Women and the Future of the Digital Economy in Asia

Decent work for all?

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FRIEDRICH EBERT STIFTUNG

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List of Abbreviations

ASEAN	Association of Southeast Asian Nations
ICT	information and communication technology
ILO	International Labour Organization
NGO	non-government organization
STEM	science, technology, engineering and mathematics

Foreword

Despite economic growth and declining poverty levels across Asia, inequality continues to increase with large groups of society remaining socially and economically marginalized.

Women in Asia continue to experience massive structural disadvantages, from early childhood education through their retirement—if they are even able to work—and into their old age. On the heels of all the economic progress now comes rapid technological transformation, which is altering the nature of work in ways that offer multiple opportunities as well as new risks for social groups across the Global South.

Technological innovation, digitalization and automation form the core of the developments changing the future of work and disrupting the way people live and work in many ways. At the same time, the digital divides and skills gaps are determining how successfully individuals can cope with the new challenges. On those scores, women start off generally at a disadvantage. Women in Asia have less access to a telephone, let alone a laptop and the Internet. They have fewer, if any, opportunities to gain the new skills needed to thrive in jobs created in the Fourth Industrial Revolution. For women and men to fully participate in the digital economy, it is important to ensure their meaningful access and participation.

The goal for us in development cooperation work is to find socially just and gender-equal responses to these challenges. Technological developments need to be accompanied by appropriate policies. If existing socioeconomic inequalities and injustices are ignored, vulnerabilities and discrimination can be amplified.

Through our regional networks, Friedrich-Ebert-Stiftung (FES) brings together diverse voices from social movements, civil society organizations, trade unions, political parties and academia to jointly develop progressive ideas and narratives for advancing social justice. Among the most innovative platforms is its Women and the Future of Work in Asia Project.

Although the future of work is debated worldwide, marginalized voices are missing from the conversation, and perspectives, particularly from the Global South, are underrepresented. FES aims to expose these blind spots by gathering women's perspectives and voices from developing countries. By developing inclusive conceptual ideas and policy recommendations, we hope to mitigate the risks and the rising inequalities in the future world of work.

The FES Asia feminism project has singled out care work and the digital economy as core issues requiring further research and analyses from women's perspectives. The project's two working groups consisting of feminist researchers from nine countries in Asia worked respectively on the two core issues. Their insights contributed to the two papers. This paper focuses on the digital economy while a second paper looks at women and care work in Asia, both offering narratives on the region's situation and policies and concluding with thought-provoking recommendations.

FES and its partners aim to further promote gender equality in the world of work, with emphasis on enhancing women's participation in public and political life and promoting decent work for all persons through gender-just and human-centric economic models.

We extend our sincere gratitude to Maria Dolores Picot and Kerstin Spath, the authors of this paper on the digital economy, for their thorough research. We hope that it contributes to a fruitful discussion and provides valuable insights for future initiatives.

Mirco Günther and Lea Gölnitz
FES Office for Regional Cooperation in Asia

Introduction

All around the world, the impact of the Fourth Industrial Revolution[1] can be felt. New technologies, digitalization, automation, artificial intelligence and machine learning are changing the way we work at an unprecedented rate.

These developments, accompanied by the promise of economic growth, increased efficiencies, safety and convenience, raise questions about their impact on job security, skills needed for the future of work and, more importantly, their implications for women.

New digital tools can be empowering and can support a new source of inclusive global economic growth. Technology adoption cannot be predicted, however, and some technologies will help enhance workers' productivity without replacing them as "job automation takes place only where it is both technically and economically feasible" (ADB and others, 2018, p. 49).

The adoption of new digital technologies means that women across Asia have access to a growing gig economy that allows for flexible, independent work arrangements via digital platforms. For instance, with Grab, a Singapore-based ride-hailing mobile application that operates in South-East Asia, the number of women driving ballooned by more than 230 per cent in 2017 (Grab, 2018). Yet, the gig economy may be a reinforcer of gender stereotypes and offer precarious working conditions for women due to its high levels of informality.

Nonetheless, there is no denying that the "new technologies will alter the composition of skills needed by the workforce. It may also lead to more frequent unemployment, lower wage growth—especially for the less skilled—and widening income inequality" (ADB and others, 2018, p. 50). Women and girls are assumed to be particularly affected, which is why it is imperative to focus on them.

While some progress has been made in the region towards gender equality at work, women already face additional challenges in the age of automation—with the skills and connectivity access they lack. Women and girls will need to be equipped with relevant knowledge in the science, technology, engineering and mathematics (STEM) fields and with skill sets to adapt and shift towards more productive, better-paid work. If they cannot, they could experience a growing wage gap or risk having to leave the labour market (McKinsey and Company, 2019a, p. vi).

Supporting women to benefit from the advantages of the Fourth Industrial Revolution will mean greater female labour force participation as well as positive impact on the whole of society from a social as well as economic point of view.

Decent work

According to the International Labour Organization (ILO), "decent work" refers to work that is productive, delivers a fair income with security and social protection, safeguards basic rights and offers equality of opportunity and treatment. Decent work provides prospects for personal development, the chance for recognition and the freedom to express concerns. Decent work also enables individuals to organize and participate in the decision-making that will affect their lives, and it promotes equal opportunities and treatment for all women and men.

The ILO developed its Decent Work Agenda, building on four pillars: (i) job creation, (ii) rights at work, (iii) social protection and social dialogue and (iv) gender equality, which is a cross-cutting theme.

Decent work is also one of the United Nations Sustainable Development Goals (Goal 8: Decent work and economic growth), which aims to "achieve fill and productive employment and decent work for all women and men by 2030" (UNDP, n.d.).

While much has been written about the overall advantages that greater female participation in the labour force means for women's economic empowerment, there are also intrinsic advantages for the world economy. In a recent study, researchers with the McKinsey Global Institute estimated that in Asia and the Pacific alone, promoting more women into full-time employment in higher-paid, higher-productivity sectors would add 4.5 trillion US dollars per year to the region's gross domestic product. This would constitute a

12 per cent increase over current figures (McKinsey and Company, 2018).

Greater female labour force participation does not always carry with it positive outcomes for women, however. It can also relegate them to lower-paid occupations as well as create a double burden of paid work and unpaid care work.

The debates on the future of work and the impacts of the digital economy only recently brought in an Asian perspective. Despite the fact that the jobs that are most vulnerable to automation are the low-paid, lower-skill jobs that women typically occupy, the consequences of automation on their employment and the role of women in the region's economic development are frequently overlooked. This paper singles out that knowledge gap and concentrates on the economic and social implications of automation and digitalization for women. In doing so, it discusses what should be done to ensure that the future of work holds decent and sustainable work opportunities for all persons who want employment.

The paper set out to answer two questions: First, what are the central discussions on the future development of the digital economy and its impact on society at the global and regional levels? Second, what are the main challenges for women from an economic, social justice perspective around the digital economy in Asia?

After examining those questions, the paper looks at the feminist perspectives around building a just and sustainable digital economy as well as considering the relevant actors working to ensure an equal gain from the technological advantages for societies as a whole. It considers the blind spots in the current debate on the future of work with a view to digitalization and automation. To conclude, the paper provides recommendations for policy-makers and decision-makers to act upon when considering the risks and benefits of a digitalized future of work in Asia.

Global and regional developments and trends

The global economy is being transformed due to the adoption and rapid spread of digital technologies and many new economic opportunities. The digital transformation taking place in the world is driven by technologies, such as artificial intelligence, cloud computing, robotics, blockchain, big data analytics and the Internet of things.

These digital technologies have the power to increase productivity (especially among low-skilled workers) and create innovation, transforming economies and impacting heavily on productivity, skills, income distribution, well-being and the environment (OECD, 2017, p. 3).

Contrary to the traditional North-South divide between the wealthy developed countries and the poorer developing countries, the economic geography of the digital economy is "being led by one developed country, the United States, and one developing country from Asia, China" (UNCTAD, 2019, p. 3).

There is a digital divide within Asia, however, that does not allow all countries to fully participate in the digital economy. More than 70 per cent of people in Myanmar, listed as one of the United Nations Least Developed Countries, remain offline (IMF, 2018).

And there is also a rural-urban divide with mobile telephone Internet access within countries, especially in the low- and middle-income countries of South Asia, where rural populations are 40 per cent less likely to access the Internet through a mobile telephone than urban populations (Bahia and Suardia, 2019, p. 8).

