GENDER EQUALITY IN DIGITALIZATION

Key issues for programming

Acknowledgements

Foreword

The COVID-19 pandemic has accelerated the digital and data-driven transformation, globally and in Europe and Central Asia. Digitalization today permeates every aspect of our economic, political and social lives. Entrepreneurs can leverage digital technologies to scale up their businesses, citizens can make use of the mobile internet and digital devices to participate in consultations and democratic processes, migrants can use mobile money operators to send remittances back home, older people and people with disabilities can access telemedicine services more easily, and workers can take advantage of flexible work arrangements and teleworking opportunities to balance their private and public lives.

However, digitalization is not gender neutral. Social and gender norms and deep-rooted gender stereotypes prevent women and girls from harnessing the myriad opportunities offered by digital technologies for personal and professional advancement. Technology-facilitated gender-based violence is a growing phenomenon, exacerbated by the widespread use of social media and digital platforms, as is the targeting of women in politics, civil society and human rights. Women are still scarce among decision-makers in the digitalization sphere.

As our societies and economies accelerate their digital transition, we must recognize that digitalization and digital tools hold immense promise as key enablers of women's empowerment, but also seriously imperil women's safety and rights. Failing to understand and address the differentiated impacts of technology on women and men is likely to increase the gender digital divide, deprive women of voice and participation and intensify risks to their safety.

This paper is a call to pay greater attention to gender equality and women's empowerment in the digital age, build capacities and partnerships, and dismantle gender stereotypes and other barriers so that women benefit equally from the opportunities offered by digitalization. It calls for the increased participation of women and gender experts in the development of digitalization policies and in decision-making processes.

It is my hope that the findings and practical recommendations offered here will help UNDP country offices and policymakers to build a gender-responsive digital ecosystem that empowers women for an equal future.

Mirjana Spoljaric Egger,
Director, UNDP Regional Bureau for Europe and CIS
and Assistant Administrator of UNDP

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I. REALIZING THE POTENTIAL FOR GENDER EQUALITY IN DIGITALIZATION

I. Realizing the potential for gender equality in digitalization

Digitalization is a central feature of modern societies and a functional tool for achieving sustainable development. Access to digital tools and technologies unlocks opportunities for social interaction. It is also key to the **"future of work"**, and, more broadly, for the **future of development**. For example, telemedicine services can improve access to health care facilities, extend and improve health care coverage, while e-governance can support public services and increase interactions with users and their participation in decision-making processes.[1] Systematic collection and use of disaggregated data can help to deliver tailored services and solutions based on needs and to address specific barriers. The 2030 Agenda for Sustainable Development and several of its targets point to the potential of digital technologies to contribute to sustainable development and to acceleration of human progress (Annex 1).

However, digitalization is not gender neutral. To unleash its full potential, its gender dimensions must be taken into consideration. Failing to understand and address differentiated impacts of technology on women and men is likely to increase the gender digital divide.

Gender equality in the digital sphere has assumed increasing importance in the digital and data-driven transformation of the economy and governance systems, accelerated by the COVID-19 crisis.

By 2022, **65 percent of global gross domestic product (GDP) will have been digitized**.[2] But today about 234 million fewer women than men can access the mobile internet in low- and middle-income countries.[3] Greater digital access for women would expand their economic opportunities and better position them in the labour market, especially considering the impact of digital transformation and automation on employment opportunities—a study conducted in 30 countries found that women's jobs have 70 percent or higher risk of automation.[4] Moreover, an additional 600 million women and girls accessing online services around the world could result in an increase of US$18 billion in GDP.[5]

Digital technologies are also key enablers for **women's civic engagement**, for their ability to communicate and for their mobility. Access to digital devices increases the influence of women's organizations and the visibility of women's agendas online. Digital activism and

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1   G. Shivam, How digitalization is supporting sustainable development, GlobalDev, 22 October 2019.
2   International Data Corporation (IDC), IDC Reveals 2021 Worldwide Digital Transformation Predictions; 65% of Global GDP Digitalized by 2022, Driving Over $6.8 Trillion of Direct DX Investments from 2020 to 2023, 29 October 2020.
3   Global System for Mobile Communications Association (GSMA), 2021, Connected Women. The Mobile Gender Gap Report 2021.
4   E. Dabla-Norris and K. Kochhar, Women, technology and the future of work, International Monetary Fund Blog, 16 November 2018.
5   Policy Department for Citizens' Rights and Constitutional Affairs, European Parliament, 2018, The underlying causes of the digital gender gap and possible solutions for enhanced digital inclusion of women and girls.

social media campaigns may not substitute for offline engagement in the foreseeable future, but they can support women's claims and help activists to organize communities and movements.[6] Evidence shows that digital technologies play an important role in democratic processes, self-organizing, self-help and mutual learning; with greater access to quality digital services and information, more women can participate in these processes.[7]

Access to the mobile internet and online platforms also plays a critical role for the **emotional well-being of migrant families and migrant communities**, including refugees. Research shows that mobile technologies help women migrant workers to alleviate stress related to social isolation, to stay in contact with their relatives, to learn about their rights and to exchange information within migrant communities.[8]

Digitalization and digital tools hold immense promise as key enablers of women's empowerment, but also seriously imperil women's safety and rights. The widespread use of social media and digital platforms has facilitated the emergence of **technology-facilitated gender-based violence**,[9] exacerbated by the increased use of online spaces during the COVID-19 pandemic. Women's and human rights defenders, women in politics and civil society organizations and coalitions, journalists, women with disabilities or belonging to minorities and LGBTI (Lesbian, Gay, Bisexual, Transgender and Intersex) people are particularly targeted by online violence. Research suggests that online violence against women has severe impacts on their physical, psychological, social and reproductive health and may restrict their access to services and to information available online, as well as their chances of being active digital citizens.[10]

This paper analyses current barriers to gender equality in digitalization and identifies entry points for the United Nations Development Programme (UNDP) and national partners in governments to develop gender-responsive digital initiatives and policies. It argues that achieving gender equality in information and communication technology (ICT) and digitalization processes is not merely about ensuring women's access to digital tools and employment opportunities in ICT and in the science, technology, engineering and mathematics (STEM) fields. Gender equality in digitalization entails structural and transformative changes that involve every aspect of digital governance and every actor in the digital ecosystem. It means ensuring that all voices and perspectives are heard, including those of gender and ICT experts. Mainstreaming gender in the design and implementation of national digital strategies is essential for an equitable and gender-responsive COVID-19 recovery.[11]

6   S. Toor, Digital activism: empowering women, creating change and demanding human rights, Open Global Rights, 22 September 2020.

7   D. Robertson and M. Ayazi, How Women Are Using Technology to Advance Gender Equality and Peace, United States Institute of Peace, 15 July 2019; L. Happ, Aborting in Isolation: Observations on Argentine abortion activism during COVID-19, London School of Economics Blog, 16 December 2020.

8   A. Chib et al., International Migrant Workers' Use of Mobile Phones to Seek Social Support in Singapore, USC Annenberg, Volume 9, Number 4, Winter 2013, 19–34; V. Ruget and B. Usmanalieva, Can smartphones empower labour migrants? The case of Kyrgyzstani migrants in Russia, in Central Asian Survey, Vol.38, Issue 2 (2019), 165–180; Office of the United Nations High Commissioner for Refugees (UNHCR), Geneva, 2016, Connecting Refugees: How the Internet and Mobile Connectivity Can Improve Refugee Well-being and Transform Humanitarian Action.

