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Gender and Digitisation in Asia: Future Policy Pathways

By Vidisha Mishra

Editor: Angela Chen

HEINRICH BÖLL STIFTUNG
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Technologies of the fourth industrial revolution (4IR) and the digital revolution are reorganising societies. The emancipatory promise of 4IR and associated technologies such as artificial intelligence (AI), the Internet of Things (IoT), and other information and communications technologies (ICT) have become key to policy discussions around the globe. While the potential of these digital technologies in catalysing socio-economic development is recognised, it is also clear that the benefits of this digital revolution have not been evenly distributed. Globally, there remains a gender divide in access, skills, inclusion, and meaningful usage of digital technologies – a gap that is widening in some countries. The ubiquity of digital technologies in society, politics, and culture today, and its increasing influence in the future, means that such gender gaps translate to unequal access to fundamental rights.

To ensure that the digital revolution realises its transformative potential instead of exacerbating and creating new gender inequalities, it is important to understand the many intersections of digitisation and gender from a policy perspective. As the situation varies greatly by region and context, this paper focuses specifically on ICT and gender in Asian countries, particularly South Asia (India, Bangladesh, Sri Lanka, Pakistan, Afghanistan) and Southeast Asia/ASEAN (Myanmar, Cambodia, Indonesia, Malaysia, Philippines, Singapore, Thailand, and Vietnam).

The paper examines four major issues. First, access and usage – that is, who is using digital technology, who is building technology, and whose voices matter in the global debate over technology. Second, the gendered implications of how automation is changing the world of work. Third, the future of care work in a world of platform labour and social robots. Finally, the paper will discuss education models in the 4IR. A clear-eyed evaluation of the current reality, free from the techno-deterministic narratives that so often accompany accounts of technological progress, will aid policy discourse and action that leaves no one behind.

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I. Access and the Digital Gender Divide

The digital gender divide[1] comprises two related parts[2]: access and meaningful usage; and participation in the design, development, production, and governance of ICTs.

As it stands, girls, women, and marginalised groups are least likely to have access to technology; they are also least likely to participate in building these tools.

Who is using digital technology?

Phone connectivity and Internet access are considered key utilities and public goods. However, at the end of 2019, the International Telecommunication Union (ITU) estimated that approximately 3.6 billion people remain offline, with women's Internet use falling behind in the developing countries of Asia and the Pacific. In this region, the Internet use gender gap – the difference between Internet user penetration rates for men and women relative to the Internet user penetration rate for men – grew to 24.4 percent in 2019 from 17.4 percent in 2013[3].

In low- and middle-income countries, 433 million women are unconnected and 165 million fewer women own a mobile phone when compared to men[4]. Data on mobile ownership is crucial in the Asian context because the majority of women in South and Southeast Asia rely on mobile devices to access the Internet.[5] According to data from GSM Association (GSMA)'s Mobile Gender Gap Report 2019, 96 percent of women in Myanmar and Bangladesh, 86 percent of women in Indonesia, 71 percent of women in Pakistan, 61 percent of women in India, and 34 percent of women in China rely on mobile as the sole or primary means of Internet access[6].

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1 Though it is not reflective of reality, most of the available empirical work assumes a male-female gender binary.

2 Souter, David and van der Spuy, Anri. (2018). W20 Digital Inclusion Background Paper. GSM Association. Available: https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2018/06/GSMA_narrative_VF.pdf

3 International Telecommunication Union. (2020). Measuring digital development: Facts and figures 2020. Available: https://www.itu.int/en/ITU-D/Statistics/Pages/facts/default.aspx

4 Rowntree, Oliver et al. (2019). The Mobile Gender Gap Report 2019. GSM Association. Available: https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2019/03/GSMA-Connected-Women-The-Mobile-Gender-Gap-Report-2019.pdf

5 Ibid.

6 Ibid.

Furthermore, per the GSMA report, South Asia has the largest mobile ownership gender gap of any region worldwide, at 28 percent, and women in South Asia are 58 percent less likely than men to use the Internet on a mobile phone. In contrast, there is only a 1 percent mobile ownership gender gap in East Asia and Pacific; women in these regions are only 4 percent less likely than men to use a mobile phone for Internet access[7].