Despite the digital divide, transformation of the economy is shepherding progress for millions of citizens across Asia, along with risks and challenges. The debate around the future of work is filled with polarized opinions between people who anticipate unlimited opportunities and people who predict significant job disruption (WEF, 2016, p. v).

Workers could lose their jobs to automation. And growing inequalities regarding access to the labour market as well as growing inequalities in the wage structure between low-paying and high-paying jobs are just some of the risks that workers are looking at as the world moves further into the Fourth Industrial Revolution.

The adoption of new technologies, especially artificial intelligence, will "lead to a major shift in the labour market, including the disappearance of jobs in some sectors and the creation of opportunities in others, on a massive scale" (Bahia and Suardia, 2019, p. v). Retail, manufacturing and health care are among the sectors expected to be affected the most.

Moreover, a large amount of administrative or routine tasks will be completed through digital tools, such as virtual assistants or artificial intelligence for the registration of appointments or travel arrangements. But workers are still going to spend more time interacting with customers, patients, etc., which will require interpersonal skills development and problem-solving skills.

Automation

"Automation" refers to the creation and application of technology to allow a process or a system to operate mechanically, with minimal human involvement. It can be partial, where certain functions are still performed with human interaction; or total, whereby no human involvement is necessary. Automation is already applied in several industries, such as manufacturing, agriculture, transport and defence. Some of its benefits include reduced costs, increased productivity and availability and improved quality. Job loss with its consequent loss of income, job adaptation and the lack of necessary skills are some of the disadvantages of the automation process.

Across all countries, workers with a low level of education are at the highest risk of displacement. Several international organizations, such as the International Monetary Fund, the World Bank and the Organisation for Economic Co-operation and Development, agree that women are at higher risk of displacement than men because of the types of jobs they typically perform, which consist of routine, repetitive tasks, and because

of their low education level. This is particularly true for developing countries, where routine jobs could be easily replaced with automation.

What is the digital economy?

The term "digital economy" was coined by Don Tapscott in 1995. In his book, *The Digital Economy: Promise and Peril in the Age of Networked Intelligence,* Tapscott showed how the Internet would change the way businesses are conducted. The digital economy refers to a broad range of economic activities that rely on digital computing technologies as factors of production. It consists of various components, which include government, policy and regulation, the Internet, intellectual property rights, human capital and knowledge workers as well as emerging technologies. While some countries in Asia are benefiting from the current trend of digital transformation, developing countries that lack access to basic Internet services and infrastructure due to various socioeconomic factors are still unable to take full advantage of the benefits offered by the adoption of the digital economy.

Some of the emerging jobs include software and application developers, data analysts, scientists, managing directors and chief executives. The jobs created by automation and those that will survive will likely be more demanding in terms of technical skills and cognitive abilities than the jobs they replace.

Some countries in the region have been working to prevent a shortage of human resources and human replacement by equipping their citizens with the required skills to adapt in a changing world. For example, Singapore's Ministry of Manpower, together with the Ministry of Education and other government agencies, launched SkillsFuture. It is an "integrated system of education training to provide all Singaporeans with the enhanced opportunities to acquire greater skills proficiency, knowledge and expertise" (MOM, n.d.). Similarly, Thailand launched a Digital Government Academy to promote the development of digital knowledge of government authorities and public officials (TDGA, n.d.).

The World Economic Forum launched the ASEAN Digital Skills Vision 2020 initiative in 2018, pledging to equip 20 million workers with digital skills by 2020 and supported by some of the major tech companies, such as Google, Microsoft and Cisco Systems (Di, 2018).

The impact that digital transformation is already having on societies can be seen at different levels. It influences human relationships and the way people interact with each other as customers, employers and workers, facilitating communication and inclusion. It also has an impact in the way citizens interact with their government and the services that governments provide.

Digital transformation also brings with it concerns for job stability as well as data privacy, security and the way tech companies could use this transformation to their advantage.

Going digital

Not since the mechanization of labour in the beginning of the Industrial Revolution have changes in the world of work been so intensely debated. Government officials and business managers globally are coming to terms with the potential effects of artificial intelligence, robotization, high-speed mobile networks, cloud computing and more.

While some developed economies of the world are increasingly benefiting from digitalization and automation innovations, less developed countries are lagging. This effect is also felt at the regional level and within countries.

According to the International Labour Organization (ILO), "technological progress and policies designed to foster innovation in the Asia-Pacific region seem to be creating jobs and incomes at a disproportionately higher level in urban areas" (ILO, 2020, p. 13).

Asia has a fast-moving digital ecosystem. Much of this has been enabled by rising mobile telephone adoption and consumers' willingness to integrate mobile phone solutions into their daily lives. Although e-commerce or Internet-banking penetration might be low in countries like Pakistan and Mongolia, social network penetration is generally high in Asia. East Asia even has the highest social media penetration rate in the world (We Are Social and Hootsuite, 2019), resulting in unique business opportunities that take advantage of various social media networks. The "super apps" Line and Zalo, which dominate the Thai and Vietnamese markets, respectively, are two examples of such native platforms (ADB, 2018).

Another example of the impact of digitalization and the future of work in the region can be seen in India, where digital and mobile telephone payments are creating opportunity for small businesses and bringing convenience to people without access to a bank account or a credit card. The initiative is supported by the government via its Digital India programme, which aims to "transform India into a digitally empowered society and knowledge economy" (Cashless India, n.d.).

Asian countries see the potential that digitalization and automation bring. Yet, at the same time, they recognize the significant challenges this digital transformation presents if they are not able to upskill workers and embrace technological innovations. Some countries in the region have welcomed technological innovation and promoted digital transformation policies, such as China, which already leads in the e-commerce sector and is now starting to adopt digital technologies into its manufacturing sector.

Super apps

A "super app" is a mobile telephone application within an umbrella app that works as a marketplace of services and offerings, delivered via in-house technology and through third-party integrations and acting as a "one-stop shop". While millions of people in Asia's emerging markets do not have access to a personal computer, they do have smartphones and use mobile phone applications on a daily basis. Consequently, super apps have become a way of doing business. The two leading super apps in Asia, WeChat and Alipay, originated in China. They can be used for services ranging from e-payments and financial services to instant messaging and food delivery. In addition, a leading super app in South-East Asia, Gojek, began as a ride-hailing app in Indonesia and is now offering services from fintech to massage services in countries across the region.

However, there is a question of whether the rise of these super apps will hamper online competition and innovation. Privacy is another concern because these super apps have the ability to collect a lot of users' data.

Other examples of the trends and impacts of digital transformation come from South-East Asia. In Singapore, the government launched the Smart Nation initiative. In doing so, the island State is setting the pace of innovation and the application of technology for the private sector with which it aims to transform the government, businesses and society in general with the application of digital technology.

In 2018, as part of Singapore's chairmanship of the Association of Southeast Asian Nations (ASEAN), the ASEAN Smart Cities Network was established as a way for cities to exchange good practices and urban solutions, with the goal of improving people's lives by using technology as an enabler (Smart Nation Singapore, n.d.).

In 2015, Indonesia launched its 2020 Go Digital Vision campaign to boost the country's digital economy. Its goals include establishment of local e-commerce sites for agriculture and fisheries, incubated tech start-ups, 8 million small and medium-sized enterprises digitized and broadband network access to more than 150 municipalities across the country.

In Thailand, the government, working in partnership with business leaders, initiated the Thailand 4.0 strategy with the aim of moving away from the middle-income trap and transforming the country into a developed nation by improving its infrastructure and connectivity. To achieve this, the government will increase its expenditure on research and development, offer tax breaks and "smart" visas for companies and raise the education standards of its population (Anuroj, n.d.).

Women and the future of work: Challenges and opportunities

The labour market is a precarious place for many women in the region. They experience multiple disadvantages that range from intrinsic social norms to access to education and to gender-biased norms in the labour market. These obstacles become even more difficult for women in rural areas and are exacerbated by women's unpaid work. Occupational segregation in the region "generally confines women to jobs with low pay, worse prospects for career advancement, poor working conditions and a lack of access to maternity protection. It contributes to the gender pay gap, and it hinders women from taking up jobs and occupations in sectors with job growth" (ILO, 2018, p. 7).

Having greater female labour force participation, together with policies that support their advancement, is a well-studied economic and social imperative: it boosts productivity and economic growth, reduces income inequality and supports economic resilience (IMF, 2018).

The main narratives on the future of work agree that automation presents unique challenges for women in the workforce due to the concentration of women in lower- and middle-skill jobs (such as manufacturing and clerical jobs) (Wesley and Midgley, 2019).

