The Future of Work Across ASEAN

Policy Prerequisites for the Fourth Industrial Revolution

Regional Summary and Recommendations

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Regional Summary and Recommendations

This white paper was written by John Karr, Benjamin Lokshin, and Katherine Loh from research carried out by The Asia Foundation's regional staff and consultants, including Socheata Sann, Fadila Ayu Hapsari, Sunita Anandarajah, Patrick Bolaños, Apichai Sunchindah, Huong Nguyen, Sarah Kuruvilla, Diana Kelly Alvord, Soniya Sharma, Toffy Charupatanapongse, Drew Hasson, and Rosita Armytage. Randeep Sudan served as a reviewer.

Graphic design and layout by Ananda K. Maharjan.
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Produced with support from Microsoft Philanthropies.

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.

For more information on our work visit www.asiafoundation.org.

February 2020

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. 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.

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.

The Asia Foundation/Conor Ashleigh

STRUCTURE OF THIS PAPER

This paper is organized as follows: Part 1 provides an overview of the 4IR technologies most anticipated to impact ASEAN economies in the coming years. Part 2 surveys the macroeconomic and political factors currently influencing labor demand in ASEAN. Part 3 presents the Key Recommendations distilled from a larger regional scoping effort conducted by The Asia Foundation in seven ASEAN member states. For more information on the research and additional reading, visit www.asiafoundation.org.

PART 1

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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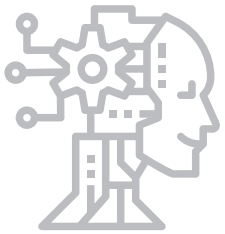
Artificial Intelligence and Machine Learning



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 systems[4] 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

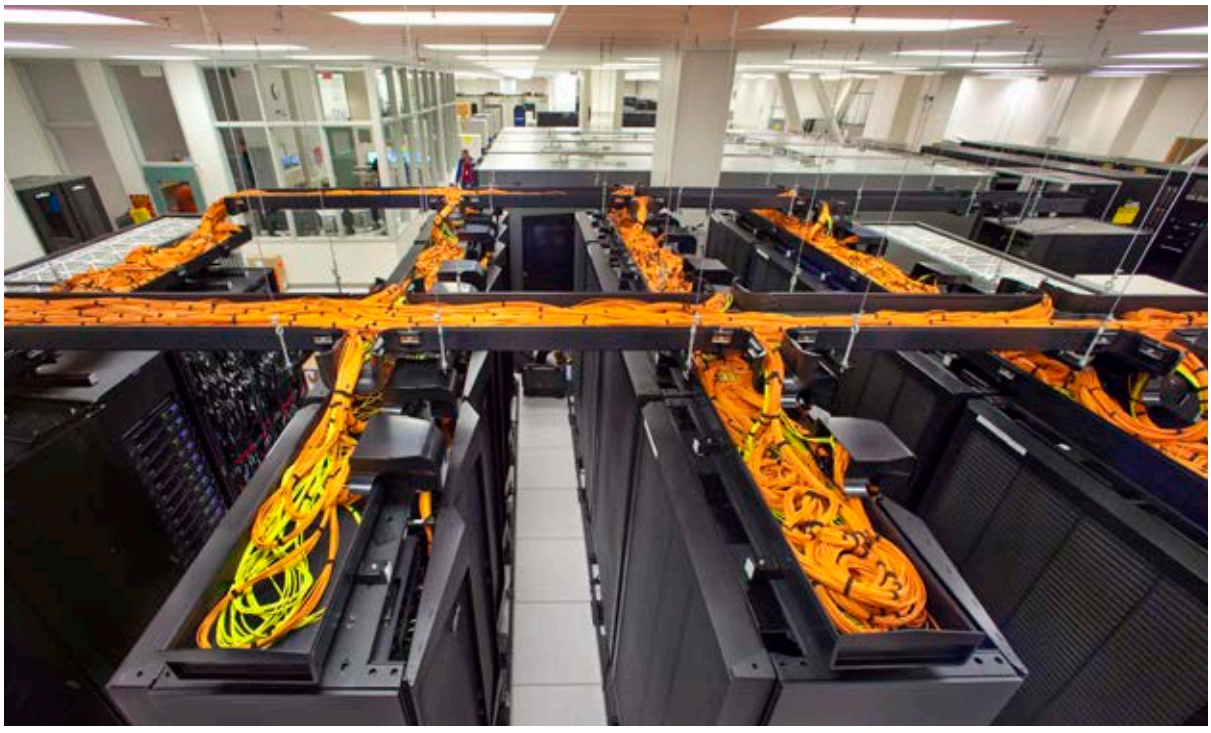
Cloud computing technology became widespread in the early 2000s, when tech giants like Amazon, Google, and Microsoft made their worldwide network of data centers available to other companies and individuals as a virtual service. Thanks to economies of scale, these distributed networks are extremely efficient 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 2

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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 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.

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.

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PART 3

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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.

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- **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.

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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.

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AUTHORS

John Karr is the Senior Director for Technology Programs at The Asia Foundation where he leads a region-wide effort to promote policy reforms that accelerate innovation in the digital economy. John works closely with Asia's digital entrepreneurs and innovators to understand how technology shapes the region, and directs an array of technology initiatives designed to help people live safer, smarter, and more productive lives.

Benjamin Lokshin is Assistant Director for Technology Programs at Asia Foundation, where he manages research initiatives, software projects, and development programs across the Asia-Pacific. His work has focused on the role of online platforms in supporting labor and employment in the region, especially for migrant workers and micro-enterprises. He received a B.A. and a master's degree in East Asian Studies from Stanford University.

Katherine Loh is an independent economic development specialist with over twelve years of experience. She has area expertise in regional alliances like ASEAN and APEC, the future of work, and how new technologies are changing markets and private sector reform. Her work has taken her to 11 countries across Asia. She holds a master's degree in Economics from the University of California, Los Angeles.

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