce's skills, knowledge, and training. Through coordination at the national and regional level, policymakers can work with the private sector in order to unlock useful market data that already exists. Innovative new public-private partnerships can help policymakers establish new data-sharing initiatives that give leaders better tools to predict skills shortages and gaps in training capacity. Technology can also play a role, as connected databases and artificial intelligence systems make it possible to track real-time trends at a massive scale.

Another challenge is to coordinate across ministries and agencies, as well as between public and private sectors. As governments enhance their capacity to collect actionable market intelligence, they must be able to share it with stakeholders in meaningful ways. This can be done through reducing bureaucratic silos among ministries. The creation of cross-ministerial working groups on labor market trends within government or the formation of policy co-creation workshops to engage experts in and out of government are two examples of how this can be achieved. ASEAN economies can also create more realistic plans for upskilling and training by conducting long term planning activities that incorporate strategic foresight and forward-looking research.



The Asia Foundation/Tran Giang Linh



ENHANCED CAPACITY TO DELIVER SKILLS TRAINING THAT FITS THE MARKET

By encouraging innovation and adaptation in skills training ecosystems, policymakers can create more flexible and responsive tools to address upskilling and retraining needs that reduce deployment times, increase precision in the delivery of services, and respond to skills gaps as they emerge.

As employers demand new and different skills, traditional education and training pathways may fall out of step with the evolving marketplace. This problem is particularly severe for communities that are typically excluded from elite technical education pathways – most notably women, rural people, and other disadvantaged populations. Therefore, ASEAN economies should enhance their capacity to respond to skill shortages by encouraging inclusive innovation and adaptation in the training ecosystem. In doing so, they will create more flexible and responsive systems and resources that can be deployed quickly as new skills gaps are identified.

Policymakers should focus on the addition of new capabilities to existing education and vocational training services, the enhancement in discoverability of these services, and the creation of new models of continuing education. For example, governments could choose to focus on innovative, flexible credentialing models. In addition, special attention should be paid to creating pathways for female workers and other marginalized populations that can help these groups access the requisite skills development resources necessary for the upcoming economic repositioning.

Policymakers must work with academia, civil society, and private sector actors to explore new partnerships, informed by improved labor market dashboards, in order to foster a skills training ecosystem responsive to the needs of a rapidly evolving labor market. Stakeholders must also work together to ensure that workers and employers are aware of and able to access upskilling resources. New means of communication, such as social media, could facilitate this, and policymakers must work to design and promote innovative upskilling models that meet the needs of women and the underserved.



STRUCTURAL REFORMS TO PROMOTE MORE INNOVATIVE ECONOMIES

The ASEAN region is at a crossroads, where labor-intensive, export-led growth may no longer present the benefits it once did due to the impact of 4IR technologies. In response, ASEAN policymakers should redouble their efforts to institute key structural reforms that strengthen local innovation ecosystems and enable the region’s entrepreneurs to harness 4IR transformations in ways that generate jobs.

It appears that, from the standpoint of economic history, the greatest benefits of technology-driven innovation accrued to the societies and governments that remained open to it. Policymakers are advised to consider prior periods of technology-driven change; reflect on the past and future of work; and note that, on balance, innovation has historically led to periods of significant job creation. The transformation of so-called “cottage industries” during the First Industrial Revolution – in which local artisans developed hand-crafted products for local distribution – is a case in point. During this period, innovations in textile manufacturing helped produce clothing more rapidly and at a lower cost, ultimately leading to the formation of the garment industry – a source of global job creation for centuries thereafter.

Today, the Fourth Industrial Revolution presents similar opportunities to establish new centers of innovation and growth within ASEAN. Already, a cohort of talented young entrepreneurs, software engineers, web developers, and product designers are building creative communities in Southeast Asia’s urban hubs that have produced dozens of globally impactful companies and inventions, including billion-dollar internet companies like Grab, Gojek, Tokopedia, Lazada, and Sea. As the world economy shifts toward digitally-enabled services, the future of ASEAN’s industrial competitiveness and income growth lies largely in these innovation and knowledge sectors of the broader economy.

Policymakers can capitalize on this shift by promoting policies that aim to grow knowledge and innovation ecosystems within the region. They can do this by promoting a governance system and business environment that encourages businesses in the knowledge economy to innovate. Critical policy considerations include rules that promote domestic and foreign direct investment, technology transfer, the repatriation of human capital, tax incentives for entrepreneurial behavior, as well as regulations that protect and encourage the development of intellectual property. In doing so, policymakers will help strengthen and diversify key sectors of local economies that are likely to drive innovation, sectoral

growth, and job creation. Conversely, governments should steer away from policies that inhibit innovation by engaging in protectionism, over-regulation, or the creation of “walled gardens” online.

Finally, echoing the conclusions above, this paper encourages policymakers to use cross-sectoral collaboration and experimentation to understand and prepare for future innovations. While recognizing the unpredictable nature of economic transformation, policymakers can use techniques like scenario planning and regulatory sandboxes to create thorough roadmaps based on the best available evidence.



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STRUCTURE OF THIS PAPER

This report is organized as follows: the Key Recommendations section details the above policy interventions through the lens of challenges presented by the expanding adoption of 4IR technologies. Part II provides an overview of the technologies most anticipated to impact ASEAN economies. Part III surveys the macroeconomic and political factors affecting work across the region. Finally, Part IV presents seven country case studies, which assess the current state of affairs of each country’s labor force and the actions – as well as gaps in those actions – policymakers are taking to prepare its workforce for the impact of 4IR. Each country assessment also suggests a path forward: steps that policymakers can take now to prepare their workers to not only survive but prosper in the labor market of the future. This report’s analysis makes clear how truly cross-cutting a phenomenon 4IR is; policymakers tasked with managing 4IR effects in ASEAN will require better data and evidence, a vision for what future ASEAN economies should look like, and deeper cross-sectoral collaboration towards achieving that vision.



PART 1

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Key Recommendations

A key goal of labor and employment policy is to create the conditions within local economies whereby citizens can develop the skills necessary to gain access to higher paying jobs. In addition, there is a need to support policies that foster a resilient, innovative, and forward-looking economy which promotes knowledge work as a complement to more traditional forms of employment, and helps local entrepreneurs establish firms that can compete on the global stage.

This paper examines the challenges confronting ASEAN policymakers in the face of the Fourth Industrial Revolution and how they can work together with relevant stakeholders to promote prosperity, jobs, and inclusive growth. In particular, this paper suggests a set of practical steps that can be taken now that will benefit the region's economies regardless of the shape of the coming decade's labor market shifts. Proposed interventions highlight the need for reforms that 1) improve data and evidence for policymaking, 2) make education and vocational training more adaptable and responsive, and 3) promote more innovative economies.

The following recommendations are provided to ASEAN member states to support their efforts to measure and respond to technology-driven changes in local labor markets. Taken together, these recommendations can aid ASEAN leaders in their efforts to capture the benefits of 4IR innovations that lead to inclusive economic growth.

POLICY PARTNERSHIPS TO IMPROVE LABOR MARKET DASHBOARDS:

To formulate responsive labor market reforms, policymakers must strengthen their understanding of the challenges ahead with better data. Through coordinated policymaking at the national and regional level and innovative new public-private partnerships, policymakers can leverage new repositories of workforce data to more accurately evaluate current and future trends in the labor market.

ENHANCED CAPACITY TO DELIVER SKILLS TRAINING THAT FITS THE MARKET:

ASEAN countries must upgrade their existing education and vocational training ecosystems in ways that make them more adaptable and responsive so that gaps in skills can be addressed more rapidly and effectively. This can be achieved through smart government action and more robust partnerships with private sector actors. Policymakers should also develop new approaches to continuous learning, upskilling, and credentialing that are more accessible to women and underserved populations.

STRUCTURAL REFORMS THAT PROMOTE MORE INNOVATIVE ECONOMIES:

Policymakers can address the shifting demand for workers away from labor-intensive roles and towards more knowledge-centric jobs by promoting policies that aim to grow the local digital and service economies as well as the knowledge sector, where demand for workers is likely to expand.



POLICY PARTNERSHIPS TO IMPROVE LABOR MARKET DASHBOARDS

To formulate effective policies that are responsive to 4IR challenges, policymakers need accurate, up-to-date analytics that help them anticipate labor market trends and gaps in workforce skills. They must explore new public-private partnerships that give policymakers access to data with which to evaluate labor market trends. They must also collaborate across bureaucracies that have traditionally isolated questions of technology and the economy into specific ministries, and draw in expert voices from outside of government to better assess the future of work and improve governments' capacity to plan for long-term upskilling needs.

Challenge: The Fourth Industrial Revolution will increase the variability and rate of change of skills demand in ASEAN in ways that outpace the speed at which governments can gather relevant, up-to-date labor market data and thereby accurately evaluate these shifts.

Recommendation: Expand governments' access to key data and knowledge resources necessary for smart and responsive labor policy.

- **Leverage Existing Private Sector Resources:** Policymakers can develop a better understanding of how the demand for skills and competencies is evolving by examining a broader basket of market and product data, in particular that which is already available on online platforms. They can work with global labor market platforms and service providers such as Burning Glass, EMSI, and LinkedIn, as well as local job search platforms, and enable data sharing through programmable interfaces (APIs) and open data.



The Asia Foundation/Andrew Thornley

- **Establish Public-Private Data Sharing Initiatives:** To develop new and co-created data resources, ASEAN member states – both nationally and regionally – should explore new, secure public-private labor market data sharing partnerships with a range of private sector and CSO actors that can give the region’s leaders new tools to predict skills shortages and gaps in training capacity while respecting data privacy. This will also require building skills and capabilities in data analytics within government organizations tasked with policies related to the future of work.

Challenge: The future of labor market innovation will be a rapid, cross-sectoral process that challenges traditional government policymaking.

Recommendation: Enhance the capacity of ASEAN member states to craft responsive and timely upskilling policies which are multi-faceted and reflect the input of experts from across government, academia, and the private sector.

- **Reduce Bureaucratic Silos:** Create cross-ministerial working groups within ASEAN which can address labor market issues horizontally within bureaucracies and enhance the capacities of ASEAN member states to implement nimble and responsive approaches to upskilling needs. An end goal of these working groups would be to formulate cross-sectoral strategies for addressing 4IR challenges.



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- **Promote Policy Co-Creation Workshops:** Policymakers should build constructive and collaborative partnerships with experts and academics across many fields through policy co-creation workshops which focus on formulating strategies and recommendations for skill shortages.
- **Enhance Government Capacity to Conduct Long Term Planning on Upskilling:** Policymakers should develop new mechanisms for long term planning that incorporate strategic foresight and forward-looking research. Singapore's Centre for Strategic Futures can serve as a useful role model in this regard.

CASE STUDY: LABOR MARKET DATA IN SINGAPORE

Singaporean policymakers consistently collect and assess data on the workforce and marketplace to monitor current labor market demand and make evidence-based predictions on the future needs of the labor market. For example, the Manpower Ministry has made it compulsory for companies to report retrenchments within five working days, if five or more staff are retrenched within six months. This enables the government and unions to act on the data more quickly. There have also been calls to use data from job postings on the national Jobs Bank more fully; for example, if a vacancy for a particular type of job is re-posted, it may indicate more Singaporeans need skills in that area.



ENHANCED CAPACITY TO DELIVER SKILLS TRAINING THAT FITS THE MARKET

Governments should enhance the upskilling ecosystem's capacity to meet the needs of the future by proactively upgrading existing educational and vocational training services, improving their accessibility and discoverability, and creating new models for continuing education. Policymakers must ensure certifications meet regional standards and initiatives serve women and underserved populations, such as those in rural regions.

Challenge: Traditional methods of skill building and technical and vocational education and training (TVET) are not responsive enough to match the increasing variability in labor market skills demand, nor do they match the demand for upskilling from workers themselves.

Recommendation: Policymakers must work with academia, civil society, and private sector actors in order to design and promote creative models of continuing education, training, and skills building.

- **Reform Curricula to Address the Changing Nature of the Workforce:** ASEAN has undertaken a series of exploratory efforts to promote education reform in the region, including the development of the ASEAN Workplan on Education. The Workplan should be expanded to cover curriculum reform that addresses the evolving needs of increasingly innovative economies – noting STEM as well as the promotion of foundational skills such as literacy, numeracy, digital literacy, critical thinking, creative problem solving, and emotional intelligence.
- **Exploit Private Sector Partnerships to Develop New Models of Upskilling:** Employers, more so than governments or training providers, have direct insights into workforce skills gaps, and they have an inherent interest in growing the pool of hireable workers



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with industry-relevant skills. However, not every company in ASEAN is able to convey these insights to government, and few administer formal training programs in-house. Policymakers can bridge these gaps by facilitating partnerships around curriculum development that align public and private upskilling programs with the needs of the market and with consensus-based standards for certification. Employers can take on a dual role: first, in articulating which skills are needed among their workforce, and second, in supporting awareness and implementation of relevant upskilling programs.

- **Promote Lifelong Learning as an Education Principle in Partnership with Business:** As businesses face more demanding and competitive environments, business leaders will require that more of their employees embrace lifelong learning. ASEAN member states should therefore explore ways to incentivize businesses to upskill their workers as well as ways to incentivize workers to seek training opportunities.
- **Consider Innovative, Flexible Credentialing Models:** With rapid changes in technology and continuously evolving business models, ASEAN member states should consider introducing more flexible training models, including those that can be delivered online, such as micro-masters degrees. These degrees require relatively modest time commitments from workers, and are low cost, knowledge-intensive credentials that can better meet the needs of a changing market. Other innovative models include on-demand training, on-ramp training programs, and work-based learning experiences.



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Challenge: Workers remain unclear on the upskilling resources available to them.

Recommendation: Improve accessibility and discoverability of upskilling resources.

- **Improve Accessibility and Discoverability of Resources with Special Focus on Women and the Underserved:** Governments and the private sector should work together to ensure that workers and employers are aware of and able to access upskilling resources. Governments should also work to create better pathways for women to return to the workforce after a career break and to advance further within high-growth fields such as STEM. New means of communication, such as social media, can facilitate this. ASEAN member states should examine, as appropriate for each country context, how social and other digital media can be leveraged to raise the visibility of new skill building services and generate data on the quality and accessibility of current offerings.

CASE STUDY: ONLINE LEARNING IN THAILAND

In Thailand, a national online course platform called Thai MOOC (massive online open course) was established in 2017 through a partnership between the Ministry of Digital Economy and Society, Ministry of Science and Technology, and Ministry of Education. Thai MOOC is built on the open source edX framework, and its aim is to fulfill the “Thailand 4.0” vision of ensuring lifelong learning for citizens. The project also has partnerships with government organizations and universities. This unusual model allows people to enroll remotely in short-term courses and earn certificates that are recognized by Thai universities.



STRUCTURAL REFORMS THAT PROMOTE MORE INNOVATIVE ECONOMIES

Job losses will occur as 4IR disruptions ripple through certain industries, some of which have been relied upon as key drivers of growth for the ASEAN region. Policymakers may be tempted or pressured to sustain these sectors, but they should instead focus on growing the local digital and service economy where, ultimately, future opportunities for growth and job creation reside. They can do this by promoting a governance system and business environment that encourages the private sector to innovate. This includes policies that promote domestic and foreign direct investment, technology transfer, the repatriation of human capital, tax incentives for entrepreneurial behavior, and regulations that protect and encourage the development of intellectual property. Conversely, governments should steer away from policies that inhibit innovation by creating walled gardens or separating local networks from global ones. Recognizing the unpredictable nature of economic transformation, policymakers can create thorough plans based on the best available evidence.

Challenge: Technology may adversely disrupt sectors of the economy that were once drivers of growth, and policymakers may feel pressure to sustain these sectors.

Recommendation: Promote the growth of digital and service economies that will generate new, higher-value employment opportunities and offset job losses occurring in other sectors.

- **Encourage Proactive, Business-Enabling Policy Measures that Lay the Structural Foundations for Innovation and Inclusive Growth:** To support the growth of the digital and service economies, governments should pursue key policy reforms on cross-border data issues, tax incentives to encourage investment, a predictable and non-discriminatory digital service tax policy, and immigration and work visa rules designed to accommodate the demand for skilled digital entrepreneurs and knowledge workers.



The Asia Foundation/Ted Alcorn

Protecting and promoting the development of intellectual property rights will also encourage firms to innovate.

- **Encourage Global Interconnectedness and Resist the Rise of a “Splinternet”:** ASEAN member states should avoid the “walled-garden” approach to managing internet resources as such efforts ultimately inhibit the growth of digital service and knowledge economy jobs.

Challenge: It is difficult for policymakers to track and predict the real effects of new and emerging technologies that are not yet widely adopted.

Recommendation: Use cross-sectoral collaboration and experimentation to understand and prepare for future innovations.

- **Conduct Scenario Planning around Potential 4IR Transformations:** Scenario planning approaches have proven helpful for policymakers seeking to understand and prepare for potentially transformative innovations, from self-driving cars to drones. ASEAN countries would do well to pursue such an approach, working with cross-governmental counterparts and citizens to “wargame” the implications of various policies vis-à-vis key knowledge and service sectors’ job demand.



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- **Build Regulatory Sandboxes:** For cases where current regulatory frameworks do not properly account for new innovations, policymakers should allow the private sector to engage in the context of “regulatory sandboxes” – clearly delimited spaces where innovators have permission to work out their ideas in coordination with regulatory bodies.

CASE STUDY: PROMOTING INNOVATION IN MALAYSIA

The Malaysian Government has acknowledged the importance of the digital economy by undertaking concerted efforts to spur digital transformation. The Malaysia Digital Economy Corporation (MDEC), a government-owned institution responsible for the management of the Multimedia Super Corridor in Malaysia as a technology industry and commerce zone, is tasked with spearheading Malaysia’s Digital Hub and various technopreneurship programs to attract global and local start-ups. This resulted in related investments of RM16.3 billion in 2016. The Malaysian Global Innovation and Creativity Centre (MaGIC) has become an important incubator of new startups and a catalyst within the digital entrepreneurship community.





PART 2

The Asia Foundation/Conor Ashleigh

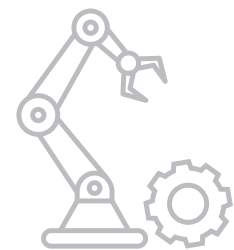
4IR Technologies Altering the Landscape of ASEAN Industries

How will artificial intelligence affect the transportation industry? What skills will be needed for the next generation of workers in high-tech agriculture? What employment options are available to migrant workers in the garments sector should their jobs be replaced by robots? Labor market predictions rely not only on accurate economic data, statistics, and a clear-eyed analysis of the larger macroeconomic and political trends that affect work across ASEAN, but also an understanding of the complex technologies affecting the future of work. This section surveys several technologies changing the nature of jobs in ASEAN now and in the years to come.



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Automation and Robotics in Manufacturing



Automation refers to hardware or software that is capable of doing tasks automatically without human intervention, while robotics refers specifically to the development of automated machines. Although replacing human labor with robots and automated systems can be a clear net positive in many instances (such as for physically dangerous jobs) these technologies threaten to displace many traditional occupations. The most prominent example is the manufacturing sector, where robots equipped with cutting-edge technologies can do much of the assembly-line work currently conducted by humans. Some companies have even built so-called “lights-out” factories, where lights and heating are unnecessary because there are no humans on the factory floor. While industrial robots have existed in some form for decades, the maturation of more advanced sensing technologies, including computer vision, will accelerate this transformation.

Leading occupations in a number of ASEAN countries are at a high risk of replacement or drastic realignment as a result of automation. For example, in Cambodia, where garment production dominates the manufacturing sector and is an important source of rural employment, close to half a million sewing machine operators may lose their jobs to automation. Similarly, Vietnam’s footwear and garments sector accounts for nearly 40% of rural manufacturing jobs. In Thailand and Indonesia, the automation risk is particularly acute for approximately one million shop sales assistants and about 1.7 million office clerks, respectively.¹ Food and beverage production contributes to 27-30% of all rural manufacturing employment in these countries and these jobs are also at risk of automation. Because rural workers have, on average, lower levels of education and more limited reskilling and upskilling opportunities, automation and robotics pose a significant risk to their livelihoods.

But the rise of factory automation does not mean that all of ASEAN’s 18 million or more manufacturing workers will be left jobless, if and when their factories are automated.² Even highly automated factories require human labor to design, monitor, service, and “train” the machines. For example, both Toyota and Tesla rely on thousands of human workers to run their high-tech car factories.³ Though repetitive, unskilled, and purely physical manufacturing tasks are most likely to be automated, new opportunities will open up in these same sectors, requiring workers to have higher-order skills in problem-solving, data literacy, and communication.