9   European Institute for Gender Equality (EIGE), 2017, Cyber violence against women and girls.

10   UN Women, 2020, Online and ICT-facilitated violence against women and girls during COVID-19.

11   A. Gurumurthy, Gender and ICTs: Overview report, in Institute of Development Studies, September 2004; Organisation for Economic Co-operation and Development (OECD), 2018, Bridging the digital gender divide. Include, upskill, innovate.

II. GENDER AND DIGITAL INCLUSION: CURRENT PICTURE AND EXISTING BARRIERS
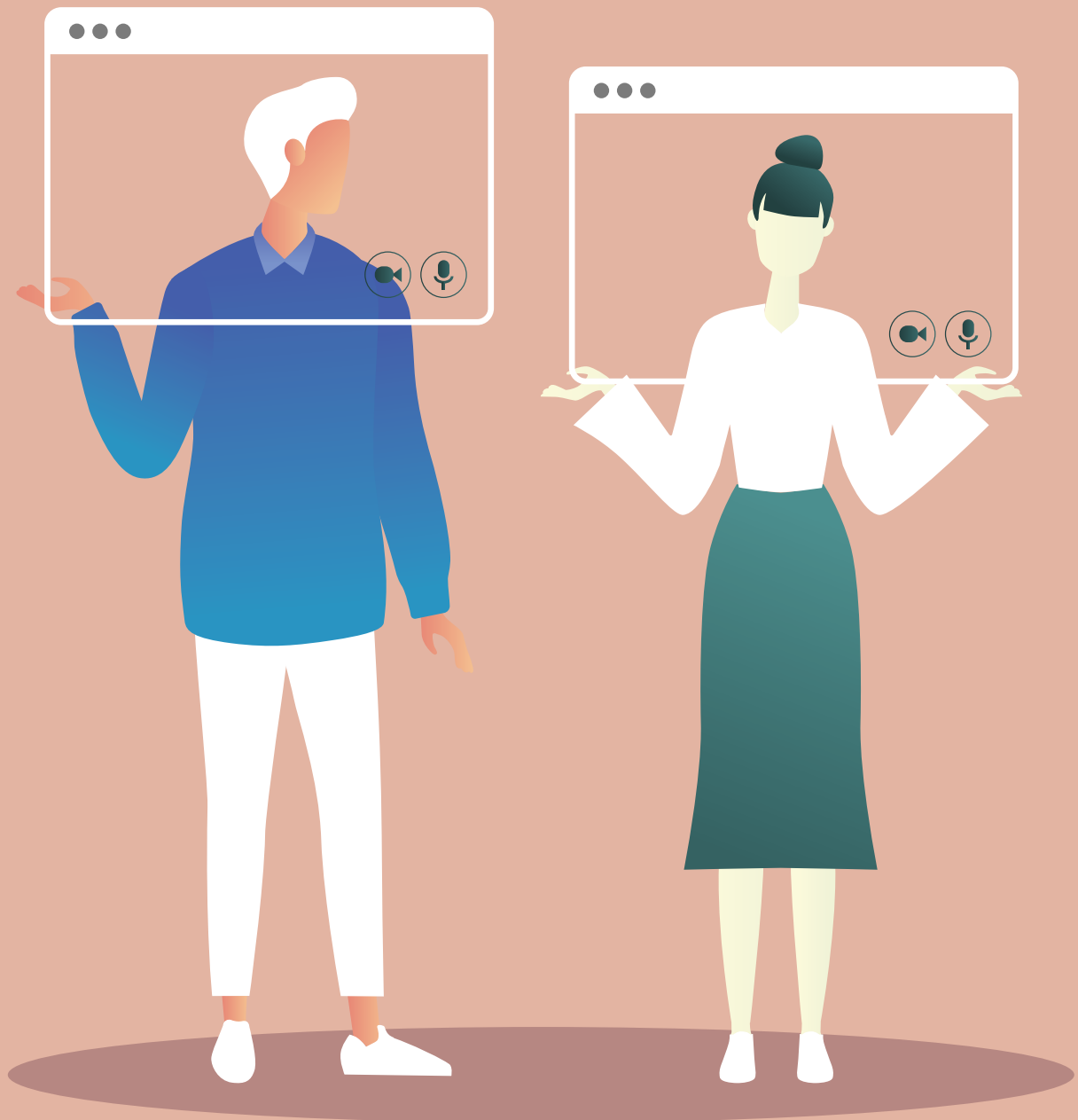
II. Gender and digital inclusion: current picture and existing barriers

Achieving equality in digital inclusion requires a multi-sited and multifaceted approach.

First, the **engagement of a diverse set of stakeholders** (governments, local administration, private actors, civil society and users themselves) is crucial to advance gender equality in the digital age. Governments can play a fundamental role by increasing the digital infrastructure, building enabling technologies and adopting regulatory frameworks and protocols ensuring that women have equal access to means of digital identification and e-services, and that their privacy is protected.[12] New technologies, including national electronic IDs and biometrics, and digital infrastructures—from national data stacks, health data management systems and agriculture data stacks to artificial intelligence (AI) principles—are currently available, changing the idea of e-governance.

These bring opportunities and challenges that require intervention from governments to ensure that the privacy and security of groups and individuals are protected. Governments can also enhance affordable and inclusive service delivery by the public and private sectors, and allocate budgetary outlays to initiatives that aim to ensure gender-responsive e-government design and implementation.[13] National statistical agencies and academia can partner to generate and make gender-disaggregated data available, which is essential to develop inclusive digital strategies, while the public and private sector can incentivize gender-responsive leadership to ensure women can meaningfully participate in the development of these strategies.[14] Importantly, the **active involvement of women, gender equality experts and women's organizations** in policy development and service design and delivery is key to enhancing women's digital inclusion, and in ensuring that policies and services address their needs.[15]

Secondly, it is important to understand that **access, ownership and use of digital tools are not gender-neutral**.[16] Women globally tend to face more barriers than men in accessing and using technology—in addition to lack of skills, they are also subject to greater family restrictions due to existing social norms and gendered expectations—and are thus excluded in the digital transition. Across low- and middle-income countries, women are seven percent less likely

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12   A. Madgavkar et al., COVID-19 and gender equality: Countering the regressive effects, McKinsey Global Institute, 15 July 2020.
13   United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP), 2016, E-government for women's empowerment in Asia and the Pacific.
14   T. Sprague, I. Mariotti and E. Cape, Harnessing Information and Communications Technologies for gender equality in Europe and Central Asia, UNDP Development Futures Series, 6 July 2021.
15   UNESCAP, E-government for women's empowerment in Asia and the Pacific.
16   OECD, Bridging the digital gender divide. Include, upskill, innovate.

than men to own a mobile phone and 15 percent less likely to own a smartphone, while only 58 percent of women use the mobile internet.[17]

In Europe and Central Asia (ECA) (including Russia), 52 million women lack access to the mobile internet. In comparison with men, **women in the ECA region are four percent less likely to use the mobile internet**, even though they are two percent more likely to be owners of mobile phones.[18] With a few exceptions, women in this region are also less likely to access the internet for personal use (Table 1).[19]

Table 1: Individuals using the internet, by gender (%)

Country/Territory	All individuals	Women	Men
Albania	72.2	71.2	73.2
Armenia	66.5	67.2	65.8
Azerbaijan	81.1	78.0	84.2
Belarus	85.1	85.7	84.2
Bosnia and Herzegovina	73.2	69.3	77.8
Georgia	72.5	71.9	73.3
Kazakhstan	85.9	84.9	87.1
Kosovo*	89.4	89.0	89.9
Montenegro	81.4	80.7	81.9
North Macedonia	81.4	79.2	83.5
Serbia	78.4	76.0	81.8
Turkey	77.7	72.1	83.3
Ukraine	70.1	68.2	72.4
Uzbekistan	70.4	65.9	74.9

Source: ITU, Individuals using the internet (from any location), by gender**

(Latest year available, no older than 2018; age scope of population varies across countries and territories)

Thirdly, it is important to understand that women and any target social groups are not homogeneous and have diverse vulnerabilities under different conditions. It is therefore essential to adopt an intersectional approach when analysing patterns of digital exclusion. The digital gender gap in the use of mobile internet is closing: from 25 percent in 2017, to 19 percent in 2019 and 15 percent in 2020.[20] In 2020, an estimated 112 million additional women joined the digital world with mobile internet across low- and middle-income countries.