According to a McKinsey forecast, between 40 million and 160 million women globally might need to transition to other roles by 2030, mostly higher-skill ones. To manage this challenge, women need to be skilled, mobile and tech-savvy. Yet, they face barriers on all levels and will require targeted support from governments and employers (McKinsey and Company, 2019a).

Another factor of concern in the discussions on the role of women in the future of work is the need for women to occupy more managerial roles at the senior level, across sectors and occupations. The reason: the underrepresentation of women in professional and managerial positions leaves them at greater risk for displacement (Brussevich and others, 2018).

At the same time, there are jobs that are likely to grow in traditionally female-dominated sectors, such as health. Demographic changes are increasing the demand for care work, education, customer service and social services. All these jobs require cognitive and interpersonal skills and are thus less prone to automation.

Additionally, the gig economy offers women the possibility of flexible work arrangements and thus enables them to balance work and family commitments while earning a living. But when it comes to women's participation in the gig economy in the developing world, a large majority of women lack the necessary technical and social skills to compete in an online platform environment.

The platform economy

The gig economy functions as an umbrella term for various working models commonly known as "gig economy, on-demand economy, crowdsourcing, microworkers, collaborative economy, uberization of employment' and access economy" (Parternio, 2020, p. 21). It refers to temporary (part-time or full-time) work engagements by which companies hire independent contractors or freelancers instead of full-time employees. Tasks allocated through such platforms range from ride hailing and food delivery to personal services and digital content creation and consultancy service for larger firms. Among its advantages, the platform economy allows workers independence, the freedom to choose their working hours and, sometimes, flexible work arrangements to do telework. Despite these benefits, this new type of work also possesses disadvantages for workers, especially for low-skilled labourers, because many of the jobs have unpredictable schedules, lack job security, income stability and social protection benefits.

As well, these types of flexible work arrangements can reinforce gender stereotypes and traditional gender roles if cultural norms go unchecked (women are perceived as less committed and less productive if unable to extend their working hours due to care responsibilities), resulting in a step backward in women's economic participation and empowerment.

The perceived flexibility also can intensify women's care burdens instead of easing them.

Gender digital divide

The gender digital divide refers to the gap between men's and women's access to technology. It denotes the differing amount of information between those who have access to technology and the Internet and those who have been marginalized from accessing information and communication technology (ICT) tools for their socioeconomic development.

It also considers the differences in resources and abilities to access and effectively use ICT for development that exist within and between countries, regions, sectors, socioeconomic groups and gender.

Digital divide

The "digital divide" refers to the growing gap between members of the society who have the economic means, the technical skills and experience to access information and communication technology (ICT) and those who do not have access to mobile phones, computers and/or the Internet. The divide covers several layers, including *accessibility and connectivity*.

Several factors, such as age, levels of education, income, ethnicity, race, sex and geographical location, seem to magnify the digital divide. Along with the gaps that separate segments of society, whole nations can be divided into those who are able to take advantage of the new ICT opportunities and those who are not. With an increasing amount of information available only for those able to access ICT tools, being disconnected could mean the inability to participate in and benefit from the advantages of the modern economy.

According to an International Telecommunication Union's (ITU) 2019 report, while Internet use continues to increase, the same can be said about the gender digital divide. Globally, 48 per cent of women are using the Internet, compared with 58 per cent of men, representing a gender gap of 17 per cent (ITU, n.d.).

Several studies on the role of women in the future of work have indicated that digital disruptions in the workplace will cast women aside. Providing women with the necessary tools and resources to adopt the new digital technologies would empower them both economically and socially. At the same time, it would ensure their participation in the economy and increased levels of productivity.

If not actively included in preparations for the future of work, women will face several challenges in the labour market and with their financial status. With the job market becoming increasingly digital, women who do not have access to digital technologies will not be able to see job advertisements, apply for them and gain insightful information on wages or their labour rights. Additionally, by being digitally excluded, women will encounter even more difficulties in accessing financial services, which are becoming increasingly reliant on computer algorithms (Sorgner and others, 2018).

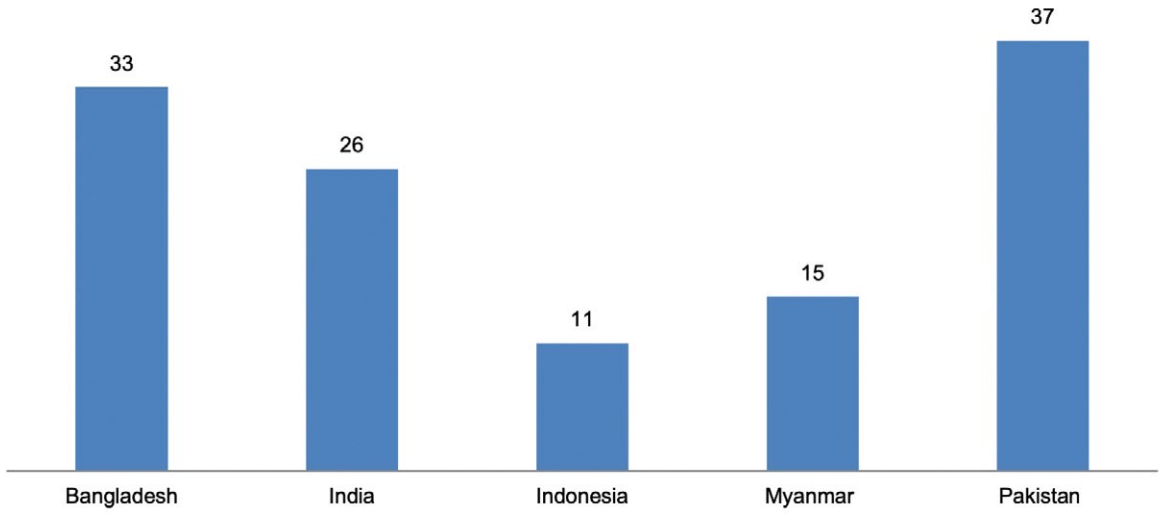
To prevent this from happening, women should have the same level of digital fluency and access to digital technologies as men do. Data show that in Asia, the gender gap in mobile telephone ownership varies greatly. The largest mobile gender gap of any region worldwide is in South Asia, at 28 per cent. In general throughout Asia, with the exception of China, where there is no gender gap, women have far less access than men to mobile telephone ownership (figure 1). In Bangladesh, the gap is 33 per cent; in Pakistan it is 37 per cent; in India, 26 per cent; in Indonesia, 11 per cent; and in Myanmar it is 15 per cent (Rowntree, 2019, p. 15).

The gender gap widens further when considering smartphone ownership and mobile Internet use (figure 2), reaching up to a 71 per cent gap in Pakistan, 58 per cent in Bangladesh and 56 per cent in India (Rowntree, 2019).

As figure 3 illustrates, only 27 per cent of women in South Asia, compared with 64 per cent of men, use the Internet through a mobile telephone (Rowntree, 2019).

Figure 1: Gender gap in mobile telephone ownership.

Source: Rowntree, 2019.



The top barriers cited for women's mobile telephone ownership and Internet use (from a phone) are literacy and skills. In some of the developing countries in the region, such as India, Bangladesh and Pakistan, women and girls are discouraged by their male relatives from having access to both a mobile phone and the Internet. Those three countries have the largest gender gap in Asia when it comes to mobile phone ownership and Internet accessibility (LIRNEasia, 2019).

Moreover, women and girls in the region are often excluded from the creation of digital tools and platforms, which is exacerbating the existing gender inequalities in the accessibility and services that these tools provide.

The overall effect of the gender digital divide is that women have greater difficulty in learning new skills, working remotely in jobs that require Internet access and in accessing lines of credit and additional financial services.

Figure 2: Gender gap in mobile telephone ownership and Internet use.

Source: Rowntree, 2019.

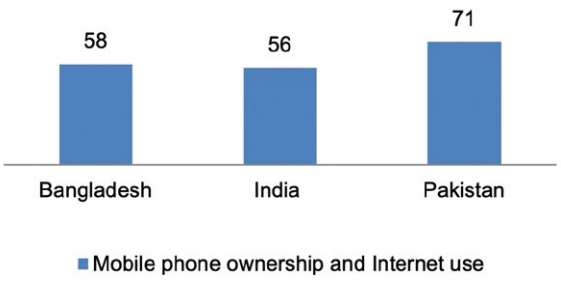


Figure 3: Gender gap in South Asia in Internet access with mobile telephone.