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Artificial Intelligence and Machine Learning



Artificial intelligence (AI) refers to the ability of software or hardware to exhibit human-like intelligence. In modern systems, AI is usually combined with machine learning, which allows computers to autonomously learn new processes by analyzing massive quantities of data. Unlike other forms of automation, AI-powered systems are able to sense and react dynamically to new conditions, invent new solutions on the fly, and perform complex tasks, such as driving vehicles, recognizing speech and text, and generating new text and images. AI has wide-ranging applications, from detecting fraud in banking systems⁴ to sorting cucumbers on a family farm.⁵ Its introduction and widespread adoption is likely to affect employment more than any previous technology due to its ability to substitute not only tasks involving physical labor, but those requiring analysis, cognition, and verbal communication as well.⁶

AI is predicted to significantly increase employee productivity, but it may also displace large numbers of workers in the manufacturing, transportation, and professional services sectors. The increase in employee productivity will be most significant in ASEAN's lower- and upper-middle income countries, including the Philippines, Malaysia, and Indonesia, with productivity growth estimated at between 46% and 52% according to one report.⁷ High-income countries will also see increases, such as in Singapore, where employee productivity will increase at a lower but still significant rate of 38%. Even if the level of employment across ASEAN countries remains the same, economies are likely to undergo a dramatic shift from agricultural and manufacturing jobs to higher-value service-sector jobs.⁸

The resulting impact on employment patterns is likely to be dramatic. One study found that 56% of manufacturing workers in Vietnam, the Philippines, Thailand, Indonesia, and Cambodia are likely to be displaced by AI.⁹ Workers who adequately upskill to manage the higher-order tasks AI enables may be able to remain in their sectors and even increase their incomes. But the least-skilled are most likely to be displaced and potentially forced to compete for a diminishing supply of low-paying work that cannot easily be replaced by AI or other forms of automation.

Additive Manufacturing



Additive manufacturing (AM), also sometimes referred to as 3D printing, is a production process in which a machine converts digital blueprints or scans into a physical object by layering material into precise shapes. Provided with the appropriate design data, AM allows a single machine to produce a near-infinite variety of unique and specialized objects. For this reason, AM is especially valuable for rapid prototyping and customization, and it is now frequently integrated with conventional manufacturing techniques to make factories more efficient and responsive to customers' needs.¹⁰ Combined with a shift to a regional model of manufacturing, AM allows ASEAN companies to manufacture the parts they need on-site or nearby. Given rising protectionism and global trade conflicts, this is an effective strategy for companies to reduce production costs, tariffs, and time associated with importing parts from abroad.

AM is becoming critical to a broad range of industries, including aerospace, healthcare, automotive, and tooling. In the Philippines, for instance, the Department of Science and Technology (DOST) has established two facilities to support the development of AM, with the goal of increasing the productivity and quality of the country's aerospace, defense, biomedical, healthcare, and automotive industries.¹¹ However, because AM requires expertise, a skills shortage is emerging in ASEAN countries. Investing in reskilling and educating the workforce will be critical to ensuring the growth of industries increasingly reliant on AM.¹²

Internet of Things



The Internet of Things (IoT) is composed of a “global network of computers, sensors, and actuators connected through Internet protocols.”¹³ The term encompasses anything connected to the internet, but is increasingly being used to define objects that “talk” or transmit data or information to each other over the internet. Cars, kitchen appliances, and even heart monitors can all be connected through the IoT.

No sector has been more impacted by IoT technologies than manufacturing, which has been using IoT solutions to track resources in factories, consolidate control rooms, and

improve the efficiency and productivity of operations through “predictive maintenance.” The benefits of IoT in manufacturing include increased safety, profitability, and efficiency of factories by providing an additional layer of automated oversight. In addition, IoT allows companies to gather real-time analytics on hundreds or thousands of physical objects and mechanical systems. In general, workers are expected to benefit from these improvements, as are consumers. However, the paradigm shift that accompanies IoT will also require ASEAN’s workers to shoulder new responsibilities and handle large quantities of data, rather than solely relying upon their prior experience or intuition. Workers in IoT-powered factories will need to acquire new skills, especially digital literacy, critical problem-solving, and data literacy.¹⁴

Cloud Computing



Cloud computing technology became widespread in the early 2000s, when tech giants like Amazon, Google, and Microsoft made their worldwide network of data centers available to other companies and individuals as a virtual service. Thanks to economies of scale, these distributed networks are extremely efficient and reliable, and they enable companies to set up and launch their own web services quickly and cheaply. Cloud computing has enabled the growth of innovation ecosystems around the world, as it allows entrepreneurs to rapidly build, test, and grow new apps and websites. These technologies also make “analog” businesses more efficient by providing more efficient internal IT infrastructure and international communications. Cloud computing has given rise to entirely new “platform” business models that rely on continuous data transfer between widely dispersed users.

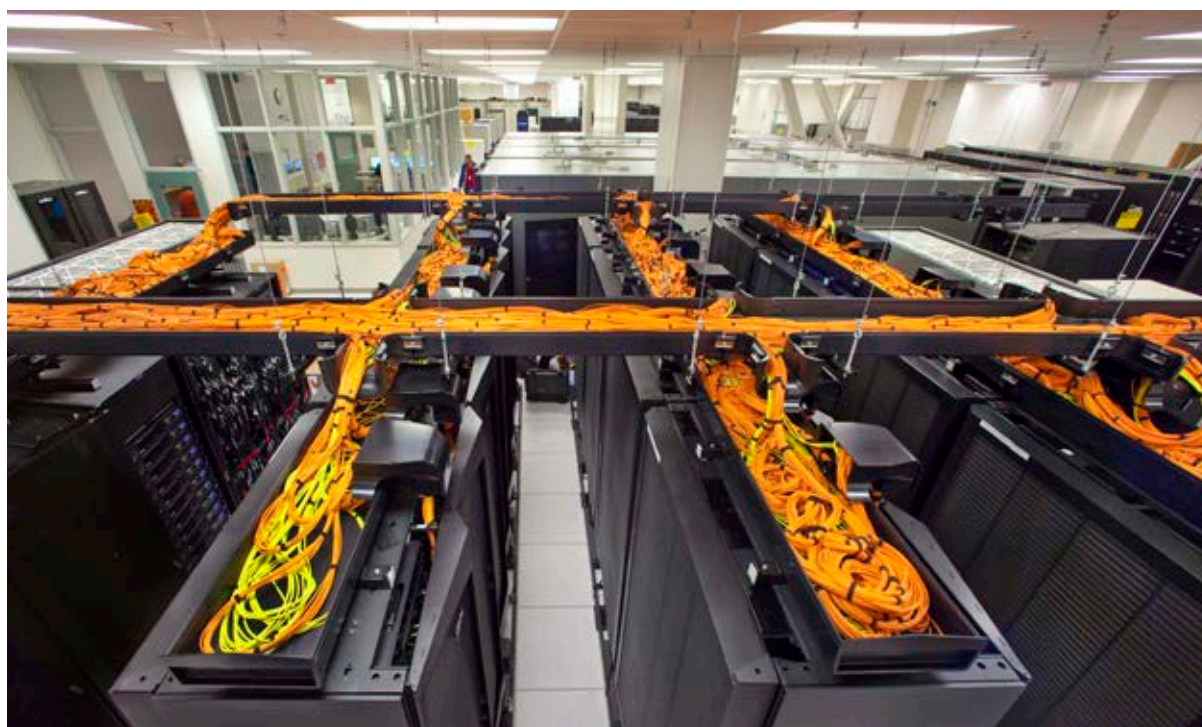
Cloud computing services almost always necessitate the cross-border flow of data, sometimes bouncing through multiple jurisdictions before reaching a destination. Data held “in the cloud” may also be stored on servers located in a different country from the company that actually owns the data, raising potential concerns in countries where data localization is legally mandated. The 4IR technologies underpinning the new economy, such as IoT and certain AI services, rely on cheap and accessible cloud computing resources, and restricting cross-border data flows can have far-reaching effects on businesses and consumers. Policies that inhibit data flows due to national security or privacy concerns thus run the risk of raising costs and dampening many of the benefits of 4IR technologies and online platforms.

Predictive Analytics



Predictive analytics is, as defined by IBM, the use of “advanced analytic capabilities spanning ad-hoc statistical analysis, predictive modeling, data mining, text analytics, optimization, real-time scoring and machine learning.”¹⁵ All of these tools help organizations discover patterns in data and predict events in the future, often with remarkable precision.

The financial sector and many internet companies have already adopted predictive analytics for fraud detection, customer analysis, and evaluating credit risk. The Commonwealth Bank of Australia, for example, uses analytics to predict the likelihood of fraud activity for any given transaction before it is authorized – within 40 milliseconds of the transaction initiation. Other businesses use predictive analytics to predict and respond to the human resource needs of their companies, and to proactively develop a talent management pipeline. Leading companies are using predictive analytics to understand and forecast where talent will be plentiful and scarce, how talent will move between roles, and even who will leave and when. As accurate and up-to-date data becomes more prioritized and accessible, ASEAN governments may be able to harness predictive analytics to better gauge trends in their own labor markets.



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PART 3

UN Women/Staton Winter (CC BY-NC-ND 2.0)

Macroeconomic and Political Trends Affecting Work Across ASEAN

ASEAN's labor markets are evolving rapidly in response to shifting trends in the region's economic and political landscape. These trends intersect with the accelerating adoption of new technologies by businesses and individuals, creating a complex system of push and pull factors that affect the future of work in the region.

Within such a dynamic setting, predicting with accuracy the impact of 4IR technologies on the demand for labor is challenging. Certain aggregate shifts in labor demand, such as the growing concentration of global supply chains within ASEAN, will generate broadly positive macroeconomic effects that are likely to increase the demand for workers in many sectors. On the other hand, negative influences, such as the effects of climate change on rural and coastal areas, may reduce the viability of traditional employment options, further exposing the vulnerability of people's livelihoods. This section reviews a set of broad macroeconomic and political factors influencing policymakers' ability to assess the impact of 4IR on jobs and skills demand in the region.



TREND 1: The Digital Economy Promises New Jobs

Entrepreneurship in ASEAN’s digital economy is growing more accessible and globally significant, leading to new investment and wealth creation in the region, as well as uncertainty about where the benefits will accrue.

In the first quarter of 2019, while the rest of Asia saw a pullback in venture capital funding, ASEAN startups raised billions of dollars from investors in Silicon Valley and elsewhere.¹⁶ These companies, including at least ten “unicorns” with valuations of more than US\$1 billion, are transforming industries across the ASEAN region and beyond. New technologies introduced by these companies have shifted many job functions, replaced certain human roles, and generated a new set of jobs requiring complementary technical and administrative skills. Some of these technologies have already dramatically changed the way governments, companies, and individuals are communicating ideas, executing policies, and doing business. Other technologies are poised to affect these processes in the near future.

As evidenced by the many stories of successful founders from Southeast Asia (including Grab, valued at \$14 billion, and Gojek, valued at \$10 billion), it is in many ways easier to start a new enterprise in ASEAN than ever before. At a basic level, starting an internet company requires a digital device, an internet connection, and some degree of digital literacy. A would-be entrepreneur in Bangkok, Penang, or Phnom Penh equipped with just these prerequisites could theoretically access a massive quantity of online learning materials, platform infrastructure and free software frameworks, inexpensive third-party solutions for business management and marketing, and active communities of like-minded founders and investors within their region’s innovation ecosystems.¹⁷ Some governments have taken active roles in promoting these ecosystems, such as Indonesia’s “1000 Startups” program and the Malaysian Global Innovation and Creativity Centre (MaGIC).

New internet companies also create new jobs. The Southeast Asian internet economy employs an estimated 100,000 skilled professionals and four million “partners”, or workers on flexible schedules who provide food delivery, e-commerce logistics, or transportation to customers. By 2025, those figures have the potential to grow to 200,000 skilled jobs and 12 million partner jobs.¹⁸ However, the impacts of the widest-reaching “gig economy”

companies are highly contested, with ongoing debates around the welfare of on-demand workers, the sustainability of highly leveraged venture-funded enterprises, and the correct regulatory approach to new companies that disrupt established industries. In the absence of clear answers, policymakers, analysts, and industry leaders will need to work together to establish an environment in which ASEAN's burgeoning digital economy can continue to grow inclusively and sustainably.



TREND 2: Global Supply Chains are Shifting to ASEAN

Worldwide supply chains are moving to the ASEAN region, leading to consistent economic development and opportunities for immediate job growth.

Four decades of strong economic growth in ASEAN economies has generated a new middle class and modern industries that can compete on the global stage. The opportunities for job growth across ASEAN economies, especially the rapidly-developing “ASEAN 5” (Indonesia, Malaysia, the Philippines, Thailand, and Vietnam), are significant. The ASEAN 5 grew collectively at a rate of 5.2% in 2018, against global growth of 3.6% in the same period. These five economies are predicted to maintain this growth in the coming years at a rate of 5.1% in 2019 and 5.2% in 2020, while global growth is predicted to further decline to just 3.3% in 2019.¹⁹

The ASEAN region has emerged largely unscathed by the latest tensions and stresses that have caused global growth to slow. The escalation of U.S.-China trade tensions, tightening of credit in China, macroeconomic stress in Argentina and Turkey, disruptions to the auto sector in Germany, and financial tightening as part of the normalization of monetary policy in the larger advanced economies have not significantly affected the ASEAN region.²⁰ Instead, ASEAN has benefited from the reconfiguration of worldwide supply chains. As production costs in China have risen and uncertainties in US-China trade relations have increased, global manufacturing is now relocating from China to ASEAN. The region has also continued to receive high levels of Foreign Direct Investment (FDI) as a result of its largely successful shift from an agriculture-based economy to one increasingly supported by manufacturing and services, a growing consumer market, a better educated workforce, improved infrastructure, and an expanding logistics network.²¹



TREND 3: The Rise of the Global Service Economy

Cross-border services are becoming more important than the physical trade of goods, forcing ASEAN value chains to become more knowledge-intensive and reliant on high-skilled labor.

While ASEAN economies have benefited from current geopolitical trends diverting trade away from China, the region is still subject to global reductions in the cross-border trade of goods. The global trade slowdown experienced over the past eight years is likely to become the “new normal,” as reshoring in developed economies takes place, protectionist measures rise, and the global demand for goods decreases.²² Though more goods continue to be manufactured, fewer of those goods are being traded across borders, as companies are increasingly establishing their production sites close to their intended consumers. The production of certain goods (particularly automobiles, computers, and electronics) is also becoming more regionally concentrated in Asia and Europe. Even with the immediate gains due to geopolitical effects, ASEAN economies may be unable to sustain their growth in the long term by solely relying on the inexpensive, low-skilled labor force that has driven their development so far.

At the same time, cross-border services are growing, with some assessments indicating that services now make up half of all cross-border trade.²³ Increases in productivity brought about by new and more efficient technologies and higher consumer savings driven by lower prices for goods could stimulate demand for these services. Indeed, job losses in developing Asia due to technological advancements have so far been more than compensated for by rising domestic demand among a growing middle class.²⁴ ASEAN economies have much to gain from the shift in demand for services if they are able to continue their evolution toward knowledge-intensive service industries, especially those delivered through global digital platforms.



TREND 4: Citizens are Better Educated and Tech-Savvy

ASEAN’s many educated, internet-literate workers are adapting to new roles in knowledge management and digital services.

Though disparities exist between and within economies, ASEAN citizens as a whole are better educated and more familiar with digital technologies than ever before. Higher education institutions in ASEAN are engaging their counterparts across the region as well as globally and aligning their national education strategies with those of others. For instance, Thailand has begun to recognize transnational educational qualifications, and

Vietnam has increased its collaboration with regional accreditation recognition and quality assurance agencies.²⁵ Furthermore, greater access to technology and online resources is making lifelong learning practices more accessible, equitable, and inclusive.²⁶

ASEAN customers and employees are adopting new technologies at a pace that is accelerating.²⁷ The vast majority of internet users connect through their smartphones, and Southeast Asians spend upwards of four hours per day on the mobile internet – the highest in the world.²⁸ ASEAN internet users access an array of services, many created by homegrown internet startups, to buy and sell goods, access transportation, book travel, apply for jobs, use financial services and payments, and enroll in online courses. Such familiarity and comfort with digital platforms stands to serve them well in the coming decades.



TREND 5: ASEAN Faces Rising Levels of Income Inequality

The gains of industrial growth are often distributed unequally, and growth driven by technological innovation may further entrench “digital divides.”

As in the rest of the world, growth across ASEAN has not always occurred at the same rate throughout the population. All countries in the region, except the Philippines and Cambodia, are experiencing rising levels of inequality (as measured by the Gini Coefficient). A striking example is Thailand, a country that has experienced tremendous growth, but whose richest 1% now own, according to Credit Suisse, fully two-thirds of the total wealth.²⁹ This is a considerably higher proportion than any other country included in Credit Suisse’s annual survey.

It is unclear whether the overall productivity gains and democratization of service provision promised by 4IR technologies will smooth out these income and wealth inequalities, or whether these technologies will further concentrate wealth and income growth in privileged sectors to the detriment of others.³⁰ However, there is no doubt that numerous “digital divides” continue to inhibit many citizens from participating in the digital economy to the fullest extent, reducing the earning potential of those on the wrong side of the divide. Across the region, the best-connected and most digitally-literate individuals tend to be men in urban areas, while women, the elderly, persons with disabilities, and rural communities remain at the fringes of the digital economy, unable to build digital skills, and largely excluded from ICT policy-making processes.³¹ This digital divide, if left unaddressed, threatens to further entrench inequalities within ASEAN societies and slow the region’s growth potential.



TREND 6: Women Often Bear the Brunt of Economic Disruption

Gender-sensitive policies are needed to unlock the latent capacity of the millions of women who will join the workforce in the coming decades.

As the Fourth Industrial Revolution takes shape in ASEAN, women will face new challenges that often intersect with traditional ones. For example, women have traditionally been employed in factory work that consists of repetitive, easily routinized tasks that are likely to be automated in the coming years. Administrative and clerical service workers – pursuits which have also been traditionally held by women in ASEAN – are similarly likely to see a degree of automation that contributes to job loss. Given these trends, ASEAN will need to address the unique challenges faced by women and devise strategies that can help them manage 4IR disruptions.

Digital technologies in particular offer women new paths to prosperity in light of 4IR. For women entrepreneurs, new technologies offer both the flexibility needed to manage work and family responsibilities, and also the possibility to expand their customer base beyond their own cities. A McKinsey survey in Indonesia found that women-owned micro, small, and medium-size enterprises (MSMEs) generate 35% of e-commerce revenue, compared with only 15% of offline MSME revenue, and women entrepreneurs contribute more than 9% of the country's GDP.³⁶ This e-commerce business model reveals the untapped potential of women in the future of work.

However, the gender digital divide threatens to keep these possibilities beyond many women's reach. There are a number of aspects to the divide. First, women lag behind men in access to digital technology and the internet. According to the GSMA, low literacy and digital skills were the top barriers preventing female mobile owners in Asia from using the internet.³⁷ Women are also at a disadvantage in accessing resources that would help them learn how to use digital technologies, and are generally underrepresented in the STEM disciplines. For example, an ILO report found that in Thailand, 1 in 4 men studied STEM degrees, compared to only 1 in 7 women.³⁸ The lack of women in STEM cuts off the pipeline of potential female workers with the skills needed to design and create digital technologies, as well as women in leadership and decision-making roles in the digital sector.

Until policymakers address these aspects of the digital divide, the economic potential of women will remain underutilized. Finally, given that women often shoulder the bulk of

household labor *in addition to work outside the home*, they have less time than men to undertake upskilling activities.



TREND 7: Climate Change & Migration Offer New Challenges

Large-scale impacts of climate change and migration will force economies to make adjustments to protect the most vulnerable segments of the workforce.

Southeast Asia's primarily agriculture-based economies are extremely vulnerable to climate change. Between 1990 and 2010, emissions of carbon dioxide increased faster in Southeast Asia than anywhere else in the world, and the region has experienced rising temperatures each decade since 1960. Climate change is expected to have particularly serious effects on agriculture, fishing, tourism, and health and result in significant loss of traditional jobs. Rice yields in Indonesia, the Philippines, Thailand, and Vietnam alone are expected to drop by as much as 50% by 2100 from their 1990 levels as a result of climate change.³⁹ The impact of climate change on the region is likely to be most acute in Vietnam, due to its high dependence on agriculture, low level of rural development and long coastline, along with recent trends towards lower crop diversity, and the erosion of social safety nets.⁴⁰

However, renewable energy and afforestation present new opportunities to offset losses in traditional job sectors. For example, following the imposition of antidumping duties on Chinese manufacturers, Malaysia and Thailand are fast becoming global players in the manufacture of solar panels. Renewable energy technologies are on the rise, including wind power, photovoltaics, solar towers, wave energy, tidal generators, hydrogen fuel cells, biodiesel, waste-to-energy plants, lithium ion batteries, vertical farming, artificial photosynthesis, LED lighting, and recyclable electronics. These new technologies are supporting the emergence of green industries in the region, and upskilling in this area will be important to job growth in the coming years.