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17 GSMA, Connected Women. The Mobile Gender Gap Report 2021.
18 *Ibid.*
19 International Telecommunication Union (ITU), Gender ICT Statistics.
* References to Kosovo shall be understood to be in the context of Security Council Resolution 1244 (1999).
** Gender-disaggregated data for Kyrgyzstan, Moldova, Tajikistan and Turkmenistan is not available. The proportion of individuals using the internet in Moldova is 76.1 percent, while it is lower in the above-mentioned Central Asian countries—21.3 percent in Turkmenistan, 22 in Tajikistan and 38.2 in Kyrgyzstan (Source: World Bank, 2020), Individuals using the internet, % of population.
20 GSMA, Connected Women. The Mobile Gender Gap Report 2021.

However, in comparison with previous achievements, the closure of the digital gap is slowing for most access indicators,[21] particularly in countries where large parts of the population are already connected, which indicates that some groups are hard to reach and face additional digital exclusion,[22] while differences in sophistication of use combine to result in differentiated access to information and economic opportunities.

For instance, **older women are among the groups facing significant obstacles**—the digital gender divide in internet usage among people aged 55–74 is about eight percent in developing and emerging economies.[23] There are some exceptions. For example, in Ukraine, older women use digital devices more frequently than older men. This may be because they tend to ask for help more often than men and evince a greater interest in developing digital skills (Figure 1).[24]

Figure 1: How often grandparents ask for children's support with digital technologies in Ukraine
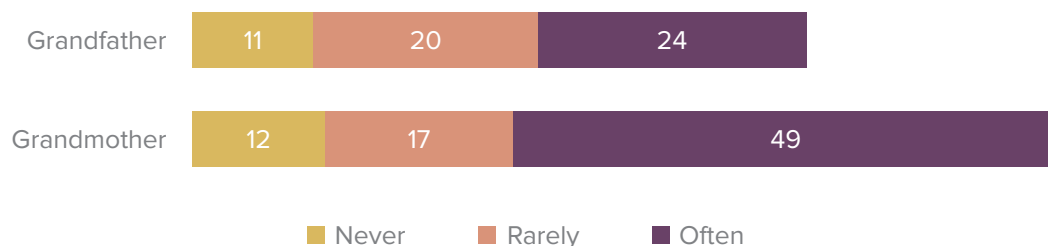
Key barriers to gender equality in the digital age

Structural inequalities that are deeply embedded in societies are key barriers to women and girls taking advantage of opportunities offered by digital technologies and contribute to leaving women behind in the transition to the digital future.

This section provides an overview of some of the main barriers to gender equality and women's empowerment in the digital age.

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21   ITU, 2018, Measuring the Information Society Report, Vol.1. Access indicators include fixed-telephone, mobile-cellular and fixed-broadband subscriptions per 100 inhabitants, mobile network coverage, mobile-broadband subscriptions, the share of households with computer, the share of households with internet accessing, individuals owning a telephone, individuals using the internet, ICT skills, fixed-broadband and mobile internet traffic.
22   *Ibid.*
23   GSMA, 2020, Connected Women. The Mobile Gender Gap Report 2020; OECD, Bridging the digital gender divide. Include, upskill, innovate.
24   "Digital Literacy: adults through the eyes of their children"(research conducted by UNDP in Ukraine and implemented in December 2019 by the MLS Group, Ukraine) (sample 100 respondents).

Gender norms and cultural stereotypes

Gender stereotypes and cultural norms often hinder women's and girls' access to digital technologies and reduce their education and employment opportunities in ICT-related sectors. For instance, parents may be stricter with girls than boys in the use of mobile phones and activities that require the use of the internet,[25] while in households with limited computing resources, there might be a preferential bias assigning their use to boys and men over girls and women.[26] Moreover, **social norms** and **gender bias** in teaching materials and techniques and **a lack of support from the family** and teachers often dissuade girls and women from choosing STEM programmes and pursuing careers in these fields.[27]

In Moldova, for instance, a study found that more than 30 percent of surveyed young women who reported liking computer science in school did not consider ICT among the choices for a future career because "it is not a domain for girls".[28] Limited exposure to women role models, including women teachers, also plays a key role in discouraging girls from choosing STEM programmes, while their interest in these subjects and their self-confidence increase when exposed to positive role models.[29] Social norms and expectations on women's role within the family and as primary caregivers, together with a masculine corporate culture, especially in the tech sector,[30] are also major barriers to women's participation in the labour force, and hamper the employment and career advancement opportunities offered to them by the digital transformation.[31]

Affordability of the internet and digital devices

Economic inequalities are both a cause and consequence of digital exclusion.[32] The economic status of mobile users determines the purchase of more advanced devices, as do cultural patterns, general infrastructure, and costs of equipment and the internet. Factors such as the affordability of the internet and the cost of smart devices are challenges that disproportionally affect women and girls, and especially the poor. **Affordability is the second most frequently cited barrier to using the mobile internet.**[33]

25   ITU, UN Women and Equals Global Partnership, 2021, Digitally empowered generation equality. Women, girls and ICT in the context of COVID-19 in selected Western Balkan and Eastern Partnership countries.

26   United Nations Educational, Scientific and Cultural Organization (UNESCO), 2020, Global education monitoring report 2020: gender report. A new generation: 25 years of efforts for gender equality in education.

27   Directorate General for Internal Policies, European Parliament, 2012, Women in ICT.

28   A. Bradetchi et al., 2014, Motivations and barriers for girls and women in STEM and ICT domains. Survey elaborated by Magenta Consulting for the Association for the Development of Information Technologies EDUCAT, in partnership with UN Women and financed by Sweden.

29   United Nations Children's Fund (UNICEF), Equals Global Partnership and ITU, 2020, Towards an equal future: reimagining girls' education through STEM.

30   EIGE, 2020, Gender Equality Index 2020: Digitalisation and the future of work.

31   OECD, Bridging the digital gender divide. Include, upskill, innovate; G. Ferrant et al., Unpaid care work: the missing link in the analysis of gender gaps in labour outcomes, OECD Development Centre, September 2014.

32   World Wide Web Foundation, 2015, Global Report, October 2015. Women's Rights Online. Translating Access into Empowerment.