It must be noted that policy narratives often conflate access with meaningful usage. For instance, the number of Internet users in Myanmar increased from less than a million people (of its population of 54 million) in 2011 to 22 million in January 2020[8]. Despite these promising numbers, digital literacy – when defined as a genuine comfort with using digital tools for educational pursuits – has not been achieved. This is particularly true for women, who have fewer options to access technology and build digital skills due to mobility restrictions and a lack of local and relevant skills training programmes. Further, women in Myanmar are more likely to report that they have no need for technology.[9] In this context, according to a study of Southeast Asia[10] by the Sasakawa Peace Foundation, technology is still regarded as a male domain. Girls and women are discouraged from accessing ICT training or employment, which ultimately has an impact on technological usage as well as on uptake of science, technology, engineering, and mathematics (STEM) subjects.[11]

The problems of access are complex and multidimensional. As our new information societies rely on the ubiquitous deployment of technologies, it is clear that the absence of intentional policy responses to these gaps will allow digital technologies to exacerbate gender inequalities rather than help reduce them.

Who is building digital technology?

Over the past decade, more attention has been placed on AI's 'sea of dudes problem[12]' – the phenomenon of mostly white men designing AI and hardcoding their narrow view of the

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[7] Ibid.

[8] Kyaw Myint, M. (2020). Bulldozing ASEAN's Digital Divide, In Asia: Insights and Analysis. The Asia Foundation. Available: https://asiafoundation.org/2020/09/02/podcast-bulldozing-aseans-digital-divide/

[9] IREX. (2018). Women and Digital Skills: What's Driving Myanmar's Growth. Available at: https://www.irex.org/sites/default/files/pdf/women-digital-skills-myanmar.pdf

[10] Sasakawa Peace Foundation. (2017). Advancing Women's Empowerment: ICT Skills for Girls and Women in Southeast Asia. Available: https://www.spf.org/awif/wp-content/uploads/2018/05/ICT-SKILLS-FOR-GIRLS-AND-WOMEN.pdf

[11] Ibid.

[12] Clark, Jack. (2016). Artificial intelligence has a 'sea of dudes' problem. Bloomberg News. Available: https://www.bloomberg.com/professional/blog/artificial-intelligence-sea-dudes-problem/

world into machines, leading to biased datasets that feed into oppressive algorithmic results for marginalised communities. Many of these issues have been recognised and efforts to make amends are underway.

Despite growing awareness of the importance of equal gender participation in developing technology, stark gender disparities remain within global AI talent. In 2018, the World Economic Forum attempted to identify the gender gap in the talent pool by surveying LinkedIn users who self-identified as possessing AI skills.[13] According to the survey, only 22 percent of AI professionals globally were female, compared to 78 percent who were male. Other interesting results were present at the country level. India was amongst the top three countries (alongside USA and Germany) with the largest AI workforce; however, it also had one of the largest gender gaps, with only 22 percent of women doing AI-related work. Singapore was the only Asian country with one of the smallest gender gaps.

Another study – conducted in 2017 by Element, AI, and Wired – attempted to evaluate the gender imbalance in research and academia across 23 countries. Again, the survey found significant gender disparities and not a single country was close to parity. Within Asia, India had one of the worst ratios with 94.4 percent male to 5.6 percent female researchers in the AI field. Further, even advanced economies such as South Korea (12.1 percent), Singapore (12.1 percent), Japan (14.3 percent women), and China (14.1 percent women) reported abysmal ratios.

At the same time, it is important to avoid generalisations. As the table below demonstrates, while countries such as Singapore and South Korea rank higher in the Human Development Index, countries that rank much lower have greater shares of female graduates among all graduates of tertiary programmes in STEM. This gender-equality paradox in STEM – where countries that traditionally enjoy less gender equality fare better than gender-progressive counterparts – has been a subject of recent research[14]. One explanation suggests that girls in less gender-equal countries are more inclined to pursue STEM professions because these disciplines are believed to offer more financial certainty and security[15].