ASEAN economies are also deeply impacted by migration, including rural-to-urban migration, intra-regional migration within ASEAN, outward migration from ASEAN to other parts of the world, and inward migration of workers from less developed countries in South Asia. Thus far, migration has been a net benefit to ASEAN by providing steady remittance income from overseas workers and by filling gaps in each country's labor market.⁴¹ However, the vast majority of migrant workers are low-skilled or unskilled

laborers whose personal and financial security is often placed at risk. Additionally, the occupations that typically employ migrants, such as manufacturing, food service, and clerk positions, are at high risk of substitution by automation.⁴² Domestic and foreign migrants will undoubtedly continue to play a key role in the ASEAN labor market for the foreseeable future, but policymakers will need to contend with how the broader economic and political trends impacting the region will affect the migrant workers upon whom their countries depend.



The Asia Foundation



PART 4

World Bank/Gerhard Jörén (CC BY-NC-ND 2.0)

How ASEAN Countries are Preparing their Workforces for the Impact of 4IR

The actions ASEAN governments and businesses are taking to prepare their workforces for the impact of the Fourth Industrial Revolution vary widely. Singapore, for example, is already a global leader in technology entrepreneurship and the adoption of technology in government. In less economically developed countries like Cambodia, policymakers are working to put into place the basic IT infrastructure required to digitize critical government and business functions. Less developed countries must also grapple with funding and implementing upskilling programs needed to train their workforce to effectively utilize new technologies. This section takes an in-depth look at what seven ASEAN nations are doing to prepare their workforces for the future of work and identifies in each country examples of good practices being implemented by government and private sector stakeholders. Each chapter highlights major challenges still to be addressed and offers a path forward along three axes of policy interventions: policy partnerships to improve labor market dashboards, enhanced upskilling capacity to respond to market demands, and structural reforms that promote more innovative economies.

CASE 1:

CAMBODIA



THE FUTURE OF WORK IN CAMBODIA

- Driven by manufacturing and tourism, Cambodia's economy has grown at an average annual rate of 7.7% since 1995.
 - Cambodia's workforce is characterized by low education, low-to-medium skill levels, low technical literacy, and an average age of 34.6 years old.
 - More than half of Cambodian workers (over 4 million jobs) are at a high risk of automation, in particular those in the textiles, clothing, and footwear (TCF) manufacturing sector.
-
- Cambodia's policymakers face the major challenge of shifting their existing labor policy frameworks beyond the initial planning phase to implementation, while simultaneously addressing the data-impooverished environment in which planning has taken place thus far.
 - Both the public and private sectors are lagging in preparing the workforce for the digital revolution sweeping the region. Cambodia's education and TVET systems are still low performers compared with those of other countries in the region. But the National TVET Policy offers a timely framework within which to find solutions to enhance the country's upskilling capacity.
-
- Cambodia's digital economy is still in the early stages. Little quantitative information is available on its actual size and scope. Policymakers must closely monitor this sector and create an enabling regulatory environment for the digital economy to grow.



The Asia Foundation/Karl Grobl

Driven by garment exports and tourism, Cambodia's economy has sustained an average annual growth rate of 7.7% between 1995 and 2018, making it among the fastest-growing economies in the world. As global demand peaked in 2018, economic growth is estimated at 7.5%, compared to 7% in 2017, and is expected to remain robust over the medium term.⁴³

Poverty continues to fall in Cambodia. According to World Bank estimates, the percentage of the population living below the poverty line dropped from close to 48% in 2007 to just 13.5% in 2014. Yet while Cambodia has achieved the Millennium Development Goal (MDG) of halving poverty, the vast majority of families who escaped poverty did so only by a small margin. Around 4.5 million people remain near-poor, and 90% of them live in rural areas and have limited ability to absorb even small economic shocks.

The workforce is characterized by low education and low-to-medium skill levels, with an average workforce age of 34.6 years old.⁴⁴ Generally, jobs are evenly distributed between men and women across all economic sectors in Cambodia. Of the country's 3.3 million wage employees, 1.8 million (54%) are concentrated in just three sectors: agriculture; textiles, clothing, and footwear (TCF); and manufacturing and construction, all of which are highly susceptible to technological substitution. Occupations at high risk of automation include sewing machine operators, stall and market salespersons, bank tellers, accountants, street food vendors, crop farm laborers, and construction and retail workers.

While product customization technology, such as additive manufacturing, body scanners and computer-aided design, is driving the TCF sector globally, robotic automation and automated sewing machines are likely to have the greatest impact on TCF enterprises and workers in Cambodia. As a traditional sourcing market for international buyers, the TCF

sector is highly integrated with and dependent upon the global market. Consequently, as US tariffs on Chinese textile and clothing manufacturing make these items more expensive, a significant number of manufacturing firms are shifting to Cambodia. Despite the benefits Cambodia could receive from this shift in global supply chains, around 88% of its workers in the TCF sector, the majority of whom are female, are at risk of automation.

Women, those educated at only a secondary school level, and those in rural communities are especially vulnerable. Overall, Cambodian women are 50% more likely than men to be employed in an occupation at high risk of automation. Primary school graduates are 20% more likely to be in a high-risk occupation than post-secondary graduates. For the 14% of Cambodians who obtain a bachelor's degree or higher, there is a significant disparity between men and women choosing to pursue science, technology, engineering and mathematics (STEM) degrees, with 27.8% of male students pursuing STEM degrees compared with just 14.6% of female students.⁴⁵ This disparity places Cambodian women at a disadvantage in an increasingly technologically advanced job market.

In general, Cambodian workers lack many of the skills needed to work effectively in a digital economy. This includes managing online information, i.e. the ability to search for, identify, evaluate and communicate online data; collaborating online, i.e. the ability to use tools such as cloud storage, productivity applications, calendars, web meetings, and learning environments; and analyzing data, i.e. the ability to extrapolate trends and patterns in data using spreadsheets and other tools.⁴⁶ The lack of skilled workers also constrains the ability of domestic enterprises to adopt the technologies required to develop and to remain regionally competitive. This skills shortage is exacerbated by a lack of foreign language skills. And since most internationally developed online training materials are not available in Khmer, it is that much more difficult for employees to self-direct their own learning in this area.

Cambodia urgently needs to prepare its workforce for the labor market disruptions that 4IR promises to bring. As technologies become more cost-effective, Cambodia will lose the comparative advantage it possesses through its low wage workers, and ultimately Cambodian exports will lose their competitiveness. This will lead to the relocation of TCF production elsewhere and the loss of employment of a significant share of its workers, or both. The country's heavy reliance on the TCF sector makes prioritizing economic diversification and economic growth in other sectors a prudent strategy. Cambodia is significantly behind its ASEAN neighbors in making this transition, but this also means it can look to existing models of success to implement sensible and informed policy reforms.



POLICY PARTNERSHIPS TO IMPROVE LABOR MARKET DASHBOARDS

The Government of Cambodia has stated its goal of becoming a digital economy by 2023 and announced a coordinated and ambitious overarching strategy to respond to the challenges of 4IR, strengthen the nation's education, and diversify its economy. The Rectangular Strategy for Growth, Employment, Equity and Efficiency (2018) policy includes a series of ancillary policies, such as the National Policy Framework on Technical and Vocational Training 2017-2025, the Cambodian Qualification Framework, National Competency Standards and Competency-based Curriculum. These policy frameworks address a number of the nation's education and training issues, such as technical and vocational training accreditation, the establishment of the model centers for technical training, and enacting a national day of technical and vocational training. However, at of late 2019 they remain in the nascent development and planning stages and are not yet widely publicized to the broader population, nor are they supported by a realistic timeframe for implementation.

Moreover, while existing policies commit to making evidence-based plans for a digital transformation, they do not clearly articulate the means by which such evidence will be collected. The Ministry of Labor and Vocational Training, for instance, is tasked with responding to the needs of the current job market, rather than improving data analytics to anticipate and prepare for upcoming shifts in the market. The National Institute of Statistics is charged with leading and coordinating the gathering of the nation's statistics, but it is a decentralized organization, and it is not clear what agency is ultimately responsible for overseeing the collection and assessment of 4IR-related trends in labor market data.

The government's commitment to developing a data-driven tracking tool – which would allow them to monitor current labor market demand and predict future shifts – is currently hampered by limited funds and human resources. Without such a systematic tracking tool in place to capture data on jobs and skills trends, policymakers' ability to track changing market demands and workforce trends is severely constrained. Instead, individual ministries are dependent upon their own market assessments developed through a limited set of individual consultations with specific private sector corporations. The National Institute of Posts Telecommunications and Information Communication Technology (NIPTICT), for instance, devotes significant resources to conducting annual consultations with a select group of large companies to assess their workforce demands and update their institutional training curriculum.

To some extent, other non-governmental stakeholders are filling in the gaps in understanding. For example, the German think tank KAS surveyed 61 companies in Cambodia to gain insight into the private sector's and Cambodian workforce's readiness for a digital economy. It found that while 83% of companies surveyed acknowledged that digital technologies will significantly transform their industry in the next ten years, only 22% of them were prioritizing preparation for this transformation.⁴⁷ This is the kind of investigation that policymakers must coordinate if they are to plan effectively for and tailor policies to the future.

The Path Forward

Cambodia's policymakers face the major challenge of shifting their existing policy frameworks and coordination mechanisms beyond the initial planning and assessment stages into implementing specific actions to prepare a future-ready workforce. To ameliorate the data-impooverished environment in which planning is presently being conducted, policymakers must begin the hard work of cross-ministerial harmonization of 4IR agendas. For example, the private sector consultations conducted by the NIPTICT and by other ministries contain troves of data that likely can be turned into useful, actionable information, if done in coordination with the National Institute of Statistics' data collection efforts.

Government must also look for partnerships in the private sector and elsewhere to gather relevant, up-to-date labor market data with which to inform their policymaking. Critical to their data-gathering efforts will be data on skills and certifications sought by employers, as well as skills gaps and training requirements that will be useful to emerging industries and also to existing industries seeking to remain regionally competitive. There are a number of local jobs posting websites, such as pelprek.com and bongthom.com, that also serve as recruitment agencies. These would be good starting points for the task of developing measures to track changing market demands and workforce trends. In addition, companies often use social media sites like Facebook to list job openings. Thus, it may be worth exploring ways to mine relevant information posted on social media sites.



ENHANCED CAPACITY TO DELIVER SKILLS TRAINING THAT FITS THE MARKET

Cambodia's workforce is currently ill-prepared to absorb the impact that 4IR technologies will have on its labor market. For workers, even having skills in technologies already commonly in use today, such as code writing or website designing, is rare, as evidenced by a survey of employees performed by KAS.⁴⁸ There are a number of factors impacting the preparedness of Cambodia's workforce for 4IR. First, the quality of Cambodia's education system (including vocational education) is still low compared to that of many of its neighboring countries, and does not meet market demands nor regional standards. Challenges also remain in raising educational attainment rates in secondary and post-secondary education. For workers who would like to improve their skills, it is often incumbent upon themselves to find the resources to do so, but much of the existing resources are in English and therefore inaccessible to them. For employers, many are disincentivized to provide their staff with training, out of fear that they will leave the company after receiving training.

The World Economic Forum's 2017 Global Human Capital Report rates Cambodia the poorest among ASEAN member states for educating and training its citizens to develop a competitive workforce. However, Cambodia's government is implementing a host of initiatives to improve its education system. For example, it is increasing the pre-service teacher training requirement for primary and secondary teachers from two years to four years, aiming to increase their educational attainment level to a bachelor's degree.⁴⁹ This would put Cambodia's educational standards on par with Thailand's, where all K-12 teachers must hold at least a bachelor's degree. In addition, the Ministry of Education, Youth, and Sport (MoEYS) continues to refine its strategy on ICT in education, for example, by incorporating ICT into the curriculum from grade 4 through grade 12 since 2015. MoEYS also developed a STEM Policy in 2016, which aims to strengthen the capacity of students in schools and universities in STEM to respond to job market needs and ASEAN integration; formed STEM universities and STEM clubs; and provided capacity-building for teachers and researchers in STEM fields.

Cambodia's TVET system is also saddled with a number of challenges that render it inadequately responsive to labor market demands. An ADB assessment cited a variety of reasons, from outdated training methods and equipment, to trainers' lack of direct industry experience, as well as limited financial resources for the TVET system.⁵⁰ Moreover, attitudes towards TVET are negative, as many view it as a second option, or

as education meant for the poor, marginalized groups, or school dropouts. Finally, TVET qualifications are not standardized or accepted across other education streams or the private sector within the country, much less regionally across ASEAN. Cambodia's latest National TVET Policy (2017–2025) is intended to address these constraints, with its stated aim of supporting “lifelong education and employability” for the workforce. The government knows that it cannot achieve this goal alone and thus includes among its policy objectives the enhancement and promotion of closer collaborations between educational and TVET institutions and the private sector.

“ We cannot avoid the evolution of technology, so we have to be ready and improve the skills [of workers] so that they are flexible to the demands of industry. Cambodia’s workforce is still young, and we have time if we start now to adjust the education and vocational system to get the desired outcome. ”

Mey Kalyan, senior advisor to the Supreme National Economic Council⁵¹

Various Ministries have begun exploratory digital training strategies. For instance, the NIPTICT is working with the Japan International Cooperation Agency (JICA) to establish an “IT passport” curriculum and certificate system for Ministry personnel. To date, the IT passport has provided training to 3,000 people and now online modules are being developed with the goal of introducing the program as a qualification to work within the Ministry. Initiatives such as these are still in the formative stages and largely ad hoc. However, they demonstrate a government commitment to redressing the country’s overall low digital literacy, beginning with its own employees.

Some companies are also demonstrating an initiative to train their employees. For example, Smart Axiata Company Ltd. (SMART), Cambodia’s leading mobile telecommunications corporation, is at the forefront of advancing good practices by supporting the development of the country’s digital ecosystem. Through its technopreneurship and innovation programs and digital startup initiatives, SMART is working to improve the country’s digital and ICT literacy, promote continuous education, and build the next generation of leaders in the digital era.

Other stakeholders are also rising to the challenge of upskilling Cambodia's workforce. Non-profit organization Passerelles Numeriques Cambodia (PN) provides education and technical and professional training in the digital sector to small groups of young, underprivileged people. The curriculum is updated every two years based on demand assessments from local partner companies and an analysis of the global movement of market-leading companies like Microsoft. Since 2005, 1,437 students have graduated from its Data Management Operator training programs. Of the 965 students who graduated from its two-year program, 90% of them found employment within two months after graduating and 100% within three months, earning an average monthly salary of USD \$256, about twice as high as the national minimum salary. Professional training programs like these can be models for how Cambodia's TVET system designs new curricula to bring the country's workforce into the digital future.

The Path Forward

The government has announced its aspiration to attain upper middle-income status by 2030. But to do so, the country will need to develop the skills of the Cambodian workforce to effectively utilize new technologies and respond to changing market demands. Currently, both the country's government and private sector are lagging in preparing its workforce for the digital revolution sweeping the region. The National TVET Policy offers a timely framework to find solutions to enhancing the country's upskilling capacity.

Public-private partnerships will be an important avenue through which enhancements to the existing TVET system are made. For example, one solution to outdated training materials and curricula could be found in partnerships between TVET providers, local businesses engaged in translation work, and online training platforms such as Coursera, edX, Udemy, Udacity, or Khan Academy. To improve the accessibility and awareness of training and reskilling resources, policymakers should consider coordinating with the TVET system, social media sites, and private sector to implement outreach and marketing campaigns. Policymakers should also explore ways to reproduce successful models of in-house employee training programs, such as those already being implemented by companies like Smart Axiata, or by adapting and extending curricula like the government's own "IT Passport."



STRUCTURAL REFORMS THAT PROMOTE MORE INNOVATIVE ECONOMIES

Cambodia's impressive economic growth over the past two decades has relied to a large extent on the export of low-value goods such as garments, which has been possible due to the sector's low wages. However, as wages rise and automation becomes an increasingly attractive and cost-effective option, Cambodian industries will eventually be faced with pressure to eliminate jobs. Smaller and locally owned TCF enterprises in Cambodia tend not to engage in technology upgrades to the same extent as those connected to global value chains, which is likely to render them uncompetitive over time. Larger firms may be faced with the challenge of finding adequately trained staff to fill positions with higher skills requirements. Whatever the scenario, Cambodia will need to pursue new drivers of economic growth, a labor market ready to absorb workers, and a workforce equipped with the skills demanded by that market.

Cambodia is at a critical juncture in its development. The government is looking to the promotion of the digital economy as a key step in the country's strategy to boost productivity and transform the economy. Accelerating development of the digital economy requires innovation and development in the telecoms and ICT sectors and a conducive business environment for start-ups, small- and medium-sized enterprises, and investors. Policymakers have articulated multiple objectives for their strategy, including creating a robust digital environment that allows both small and large firms to connect to the global digital economy value chain, creating new business activities in digital payments, online entertainment and e-commerce, and increasing the number of users who adapt themselves to such technologies. The National Assembly's approval of the E-Commerce Law in October 2019 was an important step forward in this respect.

“ [We] will focus on strengthening and expanding the foundation of the digital economy in both hard and soft infrastructure, developing human resources and skills in line with the new context, as well as developing an appropriate legal and regulatory framework. ”

Aun Pornmoniroth, Minister of Economy and Finance⁵²

Presently, Cambodia's digital economy is still in its nascency, and little quantitative information is available on its actual size and scope. Access to mobile technology is high, but mobile broadband and fixed broadband subscriptions remain low and below that of ASEAN and global averages.⁵³ E-commerce platforms like Alibaba and locally based services like ride-hailing app PassAPP are increasingly popular, and digital payments platforms are emerging. But overall, digital adoption remains low, especially for businesses and government. In addition to much-needed digital infrastructure, the World Bank notes there is a broad need to develop complementary regulations, skills, and institutions.⁵⁴ In particular, the lack of a well-developed legal and regulatory framework for e-transactions, data protection and privacy, cybersecurity, consumer protection for online purchases, and cybercrime prevention are major limiting factors in the growth of the digital economy.

The Path Forward

In addition to making the necessary investments in infrastructure and investing in training resources as described above, policymakers must focus on creating an enabling regulatory environment for the digital economy to grow. Businesses and individuals will be reluctant to use digital technologies, such as mobile banking and payments, or develop business models that rely upon them until they feel confident in the government's willingness and ability to protect their privacy and data. Start-ups will also need to trust that their intellectual property is being protected by a robust IPR regime. Already policymakers are turning to the private sector to seek their cooperation in the development of coherent ICT regulations. For example, the Ministry of Posts and Telecommunications and local conglomerate Royal Group recently signed a public-private partnerships to establish ICT regulations and invest in digital infrastructure. As the regulatory environment is still incomplete, policymakers should provide "regulatory sandboxes" to give the private sector freedom to innovate.

The government has a key role to play in encouraging the digital scene and promoting successful models of businesses using digital technology and reducing barriers to their entry. Some ministries are doing just that. For example, the Ministry of Industry and Handicrafts has introduced a "SMEs go digital" policy which seeks to link tech start-ups to SMEs. The Ministry of Economy and Finance is supporting new tech start-up companies by providing tax exemptions and low interest loans. Other agencies must follow suit to nurture a diverse and thriving digital and service economy.

CASE 2:

INDONESIA



THE FUTURE OF WORK IN INDONESIA

- Indonesia's labor force is relatively young, and the country can expect to enjoy a "demographic bonus" in the coming decade.
- Manufacturing accounts for about 18% of GDP, 15% of the labor force, and is the main focus of the government's 4IR roadmap.
- Coordination between ministries and with the private sector to develop labor market benchmarks will be valuable for the effective evaluation and implementation of future plans.

- Indonesia's vast TVET system is undergoing a nationwide "revitalization", but presently many students still graduate without skills that make them employable.
- The flexibility of digital technology has helped unleash the potential of women entrepreneurs, who lead 35% of Indonesia's SMEs and contribute more than 9% of GDP.

- The nation's internet economy is strong, growing, and expected to reach USD 100 billion by 2025. Its tech start-up scene is fueling a dynamic and growing digital economy.
- Policymakers can continue to encourage the development of the digital economy and support 4IR-readiness by making improvements to IPR and tax regimes.



The Asia Foundation/Conor Ashleigh

Indonesia's economy has remained robust and globally connected, even amid trade tensions affecting other parts of the region. Supportive government policies have enhanced the country's macroeconomic stability, and an extensive effort to expand infrastructure and invest in human capital has led to a good outlook for future growth. Among those efforts are reform initiatives with stakeholders in the industrial sector, especially in increasing productivity through technology.