33   GSMA, Connected Women. The Mobile Gender Gap Report 2021.

Lack of literacy and digital skills

Another important exclusion factor is the general access to education and the literacy rate in societies. Women with secondary education are six times more likely to use the internet than women with a primary or lower-level education.[34] The more advanced the device, the higher the level of literacy needed for its adoption and frequent use of the internet. Moreover, women are generally less likely than men to have digital skills across all levels of digital literacy: for instance, they are 25 percent less likely to use ICT for basic purposes, such as using arithmetic formulas in a spreadsheet.[35] This gap further widens along the skills spectrum: **women are four times less likely than men to have advanced ICT skills**. Greater awareness-raising and digital literacy campaigns can broaden knowledge about functionalities of devices, of the internet and of opportunities arising from being connected, while digital skilling and upskilling programmes in formal and informal contexts and gender-sensitive training for teachers can reduce the gender gap in digital skills.[36]

External factors: regulations, infrastructure, trust towards mobile operators and digital infrastructural services

External factors may be barriers to or enablers of women's digital inclusion, as well as of digital financial inclusion. For instance, a factor of digital exclusion and a barrier to women's use of mobile money is the role of **legal frameworks** (registration requirements), infrastructure and general **trust towards mobile agents**/operators[37] and digital infrastructure services. Basic infrastructure impacts women owning and using mobile devices. Poor network quality and limited interoperability are great challenges, especially (but not only) in rural and remote areas.

Crucially, a lack of operator/agent trust is defined as the "perceived unreliability of the mobile operator or network and consequent fear of being deceived" and is one of the most important barriers to women's ownership and usage of mobile devices.[38] This is linked to a lack of trust in digital infrastructure services, which are now indispensable. For example, unless fintech markets are well-regulated and standard settings are designed to be gender-sensitive, women borrowers may face discriminatory outcomes, while digital ranking-and-scoring systems in welfare services may disadvantage women, especially those in marginal social locations.

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34   World Wide Web Foundation, Women's Rights Online. Translating Access into Empowerment.
35   UNESCO, 2019, I'd blush if I could: closing gender divides in digital skills through education.
36   *Ibid*.
37   Consultative Group to Assist the Poor, 2018, New Insights on Women's Mobile Phone Ownership.
38   GSMA, 2015, Bridging the gender gap: Mobile access and usage in low- and middle-income countries.

Gender bias in design and gaps in access to services

Since 2018, the number of countries offering online information and services targeting different population groups—i.e. youth, the elderly, people with disabilities, migrants and people living in poverty—has increased by 11 percent; with regard to women, such services are now offered in 151 countries (61 countries in 2016; 135 in 2018).[39] The COVID-19 pandemic is accelerating the digitization of social protection and public administration programmes.[40] Algorithmic profiling is replacing face-to-face interaction and decisions are being made based on big data resources. The potential of automated decision-making systems (ADMS) can be revolutionary in defining patterns and solutions for many gendered inequalities (e.g. poverty, unpaid care work), but if not designed and governed in a gender-sensitive manner, these systems can perpetuate inequality.[41] The key gender gaps to consider in ADMS are as follows:[42]

- **Gender bias in datasets**, due to the underexploitation of qualitative data, lack of collection and use of gender- and age-disaggregated data.

- **Gender-blind decision-making models**, due to a deterministic approach to prediction,[43] the weight of gender variables, and a lack of gender impact assessments.

- **Gender-blind design**, due to the lack of involvement of different groups in co-design, gendered barriers in participation and the consideration of men as default recipients.

The COVID-19 pandemic and ensuing lockdowns forced many countries and territories to speed up e-governance and administration strategies. However, a United Nations e-government survey shows that this transformation has not benefited all social groups equally.[44] As a consequence of the gender digital divide, fewer women than men have access to these digitalized services. The survey stresses the role of women and women's organizations in designing e-governance tools to ensure inclusive and adequate adopted measures. Such participation can also minimize the risks and increase benefits related to AI technologies.[45]

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39   United Nations Department of Economic and Social Affairs (UN DESA), 2020, E-Government Survey 2020. Digital Government in the Decade of Action for Sustainable Development. With addendum on COVID-19 response.

40   S. Kostenbaum and C. Dener, Digital services help governments deliver solutions during COVID-19, World Bank Blogs, 26 May 2020.

41   Digital Future Society, 2020, Towards gender equality in digital welfare.

42   Ibid.

43   This approach consists in the belief that algorithms can make more accurate predictions than human beings.

44   UN DESA, E-Government Survey 2020. Digital Government in the Decade of Action for Sustainable Development. With addendum on COVID-19 response.

45   Ibid.

> ## Box 1. Common barriers to digital inclusion from a private sector perspective
>
> The World Benchmarking Alliance points to three common barriers to digital inclusion:[46]
>
> - A missing focus on private sector accountability. It is crucial to include an analysis of what private sector and international companies do—as owners of infrastructure and resources—to ensure women's equal participation and women's rights.
>
> - Too much emphasis on access, and especially on internet connectivity, with a missing perspective on the Internet of Things, artificial intelligence and other technologies.[47]
>
> - A missing perspective on innovation, with the innovation divide one of the most neglected dimensions of digital inclusion.[48] In mainstreaming gender equality into innovation, existing barriers to gender equality, design-related aspects and innovation management must be addressed.[49] Measures to monitor and diminish innovation inequalities among countries and within societies are critical to prevent further inequalities in the future, since "the digital innovation of today becomes the digital divide of tomorrow".[50]

Lack of employment and entrepreneurship opportunities in the digital sector

a) Digital entrepreneurship and income generation

Evidence shows that women-owned e-commerce companies face greater barriers than those owned by men in entering the market and scaling up their business—including a lack of access to funding, patriarchal attitudes and less specific digital training.[51] Women-owned businesses selling on e-commerce platforms tend to be small-sized businesses, with limited growth potential and low profit margins. On Alibaba, for example, the average sales revenue for women-led companies is 18 percent lower than for those led by men.[52] Moreover, **women-led companies worldwide export on average to nine countries, compared to 15 countries**

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46   World Benchmarking Alliance, March 2019, Digital Inclusion Benchmark: Scoping Report 2019.

47   The human rights approach can serve as an additional key perspective. IT for Change India stresses the role of digital justice and human rights in the technology, including data protection and data redistribution in the digital economy, users and platform workers' rights, cyberviolence and the responsibility of different social actors for digital justice.

48   G.S. Drori, "Globalization and technology divides: Bifurcation of policy between the 'digital divide' and the 'innovation divide'", in Sociological Inquiry, 80(1), 2010, 63−91.

49   International Development Innovation Alliance, October 2018, Toward Bridging Gender Equality & Innovation.

50   World Benchmarking Alliance, Digital Inclusion Benchmark: Scoping Report 2019.

51   Consumer Unity and Trust Society (CUTS) International, 2018, Overcoming Gender Challenges in E-Commerce. What is being done to support women-owned MSMEs?