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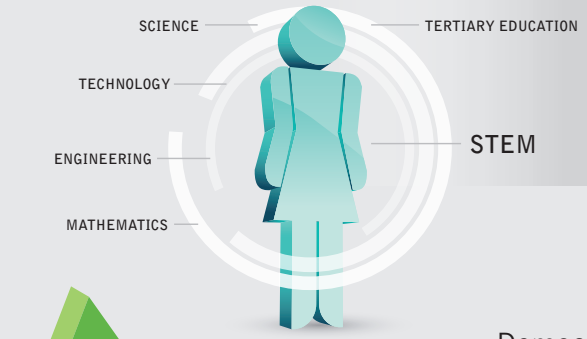
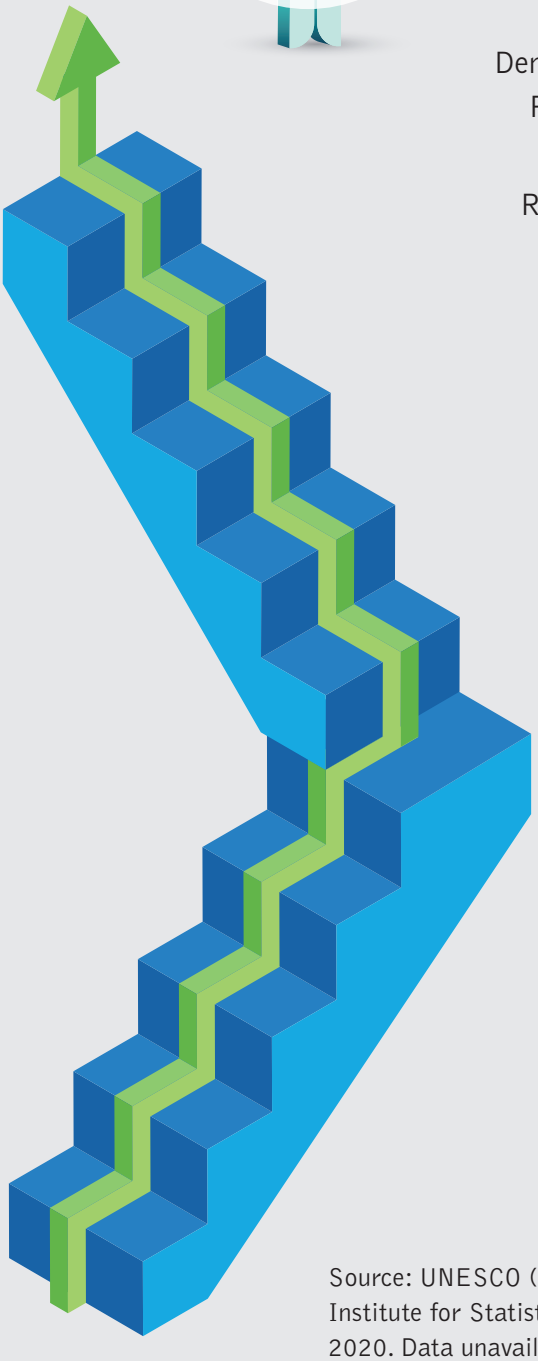
[13] World Economic Forum. Addressing Gender Gaps in Artificial Intelligence. Available: https://reports.weforum.org/global-gender-gap-report-2018/assessing-gender-gaps-in-artificial-intelligence/

[14] Stoet, Gijsbert. (2018). The Gender-Equality Paradox in Science, Technology, Engineering, and Mathematics Education. Available: https://journals.sagepub.com/doi/10.1177/0956797617741719

[15] Khazan, Olga. 2018. The More Gender Equality, the Fewer Women in STEM. The Atlantic. Available: https://www.theatlantic.com/science/archive/2018/02/the-more-gender-equality-the-fewer-women-in-stem/553592/

Table 1: Share of graduates from science, technology, engineering and mathematics programmes (STEM) in tertiary education who are female (%)





Country	Human Development Index (HDI) Rank 2020	Data available in the most recent year	
Singapore	11	34.3	2017
Democratic People's Republic of Korea	no data	19.3	2015
Republic of Korea	23	25.2	2017
Malaysia	62	34.2	2018
Sri Lanka	72	40.6	2018
Thailand	79	30.1	2016
Indonesia	107	37.4	2018
Philippines	107	36.3	2017
Viet Nam	117	36.5	2016
India	131	42.7	2018
Bangladesh	133	20.6	2018
Cambodia	144	16.7	2015
Myanmar	147	60.8	2018

Source: UNESCO (United Nations Educational, Scientific and Cultural Organization) Institute for Statistics (2020). Data Centre. http://data.uis.unesco.org. Accessed 21 July 2020. Data unavailable for Afghanistan, Bhutan, China, Japan, Nepal, and Pakistan. Reference: http://hdr.undp.org/en/indicators/183506

National policies in nearly all Asian economies do focus on encouraging girls to take up STEM subjects. However, the main finding in the region is that women drop out – that is, the higher you go, the fewer women there are, a phenomenon known as the 'leaky pipeline.' This phenomenon necessitates a closer and more critical look at efforts to retain women and create an environment truly welcoming to them at all levels.