The "Making Indonesia 4.0" Road Map is the government's strategy to prepare the country for the Fourth Industrial Revolution by upgrading its manufacturing sector to become a global "top 10 economy" by 2030. Manufacturing is also a core focus of the country's medium-term Technocratic National Mid-Term Development Plan (Rencana Pembangunan Jangka Menengah Nasional, or RPJMN) 2020-2024, and preparing for "Industry 4.0" has been previously emphasized in three of nine points under the national strategic program for 2014-2019 (Nawa Cita), developed under President Joko Widodo's leadership.^{55 56}

Manufacturing accounts for about 18% of Indonesia's GDP and employs 14.7% of its workforce.⁵⁷ "Making Indonesia 4.0" has five priority sectors: food and beverages, textiles and textile products, chemicals, electronics, and the automotive industry. These five sectors account for 60% of Indonesia's manufacturing GDP and exports. The initiative was launched in 2018 with the involvement of government institutions, industry associations, entrepreneurs, and technology providers. Through the adoption of new and emerging technologies, such as IoT, AI, human-machine interfaces, robotic technology, and 3D printing, policymakers hope that this road map will create new jobs for 7-19 million people and encourage more exports in both manufacturing and non-manufacturing sectors.

In addition to upgrading a low-skilled manufacturing sector, the government is addressing the sector's need to move upstream as well as diversify its participation in global value chains. Presently, the country's manufacturing sector is more biased toward primary sectors: supplying raw or intermediate materials upstream, rather than producing higher value products downstream. President Joko Widodo said of the country's need to move up the value chain, "With innovations, quality human resources, and mastery of technology, we can be released from the curse of natural resources."⁵⁸

Indonesia's internet economy is strong and growing. In 2018, its gross merchandise value (GMV) market size reached USD 27 billion, compared to USD 8 billion in 2015, and is expected to reach USD 100 billion in 2025 through further expansion of e-commerce, online media (including online advertising, gaming, video, and music on demand), ride-hailing, and online travel.⁵⁹ Digital technology has gone hand in hand with Indonesia's thriving MSME sector and creative economy, and the government has taken a multipronged approach to nurturing these sectors, from supporting business incubators to growing the country's reservoir of knowledge, talent and skills.

Indonesia's creative economy contributes more than 7% of the economy's total GDP, represented more than 8 million businesses in 2016, and employs more than 17 million people. In 2015, President Jokowi established Bekraf, the Indonesian Creative Economy Agency, a non-ministerial agency dedicated to assisting the President to set, coordinate, and synchronize policy on the creative economy. The following year, President Jokowi signed the e-commerce road map of 2017-2019 to synchronize each government organization's role on a number of fronts, including funding, taxes, consumer rights, vocational education, human resources, communications infrastructure, logistics, and cyber security. Although the October 2019 cabinet merged Bekraf into the Ministry of Tourism and Creative Economy, making its future role as a stand-alone agency less clear, the simultaneous appointment of Gojek founder Nadiem Makarim as Minister of Education and Culture brings serious digital economy bona fides to the government.⁶⁰

However, this support from the government may not be sufficient in order to develop a future-ready Indonesian workforce. More work is needed to promote lifelong learning beyond the school system and advance vocational education that develops skills demanded by the private sector. Arguably the most challenging matter of concern is the lack of a proper coordination mechanism between government agencies, the private sector, civil society, and academia – especially in regards to the country's MSME sector. The MSME sector is Indonesia's largest employer, and its vastness and diversity makes it all the more difficult for policymakers to implement a one-size-fits-all strategy to prepare its workers for the future and assist enterprises in adopting new technologies.

“ The world is not merely changing, but it is being disrupted... Some old business patterns have suddenly become obsolete. Moreover, new business patterns also emerge. Established skills have suddenly become irrelevant, and new skills have become the need of the hour... We face competition with creativity, innovation, and speed. Hence, there is no other choice left but for us to change... Old ways that are not competitive cannot be continued. New strategies must be created. New ways must be adopted. ”

President Joko Widodo at the Annual Session of the People’s Consultative Assembly of the Republic Indonesia 2019⁶¹



The Asia Foundation/Andrew Thornley



POLICY PARTNERSHIPS TO IMPROVE LABOR MARKET DASHBOARDS

In its RPJMN for 2020-2024, the Indonesian government outlines plans to develop citizens' skills by creating vocational partnerships between government organizations, educational institutions, industry groups, and regional governments; encourage educational governance; expand activities within the creative economy; strengthen the creative economy and digital economy in growth areas in culinary arts, fashion, games, music, film, craft, mobile applications and digital content; and encourage higher-quality education by providing better infrastructure and support for soft-skills development.⁶²

“ The National Industrial Committee is prepared for the digital era. Coordination is needed both for harmonization of regulations, fiscal incentives, and telecommunications infrastructure. [...] In preparing the [Making Indonesia 4.0] road-map we do not rely on a single Ministry, but on a synergy of various Ministries. ”

Airlangga Hartarto, Coordinating Minister for Economic Affairs⁶³

Indonesia's policymakers acknowledge that government collaboration with the private sector, nonprofits, and other actors is critical to realizing the country's ambitious plans to develop its economy and prepare for 4IR. A new law, the National System of Science and Technology Law (UU Sisnas Iptek), will address the lack of coordination between institutions that is hampering progress in research and innovation in Indonesia. One example of cross-institutional coordination already taking place is PulseLab Jakarta, a pilot initiative between the UN and the National Development Planning Agency (Bappenas). Its aim is to bring together the Indonesian government, non-governmental organisations, and the private sector to research and facilitate the adoption of new approaches for applying novel digital data sources and real-time analysis techniques to social development.

“ The government needs to initiate dialogue with the private sector to jointly identify and address obstacles to the development of a modern manufacturing sector. It is critical for policymakers and the private sector to collaborate in discovering those new and more sophisticated products that Indonesia could successfully diversify into. ”

Jesus Felipe, ADB advisor on economic research and regional cooperation⁶⁴

Another example is the Indonesia Startup Database and Mapping initiative, a collaboration begun in 2018 between Bekraf, the Indonesia Digital Creative Industry Society (MIKTI), and Telkom Indonesia. The objective of the initiative is to collect data on the number and distribution of tech startups throughout Indonesia and create a reference point by which to gauge the growth and needs of the country’s startup ecosystem. Its goal is to determine how many and where incubators and accelerators need to be built as well as the availability and quality of talent in a particular city. Additionally, it aims to form a network of mentors who can assist startups. Ultimately, this data is being gathered to inform policymaking on tech startup investment and workforce needs.

The Path Forward

The “Making Indonesia 4.0” Road Map and other initiatives are ambitious plans to usher Indonesia into a new era of industrialization, but many challenges lie ahead. For example, each ministry is implementing “Making Indonesia 4.0” initiatives, but presently, the harmonization of particular assignments across ministries is not monitored and evaluated regularly. Policymakers can improve their coordination and collaboration on enacting initiatives in industrialization, ICT, education, and the creative economy through more cross-ministerial working groups. Industry experts and academics should also be brought into policy co-creation workshops to inform dialogue, develop benchmarks, and monitor progress. These workshops can also be used to establish and expand novel data sharing initiatives, such as the Startup Database and Mapping initiative, to address gaps in information that prevent the effective evaluation of programs and the assessment of future labor market needs.



ENHANCED CAPACITY TO DELIVER SKILLS TRAINING THAT FITS THE MARKET

Indonesia's labor force is relatively young, and in the coming decade, the country can expect to enjoy a "demographic bonus" in which the productive share of the population is greater than the non-productive share. The population that is in its productive age (15-64 years old) reached 179.13 million people in 2018, more than two-thirds of Indonesia's total population. The value this demographic bonus represents is clear to the government, as evidenced by the 20% of the state budget it allocates to education and vocational programs.

“ If we can focus greater on developing human resources and employing novel methods, the government believes the demographic bonus will serve as a leap of progress for the Indonesian nation. We need skilled human resources capable of mastering knowledge now and in the future. ”

Airlangga Hartarto, Coordinating Minister for Economic Affairs⁶⁵

In interviews for this report, Indonesian education policymakers described an effort to shift the national educational system to “encourage education that produces innovation, to facilitate the students to learn from various sources, to engage in creating and sharing knowledge and experiences, to learn to contextualize their knowledge, innovate with machines and technology, and foster the students’ entrepreneurship skills through education 4.0; whereas in the previous method of learning, education 3.0, was only focused on producing knowledge.”⁶⁶

A significant focus of this effort is President Jokowi’s nationwide initiative, formalized by presidential decree in 2016, to “revitalize” Indonesia’s vocational school system. There are as many as 14,000 vocational schools in Indonesia enrolling 320,000 students, but many of these students still graduate without skills that make them employable.⁶⁷ Under the president’s initiative, the Ministry of Education and Culture (MoEC) has implemented

improvements across more than 2,000 vocational high schools. This includes the linking of schools to businesses and industries through Indonesia’s “dual education system,” the synchronization of curricula, and the development of learning resources that are oriented toward “4IR competencies,” like augmented reality, virtual reality, 3D printing, tourism promotion, game development, smart schools, IoT, e-commerce, and entrepreneurship. The MoEC also hosts an online course platform, Rumah Belajar, that offers MOOCs (massive open online courses) on a variety of subjects.

On a broader scale, the Ministry of Communication and Information (Kominfo) inaugurated its Digital Talent Scholarship in 2018 to create a future cadre of digital technicians equipped to navigate the country through 4IR. The two-month training is held across 28 universities and 22 institutes of technology (Politeknik) across Indonesia and engages in partnerships with global technology companies, including Amazon, Cisco, Google, and Microsoft. Its goal is to increase Indonesian human capital in a wide range of areas, including digital literacy, data science, IoT, AI, Big Data, cyber-operations, cybersecurity, cloud engineering, and digital policy.

“Indonesia is committed to join forces with other G20 countries to address skills mismatch and youth unemployment. Revitalization of vocational education and training (VET) is now one of the priorities of the Government of Indonesia to improve and strengthen skills of Indonesian workers and to increase the readiness of Indonesian workers in facing globalization, technological changes as well as structural changes in economies.”

Rudy Salahuddin, Deputy for Coordination of Creative Economy, Entrepreneurship and Competitiveness of Cooperatives and SMEs of the Coordinating Ministry for Economic Affairs⁶⁸



The Asia Foundation/Conor Ashleigh

Within the private sector, some businesses are providing educational resources directly. In the automotive sector, for example, PT Toyota Motor Manufacturing Indonesia (TMMIN) supports a linking and matching program at several vocational schools that prepares workers for 4IR. The company is implementing the Toyota Technical Education Program (TTEP) to contribute to up-skilling and re-skilling of workers in the automotive sectors and increasing workers' knowledge and skills in logistics, maintenance, manufacturing, and production management. Similarly, PT Astra Honda Motor (PTAHM) is working with vocational high schools in Solo, Central Java to develop and implement the Technical and Motorcycle Business curriculum, which provides students with skills and technical knowledge related to the motorcycle industry.

“ We have conducted this vocational programme because it is beneficial to the company. It is also to support the government in developing Indonesia’s human resources. Through this programme we can also produce competent workers who in turn will increase the productivity of the company. ”

Amirul Chusni, Division Head of Learning Centre of PT TMMIN⁶⁹

The Path Forward

Policymakers must ensure that the younger generation and productive population are adequately equipped to handle the economy of the future by making sure that quality education and training resources are available and accessible. At present, they are tackling Indonesia's educational and vocational needs through an arsenal of initiatives. Indeed, a range of ministries are responsible for TVET in Indonesia, the most prominent ones including the MoEC, the Ministry of Research and Technology (Kemenristek), and the Ministry of Manpower (Kemnaker). Local governments are also playing an important role in TVET delivery.

However, as a result of the dispersal of responsibilities across bureaucracies, synchronization and standardization on curricula and materials are not efficient. Moreover, it is challenging for market-based information on current and future skills gaps and training demands to make its way to decision-makers and subsequently to educators. Policymakers should enable partnerships between government, the private sector, TVET providers, and online job posting platforms such as Kalibrr in order to anticipate and respond to the skilling needs of the market with appropriate courses and trainings. They may look to successful models like those implemented by TMMIN, PTAHM, and pilot programs elsewhere in other sectors and throughout the country.

Indonesia's geography is another constraining factor in the transfer of knowledge, as resources, production facilities, and technological innovation are mostly centered in Java, rather than the outer islands. Policymakers must commit to investing in digital infrastructure and implementing skills training and education programs in remote areas (known in Indonesia as “3T” – outermost, frontline, and disadvantaged), a significant challenge for an archipelagic nation composed of thousands of islands.



IMF/Stephen Jaffe (CC BY-NC-ND 2.0)



STRUCTURAL REFORMS THAT PROMOTE MORE INNOVATIVE ECONOMIES

Indonesia has a vibrant culture of creativity and entrepreneurship that nurtures a diverse MSME sector. MSMEs (not including those in the agricultural sector) account for 61% of GDP and 88% of employment, thus representing an important area of focus for the future of Indonesia's workers.⁷⁰ Many MSMEs are pursuing opportunities in the digital economy, and policymakers are aware of their potential to the economy. To that end, several initiatives are under way to improve the overall climate for innovation and investment, including investment in digital infrastructure, strengthening data protection laws, and attracting foreign talent and investment. For example, Indonesia is completing the Palapa Ring network, a 35,000-km fibre optic cable network that will provide access to 4G services throughout the archipelago, bring connectivity to rural areas and the eastern region, and aid in the development of the digital economy. The government is also making it quicker and easier for overseas investors and foreign workers to obtain visas and residence permits by simplifying processes and putting applications online.⁷¹

Bekraf, the national creative economy agency, has encouraged digital entrepreneurship through a number of measures, including helping talented leaders register their intellectual property, enabling access to mentorship through programs such as Bekraf Developer Day and Scale Up Asia, and facilitating access to funding through the Go Startup Indonesia platform and the Government Aid for Creative Economy Infrastructure (BANPER). Bekraf has also worked to build a sustainable and inclusive digital economy ecosystem by targeting women and people in rural Java and outer islands in ICT through the Bekraf Digital Entrepreneurship (BDE) program, although enabling innovation and entrepreneurship in rural and outlying areas remains a major challenge for national and local policymakers. Bekraf's merger into the Ministry of Tourism and Creative Economy in 2019 may mean further alignment between the tourism sector and the creative economy.

Other government actions are working to scale up the country's 4IR-ready human capital and digital economy. The E-commerce Road Map of 2017-2019 is meant to synchronize each government organization's role in funding, taxation, protection of consumer rights, vocational education and human resources, communication infrastructure, logistics, and cyber security related to e-commerce and the digital economy.⁷² Other relevant government initiatives include the "1000 Digital Startup Movement," "Eight Million Micro, Small, Medium Enterprises Go Online," and "One Million Fishermen and Farmers Go Online."⁷³

As agriculture still plays an important role in the economy, the Indonesian government has encouraged private sector-led agricultural innovations such as 8villages, a mobile platform for farmers in Indonesia. The 8villages platform enables real-time communication between farmers, the public sector, and the private sector to gain and deliver information about agriculture, such as the supply of agriculture product needs. Since its establishment in 2012, the platform has gained more than 5,000 farmer members across Indonesia, and through its Rego Pantes e-commerce portal, it has enabled female farmers to promote and sell their agricultural products at fair prices.

In general, the government may be taking a more open and permissive regulatory stance toward the digital economy. Foreign direct investment (FDI), which saw a slow-down in 2018, is expected to play a more important role in the future economy.⁷⁴ Since his reelection, President Jokowi has encouraged a loosening of restrictions on FDI, and policymakers in his government view foreign investment in the digital economy as especially important to growth across multiple sectors.⁷⁵ Speaking at Davos in January 2019, Rudiantara, who was the Minister of Communication and Information Technology up until the October 2019 cabinet overhaul, said that his ministry would “act less as a regulator and more as a facilitator and accelerator,” with the aim of nurturing 20 more Indonesian “unicorn” companies by 2025.⁷⁶

Later in 2019, the government introduced further investment-friendly reforms, including the relaxation of data localization requirements for private sector entities (under Government Regulation No. 71 of 2019), and the establishment of specific e-commerce regulation (under Government Regulation No. 80 of 2019). Data localization requirements have been a key point of contention between the government and global digital platform companies that rely on the free flow of data, and the new regulations may alleviate the concerns of companies seeking to invest in Indonesia’s huge and growing market.

The Path Forward

Relying on its youthful population and a dynamic and growing digital economy, Indonesia is taking a proactive approach to preparing for the Fourth Industrial Revolution. Now and in the coming years, policymakers should consider how regulation and government programs can encourage the development of the digital economy and support 4IR-readiness in businesses and industries. They can do this by engaging in scenario planning to understand the implications of various policies intended to regulate the internet and manage cross-border data flows. In addition, policymakers can make Indonesia a more attractive place for innovators to set up shop by continuing to seek regulatory improvements in their IPR and tax regimes.

CASE 3:

MALAYSIA



THE FUTURE OF WORK IN MALAYSIA

- Malaysia is a regional and global hub for the knowledge economy, with an excellent business environment and strong entrepreneurship sector.
 - The government takes a multi-pronged approach to developing labor market intelligence, such as through public-private partnerships through the national talent agency, TalentCorp, and the creation of the Malaysian Foresight Institute (myForesight) – a national initiative tasked with generating insights on “strategic futures” for the country.
-
- Despite its status as a regional hub, only 28% of Malaysia’s workforce is classified as “high-skilled,” and more than half of all Malaysian jobs are at high risk of displacement by technology in the next two decades.
 - Policymakers are implementing a number of initiatives to address the gaps in Malaysia’s education and skilling programs, such as NECT-Gen-Industry 4.0 and TVET 4.0. But these training programs are often unappealing to citizens. Moreover, they are inadequately responsive to market demands, in large measure due to the surfeit of training providers and the system’s confusing, fragmented bureaucratic landscape.
-
- Malaysia is experiencing robust growth in its digital economy. However, policymakers must continue to modernize regulations to encourage innovation, investments, digital adoption and participation in the digital ecosystem, especially among SMEs, so that the economy will remain regionally competitive and can support the growth of innovative new businesses and new employment opportunities in high-value, high-growth sectors. Government must also develop policies that support the retention and attraction of top talent in the knowledge sector.



The Asia Foundation/Leandro Justen

Malaysia has been actively seeking to promote itself as a hub for the global knowledge economy and has been successfully attracting businesses in this area, using Singapore as a role model. Global e-commerce companies such as Alibaba use Malaysia as a regional hub, and Malaysian startups encounter an excellent business climate (15th globally in the World Bank Ease of Doing Business Ranking) and strong entrepreneurship environment, especially in Kuala Lumpur and Penang.⁷⁷

Despite these successes, Malaysia, like most of Asia, relies on the export of goods and services to drive economic growth, leaving its economy exposed to the volatilities of global trade and competition from neighboring economies. Malaysia would be significantly impacted by a slowdown in Chinese domestic demand, a US-China trade war, and a cyclical downturn in global sales of electronics products. For the country to continue thriving, it will need to make progress toward becoming a high-income, knowledge-based economy, while ensuring that workers are equipped with the necessary skills to succeed in this environment.

As it stands, the country continues to face challenges in aligning the nation's education system with the skills Malaysian citizens need to join the 4IR workforce. Up to 54% of all Malaysian jobs are predicted to be at high risk of displacement by technology during the next two decades, with semi-skilled jobs being the most affected.⁷⁸ Currently only 28% of Malaysia's workforce is classified as "high-skilled," a figure that policymakers are keen to increase, particularly through improvements in STEM and technical education.⁷⁹ Malaysian pupils score lower on mathematics and science than their counterparts in Singapore, Thailand, China, and South Korea, and Malaysian universities are on track to graduate far fewer students in STEM or technical fields than in arts and sciences. Other future-ready skills such as creativity, problem-solving, and collaboration are not emphasized sufficiently, especially in rural schools.⁸⁰ If left unaddressed, this will perpetuate a skills mismatch as economic activity becomes more technologically and digitally advanced.⁸¹



POLICY PARTNERSHIPS TO IMPROVE LABOR MARKET DASHBOARDS

To address the challenges brought by 4IR transformations, the government of Malaysia will need to pull all levers available to discover and manipulate new sources of labor market data. With better data, policymakers can extract better market insight and make wiser investments in workforce development and educational reform. Under the current Mahathir Mohamad administration, the Ministry of International Trade and Industry (MITI) has taken up the issue of transformative development as the chair of the Industry4WRD National Policy on Industry 4.0, which was launched in October 2018 by the Prime Minister himself.

The Industry4WRD policy identifies the importance of collaboration among government agencies as well as between the government and the private sector.⁸² The policy supports public-private partnerships in expediting the dissemination of Industry 4.0 technologies and knowledge transfer, and the government aims to work with global and local industry leaders to set up digital technology and Industry 4.0 demonstration labs. This includes the creation of public-private partnerships and collaborative programs for manufacturing activities that foster digital adoption, collaborative deployment, and development of local capabilities, especially in priority sectors and technologies. More challenging may be the streamlining of government policy on innovation and skills development, which remains spread among multiple agencies and ministries that do not always work in coordination. A 2016 report from the OECD found 44 agencies and 10 ministries involved in programs to support science, technology and innovation in Malaysia, with inadequate coordination and communication between them.