Source: Rowntree, 2019.

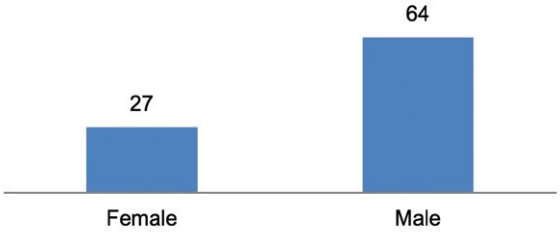
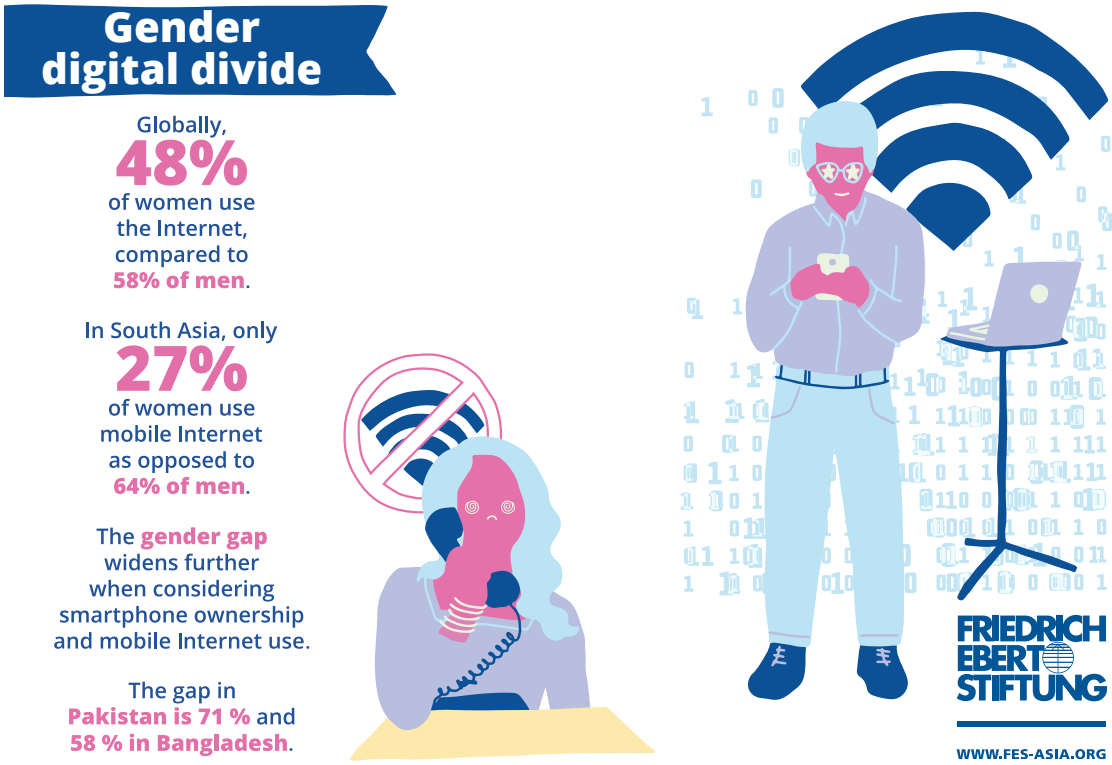


Figure 4.



Reskilling and upskilling

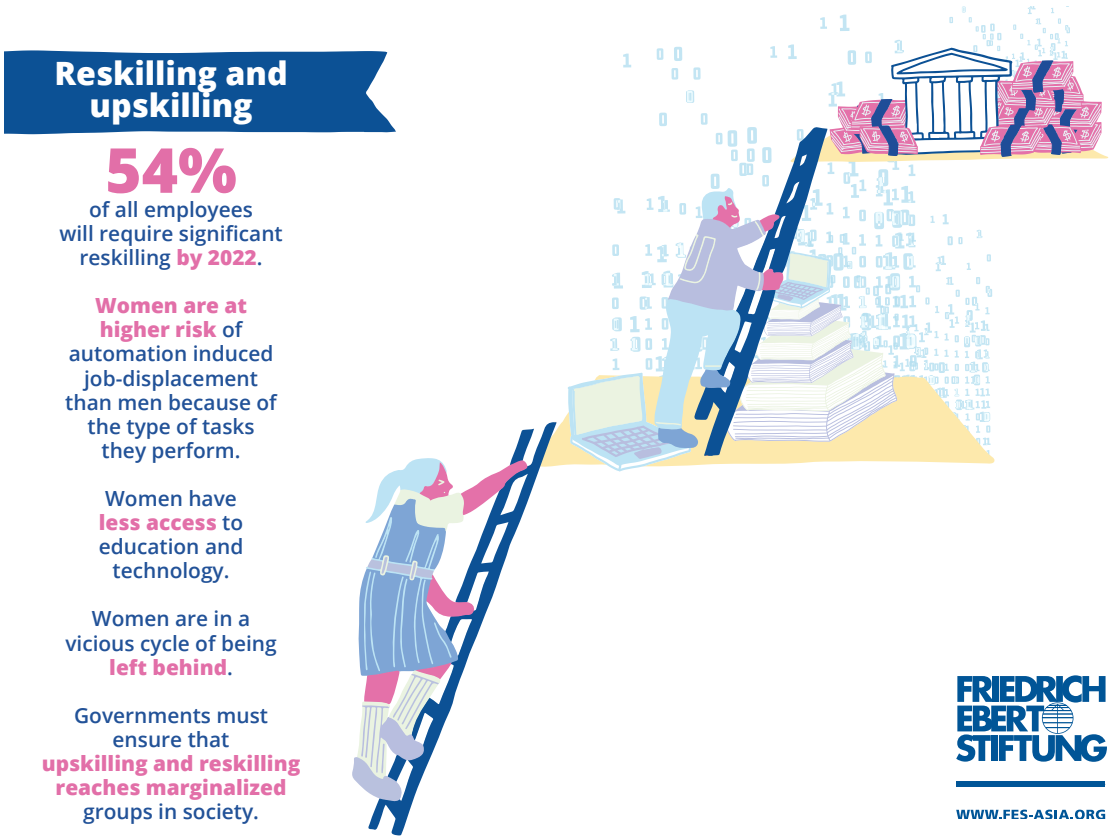
Digital transformation means that new jobs will be created while old ones will become obsolete. One way to respond to the possible danger of technology-induced job losses is to increase the capacity of workers to cope with the transitions through education. However, this is everything but self-evident. Advocates and critics alike agree that reskilling and upskilling (female) labourers is of utmost importance to ensure that workers do not lag behind. According to a recent estimate, 54 per cent of all employees will require significant reskilling by 2022. As Aneja (2019, p. 5f) warned, "The dominant policy response points to a race between education and technology and emphasizes the need for reskilling and upskilling as a way to anticipate technological unemployment. But will people be able to skill fast enough?" She goes on to question whether the demand for high-skilled workers has already outgrown the supply or whether workers will be able to catch up (Aneja, 2019, p. 6).

To tackle this issue, labourers must have access to reskilling and upskilling. Reskilling refers to the process of either learning new skills so that a worker can do a different job or of training people to do a different job. Whereas upskilling refers to the process of learning new skills that are relevant in the future workplace to avoid being replaced (McKinsey and Company, 2019b).

Entirely new forms of employment are already a reality—professions such as cloud architecture or social media management are only a couple of careers that did not exist 15 years ago. The occupational mix of most industries is changing to accommodate the new inventions and to close the gap between the digital skills that employers require and the skills that workers possess. As a result, companies will have to provide their employees at all levels with the latest digital skills to thrive and to continue attracting top talent (Tsusaka, 2020).

In its 2018 *Future of Jobs Report,* the World Economic Forum estimated that around 54 per cent of all employees

Figure 5.



will require significant reskilling by 2022, with the percentage being approximately the same for countries in South Asia and East Asia (WEF, 2018, p. ix).

There is a shift in the demand for workers, and women are finding they have to reskill with skills that are in demand to remain in the workforce and contribute to the economy. Some skills that will be required in the future of work are digital skills, such as machine learning and blockchain, but also human and soft skills, like creativity, emotional intelligence and analytical thinking.