Whose voices matter in the global debate over technology?

In addition to gender, cultural differences and contexts must be taken into consideration when addressing technology development and deployment. Narratives originating in the West increasingly acknowledge the need for 'diversity' and 'ethics' in AI research and tech companies strive to use 'AI for good.' However, scholars have argued that the use of 'ethics' and 'diversity' by such companies and communities is a smokescreen for carrying on with business as usual rather than a genuine attempt at social justice.[16]

There remains a dearth of articulations and understandings of AI and its principles in and from the Global South, especially by women researchers, practitioners, and consumers of technology. The absence of enough women in technology, in tandem with the increasing visibility of highly gendered and sexualised bots, is problematic.

Indeed, there is limited discourse on what 'good' actually means – who decides what is good and for whom?[17] Research suggests that terms often used to articulate AI principles in the West – such as 'fairness' and 'privacy' – mean different things in different places, as these conceptions are shaped by one's understanding of the relationship between individuals and society. For instance, research has shown that Americans are likely to believe that privacy is a natural right of the individual whereas Chinese citizens are more likely to view privacy in the context of family rather than personhood.[18]

How populous Asian economies respond to, and navigate through, technological transitions in the next decade will have global implications. In order for those implications to support global flourishing and equality, it is important to define the meaning of 'artificial intelligence' and other technologies – as well as 'fairness' and 'privacy' – outside the influences of male, Western, English-speaking and heteronormative imaginations.

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[16] Sloane, M. (2019). Inequality Is the Name of the Game: Thoughts on the Emerging Field of Technology, Ethics and Social Justice. In Weizenbaum Conference (p. 9). DEU.

[17] Green, B., 2019. 'Good' isn't good enough. In Proceedings of the AI for Social Good workshop at NeurIPS. Available: https://www.benzevgreen.com/wp-content/uploads/2019/11/19-ai4sg.pdf

[18] Hagerty, A. and Rubinov, I. (2019). Global AI Ethics: A Review of the Social Impacts and Ethical Implications of Artificial Intelligence. arXiv preprint arXiv:1907.07892.

II. Automation

Scholars and policymakers in South Asia – home to nearly 60 percent of the world's population – have focused on the impact of automation and machine learning (ML) on the future of work (FOW) and employment of workers. Governments, economists, and labour organisations highlight the increased vulnerability of middle- and lower-skilled workers to being replaced, which would worsen inequality and poverty and, ultimately, social cohesion. While the gendered implications of potential job displacement are multiple and varied, evidence suggests that women – in part due to the aforementioned digital divide access and skills gap – will face greater challenges without early and concentrated investments in increasing their transition to 'future-proof' occupations.[19]

The bulk of studies on the impacts of the 4IR are largely focused on the trajectories and experiences of industrialised western economies as well as China. This fails to adequately capture the policy challenges of emerging economies, where impacts of the 4IR can be witnessed even as the previous industrial revolutions have not completely unfolded. Notably, much of the literature on 4IR and AI in the Global South has been written by researchers in think tanks and universities in the Global North.[20]

Asia is heterogeneous, with countries differing in terms of demography, skilled labour, labour force participation, type of government, and patterns of interaction with global markets – all of which shape the impact of each nation's experience with the FOW trends. The International Labour Organisation (ILO) estimates that 56 percent of jobs are at risk of being automated in the ASEAN countries; according to a World Bank study,[21] 69 percent of jobs in India and 77 percent of jobs in China are threatened by automation. Southeast Asian export-oriented countries may face the economic impact of automation and job losses earlier than their less-industrialised neighbours.[22]

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[19] Magdavar, Anu et al. (2019). The future of women at work: Transitions in the age of automation. McKinsey Global Institute. Available: https://www.mckinsey.com/featured-insights/gender-equality/the-future-of-women-at-work-transitions-in-the-age-of-automation#