MITI drives the Industry4WRD national policy, overseeing technical working groups in the Ministry of Finance (MOF); Ministry of Human Resources (MoHR); Ministry of Communications and Multimedia (KKMM); and Ministry of Energy, Science, Technology, Environment & Climate Change (MESTECC). To increase data-sharing, the MoHR has led a process of generating evidence-based market predictions using nation-wide analytics, in alignment with the Human Resource Development Fund (HRDF), which is closely connected to industry and funded from mandatory industry contributions. These institutions also closely collaborate with Talent Corporation Malaysia Berhad (TalentCorp), which partners with the public and private sector on initiatives that attract, nurture, and retain the expertise required by the current workforce, and the Ministry of Higher Education (MoHE), which delivers technical and vocational education and training.

The government is taking additional steps to generate better data to inform labor market policies. TalentCorp and the MoHR's Manpower Department worked together to develop the Nurturing Expert Talent (NEXT) platform, a “national talent analytics platform that acquires and analyses data about the quality and ability of the Malaysian workforce” (TalentCorp, 2017). TalentCorp also works with the MoHR's Institute of Labour Market Information and Analysis (ILMIA) to assemble an annual Critical Occupations List (COL), which is a “comprehensive map of Malaysia's most demanded current and future skills and talent.”⁸³ TalentCorp engages with industry and representative bodies to understand current and future human resource requirements by carrying out research with recruitment firms and professional networks and analyzing millions of job postings and real-life career transitions with AI to develop insight into labor market patterns.

To encourage strategic foresight and long-term planning, the Malaysian government has created a dedicated center, the Malaysian Foresight Institute (myForesight). This is a national-level initiative within the Malaysian Industry-Government Group for High Technology (MIGHT), an independent non-profit think tank under the office of the Prime Minister. MyForesight seeks to create a common platform for the public sector, private sector, and academia to come together to generate shared insights on “strategic futures”, both locally and globally. The group conducts evidence-based inquiries into future policy issues, trend analyses, and capacity-building through the development of trainings and toolkits for government policymakers.

The Path Forward

Malaysia has implemented a multitude of measures, some replicating successful models from neighboring countries like Singapore, to help the government generate up-to-date labor market data and make informed policy decisions about its future. How successful Malaysia will be in preparing its workforce for the challenges brought by 4IR transformations starts with how well it can steer its complex of cross-ministerial working groups to work with the private sector in establishing new sources of data and creatively extracting insights out of existing sources. In addition, as Malaysia is positioning itself as a regional and global hub, it will have to direct its efforts towards parallel ministries and working groups in the region to drive cross-border data-sharing initiatives.



ENHANCED CAPACITY TO DELIVER SKILLS TRAINING THAT FITS THE MARKET

A number of public initiatives are under way to enrich Malaysia's upskilling ecosystem and retool the country's education and TVET systems to meet the demands of 4IR. The Ministry of Higher Education (MoHE) is revamping the Malaysian education system by embedding the "Education 4.0" package into the Malaysia Education Blueprint 2015-2025. The HRDF, whose mandate is to ensure the growth of a quality local workforce and meet the demands of a digitalized global economy, has committed a total of RM 203 million to three broad programs: Data and Data Professional Training, Empowering Women through ICT & Leadership Data Science, and the Malaysia Digital Economy Corporation's (MDEC) Development Program on Critical ICT Skills. Its efforts are expected to grow the number of skilled workers in Malaysia to 35% of the workforce and 1.5 million jobs by 2020.

The MoHE is also working to bridge the public-private gap and strengthen industry-academia links so that university offerings and knowledge transfer initiatives involve industry. One such initiative is TVET 4.0, a framework that will help prepare students for changes and new industries brought about by 4IR. Another initiative is 2u2i (2 years Uni, 2 years Industry), which provides undergraduates exposure to real working experience through added learning time so they can develop the necessary skills in their respective industries. Another novel program is CEO@Faculty, which engages top local and international CEOs and industry players to share knowledge, experience, and expertise with students at Malaysia's top universities, as well as provide input to academia to ensure its relevance to industry.

The Ministry of Youth and Sports is working with tech giants such as Microsoft to upgrade four Youth and Sports Skills Training Institutes (ILKBS) with Microsoft's Smart Factory module to make the ILKBS "IR4.0-ready." The Ministry of Education and the Education Performance and Delivery Unit (PADU) are also piloting a STEM Change Agent Network together with Microsoft Malaysia and organizations such as Petrosains and Kidocode to organize more engagement activities to spread awareness of STEM among Malaysian parents. In February 2019, HELP University signed an MoU with Ricoh, one of the world's leading suppliers of office automation equipment, to co-develop a Professional Certificate program in Enterprise Content Management and Document Workflow Management practices. Through the sharing of approved case studies by Ricoh with HELP University, students are able to gain a practical understanding of enterprise content management in real-life work settings.

“*Graduates from TVET programmes that are joint ventures between public TVET institutions and multinational companies have proven to be successful, where almost 90% of TVET graduates have been able to get a job after graduation. Because of this, the major players such as public and private TVET institutes should get out of their comfort zone and find effective solutions. I urge that more major industry players will be active in developing human capital and support the implementation of national TVET policies, especially in helping local TVET graduates by recognising the skills they have and then sharing the expertise available.*”

Mahathir Mohamad, Prime Minister of Malaysia⁸⁴

Many stakeholders in the private sector and the nonprofit world are also implementing initiatives to help Malaysians develop their technological skills and retrain for the jobs that will be demanded in the future. For example, the MySkills Foundation works with industry to equip at-risk youth with market-relevant skills and provide job placement services. Once students graduate with a certificate in a specific skill, MySkills helps them seek gainful employment. Another example is KnowledgeCom Corporation Sdn Bhd, a specialized company that provides technology-related certification programs to university students, recent graduates, civil service staff, and other working professionals. KnowledgeCom helps businesses identify areas for improvement, determines relevant 4IR technologies that would aid in increasing productivity, and trains their workforces on that technology.

The Industry 4.0 Malaysia Association spearheads the promotion, implementation, and advancement of Industry 4.0. It serves over 100 companies, most of which are practitioners in the Industry 4.0 spectrum such as IoT specialists, Big Data, Artificial Intelligence, Cloud, Cyber Security and Training. The Malaysian Institute of Accountants (MIA), the national accountancy body, launched its MIA Digital Technology Blueprint in 2018 to help accountants manage widespread changes arising from the digital economy and 4IR and guide them in developing action plans that are appropriate for their environment. The Federation of Malaysian Manufacturers (FMM), established in 1968, is the largest private

sector economic organization in Malaysia, representing more than 3,000 manufacturing and industrial service companies of varying sizes. FMM has led Malaysian manufacturers in spearheading the nation's growth and modernization, and frequently organizes technology talks and conferences to create awareness and upskill employees in member organizations.

The Malaysian government and private sector are working to raise public awareness of upskilling programs, and the funding available for these programs, by holding regular awareness-raising sessions with workers and businesses. To encourage more employers to train their workers to handle the digitalization of the production process, the HRDF is collaborating with KnowledgeCom and Penang Skills Development Centre (PSDC) to promote its initiative in National Empowerment in Certification and Training for Next Generation Workers (NECT-Gen-Industry 4.0). HRDF is also working with nine of KnowledgeCom's Centers of Excellence in Technology (CoET) to deliver high-end technology certification programs through partnerships with global companies like SAP, Microsoft, and Oracle.



World Bank/Nafise Motlaq (CC BY-NC-ND 2.0)

To engage women and connect them to the higher-value career opportunities in the digital economy, the National Association for Women Entrepreneurs (NAWEM) has partnered with the Centre of Applied Data Science (CADS) to address the gender gap in tech-related jobs. In March 2019, DATA FOR HER was launched to tackle the issue of talent shortage in the technology industry via the increased participation of women. DATA FOR HER will engage women from secondary schools, universities, and the workforce to break the glass ceiling through tailor-made initiatives, with the goal of closing the gender gap in the technology industry. Another initiative inspiring women to excel in technology careers is Women Who Code, a nonprofit that connects Malaysian women software developers to mentorship and learning opportunities.

The Path Forward

Despite commendable initiatives like NECT-Gen-Industry 4.0 and TVET 4.0, Malaysia's education and skilling programs are not yet fully synchronized. There are more than one thousand extant TVET training providers, including public institutions administered by six different ministries, leading to a confusing menu of offerings of widely varying quality, focus, and methods.⁸⁵ Moreover, even though TVET programs boast a graduate employability rate of 95%, citizens are not always eager to enroll in them due to relatively low salaries. This “fragmented landscape” of upskilling resources, low pay earned by graduates of TVET programs, competing accreditation standards, and other reasons were cited in the Mid-Term Review of the Eleventh Malaysia Plan as major challenges to be addressed in the coming years.⁸⁶ High-level policymakers have started discussing consolidation of the TVET industry – perhaps even putting all programming under a single agency and a single ministry.⁸⁷ Done sensitively, this may help make TVET more effective, attractive, and responsive to market needs.

Initiatives like DATA FOR HER are helping close the gender gap in the technology industry, but gender discrimination in today's workplace still prevents Malaysian women from accessing the labor market, leading to fewer career opportunities compared with their peers in neighboring countries. Women in Malaysia are highly educated and comprise 64.5% of university graduates, but tend to leave the workforce to raise families, and many never re-enter. The result is a loss of a large proportion of the educated workforce, and a self-reinforcing bias against hiring and promoting women as a result of the expectation that they will not remain in the workforce. Policymakers should continue to support initiatives that help businesses attract, train, and retain female workers, so that the gender divide is not exacerbated by 4IR.



STRUCTURAL REFORMS THAT PROMOTE MORE INNOVATIVE ECONOMIES

Digital adoption is already fairly high in Malaysia, and internet penetration stands at 86% (compared to 60% within the region as a whole). Several online platform companies founded in Malaysia have achieved success in domestic and regional markets and continue to inspire a generation of young Malaysian technology entrepreneurs. But policymakers recognize the limits of these success stories and the extent to which further work is needed to truly evolve the digital economy. In an April 2019 speech, Finance Minister Lim Guan Eng acknowledged the challenge of brain drain and cited the measures it has taken to strengthen the Malaysian software and technology community.⁸⁸ Modernizing regulations to encourage innovation, investments, digital adoption, and participation in the digital ecosystem will be important in the development of regionally competitive, innovative new businesses and ultimately new employment opportunities in high-value, high-growth sectors.⁸⁹

“ I am proud to say that Malaysia has contributed to regional digital innovation through high-profile successes like Grab, iflix and Fave. However, the Government understands that the economy might not have the sufficient support system for budding entrepreneurs in the digital space. This has unfortunately contributed to the Malaysian brain drain as talent go elsewhere to further develop their ideas. ”

Lim Guan Eng, Minister of Finance⁹⁰

The government is undertaking a number of efforts to spur digital transformation. The Malaysia Digital Economy Corporation (MDEC) is a government-owned institution responsible for the management of the Multimedia Super Corridor in Malaysia as a technology industry and commerce zone. The MDEC is tasked with spearheading Malaysia's Digital Hub and various Technopreneurship programs to attract global and local tech start-ups. This resulted in related investments of RM16.3 billion in 2016. The

Malaysian Global Innovation and Creativity Centre (MaGIC), founded in 2014 under then-Prime Minister Najib Razak and nearly shut down by the incoming Mahathir administration, has survived and regained favor as an important incubator of new startups and catalyst within the digital entrepreneurship community.⁹¹

To ensure that the digital economy works for SMEs, the Digital Free Trade Zone (DFTZ) initiative was launched in 2017 under the National eCommerce Strategic Roadmap. It aims to leverage the digital economy to boost SME export contribution to USD38 billion and create 60,000 jobs by 2025. Among others, the SME Corporation Malaysia (SME Corp), the central coordinating agency under the Ministry of Entrepreneur Development (MED), spent RM 217.33 million to implement 28 innovation and technology-related programs, benefiting 37,429 SMEs under its annual SME Integrated Plan of Action (SMEIPA).

With support from the government, SMEs are taking their own steps to prepare themselves for technology-driven transformation. In June 2018, SME Corp collaborated with Huawei Malaysia to sponsor a cross-sectoral study on 2,033 SMEs exploring the state of SME adoption of ICTs. More than half of the companies surveyed invested in technology to expand into new areas, reach new customers, and increase sales. It also found that 50% of SMEs have the “ICT leader” mindset of using ICT to grow their business or develop a competitive advantage. The investments these companies are making now will yield dividends for Malaysia’s future workforce in the form of new, higher-value jobs.

The Path Forward

Malaysia has embraced the possibilities of 4IR by implementing initiatives across multiple fronts and by collaborating with stakeholders across the public-private-CSO spectrum. Paired with an inclusive business-enabling environment, Malaysia is preparing itself well to meet the demands of the future. One area where Malaysia could do more is in retention and attraction of top talent. Would-be entrepreneurs in the digital space are seeking opportunities in neighboring countries and elsewhere, and taking their ideas with them. One study cited “low salary packages” and “limited promotional opportunities” among the frustrations felt by Malaysian workers who decided to move abroad.⁹² On the other hand, some evidence suggests that those who do go abroad for work or education are increasingly returning home to pursue greenfield opportunities in their native countries.⁹³ Policymakers may consider tailoring some of the many programs and initiatives toward incentivizing the private sector to support more rewarding career paths and retain highly skilled workers.

TIMELINE OF ASEAN EFFORTS TO ADDRESS THE FOURTH INDUSTRIAL REVOLUTION

Following the 30th ASEAN Summit in April 2017, ASEAN embarked in earnest on a process to examine the region's readiness to address the Fourth Industrial Revolution. Leaders "recognized the need for ASEAN to be well prepared and able to maximize the opportunities from the '4th Industrial Revolution,' so as to foster the region's economic growth, and promote inclusive and equitable economic development." At the 49th ASEAN Economic Ministers' (AEM) Meeting in August 2017, the ASEAN Secretariat mandated that an assessment of ASEAN's readiness for Industry 4.0 be conducted. This assessment was completed a year later and presented to the AEM meeting in August 2018. Feedback was collected from various ASEAN sectoral bodies, and the assessment was further deliberated upon at two special Committee of the Whole (CoW) meetings in January and July of 2019. These deliberations allowed ASEAN officials to discuss a series of next steps for advancing the work of preparing for 4IR in the region and to further develop a concrete plan of action.

The byproduct of this work, the ASEAN 4-IR Readiness Assessment, adopted the World Economic Forum's Readiness for the Future of Production approach and analysis based on the following five dimensions:

- innovation and technology
- human capital development
- regulatory frameworks
- infrastructure and connectivity
- inclusive and sustainable growth.

In the meantime, ASEAN has endorsed several frameworks and plans that are relevant to this effort, including the ASEAN Digital Integration Framework, ASEAN Framework on Digital Data Governance, and the ASEAN Agreement on Electronic Commerce. Plans for future endorsements include the adoption of the ASEAN Digital Integration Framework Action Plan 2019-2025, the ASEAN Innovation Roadmap 2019-2025, Guidelines on Skilled Labor/Professional Services Development in Response to the 4IR, the ASEAN Declaration on Industrial Transformation to Industry 4.0, and Framework for Digitalization of ASEAN Micro Enterprises.

With respect to workforce-related matters, the ASEAN Labor Ministers (ALM) met in April 2019 and adopted the Statement on the Future of Work: Embracing Technology for Inclusive and Sustainable Growth. Its focus and aims are as follows:

- Preparing the workforce for a future which is becoming increasingly technological.
- Increasing the participation of women, people with disabilities, the elderly, and youth in careers such as science, technology, engineering, and mathematics (STEM).
- Encouraging and supporting efforts of businesses including micro, small, and medium-sized enterprises (MSMEs) in the 4IR era.
- Sharing best practices among ASEAN member countries in responding to the changing nature of employment with information and facilitation support.
- Promoting social protection initiatives in ASEAN member states in line with decent work principles.
- Supporting efforts of employers' and workers' organizations in collective representation and social dialogue processes.
- Strengthening tripartite relations towards decent work objectives for the workforce.
- Enhancing collaboration with other relevant stakeholders including other ASEAN sectoral bodies in preparing ASEAN workers and businesses for a coordinated response to future challenges.
- Increasing cooperation with ASEAN's external partners, including the International Labor Organization, to share experiences, models, and best practices for preparing workers to adapt to future jobs.

The ALM then tasked the Senior Labor Officials Meeting (SLOM), with the support of the SLOM Working Group on Progressive Labor Practices to Enhance the Competitiveness of ASEAN (SLOM-WG), to implement the provisions of the Statement.

A draft of the aforementioned Guidelines on Skilled Labor/Professional Services Development in Response to the 4-IR was prepared by the ASEAN Business Advisory Council (ASEAN-BAC) and spells out the roles to be played by both government and private sectors. ASEAN-BAC has proposed a flagship project to spearhead its 4IR initiative. Entitled ASEAN Human Empowerment and Development (AHEAD), the project's aims include:

- Increasing awareness, knowledge and preparation for digitalization.
- Addressing opportunities and challenges of digital transformation toward human capital development.
- Promoting human capital development platform in ASEAN's policy setting.

In sum, ASEAN's overall approach to tackling the region's preparedness for 4IR continues to evolve following a series of recent efforts to integrate and coordinate the existing and emerging initiatives carried out by various ASEAN sectoral bodies. Through its ASEAN Integration Monitoring Directorate (AIMD), the ASEAN Secretariat is currently attempting to map out and tie together these respective initiatives into a unified process and system.

CASE 4: PHILIPPINES



THE FUTURE OF WORK IN THE PHILIPPINES

- The Philippines has experienced steady growth that unfortunately has not translated to job creation.
 - Many of the jobs that do exist are at high risk of elimination as a consequence of automation, such as those in the business process outsourcing (BPO) sector.
 - Women are overrepresented in low-skilled, low-income positions, and only one in two women of working age is in the workforce even though women are overall better educated than men.
-
- TESDA is the national agency responsible for training and upskilling the country's workers, and it is working with other actors in the public and private spheres to not only improve the availability of labor market data but also to upgrade the TVET ecosystem in order to provide workers the upskilling resources needed to adapt to future market demands.
 - More energy needs to be devoted to understanding and addressing the needs of the Philippines' female labor force.
-
- Technology is prevalent throughout the Philippines, with 76 million internet users (or 71% of its population) and 124 million mobile subscriptions.
 - The country is making great strides towards becoming an innovative economy. However, it is still in the early stages of developing its digital policy and has further to go in creating an enabling regulatory environment that encourages innovation and investment in R&D.



The Asia Foundation/Karl Grobl

The Philippines, the second most populous country in ASEAN with 104 million people, has been on a steady growth trajectory with an increasing GDP over the past ten years. However, this consistent performance has come with a pattern of “job-slow” growth: overall GDP growth is not translating into job creation in the domestic economy.⁹⁴ More than a third of private sector jobs are considered “precarious” employment without full legal rights, and in the informal sector (particularly for self-employed and unpaid family workers) over 38% are vulnerable to unemployment.⁹⁵ These low-skilled workers are not well-positioned for the transition to a knowledge economy. Moreover, the overrepresentation of women in low-skilled and low-income positions remains a key concern. Only one in two women of working age is in the workforce, even though women are overall better educated than men. Women’s share of industry jobs has been declining, and they hold fewer managerial or decision-making roles compared to ten years ago.⁹⁶

The national unemployment rate is higher among the more educated, and 12% of discouraged workers no longer work due to their perception that they lack the required skills.⁹⁷ This implies a demand-supply mismatch where the jobs being created do not suit available workers’ qualifications.⁹⁸ The number of Overseas Filipino Workers (OFWs) who worked abroad from April to September 2018 was estimated to be 2.3 million.⁹⁹ Remittances from these OFWs totalled over \$32 billion in 2017 and represented more than 10% of the country’s GDP.¹⁰⁰

The Philippines is among the countries in the region at the greatest risk of increased unemployment as a consequence of automation. Nearly half of wage jobs are deemed likely to be automated, along with 19% of self-employed roles.¹⁰¹ As robotic process automation (RPA) reduces the need for human input in clerical positions, such as paralegals, IT support, administration, and customer service, the Philippines will be particularly affected, as automation eliminates its market advantages of English language proficiency and low labor costs.¹⁰² An estimate by the Philippines' Department of Trade and Industry predicted that AI could replace up to half of the 1.2 million Filipinos employed in business process outsourcing (BPO), a sector that represents about 7% of the country's GDP.¹⁰³ Almost 70% of garment workers' jobs and 89% of call center workers' jobs are considered at high risk of displacement by technology.¹⁰⁴ Construction and tourism are two significant sources of jobs in the Philippines, and both sectors are also considered to have a high capacity for automation.¹⁰⁵



POLICY PARTNERSHIPS TO IMPROVE LABOR MARKET DASHBOARDS

Policymakers in the Philippines recognize the need to act cross-sectorally to address the labor market challenges expected to accompany 4IR. In 2018, the Technical Education and Skills Development Authority (TESDA), the agency responsible for training and upskilling the country's workers, was placed under the supervision of the Department of Trade and Industry by order of the Office of the President in order to promote "greater efficiency, agency convergence, and participatory governance in the delivery of essential public services at the grassroots level."¹⁰⁶ Previously, TESDA and DTI had already partnered together on the Skills Training for Employment/Entrepreneurship Program (STEEP), an initiative to provide skills training and to prospective entrepreneurs start a business.