Contrary to the view of the 2020 *Global Gender Gap Report* by the World Economic Forum in which reskilling and upskilling efforts for women looking to expand their skills should focus on those women who already are in the labour market or those who are trying to re-enter after a period of inactivity, all women should be given a chance to reskill and upskill.

Reskilling in the private sector

United Overseas Bank, a Singaporean multinational banking organization, launched a training programme, the Better U, to help staff gain new skills and get back to learning while using technology. The underlying aim is to build successful careers in the digital age. The bank has partnered with National University of Singapore to create professional and management development programmes that support the future learning needs of its employees.

Both the private sector and governments must join forces to make this a reality by increasing their public spending and investment as well as adapting education programmes to the needs of the market (WEF, 2020, p. 42). While policies and initiatives from governments and tech companies focus on upskilling and reskilling, there is also a need to address the root causes that prevent women and girls from obtaining the necessary skills, such as lack of access to basic education, infrastructure and poverty, among others.

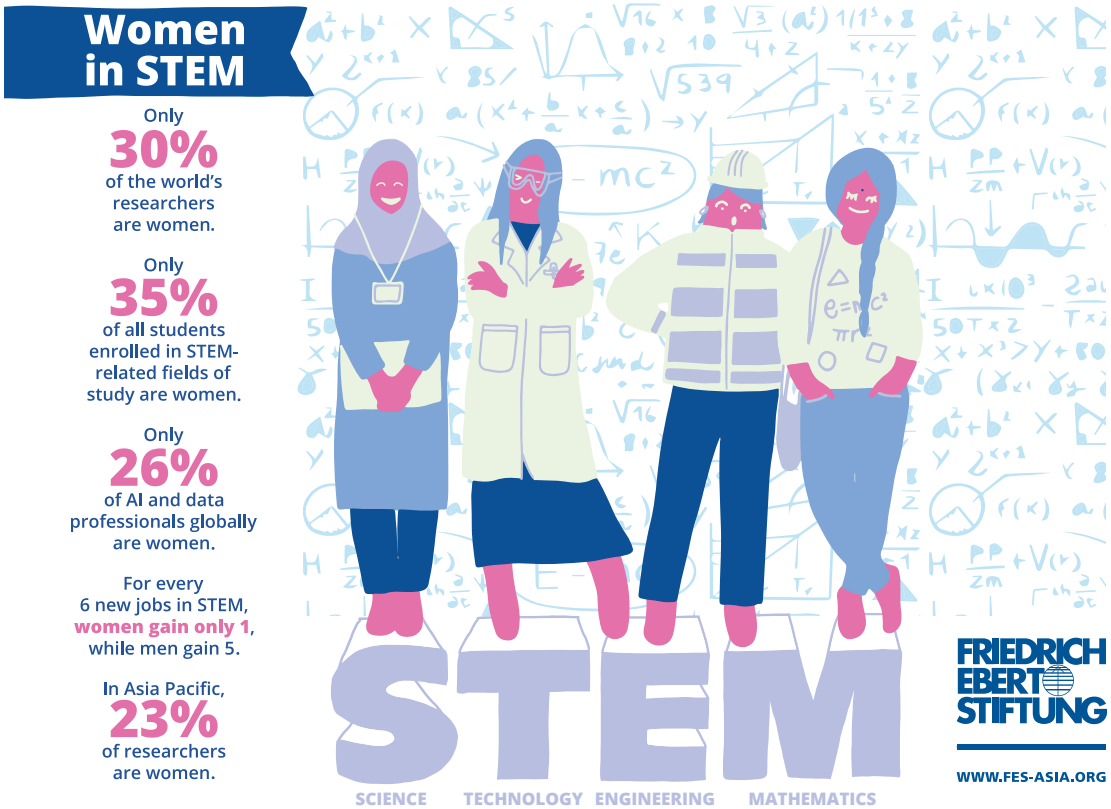
By doing so, companies will be able to fill potential talent shortfalls related to automation and digitalization, and governments will be able to sustain a low unemployment rate. It is important to emphasize, however, that adapting education to the needs of the market will not necessarily lead to more decent work.

Women in STEM—Education and employment

All around the world, women are underrepresented in science and technology jobs. According to the Institute for Statistics of the United Nations Educational, Scientific and Cultural Organization, only 30 per cent of the world's researchers are women. In East Asia and the Pacific, 23 per cent are women, while in Central Asia, women account for 48 per cent of researchers (UNESCO Institute for Statistics, 2018).

Some of the latest available data from the region indicate that the Philippines and Thailand have an above-average proportion of women working as researchers in science, technology and innovation, at 52 per cent and 51 per cent, respectively. In India, there exists a large share of women in engineering (at 20 per cent) and cloud

Figure 6.



computing (at 17 per cent) as well as in Singapore, at 27 per cent and 19 per cent, respectively (World Economic Forum, 2020).

Women's first interest in science begins in school and continues into university, where they currently constitute the majority of science graduates with bachelor's and master's degrees, outnumbering men (UNESCO, 2015, p. 85). But then the gender gap widens. Women's numbers start to drop at the PhD level, and they decrease further at the research and labour force participation levels (Thornton, 2019). And women are largely absent in higher-level managerial and decision-making positions in STEM-related fields.

Studies show that STEM is a male dominated sector in which women publish less, are paid less for their research and do not progress as far as men in their careers. In addition, there are external factors that influence women's labour force participation in STEM fields, such as family commitments, working environment and conditions and lack of career growth (UNESCO, 2017, p. 23). Due to insufficient data on the national and regional levels, the extent of these disparities remains unknown.

To address these issues and to recognize the benefits of women's participation in the STEM fields, the Asia-Pacific Economic Cooperation (APEC) launched in 2019 the Women in STEM Principles and Actions as part of its Women in STEM Initiative (2016). It focuses on identifying and addressing the social, cultural and economic barriers that women and girls experience in the STEM sectors (APEC, 2019).

Other initiatives have looked at encouraging girls into STEM courses and fields, which are equipping them with the right skills for the future of work, such as Indian Girls Code (Robotix, n.d.), a free hands-on coding and robotics education programme for underprivileged girls. The Girls2Pioneers programme in Singapore provides day camps for girls aged 10–15 to "inspire and encourage youth in Singapore, particularly young girls and women, to explore and consider careers within STEM fields" (Girls2Pioneers, n.d.).

With today's problems requiring innovative and practical solutions, there is growing awareness of the importance of encouraging female education and labour force participation—and retention—in the STEM fields in all countries in the region.

Feminist perspectives on the future of work in Asia

Why is a feminist perspective necessary?

Throughout Asia, research on the current transitions in the world of work is flourishing. However, discussions on the rise of the digital economy and the spread of automation have almost exclusively focused on technological changes, with the implications those changes will have on people have been, by and large, neglected. This is problematic because "[t]ransitions towards [the Fourth Industrial Revolution] and the future of work are […] not merely techno-scientific issues, but are inextricably bound up with questions of social arrangements and institutions, power and exclusion and normative, societal preferences (Aneja, 2019, p. 3). Until now, analyses have mostly fallen short to consider the differentiated impact the current transitions in the world of work are having across social groups.

This issue requires extensive investigation. Due to the heterogeneity of the region regarding economic development, social security provisions and educational systems, the chances and risks that the digital economy holds are expected to spread unevenly across Asian societies.

And due to their structural marginalization and underrepresentation, women are assumed to be particularly vulnerable. Hence, an intersectional feminist perspective on the future of work is needed.

Applying an intersectional feminist perspective allows for analysis, discussion and understanding of the future of work and its implications—not as a vehicle for economic progress but as a catalyst for social change. By focusing on how women are affected, it ensures that the current developments leading to the future of work do not cement existing inequalities but rather that the momentum is used to generate the prospect of decent work and ameliorate the quality of life for all. By making marginalized individuals and their narratives visible, it allows women and other marginalized groups who hitherto have been excluded from the benefits of economic progress to become agents of change.

It is important to acknowledge that there is not one single feminist stance on the topic. Whereas some feminists see the digitalization of the economy as an instrument of empowerment and a chance to liberate women throughout Asia, others fear that it will reproduce existing obstacles. They believe that the rise of Industry 4.0. will further exacerbate the socio-cultural exclusion of women.