[20] Aneja, U. (2019). Feminist Visions of the Future of Work. Friedrich-Ebert-Stiftung, Global Policy and Development. Available at: http://library.fes.de/pdf-files/iez/15797.pdf

[21] Gent, Edd. (2017). Why automation could be a threat to India's growth. BBC Future. Available: https://www.bbc.com/future/article/20170510-why-automation-could-be-a-threat-to-indias-growth

[22] Spath, Kerstin et al. (2020). The future of work: a future without women?. Friedrich Ebert Stiftung. Available: https://www.fes-asia.org/news/the-future-of-work-a-future-without-women/

From a gender perspective, the narrative is divided between scholars who believe in the potential of automation to increase opportunities and liberties for women and scholars who believe that automation will further entrench inequities.[23] Already, variations exist with regards to women's participation in the workforce: estimates[24] by the Asian Development Bank (ADB) suggest that the female labour force participation (FLFP) rate in East Asia is one of the highest in the world at 64 percent. In South Asia, it stands at 31 percent, which is much lower than the global average of 51 percent.

It is notable that women in these contexts – who are not too far behind or who even supersede men in the labour force participation rate – occupy jobs that can be easily automated. For instance, it has been estimated[25] that countries such as Vietnam (FLFP: 73 percent) and Cambodia (FLFP: 81 percent) could lose more than 80 percent of their garment, textile and apparel manufacturing jobs – which are dominated by young women – to automation.

As policymakers in Asia continue to discuss FOW, one of the leading questions must be how to 'future-proof' industries in the region and especially how future jobs can be made gender-inclusive so that automation does not disparately affect women. How can current education and skilling strategies be improved to avoid further gender segregation across industries? How can women be equipped with lifelong learning skills to weather the 4IR transitions in the short-term, medium-term, and long-term?

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[23] Aneja, U. (2019). Feminist Visions of the Future of Work. Friedrich-Ebert-Stiftung, Global Policy and Development. Available at: http://library.fes.de/pdf-files/iez/15797.pdf

[24] Asian Development Bank. (2015.) Women in the Workforce: An Unmet Potential in Asia and the Pacific. Available: https://www.adb.org/sites/default/files/publication/158480/women-workforce-unmet-potential.pdf

[25] Cliff, Valerie. (2018). The Fourth Industrial Revolution could smash gender inequality – or deepen it. World Economic Forum. Available: https://www.weforum.org/agenda/2018/03/the-fourth-industrial-revolution-could-smash-gender-inequality-or-reinforce-it

[26] Fiedler, A. (2020). Women and the Future of Work in Asia. *Friedrich-Ebert-Stiftung.* Accessed on July 5, 2020. Available at: http://library.fes.de/pdf-files/bueros/singapur/16156.pdf

III. Care Work

From social robots to digital platforms, technology is reshaping the care sector. While Asian policy narratives on 4IR have focused on the impacts of automation on the FOW, care work – both paid and unpaid – has remained underexplored within this framework. Though comparable statistics are difficult to ascertain due to methodological and language differences, one estimate suggests that women perform 75 percent of paid and 80 percent of unpaid care work in Asia.[26] A pre-Covid estimate for the region suggests that women do four times more unpaid care work than men in Asia and the Pacific.[27] [28]

Now, the Covid-19 pandemic has accelerated processes that were already in motion. The existing shortage in care workers – together with the need to minimise risk to frontline care workers – is likely to propel the automation of care sector roles. This raises concerns regarding the current policy lacunae in the context of automation, care work, and consequent gender politics in Asia.

From a policy perspective, there are three main concerns. First, in East Asia, demographic decline has caused labour shortages in the care sector. Even before the Covid-19 crisis, it was estimated that Japan would need an additional 380,000 care workers by the year 2025.[29] While the nation has been at the forefront of developing and deploying caregiving technologies, innovation is largely outsourced to the private sector and leaves little room for a nuanced critical examination of the ethical and social complexities of robot design and its impact on human-robot interactions (HRI). For instance, extant ethnographic studies in the region demonstrate that the introduction of these robots has actually increased the amount of tasks for human caregivers, deskilled aspects of care labor, and raised overall costs – while also having an adverse impact on the country's policies towards foreign care workers.[30]