In late 2018, TESDA released its Labor Market Intelligence Report, "Technological Change is Coming: The 4IR". In it, TESDA acknowledges the importance of "empirical and up-to-date data and materials necessary in addressing TVET concerns" in light of the challenges accompanying the 4IR. The report states that it "must initiate discussions with the industry and other government agencies of the implications of the Fourth Industrial Revolution to human resource development."¹⁰⁷ In July 2019, TESDA and the Department of Education (DepEd) signed an MOU to harmonize TVET in the Philippine basic education system, with DepEd underscoring a need for coordination, harmonization, and alignment between the two agencies across strategy, quality assurance standards, and data sharing.¹⁰⁸

TESDA is also working with the private sector to improve the Philippines' readiness for 4IR. It has announced plans to work with an industry association, the Information Technology and Business Process Association of the Philippines (IBPAP), to conduct a workplace skills survey that will enable the government and private sector to determine which skills will be needed in the 4IR era. The IBPAP has also developed, with support from the government, the "Accelerate PH: Future Ready Roadmap 2022," a blueprint aimed at upgrading the Philippines' IT-BPO sector, which it hopes will provide 1.8 million jobs and US\$38.9 billion in revenue by 2022.¹⁰⁹

Public initiatives on behalf of women are implemented through the Philippines Commission on Women and are mandated by Republic Act No. 9710, also known as the Magna Carta of Women, which decrees that women are equal partners in the formulation, implementation, and evaluation of policies and plans for national, regional, and local development. While there is a general acknowledgement of the need to be proactive in light of 4IR, the picture of how technology will impact the Philippines' female versus male labor force remains unclear, if not contradictory. One ILO study finds that Filipino women are 2.4 times more likely than men to work in jobs at high risk of automation.¹¹⁰ Another study by the Asian Institute of Management finds the opposite, that men hold jobs with a higher average probability of being automated than women, or 73% compared to 60%.¹¹¹



The Asia Foundation/Conor Ashleigh

The Path Forward

Cross-agency initiatives such as STEEP and the MOU between TESDA and DepEd demonstrate that collaborations across bureaucracies can be productive. Now, policymakers must continue channeling the same spirit of cooperation to develop better labor market dashboards that can help them anticipate 4IR disruptions. Policymakers should look for low-hanging fruit to immediately engage the private sector, which is more attuned to the changing industrial climate. The workplace skills survey planned by TESDA and IBPAP should focus on unearthing gaps in workers' skills that, once filled by the appropriate training, can help them stay on top of the technologies predicted to sweep through the BPO industry. Questions can also be asked that shed light on the format of training that would be most conducive to on-the-job learning for existing workers in the sector. Existing resources like LinkedIn also have a role to play in sharing labor market insights from their vast repositories of data on jobs and employment trends. Another area where policymakers can act immediately is for TESDA to expedite revisions to its regulations surrounding its Dual Training System, thus strengthening its coordination with and support of the private sector.

Presently, there is a dearth of data on the impact of technology on the Philippines' female labor force. Policymakers must be more proactive in acknowledging the particular challenges women will face as a result of technological disruption and assessing its impact. A starting point is to explore public/private initiatives that will help policymakers gather the data they need to better predict what trends are most likely to affect female workers and entrepreneurs. Only when the picture is clearer can effective policies and programs be targeted towards their upskilling needs.



The Asia Foundation/Conor Ashleigh



ENHANCED CAPACITY TO DELIVER SKILLS TRAINING THAT FITS THE MARKET

The majority of the working population in the Philippines do not have sufficient educational qualifications; therefore, they only seek low-paid or low-skilled jobs.¹¹² Occupational mobility is limited, and even though programs are offered under TESDA, only about one-half of those who enroll complete the program and receive a certification. Most of those who graduate from senior high school lack the skills to succeed in vocational or skills training. Programs are finding that students do not pass the screening to begin tech training programs because of their lack of critical thinking skills, and across the country, there is a lack of computers as well as the teacher expertise needed to prepare students in grade school.¹¹³ While the share of the population using the internet has risen from 25% in 2010 to more than 60% in 2017,¹¹⁴ technology uptake still has room for improvement. In addition, students will need stronger critical-thinking, problem-solving, and inter-personal skills to overcome the job-skills mismatch that the Philippines is experiencing, and broad curriculum changes are needed accordingly.¹¹⁵

The government has put into place new policies to address aspects of the changing labor force conditions, including the Philippine Telecommuting Act, the Unemployment Insurance initiative, Jobs Fit 2022 and the Career Guidance Advocacy Plan 2018-2022. Recent figures from the Philippine Statistics Authority reflect decreasing youth unemployment, and the National Economic Development Authority (NEDA) believes that programs implemented by the Department of Labor and Employment (DOLE), such as the Special Program for Employment of Students, Government Internship Program, and Job Start, have begun to reduce youth unemployment.¹¹⁶ Free support services are also provided to first-time jobseekers, and emergency employment and youth bridging programs are in place to support marginalized workers.¹¹⁷

“ Automation in the world of work represents great opportunities. But it can also broaden, if not properly managed, social inequalities and poverty. ”

Silvestre H. Bello III, Secretary of Department of Labor and Employment¹¹⁸

Policymakers are advancing initiatives in concert with the private sector to keep pace with the technology-driven forces expected to disrupt the nation’s labor market. DOLE is prioritizing the upskilling, reskilling, and retooling of the Filipino workforce through a number of programs. This includes its Philippine TalentMap Initiative (PTMI), a joint program with private sector entities like the SFI Group of Companies and HireLabs. At a foundational level, the Department of Education “plans to partner with businesses in drafting an education curriculum that is responsive to the needs of the economy” and that will “address the demands of tomorrow’s jobs, as it incorporates more high-value skills like critical thinking, problem solving, and creativity.”¹¹⁹

TESDA is also looking ahead towards upgrading its training regulations and programs with the proliferation of 4IR technologies in mind. Its medium-term (2018-2022) development plan specifically identifies as one of its core objectives the “[preparation of] the Philippine workforce for the challenges posed by the 4IR.”¹²⁰ At its third National Quality Technical-Vocational Education and Training (TVET) forum, themed “Driving Quality Assurance in TVET in the Fourth Industrial Revolution,” TESDA Secretary Isidro Lapeña said, “In recognition of the emerging 4IR, the changing skill sets of the 21st century and Science, Technology, Engineering and Mathematics have to be integrated in TVET, which plays an important role in the 4IR to equip the youth/learners of today for jobs in the future.”¹²¹



The Asia Foundation/Whitney Legge

The Path Forward

Policymakers can gain immediate traction by increasing the public's awareness of existing training and upskilling resources available to them like the JobStart program and the TalentMap Initiative. Social media sites like Facebook are already commonly deployed by government agencies to post announcements and can be used to spread awareness of these programs to the country's 76 million active social media users. Partnerships with popular job portals like Monster Philippines, LinkedIn, and Pinoyjobs can also be used in this capacity, as well to disseminate information on the skills most sought by employers.

The government must also collaborate with the private sector and academia to guide students' and workers' acquisition of the skills that will be demanded in the future. For example, among its guidelines to help the IT-BPO sector meet the needs of the digital age, the IBPAP's Roadmap 2022 suggests the creation of education advisory groups to serve as advocates in schools. The roadmap also recommends the establishment of a High Entry Placement Program (HEPP) targeted at graduates to directly take on value-added work (mid- and high-skill roles) and Higher Education Technology Consortia (HETCs) to enable the creation of high-skilled specialists. This kind of forward-thinking strategic planning would be valuable in all sectors and help enhance the country's overall upskilling ecosystem.

In the long run, a stronger focus is needed on providing opportunities for Filipino workers to develop the skills valued in a knowledge-driven economy, such as critical thinking, problem-solving, and interpersonal skills. With the same sense of urgency leaders in the private and public sectors are calling to enhance the TVET ecosystem, policymakers must think creatively to introduce new models of upskilling and credentialing, incorporate lifelong learning into the working training ecosystem, and incentivize the private sector to train their workers.



STRUCTURAL REFORMS THAT PROMOTE MORE INNOVATIVE ECONOMIES

The Department of Trade and Industry (DTI) is leading innovative policy through its Inclusive, Innovation-led, Industrial Strategy (i3S), a collaboration across academic, industry and government sectors to solve business innovation challenges. The i3S builds upon the DTI's previous industrial strategy, but places greater emphasis on innovation in recognition of the challenges and opportunities 4IR will pose. Through the i3S, DTI has expanded its MOU with the Department of Science and Technology (DOST) to include other key agencies, including NEDA, DICT, CHED, and DepEd to pursue implementation of the Inclusive Filipino Innovation and Entrepreneurship Roadmap. At the 2018 Inclusive Innovation Conference, Secretary Lopez discussed the roadmap, stating, "Our vision is a healthy and inclusive innovation and entrepreneurship ecosystem where stakeholders work together and collaborate in a conducive business and policy environment and driven by a creative talent pool and strong government-academe-industry relationship that supports the incubation of innovation and market-oriented research."¹²²

The Philippines may be seeing the results of such cross-sectoral collaborations, leaping 19 places in the Global Innovation Index, from 73rd in 2018 to 54th in 2019.¹²³ New pieces of legislation to promote innovation and technology entrepreneurship, such as the Youth Entrepreneurship Act, Philippine Innovation Act, and Innovative Startup Act, are being rolled out with the hope of inspiring healthier startup ecosystems in metro Manila and other urban hubs. However, expenditure on research and development, a key base-level driver of most economies' knowledge and innovation sectors, remains lower than regional neighbors and far below the UNESCO recommendation of 1% of GDP.

The Philippines' policy environment around digital economies is still nascent but evolving with an eye towards the growing importance of the digital economy and data security in the 4IR. The Department of Information and Communications Technology (DICT) was established in 2016 to plan, implement, and promote the country's ICT development agenda. Its establishment strengthens the enabling environment for private investment, coordinates policy dialogue, and expedites the development and enforcement of regulations for ICT development. Speaking at the 2018 Data Privacy Asia conference, Chairman of the National Privacy Commission Raymund Enriquez Liboro said, "As digital transactions expand, so do the risks, threats and harms [that they pose] to individuals. Protecting citizens [has] gone beyond patrolling the streets and the country's borders. Data is the new asset and personal data is the new target."¹²⁴

“ From the software, to the actual device carrying the software, to the business created from it, intellectual property can come in terms of copyright, or patent, or a trademark. IP will be at the center of this Fourth Industrial Revolution. ”

Josephine R. Santiago, Director General of Intellectual Property Office of the Philippines¹²⁵

In addition to promoting enabling ICT environments, the nation is also acknowledging the importance of strengthening intellectual property rights in order to spur innovation and competition amongst entrepreneurs. The DICT was only created in 2016, so there is still much progress to be made to the country’s ICT regulatory environment. The quality of the Philippine telecommunication and ICT regulatory environment ranks poorly relative to international best practices (127th on ITU’s ICT Regulatory Tracker for 2018), indicating great potential for industry advancement through policy reforms.¹²⁶

The Path Forward

The Philippines has a window of opportunity to accelerate the development of its digital and knowledge economies. Startup communities in and around the city of Manila, considered by some to be the most densely populated city in the world, are growing increasingly strong and mature. The city is already home to several major financial technology (fintech) companies.¹²⁷ The success of fintech in the Philippines is no accident. Rather, it is a direct result of government efforts to establish industry-friendly regulations, a “Test & Learn” regulatory sandbox, and adjustment of “know-your-customer” requirements to match the needs of emerging non-bank players.¹²⁸ Promotion of other industries could follow a similar blueprint of collaborative, industry-sensitive regulations, and incentives. To inspire success in the innovation ecosystem and match that of neighboring hubs like Jakarta and Singapore, the Philippines must dedicate further investment in basic R&D, make progress in creating a nurturing investment climate for innovative companies, and step up efforts to create spaces for innovators to advance new ideas and found new companies.

CASE 5: SINGAPORE



THE FUTURE OF WORK IN SINGAPORE

- Singapore has a highly skilled, though aging, population, with high wealth overall.
- Singapore consistently monitors its labor market to make evidence-based predictions on future needs. Its partnerships in this capacity have moved beyond its own borders to deepening regional collaborations, all the more necessary due to the country's small size and reliance on global trade networks and the flow of human capital.
- It is estimated that one-fifth of Singapore's full-time workforce will have their jobs displaced by 2028. Compared with other developed economies, Singapore's private sector provides one of the lowest levels of in-job training. But the government is offering an array of programs, such as its SkillsFuture and Adapt and Grow programs, to help workers to upgrade their skills and competencies and even train for new careers.
- Singapore is recognized as a global leader in innovation as a result of its stable and effective regulatory environment, a strong tertiary education system, and an exceptionally high rate of employment in knowledge intensive jobs. However, it cannot be complacent, as nearby urban hubs attempt to replicate the policies that have worked well for Singapore.



ILO/Giorgio Taraschi (CC BY-NC-ND 2.0)

Singapore has a highly educated population with almost universal literacy and bilingualism, which facilitates international business and collaboration. The country has already adopted advanced 4IR technologies across many areas of government and business. As a small nation-state, it does not contend with the same challenges as its highly populated neighbours.

Despite these assets, Singapore faces a number of challenging demographic trends.¹²⁹ In the coming years, its workforce growth will slow due to an aging population and low birth rate.¹³⁰ Millennials comprise an ever-greater share of the workforce – estimated to reach 75% in the next decade – and as they do, they are likely to change jobs with more frequency than the previous generation.¹³¹ As life expectancy improvements allow a greater proportion of the population to attain 100 years of age, these workers may choose to or need to remain in the workforce longer.¹³² Meanwhile, educated, able, and highly skilled members of the workforce 40 years and older voluntarily leave the workforce as they reach a level of affluence where they do not feel the need to continue working. Indeed, one out of every five Singaporeans in this age group now follows this pattern, a trend which poses challenges to employers seeking experienced workers for senior positions.¹³³

Although Singapore has a very low unemployment rate (2.1% in 2017), disruptive technologies are anticipated to displace one-fifth of Singapore's economy by 2028.¹³⁴ The workers most at risk to be displaced by 4IR technologies are those over fifty years old and those without tertiary education.¹³⁵ Singaporean workers over fifty years of age who lose or leave their employment have a 57.6% re-employment rate, compared to more than 76% for those aged 30 and below. Consequently, a large portion of workers at risk of being displaced by automation are also at risk of being structurally unemployed, and additional support networks will be needed to help them retrain and re-enter the workforce.¹³⁶ In addition, as e-commerce becomes more widely used in the years ahead, growing from 5.3% of retail sales in 2017 to an estimated 10.3% in 2022,¹³⁷ mobile and e-commerce platforms are also likely to displace Singapore's "brick-and-mortar" retail establishments and the workers that staff them.¹³⁸

The Singaporean government has adopted a centralized planning system to assess the changing requirements of the market, respond to the needs of its citizens, and prepare the workforce for the shifting requirements of the 4IR world. Yet with an aging workforce and an increasing trend towards early retirement among many of the nation's most skilled workers, the government will need to develop incentives to keep its most skilled workers in the workforce for longer, and to find ways to retrain and upskill workers over fifty.



POLICY PARTNERSHIPS TO IMPROVE LABOR MARKET DASHBOARDS

The Singaporean government's centralized 4IR strategy is based on long-term systematic planning and "tripartite" cooperation between the government, the private sector, and worker representatives. The priority the government accords to this area is evident in its allocation of high-level support to 4IR initiatives. For instance, the Council for Skills, Innovation and Productivity (CSIP) was formed in 2016 and later promoted to the level of Special Committee by the Prime Minister. Similarly, five Cabinet ministers (along with 25 leading members of the private sector) were appointed to the Committee on the Future Economy (CFE). The CFE's recommendations are implemented by the Future Economy Council (FEC), which is chaired by Deputy Prime Minister Heng Swee Keat and includes members from government, industry, labor unions, academia, and training institutions.¹³⁹

Over the past several years, the FEC has been developing Industry Transformation Maps (ITM) to chart strategies for 23 industries under six clusters, representing more than four-

fifths of the nation's GDP. These Maps are meant to systematically plan for each sector in Singapore and transform the economy for the 4IR. Committees meet regularly to forecast three to five years into the future, recommend regulations, and conduct constant evaluations that pave the way for further iterative planning.

“ We really don't want to think of ITMs [Industry Transformation Maps] as just another set of vertical silos. The nature of change, both structural changes in the global economy as well as technological changes, is that industry boundaries will also begin to blur. ”

Heng Swee Keat, Deputy Prime Minister¹⁴⁰

Singaporean policymakers consistently collect and assess data on the workforce and marketplace to monitor current labor market demand and make evidence-based predictions on the future needs of the labor market. For example, the Manpower Ministry has recently made it compulsory for companies to report retrenchments within five working days, if five or more staff are retrenched within six months. This enables the government and unions to act on the data more quickly. There have also been calls to use data from job postings on the national Jobs Bank more fully. For example, if a vacancy for a particular type of job is repeatedly re-posted, it may indicate more Singaporeans need more skills in that area.

The private sector and government are partnering across a number of sectors nationwide to pilot a range of innovative new 4IR initiatives. For example, under the Government's Research, Innovation, and Enterprise 2020 plan a Future of Manufacturing (FoM) initiative launched in 2015 brings together the Ministry of Trade and Industry (MTI); the Economic Development Board (EDB); and the Standards, Productivity, and Innovation Board (SPRING Singapore) in collaboration with industry and trade associations. FoM seeks to develop public-private partnership platforms to drive technological innovation, knowledge transfer, and adoption across the manufacturing industry. The goal of the initiative is to position Singapore as “a location of choice for developing, test-bedding and deploying advanced breaking-ground technologies in the manufacturing sector.”¹⁴¹

The National Trade Union Congress (NTUC), a national confederation of trade unions that also serves as a network of professional associations across all sectors in Singapore, launched a Future Jobs, Skills and Training (FJST) unit in 2017 to gather data on specific companies and industries that can expect new investments and jobs over a three-year time frame. FJST's goal is to act as a “strategic nerve centre, leveraging the expanded Labour Movement network and tripartite partner, to sense new and emerging opportunities so that strategic action can be taken to enable [workers] to secure better skills, better jobs, and better wages.”¹⁴² Its research will be shared with training providers and institutes of higher learning with the purpose of developing more relevant skills and training courses. The FJST also offers online training and skill-building resources for workers, some free and some via subscription.

The Path Forward

Singapore is well ahead of its ASEAN neighbors in collaborating cross-sectorally to extract useful data to inform labor market policies and tailor future-ready skills-building initiatives. Its partnerships have moved beyond its own borders to deepening regional collaborations, all the more necessary due to the country's small size and reliance on global trade networks and the flow of human capital. For example, the Committee on the Future Economy is working to help the workforce “acquire deeper knowledge of regional and global market, by spending time in these countries.”¹⁴³ The SkillsFuture Leadership Development Initiative is one example of this type of collaboration, and the government is exploring more such “internationalization programs” for businesses to improve their understanding of Asian and global markets.

Singapore ranked first globally in the World Economic Forum's most recent Technology Readiness Index (2016), which assesses the factors, policies, and institutions that enable a country to fully leverage ICTs for increased competitiveness and well-being. Policymakers should continue to seek novel ways to generate and leverage labor market data, especially from government-supported platforms like MyCareersFuture and MySkillsFuture, but the country's strong government commitment to the digital agenda and to longer-term planning initiatives means that it will continue to lead the world in its technological preparedness.