Intersectional feminism

Based on her experiences as a woman of colour, the American lawyer and civil rights advocate Kimberlé Crenshaw coined the term "intersectionality" in the 1980s. The term gives an analytical perspective to account for the fact that the experiences of women of colour "are frequently the product of intersecting patterns" (Crenshaw, 1990, p. 1243) of discrimination, which are deeply embedded into belief systems. Intersectional feminism distances itself from mainstream feminism, which takes the white, Western woman as the norm and universalizes her struggles. Instead, intersectional feminism acknowledges that the lived realities of women across the world differ fundamentally. Thereby, it aims to unleash social power structures that work "to exclude or marginalize those who are [considered] different" (Crenshaw, 1990, p. 1242).

Gender, class and race have traditionally been considered the classical identity categories that serve as a basis for discrimination (Crenshaw, 1990). In recent years, the scope of categories that serve as a basis for oppression has been expanded to include age, disability, caste, place of residence, economic background and sexual orientation. This list is not exhaustive, and a uniform understanding of which categories need to be considered is lacking (Degele and Winker, 2007). Critics have noted that it remains unclear how the various forms of oppression relate to one another. Do they overlap or intersect? Are they mutually reinforcing? And are some categories more relevant than others? (Degele and Winker, 2007; Kerner, 2007).

Despite these valid criticisms, intersectionality offers a helpful research paradigm to account for the intersecting layers of discrimination that individuals are exposed to. Thereby, it enables a more nuanced, differentiated analyses of the lived experience of individuals within society.

What are the main challenges for women from an economic, social and societal justice perspective of the digital economy in Asia?

And what issues are addressed by feminists, gender equality advocates and other regional actors? The following maps out controversies, observations, fears and hopes raised by feminists in terms of the future of work. By critically examining the discourse on the digital economy, the paper moves into the question of whether the digital economy serves to empower women or whether it further exacerbates gender inequality.

Technology for whom?

Without doubt, technologies offer great potential. They promise increased sufficiency, precision and economic growth. Artificial intelligence, for example, has enabled a Singaporean start-up to develop a mechanism to diagnose chronic wound conditions while entrepreneurs in Viet Nam have developed artificial intelligence sensors to enhance agricultural productivity and economize water use (Tan, 2020). At least in theory, technologies mobilize people around the world and enable everyone to take part in the digital life.

However, many analysts and other observers regard the seemingly uncontrollable spread of technology cautiously. They question the glorified assumption that technology will make everything better. Technological solutions might gloss over structural issues without adequately addressing them. Take, for example, an application that automatically reads out printed text. It allows an illiterate person to understand what is written in any document and thus obtain all relevant information from it. Yet, it will not eradicate illiteracy, and it might even discourage policy-makers to adopt stronger measures to eliminate illiteracy.

Whereas only a few countries, among them the United States and China, design and develop new technologies, most other countries import them, "which means that most of the engineers designing the systems may not understand local context" (Tan, 2020). Engineers in the Global North design technologies targeting their national consumers. Consequently, they do not consider the adequacy of their products for other national contexts to which they might be exported.

Critics of automation and digitalisation point out that the Fourth Industrial Revolution is erected on gendered fault lines. Consequently, technologies are not neutral but reflect the socio-cultural reality of gender inequality (Aneja, 2020). Zothan, for instance, noted that the "gendering" of technologies is further exacerbated by the absence of women in the development process of new technologies. "As a result: the men who design technology take the male as norm, thereby designing products and experiences that are exclusionary of women" (Zothan, 2019). She thus stressed "the importance of keeping women at the centre of design processes so that women's inclusion is not an afterthought".

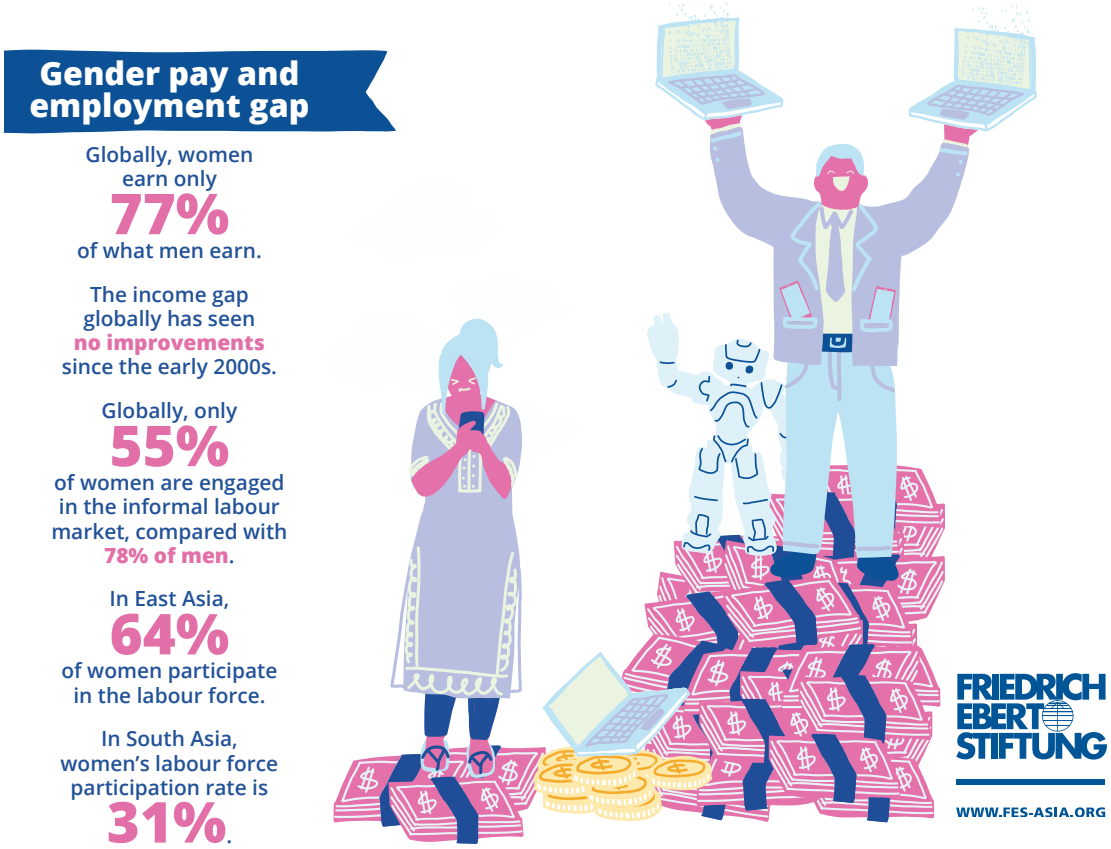
Technologically induced (un)employment

In Asia, as in other parts of the world, there are significant differences between male and female labour force participation rates, with men outnumbering women by and large. Whereas the share of men in the formal economy is estimated at 94 per cent, only 64 per cent of women are formally employed (Aneja, 2020).

Some feminists believe that the digitalization of the economy will empower Asian women by opening up new opportunities for entrepreneurship. They are convinced that flexible work arrangements in the form of platform work or e-commerce will enable women from rural areas who have hitherto been denied access to the labour market to find employment and thereby free them from their care responsibilities. They are thus convinced that the employment gap between men and women will be further reduced in the future.

Feminist who have adopted a more critical perspective highlight that such benefits will remain limited to an elitist group of female entrepreneurs who have the necessary resources at their command. Kahn (2020) even fears the negative impact: "The gains made towards narrowing the gender pay gap and raising the work status of women are being reversed by automation-led job displacement in various sectors."

Figure 7.



Women are assumed to be particularly vulnerable to technical unemployment. According to a recent report by the World Economic Forum, "over 57% of the jobs that are set to be displaced by digital automation between now and 2026 belong to women.[2] These are mid-level, routine, cognitive jobs" (Gurumurthy and Chami, 2019, p. 5) in labour-intensive manufacturing sectors, such as garment and footwear, electronics and automotive production. In contrast, women hold only a small share of the advanced technology jobs (the non-routine, cognitive tasks) that are in demand in the digital economy, "where employment expansion and real wage increase is much faster" (Gurumurthy and Chami, 2019, p. 5). In practice, this means that for every six new jobs in the STEM sectors, women gain only one job while men gain five jobs. Feminists critical of the future of work attribute deeply entrenched gendered assumptions of the alleged capacity of men and women as one of the main reasons for this tendency.

Throughout Asia (as well as the world), large segments of society believe that jobs in the STEM fields are exclusively intended for men and discourage women from pursuing a career within those fields. However, women are assumed to be somewhat shielded from the risks of automation-induced job loss in such sectors as education and health care, which have traditionally been feminized (Kahn, 2020). Because neither teachers nor nurses or doctors can easily be replaced by robots, they believe that women have little to fear, for now.