52   International Bank for Reconstruction and Development, World Bank and World Trade Organization, 2020, Women and trade. The role of trade in promoting gender equality; A. Gurumurthy and N. Chami, Building Back Better with E-Commerce: A Feminist Roadmap, IT for Change, September 2021.

for men-owned companies.[53] However, women seize the potential of digital business given the opportunity. A survey of 111 countries found that women-led businesses are 1.5 times more likely than men-led entities to consider doing e-commerce.[54]

On the other hand, despite being nearly half as likely as men to report they are trying to start a business, women accounted for only 15.6 percent of digital start-ups in the EU in 2018.[55] Likewise, in the ECA region, opportunities in the ICT and tech fields are scarce: **across Armenia, Azerbaijan, Belarus, Georgia, Moldova and Ukraine, women account for only 16 percent of founders,**[56] while in Kazakhstan this share is 7.4 percent.[57] Addressing the multiple discrimination and education-related barriers that keep women from participating equally in STEM fields, accessing digital finance and becoming digital leaders is critical to unleashing their full entrepreneurship potential.[58]

b) Digital employment

ICT is impacting the world of work, changing employment patterns and reducing work opportunities in some sectors, while creating new jobs in new fields. In the next 20 years 180 million women's jobs will be automated—however, women are 30 to 50 percent less likely than men to use the internet to increase their income or to participate in public life.[59]

The Organisation for Economic Co-operation and Development (OECD) highlights the role of the **platform economy** (and gig work) in women's empowerment in developing countries.[60] While platforms such as Uber, Fiverr, Lyft, Amazon Mechanical Turk may offer sources of income, gender discrimination is widespread in such environments: women tend to receive worse evaluations, lower auction prices on eBay and earn less as taxi-on-demand drivers (with a pay gap of around seven percent). Strong gender stereotyping leads to gender segregation in platform work and restricts women's access to perceived 'men-type jobs' (e.g. software development).[61] Moreover, women are more likely than men to drop out of platforms within 12 months (62 percent and 54 percent, respectively).[62] While the platform economy may offer women a timely solution in a difficult financial situation, the low quality of jobs and their lack of stability discourage workers' longer engagement.

53 International Trade Centre, 2017, New pathways to e-commerce. A global MSME competitiveness survey.
54 *Ibid.*
55 OECD, 2019, The missing entrepreneurs 2019. Policies for inclusive entrepreneurship.
56 EU4Digital, 21 September 2020, We need more women innovators!
57 Astana International Financial Centre (AIFC), 2021, The startup ecosystem of Kazakhstan.
58 T. Yokoi et al., Three barriers holding back the next wave of female digital leaders, Institute for Management Development, May 2019.
59 Dabla-Norris and Kochhar, Women, Technology, and the Future of Work; World Wide Web Foundation, Women's Rights Online. Translating Access into Empowerment; CUTS International, Overcoming Gender Challenges in E-Commerce. What is being done to support women-owned MSMEs?
60 OECD, Bridging the digital gender divide. Include, upskill, innovate.
61 EIGE, 2020, Gender pay gap in ICT and platform work.
62 OECD, Bridging the digital gender divide. Include, upskill, innovate.

The COVID-19 pandemic has also hastened the transformation to digital labour markets.[63] Responding to lockdowns, companies have accelerated the digitization of supply-chain and customer interactions by three to four years.[64] The pandemic increased teleworking, resulting in new work arrangements and labour relations, in changes in job quality (i.e. health and safety issues, wages and contractual issues) and work-life balance.[65] The International Labour Organization (ILO) estimates that in January 2021, 93 percent of the world's workers resided in countries with some form of workplace closure measures due to the pandemic.

The year 2020 brought unprecedented **global employment losses of 114 million jobs relative to 2019**.[66] Globally, women suffered higher employment losses (five percent) than men (3.9 percent) in relative terms, due to their overrepresentation in the most affected sectors, and increased burdens of unpaid care and housework.[67] In contrast to nearly all other sectors, **employment in ICT, where women lag well behind men,[68] continued to increase in the second and third quarters of 2020** due to rising demand for digital services.[69] Equipping women with digital skills and supporting them in transitioning to digital-related and digital-enabled forms of employment (including with training and benefits) is paramount to ensuring that women are not left behind.[70]

The gender divide in the ICT sector

The ICT sector in the European Union grew by 50.5 percent from 2011 to 2020, over nine times the increase in total employment (5.5 percent).[71] However, **women account for barely 18.5 percent of ICT specialists in the EU**.[72]

In the ECA region, women are underrepresented as students in STEM and ICT programmes (Figure 2). A lack of family support, a gender-blind or biased curriculum, and teaching approaches and gender stereotypes suggesting that girls are not fit for STEM subjects (including ICT) are some key barriers to their choosing these programmes.[73] Similarly, gender biases in recruitment, a lack of flexible work arrangements, gender discrimination in promotion and unwelcoming workplaces are among the main factors hindering women's participation in ICT employment.[74] As a result, women are a minority in the ICT sector in the ECA region. In 2018, 19,522 employees were registered in **Armenia's** ICT sector, 27 percent more

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63   McKinsey & Company, How COVID-19 has pushed companies over the technology tipping point—and transformed business forever, Survey, 5 October 2020.
64   *Ibid.*
65   European Commission's Joint Research Centre, Telework, work organisation and job quality during the COVID-19 crisis. A qualitative study, JRC Working Papers Series on Labour, Education and Technology, 2020/11.
66   ILO, January 2021, ILO Monitor: COVID-19 and the world of work. Seventh edition Updated estimates and analysis.
67   Ibid.; ILO, 2021, World Employment and Social Outlook. Trends 2021.
68   For more information, see paragraph below on the gender divide in the ICT sector.
69   ILO, ILO Monitor: COVID-19 and the world of work. Seventh edition Updated estimates and analysis.
70   Dabla-Norris and Kochhar, Women, Technology, and the Future of Work.
71   EUROSTAT, 2021, ICT specialists in employment.
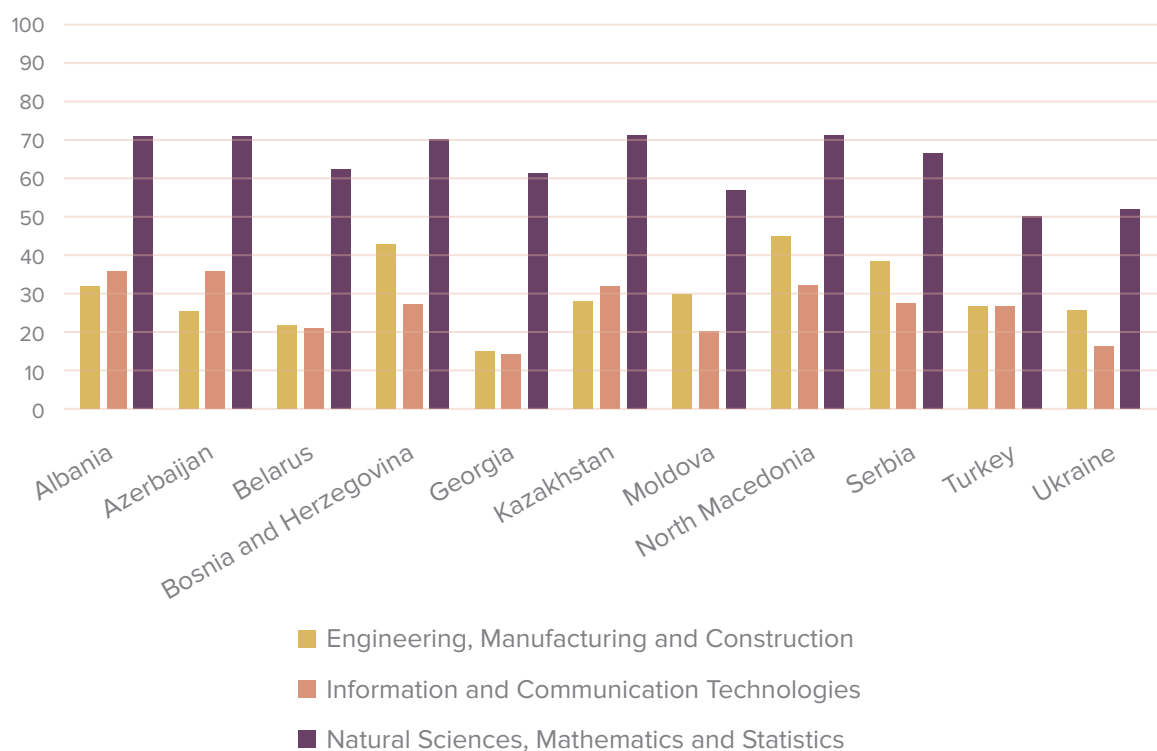72   *Ibid.*
73   UNDP, 2021, Gender equality in STEM in Europe and Central Asia region: key barriers to women's advancement in STEM careers. Summary brief; UNICEF, Equals Global Partnership, ITU, Towards an equal future: reimagining girls' education through STEM.
74   UNDP, Gender equality in STEM in Europe and Central Asia region: key barriers to women's advancement in STEM careers. Summary brief.