ENHANCED CAPACITY TO DELIVER SKILLS TRAINING THAT FITS THE MARKET

With the arrival of technological changes in the marketplace and the spread of the “gig economy,” workers are expected to acquire transferable skills and to engage in continuing education to remain competitive in the changing job market. Currently, the nation has one of the lowest proportions of employer-funded training for employees compared to other developed countries such as Denmark, Norway, and Germany.¹⁴⁴ One factor in companies’ slow response to the call for training is a fear that their investments may benefit someone else if workers do not stay long in a job.¹⁴⁵

By some measures, Singapore’s workforce gender gap is more severe than in either the Philippines or Lao PDR, affecting women’s experiences of hiring, compensation, and promotion.¹⁴⁶ The digital economy is likely to exacerbate these disadvantages for female workers. Industry leaders cite Singaporean attitudes toward the role of women in the workforce and a general reluctance among women to train in technology skills required by 4IR as key factors preventing greater participation by women in these programs and in employment in emergent sectors.¹⁴⁷ As elsewhere in ASEAN, Singaporean women are significantly underrepresented in STEM fields (holding only 30% of STEM degrees and a quarter of STEM jobs). This is in spite of the fact that women comprise 45% of the Singaporean workforce and 50% of enrolled university students.¹⁴⁸

Women in Singapore do, however, have access to a variety of reskilling and upskilling initiatives, many of which are government-funded, as well as an increasing number of professional groups that serve as resources and networks. One such network is Women in Tech Singapore, which convenes and connects women in or interested in STEM fields. Another group, the Singapore chapter of Girls in Tech, a global non-profit organization working to reduce gender inequality in high-tech industries and startups, focuses on “the underlying inhibitors of women in tech in Singapore, [which] include social perception and [the] lack of parental encouragement, academic support, industry exposure, role models, and support communities.”¹⁴⁹

Broadly, the government is allocating more resources to helping professionals, managers, executives, and technicians (PMETs) find new jobs by subsidizing their wages via the Career Support Programme. PMETs can work and get training at the same time through more than 100 Professional Conversion Programmes (PCP) in sectors that are expected to grow in the future (Seow, 2017). Workforce Singapore (WSG), formerly the Singapore Workforce Development Agency, is a statutory board under the Ministry of Manpower. Through the



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Attach-and-Train programme (AnT), WSG prepares PMETs to become job-ready, ahead of placement in selected sectors where there are strong growth outlooks and good future job opportunities. It is an extension of the PCP and puts PMETs through conversion training to take on a new career in growth sectors.¹⁵⁰ WSG's Adapt and Grow program also helps workers adapt to changing job demands and re-skill for new careers.

Another initiative the government has implemented is its SkillsFuture training courses through SkillsFuture Singapore (SSG), launched in 2015. The SSG conducts regular surveys with individuals and private companies to track the outcomes of those who have participated in its Workforce Skills Qualification (WSQ) training courses. This survey is set to be progressively broadened to cover the courses funded by the Ministry of Education (MOE) and SSG. The SSG also implements the Earn and Learn Program (ELP), which offers employers an opportunity to hire fresh graduates and allow those graduates who lack work experience to gain training in parallel with their jobs. The eight-week program allows employees to spend several days a week working on a job and the remaining days of the week getting upskilled or trained alongside it. The program has seen high participation because of its creativity in allowing new graduates to enter a rapidly changing workforce, for which the academic setting cannot sufficiently prepare them, and simultaneously gain marketable skills.¹⁵¹

The Path Forward

Faced with an aging workforce and an increasing trend towards early retirement among many of the nation's most skilled workers, the government will need to explore policies to keep its most skilled workers in the workforce for longer and to find ways to retrain and upskill older workers. The SkillsFuture and Adapt and Grow programs offer new approaches for workers to upgrade their skills and competencies. Reaching out to older workers may be a matter of further targeting their outreach, or further honing the “lifelong learning” message policymakers have adopted. In addition, policymakers can work with the private sector to promote mentor-mentee models, which may improve self-esteem and motivation in older workers and shape employers' and younger employees' perceptions and attitudes towards older workers.

Policymakers should also explore various strategies to further incentivize employer-led training and retraining activities (and address companies' reluctance to engage in training). Other countries have experimented with an array of policy tools to varying degrees of success, including employer subsidies, tax concessions, levy systems, statutory rights to training leave, training partnerships between larger firms and small businesses utilizing large firm resources, and pooling of resources between small businesses. No one-size-fits-all policy approach works, and Singapore can experiment with different arrangements targeting different sectors and different sized firms in order to optimize the provision of training to its workers.



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STRUCTURAL REFORMS THAT PROMOTE MORE INNOVATIVE ECONOMIES

Singapore has been ranked as the most competitive economy in the world as of 2019. It is also recognized as a global leader in idea generation, entrepreneurial culture, openness, and agility.¹⁵² The nation ranks eighth globally (and first outside of the U.S. and Europe) on the 2019 Global Innovation Index (GII).¹⁵³ This performance on the GII is largely due to its strong “inputs” to innovation, such as a stable and effective regulatory environment and a strong tertiary education system, and an exceptionally high rate of employment (56%) in knowledge-intensive jobs.¹⁵⁴

“ The Fourth Industrial Revolution is a dynamic and continuing process. We cannot predict how exactly it will unfold, but I am optimistic about ASEAN’s future because ASEAN has its own competitive strengths, and by pooling our ideas and resources and integrating our economies, we will be in a strong position to ride on this fourth wave to bring tangible benefits to our economies and our peoples. ”

Lee Hsien Loong, Prime Minister of Singapore¹⁵⁵

The Singaporean government’s approach to innovation is relatively open and tolerant; this enables new ideas and new technologies to be tested and refined within boundaries set out by the state, and for regulators to work directly with industry and workers to determine how best to manage potentially disruptive innovations. Regulatory sandboxes are commonly used to provide space for new and untested technologies, such as autonomous vehicles, fintech, and 5G.¹⁵⁶ This approach sometimes sets Singapore apart from other regional economies. For example, while crackdowns on cryptocurrency occurred across East Asia, Singapore allowed a wave of Initial Coin Offerings (ICOs), appointed a “Chief Fintech Officer” at the central bank, and began trialing use cases of blockchain and distributed ledgers as early as 2016.¹⁵⁷ This engendered greater trust between government and industry and encouraged many of fintech’s new players to set up shop in Singapore rather than elsewhere.

In addition to these sandboxes, Singapore’s policymakers benefit from the offerings of “strategic foresight” institutions such as the Center for Strategic Futures, a group under the Prime Minister’s Office that uses scenario planning processes to analyze possible outcomes over the next 20 years and for specific emerging issues. To spark dialogue around these issues, the Center even produced a set of illustrated “Driving Forces Cards” that delineate the current state of play, expected developments, as well as uncertainties with regard to new technologies.¹⁵⁸

Finally, as a small city-state of just over five million people, Singapore is heavily reliant on global value chains to sustain the domestic economy. Global integration is therefore first on the list of the Committee on the Future Economy’s list of strategy areas, and it puts a strong emphasis on enabling free and open markets, deepening linkages with international partners, and resisting protectionism. Recognizing that aspects of the future of the economy lie in digital services, and that the international rules and norms for this kind of trade are still being determined, Singapore has attempted to position itself as a thought leader on global digital economy regulation and trade. In May 2019, Singapore signed an unusual “Digital Economy Partnership Agreement” with Chile and New Zealand that aims to “set forward-looking standards on digital trade, and establish new international approaches to support the digital economy and trade in the digital era.”¹⁵⁹



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The Path Forward

Singapore's digital economy is very strong, and the country is better placed than almost any other nation to take advantage of the opportunities presented by the Fourth Industrial Revolution. But looking ahead, policymakers will need to consider a few troubling indicators that may suggest certain weaknesses.

First, it should be noted that Singapore's high ranking on innovation indices is largely due to the so-called "inputs" to innovation, such as strong institutions and contract enforcement, rather than the "outputs," such as patents registered and production of creative works. This points to an efficiency gap, in other words, "lower levels of output relative to their innovation input," compared to other developed countries.¹⁶⁰ In fact, the World Economic Forum's Executive Opinion Survey identified "insufficient capacity to innovate" as the second most problematic factor for doing business in Singapore, after "restrictive labor regulations".¹⁶¹ Though its open and inviting business environment will continue to attract some of the world's top companies, Singapore's aging population and low labor productivity growth rate threaten to hold back the domestic knowledge economy, especially as nearby urban hubs attempt to replicate more of the input-side policies that have worked so well for Singapore. Policymakers will need to avoid complacency and find ways of encouraging greater creativity and innovation among the population.

Second, the evolution of the digital economy is leading societies into uncharted territory with respect to social and psychological factors. This aspect of technology-driven disruption is not yet well understood, but will be crucial for Singapore to address as both a global innovation leader and a society where dissatisfaction with the psychological impacts of technology is exceptionally high. In a recent survey by Dentsu Aegis Network, 64% of Singaporeans felt that the pace of technological change was "too fast," and only 25% felt that digital technologies were meeting people's psychological needs. These metrics were much more negative than in comparable high-income countries.¹⁶² To stem greater discontentment and a backlash against the technology industry, Singapore could take a leading role in advocating for digital economy policies and practices that support health and wellbeing.

CASE 6: THAILAND



THE FUTURE OF WORK IN THAILAND

- The national Thailand 4.0 vision emphasizes innovation and technology as a path out of the middle-income trap, which has plagued Thailand for years. The Thai government has invested heavily in infrastructure and efforts to raise foreign investment and exports.
- Major improvements are needed to bring the country's education system in line with international standards. Not only do Thai students' scores on assessments of science and mathematics sit well below global averages, the gap between the quality of education in rural and urban areas is wide.
- A severe lack of skilled workers, especially technical specialists and vocational school graduates, and a population that is aging much faster than regional competitors will make it difficult for the country to find enough workers to fill the needs of its evolving industries.
- Thailand's vibrant digital economy, especially its startup ecosystem, is already enticing investment from foreign and domestic players. However, policymakers will need to closely monitor this sector to ensure that regulation keeps up with the pace of innovation.



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The most prominent national policy vision in Thailand today is “Thailand 4.0,” a broad economic model that promotes the role of technology, innovation, and creativity in unlocking a new stage of development. The policy is the successor of prior vision statements stretching back decades: “Thailand 1.0”, which focused on agriculture, “Thailand 2.0” (light industry), and “Thailand 3.0” (advanced industry).¹⁶³ With increased importance placed on innovation and the knowledge economy, Thailand 4.0 represents a shift in national priorities toward supporting growth industries, as well as enhancement of human capital to train or re-train so-called “super workers” who can fill the new jobs these industries demand. Priority industries include agriculture and biotechnology, food and beverages, smart electronics, medicine, wellness tourism, biofuels and biochemicals, automation and robotics, health care and medical services, digital industries, and aviation and logistics.¹⁶⁴

In measures of overall readiness for 4IR transformation, Thailand’s prospects are mixed. Its economy has a strong base and high degree of complexity already, and some larger companies have begun investing in new technologies and R&D.¹⁶⁵ Its innovation and technology ecosystem is also strong, albeit mostly confined to hubs in metropolitan Bangkok and Chiang Mai. But to compete with regional neighbors like Vietnam and Indonesia, wider adoption of new technologies within Thai businesses and major improvement of human capital development within the country will be required.

The share of Thai jobs at risk of automation is lower than in neighboring countries, for example, at 44% in Thailand compared to 70% in Vietnam.¹⁶⁶ However, female workers and low-skilled workers assume a disproportionate amount of that risk, and if the low-skill jobs that currently exist in the manufacturing sector are transformed by automation, millions of workers may be forced to turn to the informal sector, lowering overall labor productivity and hurting the livelihoods of workers and their families.¹⁶⁷ At the same time, Thailand's population is aging extremely rapidly. Indeed, the anticipated decline in its working age population between 2016 and 2040 is the highest in developing Asia. This demographic trend will place further pressure on policymakers to improve labor productivity in the coming years.¹⁶⁸

Thailand has already made great progress advancing its digital economy, and now, it will have to distribute this progress more evenly among its citizens. It must go beyond Thailand's urban areas and special economic zones to rural areas, and give citizens there access to digital infrastructure, skills training resources, and new economic opportunities.¹⁶⁹ This means, among other things, that major improvements are needed within the country's education system, which falls behind international standards. Thai students' performance on assessments of science and mathematics ability stand well below global averages, and there are acknowledged gaps between the quality of education in rural and urban areas.¹⁷⁰ To overcome the country's structural challenges, the Thai education system will need to adapt to provide students with better skills and career pathways in the 4IR economy.



POLICY PARTNERSHIPS TO IMPROVE LABOR MARKET DASHBOARDS

As Thailand assumed the role of ASEAN chair for 2019, it committed to placing significant emphasis on “advancing partnerships for sustainability” to drive the region forward. Domestically, too, the Thailand 4.0 strategy encourages ministerial bodies to work together to create policies that align with shared goals. Major e-government initiatives, for example, aim to harmonize systems and databases between agencies, and free access to public-interest data is enabling companies and private citizens to create new use cases and products.

Several different Thai ministries have begun long-term plans for digitization and industrial transformation. The Ministry of Digital Economy and Society (MDES) launched the Thailand Digital Economy and Society Plan in 2014; the Ministry of Labor (MoL) is implementing

a 20-year Strategic Framework on Human Resource Development (2017-2036); and the Ministry of Industry (MoI) has a 20-year strategic plan called Industrial Transformation Towards 4.0. The MoI is also undertaking a skills gap assessment of various industries, which it expects to complete by the end of 2019. The Ministry of Higher Education, Science, and Innovation (MHESI), formed in May 2019, aims to promote research and innovation for commercial uses, produce human resources, and innovate on a cycle. Its goal is to generate new bodies of knowledge to equip Thais with skills and capabilities that will enable them as well as the country to move forward in the Thailand 4.0 era.¹⁷¹

These preparations are putting the government on the right path towards 4IR-readiness. However, many obstacles stand in the way of Thailand achieving its vision of partnerships for sustainability, such as converting traditional and unstructured data into usable digital formats.

“ Big data is a key topic for the government, currently each ministry operates with a silo mentality and collects data without any consolidation [...] Thailand has a plan to develop a portal that pools all the data, but this will take time. Moving forward, the government really needs to think outside of the box about how to effectively use the data. ”

Nuttapon Nimmanphatcharin, President & CEO of Digital Economy Promotion Agency¹⁷³

The Digital Government Development Agency under the Office of the Prime Minister is leading agencies in the push for bureaucratic transformation and reduced “silo-ization” in the Thai government.¹⁷⁴ MDES has strong support from the Royal Thai Government and is responsible for coordinating the activities of several different agencies involved in data collection and digital services. These agencies include the Digital Economy Promotion Agency, the National Statistical Office, the Communications Authority of Thailand, the Electronic Transactions Development Agency, and several others.¹⁷⁵ MDES also oversees the



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National Digital Economy and Society Committee, a body chaired by the Prime Minister and mandated to “steer the implementation of Thailand’s digital economy.”¹⁷⁶ The Committee’s province ranges from development of national broadband to the promotion of the creative economy and ICT skills education.

The Path Forward

To progress toward savvier, evidence-based policymaking, Thailand will need to build the data and digital capacity of its government bodies and individual civil servants. The office of the Civil Service Commission has identified digital capacity and ICT experience among public servants as a concern. As a case in point, the civil service exam does not prioritize digital or electronic data skills.¹⁷⁷ This leaves the public sector at a serious operational disadvantage, particularly as the use of data and technology in the private sector approaches breakneck speeds. The Digital Government Development Agency is implementing a number of programs and technical solutions to encourage digitization of documents and databases. It is also working with the Civil Service Commission to introduce digital literacy training programs for public servants. But a culture of data use and data sharing will need to be inculcated among the Thai bureaucracy to generate insights relevant to the contemporary labor market and to encourage future collaborations with the private sector.



ENHANCED CAPACITY TO DELIVER SKILLS TRAINING THAT FITS THE MARKET

Currently, Thailand does not have enough specialists and experts in high-tech industries to position it as a leader in the region, with the human resources needed to thrive in the Fourth Industrial Revolution. Enrollment in technical fields remains relatively low. Only 1,295 individuals were enrolled in science and technology PhD programs in Thailand in 2013, compared to the 2,138 PhD candidates in social science and humanities.¹⁷⁸ To address the lack of industry-ready workers and equip Thais with ICT skills, the government plans to budget US\$1 billion for 12,290 doctoral researchers to serve the country's development and staffing needs over the next 20 years.¹⁷⁹

Policymakers are also addressing the country's gender disparities in STEM education, which begin as early as primary school and continue through higher education. The Ministry of Education (MoE) will partner with UNESCO to promote STEM education among girls and women through UNESCO's Global STEM and Gender Advancement project (SAGA). It is the first country in the ASEAN region to pilot a "policy toolkit" that analyzes the impact of policies on gender disparities in STEM.¹⁸⁰ The Thailand 4.0 policy is meant to transform the country without leaving anyone behind, so increasing and ensuring opportunities for women is a vital part of this agenda.



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Vocational schools, on the other hand, suffer from a serious image problem, being associated with lower-class status, machismo culture, and “gang wars” between rival colleges.¹⁸¹ Despite the strong demand for technical graduates who can build, manage, and service the automated factories envisaged by Thailand 4.0, most middle-class Thai families would be loath to send their children (and especially their daughters) to places with this reputation. The government is working to overcome these prejudices, and recently, the Office of Vocational Education Commission (OVEC) reported a rise in Thailand’s ratio of vocational students to 39.7%, towards the government’s goal of 50%.¹⁸²

“ More investors in the EEC [Eastern Economic Corridor] are adopting modern technologies, which require a certain level of know-how to operate [...] The problem is that vocational colleges and universities in the vicinity of the EEC can only supply about 30% of the demand for skilled workers. ”

Apichart Thongyou, chairman of EEC Human Resource Development Centre¹⁸³

One interesting program that may serve as a model for future education and training initiatives is a national online course platform called “Thai MOOC” (massive online open course).¹⁸⁴ Established in 2017 through a partnership between MDES, Ministry of Science and Technology (MoST), and MoE, Thai MOOC is built on the open source edX framework, and its aim is to fulfill the “Thailand 4.0” vision of ensuring lifelong learning for citizens.¹⁸⁵ The innovative model has partnerships with government organizations and universities and allows people to enroll remotely in short-term courses and earn certificates that are recognized by Thai universities.

Public-private partnerships to address the Thailand 4.0 agenda are nascent. However, existing partnerships show promise in contributing to the upskilling of workers. One example is a project between the MoL and the Automotive Human Resources Development Academy (AHRDA). The government aims to make Thailand a hub for automotive production in the ASEAN region, as the industry is one of the country’s ten

“S-Curve” industries, or industries targeted for growth. To develop talent to support the automotive industry, the MoL has joined forces with AHRDA to develop a “short-term curriculum on automobile parts production.”¹⁸⁶ With this course, the government hopes to provide vocational training for students at Nakhon Nayok Technical College and Chon Buri Technical College. In addition, the program aims to provide training for trainers, through emphasis on planning, evaluations, and formulation of skills standards. Mr. Boonlert Teeratrakul, the Deputy Permanent Secretary of Labor, believes this collaboration between the private and public sectors is an “ideal model to extend to other areas in the future.”¹⁸⁷

Another example is the work being done to develop the Eastern Economic Corridor (EEC) through private sector partnerships with OVEC. OVEC has worked in partnership with the Office of the Higher Education Commission (OHEC), the Eastern Economic Corridor Office (EECO), and the Board of Investment (BOI) to train workers to match the demands of the industries that could potentially locate in the EEC. The initiative’s emphasis is on supplying vocationally trained personnel to the 10 S-Curve industries, focusing especially on four industries, including automotive and parts, energy, food processing, and microelectronics. One public-private partnership, the Chevron Enjoy Science project, focuses on Thailand’s youth, aiming to augment “2S” or “STEM + Skills” through improved STEM education and TVET across the country.

The Path Forward

Going forward, efforts to enhance Thailand’s TVET and technical skills capacity should continue to establish the kinds of public-private partnerships exemplified above. Furthermore, policymakers should direct efforts to help TVET meet minimum regional standards. One possible path forward involves borrowing a strategy from Singapore, where companies are required to commit to training and upskilling workers or pay a tax to fund local education. Singapore’s Nanyang Technological University, for example, was formed with such support. All firms were required to contribute to this job-training fund and could apply for a refund if they developed proposals that outlined how the funds could be used to provide technology-based skills that would enable Singaporean workers to generate more high value-added outputs. This approach appealed to high-value firms and produced numerous innovative retraining proposals. By adopting these types of approaches, Thailand could enhance on-the-job training opportunities for Thai workers that centered around high value-added work.



STRUCTURAL REFORMS THAT PROMOTE MORE INNOVATIVE ECONOMIES

In 2014, MDES launched the Thailand Digital Economy and Society Plan aimed at transforming the nation into a digitized community. This plan also falls under alignment with the government's 20-year plan. The plan laid out by MDES sets a number of ambitious targets for building country-wide high-capacity digital infrastructure; boosting the economy through the use of digital technology; creating a “knowledge-driven digital society”; digitizing government services and processes; developing a workforce for the digital era; and building trust and confidence in the use of digital technology. The goal of the plan is to make Thailand's digital landscape competitive with other ASEAN countries, which are currently ahead in many metrics, including mobile penetration, smartphone ownership, and 4G rollout.¹⁸⁸ By 2027, the government hopes the digital economy will contribute a quarter of Thailand's GDP.