The platform economy as opportunity for women?

One of the most visible shifts in the world of employment has been the incremental expansion of a new kind of work: the platform economy. It functions as an umbrella term for various working models in which tasks are allocated through platforms or apps in a decentralized

manner (Graham and Woodcock, 2018. p. 242). The platform economy is a rapidly growing sector with digital labour platforms worldwide earning approximately 50 billion US dollars annually (Heeks, in Graham and others, 2019). According to Heeks, an estimated 40 million platform workers are active in the Global South alone, a large portion of whom work in Asia (Heeks, in Graham and others, 2019).

Advocates of the platform economy are convinced that this relatively new working model opens up massive possibilities for women labourers and provides essential income opportunities. For one thing, remote and flexible working arrangements allow women to freely arrange their working hours.

These advocates believe that the platform economy will facilitate women's access into the labour market, particularly for those living in areas where the local labour market holds limited options. In addition, it will allow women to compare job offers and weigh them up on a case-by-case basis to decide on the best one. Partenio (2002, p. 22) summarized the benefits the platform economy for women in noting that it offers them "opportunity to generate income or to obtain additional income, work from home or combine schedules in a 'flexible workday'".

This is precisely where critics see the problem. They perceive platform work "as a glorified form of home-based, outsourced work, which is highly insecure and unprotected" (Kahn, 2020).

Unreasonable working hours, unsafe working conditions, limited options of career progression, high stress as well as low pay and wage theft are but a few potential threats the gig economy poses to female workers. Moreover, critics are convinced that remote work reproduces a gendered division of labour. It creates a double burden for women whereby they fulfil household and care obligations in addition to the new flexible forms of employment. Platform work makes it easier for women to work from home, but "their home care responsibility burden does not lessen" (Kahn, 2020).

Arora (2019, p. 96) pointed out how women as entrepreneurs are often overlooked because their businesses are run "with little access to capital, few skills, and few opportunities for transitioning into the formal economy". Alongside the acknowledgment of the feminization of poverty by the aid industry, she calls for the acknowledgment of the feminization of entrepreneurship" (Arora, 2019, p.96).

The fact that platforms present themselves as intermediaries rather than employers and that they are oftentimes operated from the other side of the world deprives platform workers the ability to negotiate wages, communicate with other workers and organize or bargain collectively. Graham and Woodcock (2018) noted that "Uber, like Deliveroo, have seen the beginning of worker self-organization" (Graham and Woodcock, 2018, p. 246), albeit with limited success. Some feminist researchers compare digital platform companies to "neo-feudal overlords" because of their seemingly ruthless, profit-driven agenda (Gurumurthy and Chami, 2019). Because this new kind of work is not covered by existing mechanisms, it becomes easier for platform operators to "bypass rules, standards and traditions that have protected working standards" (Wood and others, in Graham and Woodcock, 2018, p. 243).

The absence of a proper working contract can lead to an informalization of work and possibly exposes gig workers to precarious, unsafe working conditions. The lack of social protection, sick or maternity leave as well as uncertainty regarding retirement and pensions deprive many platform workers of their right to decent work. Consequently, critics accuse the platform operators of following in the footsteps of neoliberal economic models.

Sceptics also note that platform work further contributes to upholding gender clichés: "Gendering has also shaped the labour force of platforms, with strongly masculinized sectors, such as transport and delivery, and others designed to provide service and care work for dependent people, which are highly feminized. Thus, the sexual-racial division of work is reinforced for women who join platforms of domestic work, pet care or passenger transportation" (Partenio, 2020, p. 23). And even if women engage in the same sort of gig work as men, they are likely to earn less than their male counterparts. In Indonesia, for example, there exists clear internal pay differentials between men and women with male Uber

drivers earning 7 per cent more than female drivers (Aneja, 2020; Wittenberg-Cox, 2018).

Finally, praising the platform economy as a catalyst for women's entry into the labour market disregards how many women across Asia do not have access to digital technologies or lack the necessary skills to meaningfully operate them. In South Asia, for example, less than one third of women can access the Internet through a mobile telephone, as opposed to two-thirds of men. Possible reasons for the gender gap are women´s low educational levels, a lack of digital literacy among females and no access to the necessary infrastructure, including the Internet. According to Arora (2019, p. 96), cell phones and the Internet, "with all their offerings for connectivity and engagement, have become needs and not just wants". And for people who are poor, just like for people who are wealthy, "the new technology tools are necessities rather than luxuries".

This is not to say that platform work is bad altogether. However, it needs to be "coupled with some basic protections" (Kahn, 2020) to ensure that gig workers receive proper contracts, fair renumeration and social protection. Kahn (2020) to concluded that "the platform economy by itself is not going to lend itself to decent working conditions unless there are some standards set for it", which is why policy-makers must become active and pass legislation to ensure decent work for platform workers. Any regulatory mechanism must be context-sensitive and account for the particularities of a local environment.

Educational demands: Reskilling and upskilling

Because women are particularly prone to technology-induced job loss, feminists explicitly demand support for women so that they can make the transition from low-skill work to medium- or high-skill work. They also acknowledge that women are confronted with higher hurdles than men, for various reasons. First, persisting social norms prevent women from taking up the same education opportunities as men. Women are seen as the main caregivers, thus household and care responsibilities prevent many girls and women from attending school or they are forced to drop out of school due to the double burden. Second, women oftentimes lack sufficient financial resources to pay for schooling. Andrews (2020) emphasized that good public education throughout Asia is oftentimes not free anymore, a consequence of which only people with adequate financial means have access to education.

And while feminists acknowledge that there have been international initiatives to increase women´s share in education and employment, they criticize these efforts for being oriented towards short-term locally confined successes rather than bringing about long-term structural betterment. The international programmes "overlook the need for sustaining efforts in upgrading over time, for long-term labour market impact, failing to create a wider impact beyond the direct beneficiaries of these initiatives" (Gurumurthy and Chami, 2019, p. 7).

Dataveillance, dependency and vulnerability

Other issues that the feminist advocates have raised regarding the digital economy concern the danger of dataveillance, online harassment and the lack of data governance, which ensures the right to data privacy across borders (Aneja, 2019, p. 4; Gurumurthy and Chami, 2019, p. 9). Critics like Tan (2020) have highlighted how the dependency on technology increases people´s vulnerability, concluding: "When people depend on technology to access their economic, social and political life, they are subject to the availability and stability of technology."

Call for political regulation

Feminists from both camps advocate adequate policies to accompany the transition to the digital economy. Because workflows and labour chains in the digital economy transcend national boundaries, regulation has become increasingly difficult.

The prompt for social protection systems that encompass minimum standards is resurfacing in debates. Rodriquez Enriquez (2020, p. 2), for example, found that only 45 per cent of the world's population has access to social protection benefits and that women in particular lack access to social protection. Women, she pointed out,

"have historically faced more obstacles to qualify for social protection benefits and/or qualify for [fewer] benefits due to their lower and poorer labour participation, their increased relative participation in formal work and their lower average wage". The uncertainties that the digital economy brings (with its depth in the informal economy, its informalization of work, the lack of contracts and the deregulation of decent work standards, for starters) further aggravate this tendency.

Although the ILO implemented Resolution 2020 in 2012, which recommends social protection floors, many Asian States fall short of providing minimum guarantees for their workers. Gurumurthy and Chami (2019, p. 11) concluded by demanding a "new social contract for the digital economy founded upon feminist ethics […] to respond to the governance challenges of the digital economy". This new social contract must ensure that enterprises, platform providers and technology companies adhere to international law and human rights standards so that male and female labourers work under decent conditions.

The question of whether digital technologies serve to empower women and contribute to gender equality does not yield a satisfactory yes or no answer. Instead, the benefits it brings and the risks it poses are much contingent upon the specific national context, the way it is implemented and the policies the transition is embedded in. If not accompanied by adequate policies, digital technologies have the potential to exacerbate "existing forms of gender discrimination" (Aneja, 2020). The following discussion looks more closely into actors in Asia that have acknowledged the differentiated impact the digital economy has on men and women. It briefly touches upon what they have done to ensure that women´s rights as workers are protected in the future of work.