than the previous year. Men account for most professionals in this industry—68 percent.[75] In **Azerbaijan**, women account for 29.7 percent of the 26,500 employees working in the ICT field.[76] Of a total of around 27,000 employees in the ICT sector in the Republic of **Moldova**, almost 30 percent are women,[77] while in **Kosovo** this number accounts for only 20 percent.[78] In **Kazakhstan** women are 43 percent of employees in the ICT sector.[79] In **Ukraine** a quarter of ICT specialists are women.[80]

Figure 2: Women in STEM education in the ECA region

■ Engineering, Manufacturing and Construction

■ Information and Communication Technologies

■ Natural Sciences, Mathematics and Statistics

Source: United Nations Economic Commission for Europe,

Tertiary students by field of study (ISCED-F 2013) and sex (data accessed in September 2021)

In **Kyrgyzstan**, the share of women in the ICT workforce has risen from 28.2 percent in 2015 to 36.3 percent in 2019.[81] Women employed as ICT specialists in **Serbia** are 25 percent, and 23.3 percent in **North Macedonia**. Women account for 16.8 percent of ICT specialists in **Turkey**.[82]

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75   EU4Digital, 14 August 2020, How to ensure rapid development in the Armenian IT sector? EU4Digital highlights women as the key to growth.

76   EU4Digital, 15 September 2020, Digital growth: working towards gender equality in IT in Azerbaijan.

77   EU4Digital, 27 July 2020, Embracing a career in IT: how support for ICT Innovation is reversing the brain drain in Moldova and setting an example in the region.

78   ILOSTAT, 2019, Tech's persistent gender gap.

79   *Ibid.*

80   EU4Digital, 28 July 2020, Ukrainian IT industry: looking for further growth and opening opportunities for women.

81   National Statistical Committee of the Kyrgyz Republic, 2020, Women and Men in the Kyrgyz Republic 2015–2019 (available only in Kyrgyz).

82   EUROSTAT, ICT specialists in employment.

Globally, the percentage of women among technical employees in the biggest and most influential tech companies tends to be very low: 23 percent at Apple, 20 percent at Google and 17.5 percent at Microsoft, and it is estimated that only one percent of applications for positions in AI are from women.[83] This lack of diversity among artificial intelligence and ICT developers proliferates stereotypes and discrimination through the products they create. For example, the feminized profiles of voice assistants reinforce the stereotype of women as men's assistants. Depending on the source data given, AI may prefer certain profiles (of men, white and wealthy people) in important areas, such as recruitment and health care, or limit its functionality for people who are not white.[84] **Achieving gender equality in leadership in the tech industry alone can add $430–$530 billion in global productivity**. This would help close the digital divide in this sector.[85]

Cyberviolence and women's safety

Women and girls using the internet risk being exposed to gender-based violence, including cyberstalking, online harassment or even sexual trafficking. For instance, in the European Union **one in ten women have experienced some form of cyberviolence since the age of 15**.[86] The COVID-19 pandemic and the increased use of digital devices and the internet have further exacerbated women's and girls' vulnerability to these forms of violence, which share the same root causes of offline violence.[87] Moreover, a lack of access to information on available remedies, limited help from law enforcement and insufficient monitoring and reporting on social media have posed relevant challenges to the protection of women's privacy and the investigation and prosecution of this crime.[88]

Although the proliferation of this form of violence is difficult to trace and combat, relevant measures can be adopted to address this phenomenon and increase women's and girls' safety. These include promoting synergies among different stakeholders to raise awareness on the issue and to change social attitudes that normalize online gender-based violence, ensuring gender-responsive design of legislation, programmes, applications and social media,[89] and enhancing the contribution of women leaders and activists to the development of internet and social media standards.[90]

83   UNESCO, I'd blush if I could: closing gender divides in digital skills through education.
84   AI Now Institute, 2019, AI Now 2019 Report.
85   Dalberg, 23 June 2016, Decoding diversity: the financial and economic returns of diversity in tech.
86   EIGE, 2017, Cyber violence against women and girls.
87   World Wide Web Foundation, 14 July 2020, There's a pandemic of online violence against women and girls.
88   European Parliament, March 2021, Combating gender-based violence: cyberviolence. European added value assessment; Cybercrime Convention Committee (T-CY), Mapping study on cybercrime, with recommendations adopted by the T-CY on 9 July 2018, Council of Europe, 2018.
89   B. Stauffer, As online gender-based violence booms, governments drag their feet, Human Rights Watch, 2020.
90   M. Verveer and L. Di Meco, Gendered disinformation, democracy and the need for a new digital social contract, Council on Foreign Relations, 6 May 2021.

On the other hand, digital advancements can be harnessed to prevent and respond to gender-based violence. During the COVID-19 pandemic, mobile applications and digital devices have proved to be particularly effective to reach groups that suffer multiple forms of discrimination, and to grant them access to information—e.g. deaf women, who cannot access traditional hotlines, can use mobile applications and platforms. Moreover, **mobile phones significantly increase women's sense of safety and independence**.[91] Mobile applications are helping women to stay safe on the streets and assisting women survivors of violence to report abuse (for example, the Be Safe application developed in Montenegro, with support from UNDP, and replicated in North Macedonia).

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91   GSMA, Bridging the gender gap: Mobile access and usage in low and middle-income countries.