Thailand boasts a relatively vibrant startup ecosystem and is home to a number of innovative and successful companies. Funding for these startups comes from both foreign investment funds and domestic sources. The Mountain View-based venture capital firm 500 Startups, which operates in Thailand as 500 TukTuks, invested US\$15.4 million in its first phase and is targeting US\$20 million for its second fund.¹⁸⁹ Startup accelerator programs, which help early-stage startups make connections, get investment, and scale up, are mushrooming in Bangkok and Chiangmai.¹⁹⁰ In 2018, the deputy prime minister, Somkid Jatusripitak, ordered the Board of Investment to spend 10 billion baht on Thai startups, and state-owned banks and agencies are also promising support.¹⁹¹

“ Accelerating and creating more startups is a core government policy to energize entrepreneurs for the future innovation-based economy and to drive Thailand's economic growth in the long run. ”

Somkid Jatusripitak, Deputy Prime Minister¹⁹²

The Path Forward

While Thailand's startup scene shows many signs of vitality, more support beyond venture capital funding and accelerator programs is needed to ensure continued, broad-based growth and innovation. To multiply the number of successful Thai startups, the country must nurture more students and researchers studying IT and business skills that match those needed by the rapidly changing modern tech industry. This may require greater or more targeted investment in education and research grants in STEM fields like computer science.¹⁹³

Global players can sometimes play a catalyzing role in technology transfer and training, and policymakers should explore such partnerships with the aim of cultivating innovation within Thailand's own borders. Examples of this are already starting to crop up. For example, working with four global IT firms – Google, Microsoft, Cisco and Huawei – MDES is designing the curricula for 84 courses that will provide up-skilling and re-skilling to workers in tech-related industries. MDES is also joining forces with the Chonburi Chamber of Commerce to promote the use of digital technologies among Thai SMEs in the flagship Eastern Economic Corridor project. Arrangements like these can help generate new globally-recognized certifications for local workers.

Startup entrepreneurs are also sensitive to regulations on intellectual property protection, taxation, foreign worker visas, stock ownership, and payment infrastructure.¹⁹⁴

Policymakers should work with entrepreneurs and technologists to better grasp how to properly regulate new industries and technologies. Regulatory sandboxes, such as those set up by the Bank of Thailand to test fintech services, are one such way that public-private collaboration can be encouraged and lead to innovation. Finally, data privacy legislation can also have a strong effect on the readiness of both domestic and foreign parties to invest in developing the Thai digital economy, as evidenced by the negative reactions to the set of privacy and cyber-security bills passed in early 2019.¹⁹⁵ Policy efforts to address data privacy should also be done in consultation with the private sector with the goal of creating a conducive environment for businesses and consumers alike.

CASE 7: VIETNAM



THE FUTURE OF WORK IN VIETNAM

- Vietnam's economy has transformed dramatically over the past three decades and is currently a thriving, globally-connected middle-income country.
 - The country's exceptional education system outperforms comparable countries in the region and even scores higher than the OECD country average.
 - Yet the vast majority of Vietnamese workers (74%) are employed in low-skill jobs, and youth unemployment is high. Many university graduates cannot find a job that uses their degree.
-
- Government responses to labor market trends are often constrained by lack of data, and policymakers often rely on personal networking rather than systematic protocols to gain access to data. A recommitment to cross-ministerial working groups and innovative public-private partnerships could uncover new streams of data for tracking labor force transformations.
 - Vietnam's educational system and growing network of TVET providers are evolving to equip the country's workforce for the demands of the future. One area for policy action is to help TVET institutions and the private sector work together to establish more enterprise-based training and apprenticeship programs.
-
- The government has begun to address the challenges of 4IR through a number of initiatives, but they are not yet under one coordinated, concerted policy. One area to address is the lack of digital standards, norms, and certifications. Policymakers can also develop supportive policies to bring SMEs and their workforces up to speed and succeed in a digital economy.
 - The tech startup scenes in Hanoi, Ho Chi Minh City, and Da Nang are flourishing and globally well-regarded. Vietnam's growing ecosystem of tech companies will play an outsized role in shaping Vietnam's future labor market and growth industries.



Justin Mott/Getty Images for The Asia Foundation

Vietnam's economy has transformed dramatically over the past three decades, rising from poverty to become a thriving, globally-connected middle-income country. Domestic consumption and income growth remain high, while inflows from direct investment, tourism, and trade have been strong, leading to broad-based growth and prosperity.¹⁹⁶ Much of this growth has come through the movement of people from traditional agriculture into newly-developing manufacturing and services industries, as well as through increased mechanization and modernization in the agriculture sector itself.¹⁹⁷ Migration out of rural areas, as well as the redesignation of many rural communes to urban wards, has raised Vietnam's urbanization rate to nearly 40% (from just 20% in 1990), and many rural and ethnic minority youth see migration as a way to improve their status, learn new skills, and feel a sense of pride.

Vietnam has a strong educational system, one that outperforms comparable countries in the region. A World Bank analysis of education systems in East Asia and the Pacific

ranked Vietnam among the top performers in the region. Vietnam's education score even exceeded the OECD average, a remarkable achievement given the country's middle income status and scarcer resources for education.¹⁹⁸ By 2016, nearly 60% of 20-to-24-year-old adults had completed secondary education, and two-thirds of 3-to-5-year-old children were enrolled in pre-primary school.¹⁹⁹ Youth literacy is nearly universal. However, educational attainment is not equally distributed, with notable gaps between rural and urban areas and Kinh ethnic people and minority populations. Youth unemployment remains high, especially among university graduates. Those who cannot find a job that uses their degree either assume positions in their field that are below their educational level or seek employment outside their fields of study.

The Vietnamese government has announced that it will prioritize adapting its industries and citizens to a digital future, but thus far, it has not yet released a national strategy on 4IR, nor has it made significant progress in enacting specific policies or actions. The government has issued a number of directives related to 4IR, including the Prime Minister's Directive No. 16, On strengthening the access to the Fourth Industrial Revolution, and the Ministry of Education and Training's (MOET) Official Letter No. 1891 to all higher education institutions to adapt the training of human resources to the needs of the Fourth Industrial Revolution. Some government agencies have begun to implement their own e-government initiatives, to varying degrees of success, but policy coordination is yet to be fully realized.

Among Vietnamese businesses and individuals, awareness of 4IR is high, but there is a general sense of uncertainty as to how it will affect them or how to harness its potential. A 2019 joint survey conducted by the Ministry of Industry and Trade (MOIT) and UNDP of 2,659 industrial enterprises found that 85% of respondents had not done anything or had done very little to prepare for 4IR.²⁰⁰ Nearly four in five had no plans to implement significant changes in the context of 4IR, including more than one-third who reported not knowing how to respond. Even among larger corporations, the adoption of 4IR technologies is uneven. Some major manufacturing companies, such as Vietnam National Textile and Garment Group (Vinatex), have announced plans to further automate their assembly lines, which could have a major impact on the job market.

Vietnam's thriving economy, relatively high level of digital adoption, and high-performing education system position it to respond well to technological disruption. However, policymakers have much work ahead of them to facilitate the country's transformation to a digital economy, including reforming its legal and regulatory frameworks, encouraging innovation, research, and start-up entrepreneurship, enhancing its TVET and overall learning ecosystem, and improving its digital infrastructure.



POLICY PARTNERSHIPS TO IMPROVE LABOR MARKET DASHBOARDS

Currently, the Ministry of Information and Communication (MOIC) is preparing a proposal on “National Digital Transformation,” which describes specific actions for updating and advancing training programs, implementing lifelong learning, and minimizing brain drain. But efforts to prepare the population for the future of work are constrained by limited access to data. The Ministry of Labour, Invalids and Social Affairs (MoLISA), which is responsible for most aspects of labor policy and technical and vocational training, publishes a quarterly newsletter with updates and predictions on the labor market.²⁰¹ This report relies on data that is provided to MoLISA by the General Statistics Office (GSO), and stakeholder interviews indicate that this data is not updated frequently enough. For example, at the end of Q2 of 2019, the most recent data available from the GSO was published in Q2 of 2018.²⁰²

While the GSO is mandated to share data with other ministries and departments, the mechanism for sharing is not clear, forcing policymakers to rely on personal networking to access datasets. Additionally, its data collection methodology itself may be flawed, as questionnaires are given to the heads of villages to be filled in themselves. When input data is not accurate, the validity of all subsequent analyses and predictions based on that data is jeopardized.

Official forums are one means by which policymakers gain access to market intelligence, though not necessarily empirical data. For example, in August 2019, MoLISA organized a National Forum on Innovation and Improving the Quality of TVET, where more than 1,000 enterprises, including the 500 largest enterprises in Vietnam, were expected to attend. The forum provided a venue in which MoLISA and other agencies could interact with companies and listen to their needs. At the recently organized Private Sector Economic Forum, which the Prime Minister and other Ministers of line ministries participated in, enterprises pointed out the gaps and challenges in current policies and legal documents.

Policymakers also often rely on private-sector or non-governmental data when official government datasets are incomplete or hard to acquire. In interviews for this report, representatives described referring to data from Navigos of Google, a recruitment and job-search platform, which some find more accurate than official data.

For now, much remains unclear about the impact of 4IR technologies on jobs in Vietnam’s current growth centers. There is uncertainty, for example, in when and how the adoption



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of robotics will affect the nature and number of jobs in the apparel industry, as there is still not a machine that can replace the cut-make-trim sewing machine operators that employ 70% of garment workers. Presently, although labor costs are increasing in Vietnamese garment factories, they evidently still pale relative to the cost of machinery.²⁰³ The dearth of reliable, timely, and accurate data makes the uncertainty all the greater and represents a huge obstacle to policymakers planning for the future of work.

The Path Forward

Limited labor market data makes it hard for the government to plan for 4IR disruptions. Data-sharing among government ministries happens largely on the basis of personal relationships rather than systematic protocols, and the private sector is often loath to share its own data with government entities. Activities like public-private sector forums help increase policymakers' awareness of the private sector's workforce needs, but these alone are hardly enough to guide policies affecting millions.

Policymakers must recommit to creating partnerships to ensure that there is sufficient data to track labor force transformations. Strategic cross-ministerial working groups and policy co-creation workshops may help establish new avenues through which government data siloed in one ministry can be accessed by another. Online job portals like Vietnamworks.com, Careerlink.vn and Anphabe.com or global companies like Google and Facebook may be more inclined to engage with government agencies in data sharing initiatives.



ENHANCED CAPACITY TO DELIVER SKILLS TRAINING THAT FITS THE MARKET

Low-skill, elementary jobs are generally those at the highest risk of displacement through automation. Unfortunately, these roles make up nearly 74% of jobs in Vietnam, and those who have only completed primary school are three times more likely to be in a high-risk occupation.²⁰⁴ In the near term, Vietnam may well be able to retain its position in global value chains through continuing low-skill, low-value-added assembly work, but this is highly reliant on global and regional trends as well as the ability of Vietnamese policymakers and workers to adapt to changing demands.²⁰⁵ In the long term, Vietnam must equip its workforce with the skills and training that are demanded by the adoption of new technologies.

“ Trained employees in Vietnam only account for 60% of the total labor force, in which only 21% received certificate and the length of training is three months or more. Therefore, when entering the industrial revolution 4.0, the labor force faces major challenges. The government must be responsible for guiding and identifying high-skilled human resources in response to the 4.0 movement. Enterprises, organizations, and individuals must do their own research in order to prepare human resources, investment, and support employees in accessing new science and technology. ”

Bui Sy Loi, Dep. Director of the National Assembly Committee for Social Affairs²⁰⁶

The potential risks of displacement are compounded for Vietnam’s millions of internal migrant workers, who upon losing their jobs tend to return to their home villages in rural areas, where their aging parents may still be taking care of small farms using traditional, non-mechanized methods. These farms face declining productivity compared to more

modern and efficient operations, as well as the threat of destruction due to climate risks such as floods, droughts, and disease. Although there are growing opportunities in off-farm labor, older relatives may not be willing to opt for non-farming livelihood strategies and may discourage young people from pursuing other livelihood opportunities.²⁰⁷ Young women in the role of daughter-in-law may be further marginalized through lack of access to household financial resources.

Despite the challenges, returning migrants also bring with them savings and valuable experience from working and living in the city. Many returned migrants are opening and operating service business that contribute to the continued urbanization of the countryside and of peri-urban areas. Others see opportunities to modernize rural agriculture through mechanization and the use of new technologies to manage farms, improve produce quality, and sell for better prices. These success stories – made possible in large part by the educational, commercial, and networking resources available on the internet – are important to highlight.

“ *A smart labor force plus creativity would serve as driving forces for economic development amid Industry 4.0.* ”

Prime Minister Nguyen Xuan Phuc at Vietnam ICT Summit 2018²¹¹

The Vietnamese TVET system has the broad task of training Vietnam’s labor force – no small responsibility, given that 85% of Vietnam’s employed workers “have not been trained to achieve any level of qualifications.”²⁰⁸ Worse, that trend is exacerbated along gender and rural-urban lines. The TVET system is in fact a large network of institutions administered by a wide range of organizations, from MoLISA and line ministries, down to provincial, city, and district governments. Run by the Directorate for Vocational Education and Training (DVET), TVET in Vietnam has seen significant improvements in recent decades, alongside a rise in the number of training institutions from 312 in 2001 to 1,347 in 2010, and a corresponding increase in enrollment.²⁰⁹ An ADB assessment cited among the TVET system’s improvements a strengthened legal and policy framework, greater flexibility (with the addition of vocational training at the college level), and higher quality of training, based on parameters such as skills standards, curriculum frameworks, and pilot learner assessments.²¹⁰

Despite these developments, many institutional weaknesses still remain that impair the TVET system's ability to prepare Vietnam's workers for the future of work. Probably the most critical of these is insufficient on-the-job training and apprenticeship opportunities. The advantage of enterprise-based training (EBT) is that, unlike TVET curricula, which are often not aligned with the skills demanded by the private sector, EBT is closely linked to the needs of the enterprise and is thus, by definition, responsive to market demands. In addition, EBT allows for continuous learning and adaptation to new technologies. Part of the reason for the lack of this type of training delivery mechanism is that collaboration between policymakers, TVET institutions, and the private sector has been weak, inhibiting the understanding for the need for such training in the first place. Policymakers have also inadequately addressed the disincentive businesses perceive about the risk of training their workers at their own expense, only to see those workers leave for other employment opportunities. Finally, many businesses – particularly SMEs, which represent the majority of employers in Vietnam – simply do not have the resources to afford on-the-job training.

Some companies are taking matters into their own hands in order to implement their own upskilling programs. One example is Vinfast, Vietnam's first major automotive manufacturer and a subsidiary of the Vingroup conglomerate. In an attempt to leapfrog older manufacturers, Vinfast is starting out by investing aggressively in building highly automated facilities, including a welding plant equipped with 1,200 robots that run on nights and on weekends.²¹² While the initial equipment and technical expertise comes from European companies, Vinfast has established its own vocational training center in Haiphong city that will teach mechatronics and industrial mechanics to Vietnamese students. Upon completing the program, students receive a certification based on German standards, enabling them to work at the Vinfast factory or at more than 50,000 German companies worldwide.²¹³

While private sector-led reskilling and training programs can be effective, the main issue is whether they are transferable or sustainable. Many companies provide training on an ad-hoc or hyper-local basis, often under an agreement with local authorities. For big companies, production facilities are sometimes moved to take advantage of preferential taxes in one zone or another, leaving its labor force behind. Smaller companies might cooperate with their local authorities to train current or potential employees, but not in an organized or broadly aligned way.



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The Path Forward

Policymakers should start with Vietnam's existing institutions to explore ways to offer enhanced upskilling resources to its labor force. Its impressive educational system and its growing network of TVET providers have the potential to equip current and future workers even more effectively for the future, but policymakers need to work together, as well as in concert with the private sector, to enhance these resources. For example, improved coordination between MoLISA (which coordinates TVET implementation) and the Ministry of Planning and Investment (MPI) and Ministry of Finance (MoF) (which have considerable financial and decision-making power) may facilitate the allocation of funds towards more urgently needed training courses.

The government should also work on a number of fronts to immediately ramp up the availability and accessibility of on-the-job training programs and ensure that these opportunities are extended to rural areas and female workers. But first, the government must convince the private sector of the advantages of EBT. The link between worker training and increased net profits is not necessarily clear to employers, and the responsibility lies with the public sector to promote businesses' understanding. Policymakers must also increase awareness, especially among SMEs, of programs and incentives offered by the government to support apprenticeship training. Finally, policymakers must work together with TVET institutions and businesses to establish on-the-job training programs and apprenticeships that produce high-skilled, action-oriented workers who are equipped to handle the needs of the market.



STRUCTURAL REFORMS THAT PROMOTE MORE INNOVATIVE ECONOMIES

While Vietnam has a very digitally-connected and digitally-literate populace, the adoption of 4IR technologies in industry is still in the early stages and not fully embraced, especially by SMEs. Among larger corporations, adoption of 4IR technologies is uneven. Some major manufacturing companies, such as Vietnam National Textile and Garment Group (Vinatex), have announced plans to further automate their assembly lines, which could have a major impact on the job market. Vinatex said it would expand investment in smart factories, placing priority on activities which can be replaced by robots.²¹⁴

“ Investing in research and development will be critical for Vietnam to join the frontiers of Industry 4.0. ‘Made in Vietnam’ should be replaced with ‘Researched and Developed in Vietnam’.”

Ousmane Dione, Country Director for Vietnam, World Bank²¹⁵

The use of data science and sensor technologies is picking up in the agriculture sector, whether in the form of cell phone apps to monitor weather conditions for farmers in the Mekong Delta or to track massive industrial supply chains.²¹⁶ Vingroup, which is Vietnam’s biggest privately-owned company, uses big data and other agricultural technologies from Israel, Japan, and the Netherlands in its projects. Major domestic technology corporations such as FPT, Vingroup, and VNPT have begun initiatives in researching and applying AI and blockchain. The recent application of blockchain technology to some agricultural export products like mangos and dragonfruit has brought high value and positive branding for Vietnamese agricultural products.²¹⁷ Development of the agro-food value chain has the potential to improve the income for women-led businesses, as well as migrant workers, many of whom may weigh the option of returning to work on their family farms.

Beyond government and big industry, much of the technology innovation occurring in Vietnam is driven by startups and young software developers. Based in hubs like Hanoi, Da Nang, and Ho Chi Minh City, these young people are generating impactful new ideas and bringing in investment from new sources. For example, Abivin, a Hanoi-based startup founded in 2015, recently won the Start-up World Cup in San Francisco, earning global recognition and a US\$1 million prize.²¹⁸ On the whole, Vietnam is increasingly recognized as an innovative economy with a high level of market sophistication and knowledge and technology output. Indeed, it was ranked the top innovative economy among all lower-middle income countries in the latest Global Innovation Index.²¹⁹

Rising companies like Abivin will play an outsized role in shaping Vietnam’s future labor market and growth industries, and major players in the public and private sectors are working to spur along their development. For example, Google and the Ministry of Industry and Trade (MoIT) launched the Accelerate Vietnam Digital 4.0 program in 2018 to provide digital skills training for 500,000 employees of SMEs. The program is now expanding to rural areas and includes a “Digital Bus” which is traveling to 59 cities and provinces in suburban and remote areas to help small businesses access digital training.²²⁰



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The Path Forward

Vietnam is poised for economic transformation, both in moving up global value chains and in growing its digital and service economies. Its strong educational system produces results that are on par with or even above OECD countries. It possesses a business climate that encourages innovation and attracts FDI, and compared to other countries in the region, Vietnam's businesses are generally optimistic about the changes that 4IR will bring. While there is still much uncertainty, a growing number of enterprises are beginning to make strategic investments in digitization and automation that will reap benefits in the coming years. The question of where to target policy initiatives to promote economic resilience may thus be more a matter of refining existing initiatives.

One area to address is the lack of digital standards, norms, certifications, and lack of clarity about regulations. This was identified as a top area of concern, with regards to embracing "Industry 4.0," for respondents in a survey conducted by consulting firm PWC.²²¹ Policymakers must address these gaps in Vietnam's regulatory framework and work to develop digital trust among domestic and international businesses and individuals.

Another area is to develop supportive policies specifically for SMEs, who represent the lion's share of Vietnam's employers, yet whose workforce are the least likely to have the skills needed to transition to a digital economy. Policymakers must continue to encourage public-private initiatives to bring SMEs up to speed. They can do this through skills-training initiatives like Google and the MoIT's Digital 4.0 program. They can also target incentive programs towards SMEs, who frequently lack the financial resources to invest in new technologies and upskill their employees.



The Asia Foundation/Leandro Justen

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