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[26] Fiedler, A. (2020). Women and the Future of Work in Asia. *Friedrich-Ebert-Stiftung*. Accessed on July 5, 2020. Available at: http://library.fes.de/pdf-files/bueros/singapur/16156.pdf

[27] Aadati, Laura, et al. (2018). Care work and care jobs for the future of decent work. International Labour Organization. Available: https://www.ilo.org/global/publications/books/WCMS_633135/lang--en/index.htm

[28] COVID-19 has caused a near universal increase in women's care responsibilities and these numbers are expected to be higher now

[29] Hirano, Y. (2017). Foreign Care Workers in Japan: A Policy Without a Vision. Nippon. Accessed on July 5, 2020. Available at: https://www.nippon.com/en/currents/d00288/

[30] Wright, J. (2019). Robots vs migrants? Reconfiguring the future of Japanese institutional eldercare. Critical Asian Studies, Volume 51, Issue 3, pp. 331-354.

Second, a majority of foreign care workers in Japan come from its Southeast Asian neighbours – in particular Indonesia, Philippines, and Vietnam – under economic partnership agreements (EPA) where they benefit from Japan's training programmes. A majority of these foreign care workers are women.[31] As a result, newer techno-deterministic policies and increased investment in care technologies in elderly care, in addition to nearsighted policies for foreign carers, threaten existing mutually beneficial regional partnerships that could meet growing care needs and build skills for women from developing countries. The long-term consequences in this scenario are underexplored from a development cooperation perspective.[32]

Third, South Asia has been experiencing a boom in digitally mediated domestic labour platforms. These app-based platforms (part of the 'platform economy') dole out work – making deliveries, driving passengers – in bits and pieces. Platform work is economically precarious and requires cobbling together various assignments without a guarantee of steady work or employee benefits. Women in particular are likely to work for domestic labour platforms doing care work or cleaning and are therefore vulnerable to the effects of this unstable economic system.[33] Academia and civil society in India has already produced an impressive body of work highlighting the increased precarity caused by digital labour infrastructures and the need for new legal frameworks and worker-led models for administration and social protection.[34] [35]

It will be important to invest in future research that unpacks existing ethnographic studies at the regional levels within Asia (East Asia, Southeast Asia, and South Asia). These studies should identify and advocate policy solutions aimed at reimagining an equitable future of care.

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[31] Peng, I., 2017. Transnational migration of domestic and care workers in Asia Pacific. International Labour Organization.

[32] Hirano, Y. (2017). Foreign Care Workers in Japan: A Policy Without a Vision. Nippon. Accessed on July 5, 2020. Available at: https://www.nippon.com/en/currents/d00288/

[33] van Doorn, Niels. (2017). Platform labor: on the gendered and racialized exploitation of low-income service work in the 'on-demand' economy. *Information, Communication & Society.* Available at: https://www.tandfonline.com/doi/full/10.1080/1369118X.2017.1294194

[34] Tandon, A and Rathi, A. Digital mediation of domestic and care work in India: Project Announcement. The Centre for Internet and Society. Available at: https://cis-india.org/raw/digital-domestic-work-india-announcement

[35] Gurumurthy, A, Chami, N et al. (2019). Making the digital economy work for informal sector women in India. Policy Brief. *IT for Change*, India.

IV. Education

New technologies of the 4IR are disrupting traditional models of work and learning. Even before the Covid-19 pandemic, current education systems – built during the first Industrial Revolution and heavily focused on memorisation and standardisation – were deemed irrelevant and in need of a drastic overhaul.[36] The ongoing crisis has accelerated trends already in progress, as well as spotlighted inequities in technological access and gains.[37] Estimates suggest that, as of April 2020, 90 percent of the world's student population has been impacted by national lockdowns, necessitating an overnight transition to online learning.[38] The Covid-19 pandemic has widened pre-existing gender gaps in education and individuals lacking access and the ability to use ICTs – predominantly rural women and girls – are more disadvantaged now than before.

While online learning platforms have gone from being a luxury to a necessity in 2020, it must be acknowledged that the process of learning itself is social and has gendered outcomes. For instance, how effective is home-based online learning for a young female learner in India, where women reportedly spend up to 352 minutes per day on domestic work, 577 percent more than Indian men, as per Organisation for Economic Cooperation and Development (OECD) data?[39]

At the same time, there are positive examples of technology being leveraged in context-specific ways. One example of a targeted edtech intervention for women is UN Women's *WeLearn*. Launched in Indonesia, *WeLearn* is a virtual skills school that offers a 'second chance' education in technical skills specifically for older women that dropped out of the formal system. A similar example from the private sector is Google's *Internet Saathi* programme that trains local women to teach each other basic hardware knowhow and digital literacy. It is now active across 289,000 villages in India.