III. FRAMING ACTIONS FOR A GENDER-EQUAL DIGITAL INCLUSION
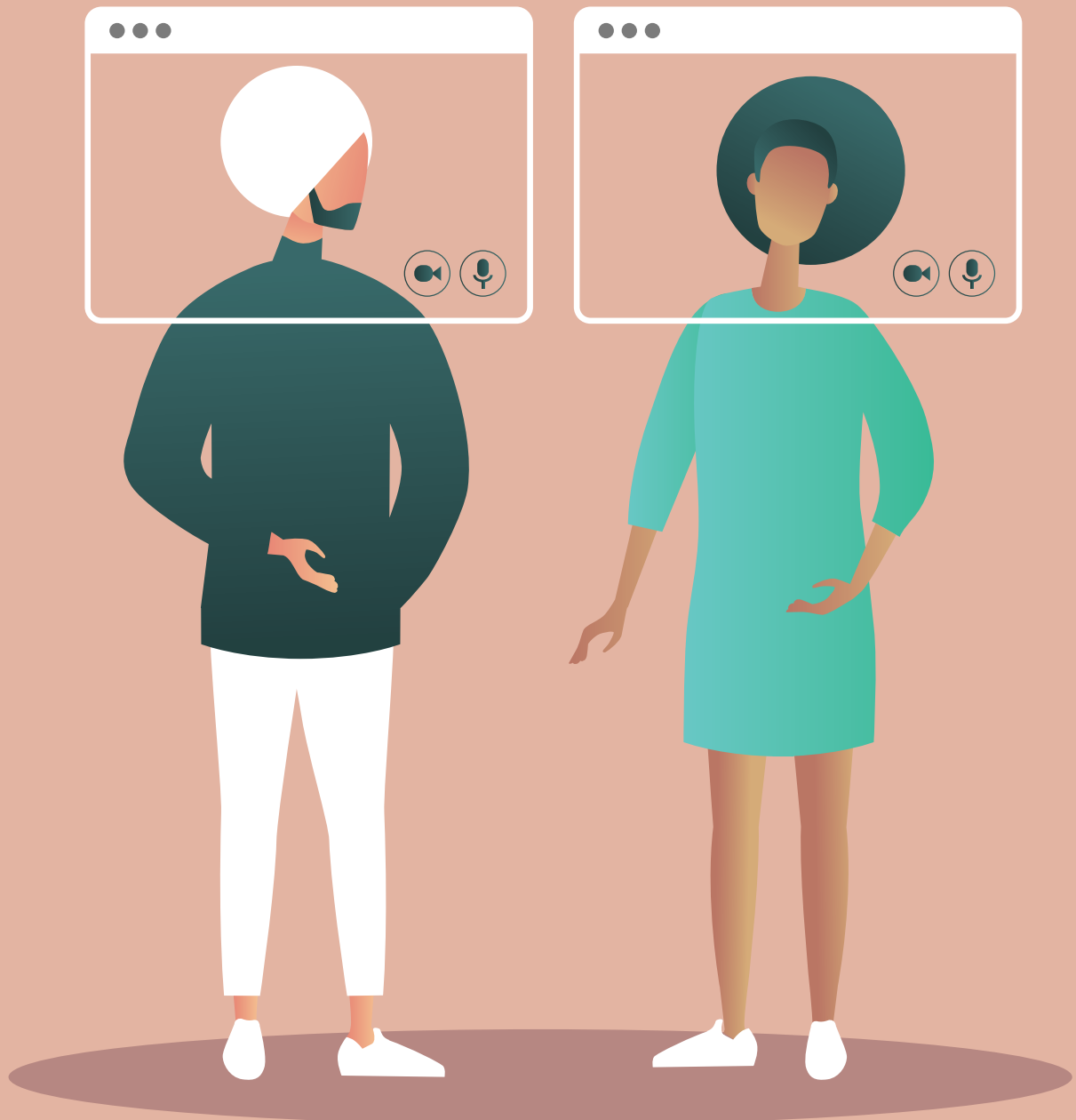
III. Framing actions for a gender-equal digital inclusion

Mapping out stakeholders, whose active engagement or lack of it influences women's digital inclusion directly or indirectly, is the first step in designing an effective and feasible road map for change. It is key to understanding the international, national, regional and local contexts for women's digital empowerment to formulate strategies and to develop concerted actions. Policymakers, the private sector, civil society, academia and international and multilateral organizations must forge strong partnerships to ensure that women are involved in and contribute to the digital transformation, participate in policy-making processes and take advantage of ICTs to improve their livelihoods and education, health and social mobility. If not adequately addressed, gender blindness in digital strategies may amplify gender inequalities.

In conclusion, 'engendering' ICT, by adopting digitalization and ICT policies with a strong gender perspective, is key not only to women's empowerment, but also to human development.[92] Adopting effective measures to bridge the gender digital divide, stimulate women's participation in STEM fields and design gender-sensitive e-services are key to advancing gender equality in all sectors.

This section offers a menu of recommendations for UNDP, including in partnership with national partners in governments and subnational authorities.

a. National and local digitalization strategies

These strategies must be designed with grassroots participation and an in-depth understanding of the gendered nature of socio-economic challenges. They must consider the factors that hinder women and girls from adopting technology and digitalization and explore use cases[93] and potential measures to mitigate these challenges. Given the digital gender disparity, mobilization and education customized to serve women and girls are key pathways to more inclusive digital strategies, together with the increased participation of women in the development process. The creation of a digital public infrastructure is also paramount to supporting the COVID-19 recovery while strengthening inclusion and ensuring respect for human rights. Below are some entry points to address women's digital exclusion and develop gender-responsive digital strategies:

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92   Gurumurthy, Gender and ICTs: Overview report.
93   MicroTOOL, Use cases. Your system at a glance. Use cases document the functionality of a planned or existing system using simple models. Use cases are developed to help people perform tasks more efficiently, by bundling all the possible scenarios that could occur when attempting to achieve a goal.

- Forge partnerships among United Nations agencies, governments, the private sector, media and civil society to address discriminatory norms at the individual, institutional and societal level (e.g. through awareness and sensitization initiatives, legislation, gender-sensitive learning approaches and environments, role models, inclusive workplace measures for work-life balance and diversity policies and programmes).

- Promote partnerships among stakeholders in government, the public and private sector and educational institutions to put in place effective actions against the digital exclusion of women.

- Build a digital public infrastructure (DPI) that is grounded on inclusivity, protects the privacy and security of individuals and groups and that is governed by regulations ensuring accountability and transparency in its implementation. Enhance the collaboration between the public and private sector in developing the DPI.[94]

- Increase cross-sectoral cooperation among governmental ministries and accelerate their capacity-building process to address the impacts of digitalization on women in their respective areas of responsibility. Enhance women's active participation in the development and implementation of digital strategies and policies.

- Support the adoption and implementation of AI-related standards and protocols for ensuring auditable and accountable integration of AI technologies in governance and the protection of human rights.

b. Gender equality in access to technology

Addressing gender gaps in access to technology has become an urgent priority. The COVID-19 pandemic has accelerated the digital transformation process and shaped the day-to-day business of living. It is paramount to ensure that access to essential products and services, which has moved online, is granted to women and men on an equal basis. Better and more affordable access to the internet can also contribute to more women taking advantage of teleworking opportunities, provided that solid social care policies and investments in the care infrastructure are in place.[95] Below are some entry points to improve women's access to the mobile internet:[96]

- Support civil society in advocating for greater and more affordable access to the internet—which is made possible by the following initiatives: providing access to internet services in local languages, lowering the cost of the internet, making 'data-light' versions of applications to reduce the cost for more price-sensitive users, or reviewing sector-specific taxes and fees that may exacerbate the cost barrier to mobile ownership and use.

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94 World Economic Forum, 31 August 2021, How to bring digital inclusion to the people who need it most; United Nations, 30 August 2021, Digital Public Infrastructure Can Help Solve Global Woes, Secretary-General Tells Ministerial Event.
95 Madgavkar et al., COVID-19 and gender equality: Countering the regressive effects.
96 GSMA, Connected Women. The Mobile Gender Gap Report 2020.

- Implement targeted digital literacy programmes to improve women's regular mobile internet use, especially for women from marginalized communities and with lower digital literacy levels.

- Enhance partnerships between UNDP and other United Nations agencies, governments and the private sector to improve underserved communities' access to infrastructure.

- Partner with educators, the media and civil society to assess and address gender biases and harmful social norms that define the differential digital access of women and men and other genders.

c. E-governance and access to e-services

E-governance can play an important role in promoting women's empowerment and gender equality. For instance, e-health services can better address the needs of older women and women with disabilities, provided that standards in digital health governance are in place to guarantee women's access to public telemedicine services. E-government interventions can also help women build peer connections and challenge social norms.[97] Explicit measures are essential for e-governance to be an effective and gender-responsive public policy instrument. UNDP can partner with governments in several actions, including the following ones:[98]

- Ensuring that the design of e-governance policies and strategies is gender-sensitive, grounded in a careful gender analysis of users' profiles and needs and founded on data governance legislation that addresses privacy and safety issues and protects human rights.