Reality check: Advocates for women's right to decent work in the digital economy in Asia

Public sector: Governments

Researchers, advocates and feminists highlight the responsibility of governments to build and provide enabling environments in which women workers can actively take part (Tan, 2020). The degree to which governments throughout Asia live up to this responsibility varies. Thailand, for example, has implemented a 20-Year National Strategy as well as its Thailand 4.0 strategy. While the former sets out a long-term development agenda, the latter focuses on "production with high value-based innovation, digitalization and automation" (Kosaikanont, 2019). Similarly, China has responded to the current transitions in the world of work with its Made in China 2025 policy, which foresees an "increased use of automation, 5G cellular technology, artificial intelligence and information technology, such as big data" (Yuting, 2020), a consequence of which classical manufacturing will increasingly be replaced by smart manufacturing. At the same time, China has stepped up efforts to reskill and upskill its workforce. But these policies fall short of sufficiently considering the diverging implications that digitalization will have on men and women. Gurumurthy and Chami (2019) perceived such lukewarm governmental attempts as a "'pink herring' that distracts from the real issues of the gender divide in techno-social capabilities and the wider socioeconomic challenges faced by women's enterprises".

International and regional organizations

International as well as regional organizations hold immense power when it comes to agenda setting. In the past, the World Trade Organization, the World Bank, the World Economic Forum and the International Monetary Fund were the drivers in debates on the digital economy. While the ILO uses a decent work perspective when discussing the changing labour market, the UN Women agency advocates equal rights for women in the labour market on a more general level (UN Women, n.d.). What is needed to respond to the current challenges that women face is a fusion of these efforts. Additionally, these agencies' work often takes a holistic, global perspective without sufficiently accounting for region- or even country-specific needs.

The future of work has become a topic for consideration for the Asian Development Bank as well as ASEAN. In its work related to the future of work, ASEAN now focuses on issues of migrant worker employability, the prospect of inclusive, sustainable economic growth and the transition

from informal to formal employment (ASEAN, 2019a; ASEAN, n.d.). Yet, so far, little effort has been made to ensure that its programmes, initiatives and policies are gender mainstreamed.

The ASEAN Foundation launched the ASEAN Digital Innovation Programme in 2019 to "create a generation of future-ready ASEAN youth" (ASEAN Foundation, 2019) by training teachers and youth on digital skills in Indonesia, Myanmar, Thailand and Viet Nam, among other countries.

As with every other policy area, however, the power of international and regional organizations is limited. While they have influence to set the agenda, their power to implement binding standards is dependent upon the implementation efforts of its members.

Private sector: Corporations and companies

Oftentimes, the private sector steps in when governments lag in their readiness to legislate. Tan (2020) rightfully observed that corporations and businesses "are already gearing up to provide services"—a motto that Gurumurthy and Chami (2019, p. 9) referred to as the "non-governance-is-good-governance" principle. Consulting corporations, such as PwC or McKinsey, have undertaken tentative research attempts on how the economic impact of technology and innovation in the digital economy in Asia differs for women (McKinsey and Company, 2018). Leading tech firms, such as Microsoft and Google, have stepped up their efforts to increase female participation in the fields of science and technology. As part of its Philanthropies Asia Program, Microsoft organizes tech workshops to encourage women and girls from marginalized communities to begin exploring STEM fields of learning. Facebook seeks to increase the digital literacy of 1 million people in the Asia-Pacific region through its We Think Digital Program. However, it would be fair to critically question whether the private corporations have the best intentions and whether they act purely altruistically. As Tan (2020) noted, many of these corporations actually gain profit when replacing human workers with machines, which means that their efforts might not be too sincere after all. And although corporate social responsibility has become a buzzword, Gurumurthy and Chami (2019, p. 6) concluded that most enterprises fall short in living up to their own values. Such enterprises are thus lamented for their "pinkwashing".

Researchers, non-profit sector, think tanks and advocacy groups

The non-profit sector has particularly advocated gender equality in the world of work. Various think tanks and advocacy groups across Asia have repeatedly called for a gender-just, human-centric future of work. IT for Change, a Bangalore-based NGO, "aims for a society in which digital technologies contribute to human rights, social justice and equity" (IT for Change, n.d.). With its work, it seeks to bring about gender-sensitive techno-social change in the information society. Similarly, Tandem Research (n.d.), which describes itself as an "interdisciplinary research collective that generates policy insights at the interface of technology, society and sustainability", has conducted research on the human dimension of technological progress, with a focus on the gendered implications of digitalization and automation. The platform Coconet specializes in advancing the digital rights of men and women in South-East Asia. Through their activism, Coconet seeks to champion women's and human rights, uncover corruption and challenge inequality in the digital world.

Trade union federations, such as Public Service International and UNI Global, have concluded agreements with multinational companies to ensure fair standards for skills and service workers around the world. In recent years, they have shifted to efforts to understand the future of work developments. UNI Global, for example, acknowledges that the transition towards digitalization has gendered implications and that women will be disadvantaged. It thus demands "that measures are put in place in relation to skills, pay, ratings, working time, algorithms and [artificial intelligence] that proactively seek to combat (gender) discrimination" (UNI Global, n.d.). Unfortunately, the trade union federation fails to provide details and specify any such measures.

Concluding remarks and outlook

The previous sections highlight how the Fourth Industrial Revolution is altering the way we work, live and interact with one another at an unprecedented pace. It has become evident that women are particularly vulnerable to the changes brought about by the digital economy.

To ensure that women are not adversely affected and to level the playing field between men and women, we must engage "the twin agendas of gender justice and economic justice" (Gurumurthy and Chami, 2019, p. 3). This twin agenda centres on the human implications of technological change and seeks to ensure that women´s rights are protected in the future of work rather than further marginalized.

Throughout the analyses in this paper, it is clear that we cannot afford to only have a small segment of the world involved in the labour market and that women need to be at the forefront of the Fourth Industrial Revolution. A boost in women's participation in the digital economy will not only improve national economies and increase household productivity and living standards in the short term but also have long term effects by increasing women's agency and overall social and economic empowerment. It is evident that a just and sustainable digital economy includes girls and boys, women and men without discrimination against race, class, sexual orientation, religion and other identity markers.

We should thus use the momentum that the digital economy has provoked to promote decent work for all people and break down the social and cultural norms that discriminate against women and their economic empowerment. There is a clear mandate for policy-makers to become active. Hence, actors throughout Asia must step up their efforts and ensure that all policies related to the digital economy and automation are sufficiently gender mainstreamed. Only when the realization that the future of work affects individuals across society differently is translated into socially just policy output will the future hold decent working opportunities for all people.

Actionable recommendations

The following 9 actionable recommendations are offered to policy-makers to ensure that women and girls are included and thrive in the Fourth Industrial Revolution.

1/ Ensure accurate, timely, gender-disaggregated data collection for the development of evidence-based policy.
2/ Promote equal access to education in STEM subjects for girls as early as kindergarten. This would put children on a level playing field and would help disrupt the negative, gender-based stereotypes about STEM education and careers. In addition, promote education in twenty-first century skills, such as creativity, conflict resolution and empathy.
3/ Maximize job placement of women in the STEM sector and break the glass ceiling that women encounter when reaching for leadership and management positions.
4/ Bridge the digital divide between women and men to improve women's labour market prospects. Governments should consider investing in capital infrastructure and ensuring equal access to finance and connectivity.
5/ Encourage women's participation in the workforce. Implement steps to address unpaid care work as a priority to boost economic growth.
6/ Rethink the social-protection infrastructure to better include those who work from remote locations or in flexible work environments.
7/ Invest in reskilling at-risk workers and upskilling the broader workforce to mitigate the impact of both, job losses and talent shortages.
8/ Focus on promoting human capital development by adopting a human-centred approach to the future of work.
9/ Consider how existing discrimination and inequalities are replicated or exacerbated by the adoption of new technologies.

The governments of Asia will have to come up with new forms of regulating the digital economy to adapt to the changing times. They should adopt a multistakeholder approach to policy making, bringing together businesses, international organizations, civil society organizations and research institutions, among other relevant stakeholders.

By focusing on these recommendations while making use of the advantages of automation and an increasing digital world, Asian countries will be better positioned to unlock the full potential of the digital economy in which nobody is left behind.

Endnotes

1. The term was coined by Klaus Schwab, founder and Executive Chairman of the World Economic Forum. In a 2016 article, Schwab stated that "like the revolutions that preceded it, the Fourth Industrial Revolution has the potential to raise global income levels and improve the quality of life for populations around the world".
2. While these figures convey a sense of the gender-specific implications of developments surrounding the future of work, they should be taken with a pinch of salt. The digital economy and automation have spread unevenly across Asia, as a consequence of which it is difficult to pinpoint exact figures.

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