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[36] Krishnan, K. (2020). Our education system is losing relevance. Here's how to unleash its potential. World Economic Forum. Available at: https://www.weforum.org/agenda/2020/04/our-education-system-is-losing-relevance-heres-how-to-update-it

[37] Coeckelbergh, M. The Postdigital in Pandemic Times: a Comment on the Covid-19 Crisis and its Political Epistemologies. Postdigit Sci Educ (2020). https://doi.org/10.1007/s42438-020-00119-2

[38] UNESCO (2020), 'COVID-19 Educational Disruption and Response'. Available at: https://en.unesco.org/covid19/educationresponse

[39] Organisation for Economic Cooperation and Development. Time-Use Statistics. 2017: Available at: https://stats.oecd.org/Index.aspx?datasetcode=TIME_USE

Future education policy interventions must avoid the technological solutionism that has so often coloured this discourse. The advent of advanced mobile technology in India prompted a surge of optimistic narratives emphasising the transformative potential of ICTs. E-learning was heralded as a flexible tool that could deliver 'education for all' by 'transcending social, economic and geographical equality,' particularly in rural areas.[40] However, ethnographic studies point out that most Indians do not use ICTs to deliberately 'empower' themselves. Rather, they use new technologies for the same purposes as their Western counterparts: for entertainment, self-expression, and communication.[41] It is, therefore, important for international policy and aid interventions to focus on the multiple local narratives in a region instead of being caught up in a single sweeping techno-optimistic story.

[40] Subhani, SR. (2017) 'Empowerment of Women Through Distance Education: A Case Study of Centre for Distance Education, Maulana Azad National Urdu University, Hyderabad.' *National Journal of Multidisciplinary Research and Development, 2* (1) 36-39.

[41] Arora, P.(2019). The next billion users: Digital life beyond the West. Harvard University Press.

V. Conclusion

It is slowly being accepted that the problems created by AI and other ICT cannot be solved using purely technical solutions, as evidenced by the growing pushback against harmful AI[42]. Technology never exists in a socio-cultural vacuum and oppressive systems are intersecting and multidimensional. There is an urgent need for cultural, social and philosophical investigations into emerging technologies.

Moving forward, science, technology, and society (STS) theorists and practitioners are shifting from simply recognising these problems towards actively designing inclusive systems and holding them accountable. Scholars such as Sasha Costanza-Chock[43] are calling to redesign systems with care for the multiplicity of social, economic, political, and other factors that shape the development, deployment, and effects of technology.

In the context of Asia, there are many rich avenues for further research. This could mean investigating the deeper reasons behind the digital gender gap and working to increase the proportion of women who work in ICT, as well as amplifying their voices in the global conversation. It could mean taking into consideration the gender politics and political relationships that affect labour and care work, and learning on both the macro and micro levels. It may mean focusing on the regional – and better yet, the local – rather than importing Western solutions alongside the Western gaze. 'Nothing about us without us,' a famous slogan used by disability activists, would be a wise philosophy to apply to matters of technology and the developing world. That the 4IR has not yet lived up to its promises is not cause for resignation. These technologies continue to blur the lines between the physical, digital, and biological spheres against the backdrop of dramatic climate and demographic transitions. With a broader lens and a commitment to listening to and elevating marginalised voices, much can be done. The 4IR is not yet over.

[42] AI Now Institute. (2019). AI in 2019: A Year in Review. Available: https://medium.com/@AINowInstitute/ai-in-2019-a-year-in-review-c1eba5107127

[43] Costanza-Chock, Sasha. (2019). Design Justice. MIT Press.

Author's profile

Vidisha Mishra

Vidisha Mishra manages the Gender and Health Hub at the United Nations University International Institute for Global Health (UNU - IIGH). Prior to joining UNU, she has worked at the intersection of research and policy advice in think tanks in Germany and India. Her work focuses on gender, new technologies, and partnerships for the SDGs. She is a member of the Women20 (W20) engagement group of the G20 economies.