- Creating transformative e-governance structures (e.g. digitalization of national identification and registration systems) and enhancing the use of digital technologies and gender-disaggregated data to improve access to social services, including health services.[99]

- Designing digitized delivery of services with an analysis of services that can be e-delivered, ensuring that they are developed considering the needs and capabilities of individuals with lower literacy levels and digital skills, and delivered in ways to benefit women.

- Promoting the active e-participation of women in consultative and decision-making processes, their networking opportunities and social participation in online spaces.

- Increasing access to public information through ICT, e.g. through role models, gender-sensitive data, open access knowledge and gender-disaggregated statistics.

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97   UNESCAP, E-government for women's empowerment in Asia and the Pacific.
98   UNDP, 2008, Gender Responsive E-governance: Exploring the Transformative Potential.
99   UNDP, National Registration and Identification System Project.

Box 2. Principles for inclusive digital welfare[100]

Four principles for creating enabling and inclusive digital welfare are as follows:

- **The creation and use of gender-relevant datasets and statistics.** Data should be presented and collected in a gender-disaggregated manner and reflect gender issues. The definitions and concepts serving as the basis for data should grasp the diversity of women and various aspects of their lives. Methodologies should be unbiased and designed to reflect gendered aspects and build representative datasets.

- **Gender mainstreaming in planning.** Gender mainstreaming should start at the policy planning stage, which ensures cost-effectiveness and reduces the risk of issues emerging during implementation. A proper gender impact assessment should consist of five steps:[101] 1) defining the policy/measure purpose; 2) checking gender relevance; 3) conducting a gender-sensitive analysis; 4) weighing the gender impact; and 5) presenting findings and proposals.

- **Co-design, oversight and feedback.** Co-design may reduce the (un)intended negative impact of designed processes and digital barriers. The design of any digital tool should be based on participation and feedback from users.

- **Equality by default.** A gender perspective should be integrated into all dimensions of measures in order to reverse situations of disadvantage based on evidence and big data.

d. Digital employment and entrepreneurship

Digital technologies and platforms offer innovative and highly remunerative employment and marketing opportunities, especially for women digital entrepreneurs. They can enable women workers to participate more actively in the labour market and help women entrepreneurs expand their business and enter global value chains. Moreover, when equally remunerated and well regulated, gig work can ensure flexibility and a better work-life balance for women workers,[102] and create more inclusive employment, especially for women in crisis and fragile settings, who are frequently affected by limited mobility and documentation. Below are some entry points to increase women's participation in the digital economy:

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100 Digital Future Society, Towards gender equality in digital welfare.
101 EIGE, 2016, Gender impact assessment. Gender mainstreaming toolkit. Prognosing direct and indirect gendered impacts of a measure/policy. The policy concerns target groups (individuals and legal entities), and it is necessary to foresee how it will affect women in terms of their access and control over resources and impact their social situation/position (in positive or negative way).
102 UNDP Europe and Central Asia, 2021, STEM4All: STEM and the gig economy.

- Design and implement gender-responsive digital skills programmes, to enable women to transition to digital-related or digital-enabled employment.

- Develop actions and awareness-raising campaigns that challenge existing digital gender stereotypes.

- Support the development of legislation recognizing and protecting the rights of workers, especially women workers, in digital value chains.

- Establish partnerships between governments and the private sector to foster the adoption of flexible work arrangements and develop solutions to enhance the public and private provision of social care services, to help address unequal distribution of care and housework responsibilities and boost women's employment.[103]

- Create supportive policies and training for women entrepreneurs in digital technologies to enhance their opportunities of the digital market by tailoring actions for women from different groups, especially from remote communities and minorities.

- Enhance the collection and use of gender-disaggregated data to support women entrepreneurs through technology-driven methods and strengthen the public provisioning of platform and data infrastructure for women-led micro, small and medium enterprises (MSMEs) and cooperatives, which can better reap the benefits of data analytics,[104] cheaply market their products and services and reduce their operation costs with cloud computing and chatbots.

- Support networking and peer-to-peer learning for women digital entrepreneurs and increase public investment in marketplaces for artisanal and small producers, many of them being women. Create an ecosystem of partnerships among UNDP, governments, the private sector and civil society organizations.[105]

e. Equal participation in STEM fields and technological innovation[106]

Globally and in the ECA region, STEM and ICT jobs are on the rise. However, education and career opportunities in these fields are still limited for women. Initiatives on education, training and mentoring programmes developed at global, regional[107] and national levels and inclusive workplace policies can increase women's participation in the STEM workforce:

- Tackle issues of gender stereotyping in STEM education and increase awareness and demonstrate the potential of ICT careers for students choosing a course of study at university.

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103 OECD, Bridging the digital gender divide. Include, upskill, innovate.
104 A. Gurumurthy and N. Chami, The deal we always wanted. A feminist action framework for the digital economy, Friedrich-Ebert-Stiftung working group on feminist visions of the future of work, 2020.
105 CUTS International, Overcoming Gender Challenges in E-Commerce. What is being done to support women-owned MSMEs?
106 UNDP, Gender Equality in STEM in Europe and Central Asia region: Recommendations to foster a STEM ecosystem. Summary brief.
107 The UNDP Europe and Central Asia STEM4ALL platform provides a space to create and share collective knowledge on gender equality issues in STEM in the region among women in STEM fields, academics, policymakers, and the private sector in the form of videos, podcasts, publications and webinars.

- Advocate for and promote recognition of women STEM leaders who serve as role models, and develop mentorship programmes connecting girls with role models.

- Build partnerships among UNDP and other United Nations agencies, governments, the private sector and civil society to support women's participation in STEM education and careers, including through programmes supporting formal and non-formal training in STEM fields, and increase men's engagement in the process of fostering women's participation in STEM fields.

- Incentivize the adoption of transparent and gender equitable recruitment, promotion and remuneration policies.

- Adopt and implement policies favouring co-design models in the development of AI, Internet of Things and other digital and e-governance tools.

- Map the impacts of technological innovation on different social groups and partner with the private sector to foster inclusive and needs-responsive design.

- Support governments in introducing gender quotas in incubator or accelerator programmes, with the perspectives of women as employers and users being taken during the design process of products/services.

f. Cybersecurity and cyber safety for women

The internet poses cybersecurity risks, such as cyberbullying or online harassment, social engineering, grooming by sexual predators or addiction. These risks have intensified with the digital migration accelerated by COVID-19, with serious consequences for mental health, self-esteem and confidence, especially for women and young people. More proactive measures and awareness are necessary to prevent women from falling victim to these threats. Moreover, women's limited representation globally in the cybersecurity field poses a challenge, as failing to integrate the gender perspective and ensure women's meaningful participation in decision-making and oversight mechanisms can lead to security needs being overlooked.[108]

More initiatives on education and specific skills, confidence training and role modelling through women-driven/led networking associations are necessary to ensure a more gender balanced cybersecurity workforce that incorporates gender perspectives.[109] UNDP can partner with governments to undertake the following activities:

- Adopt measures addressing toxic masculinities and patriarchal attitudes as main factors conducive to gender-based cyberviolence and acknowledge that this form of violence is a continuum to offline violence.

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108 E. Dorokhova et al., Cyber violence against women and girls in the Western Balkans: selected case studies and a cybersecurity governance approach, Geneva Centre for Security Sector Governance, 31 March 2021.
109 CISOMAG, 8 March 2020, Closing the skill gap with more women in cybersecurity.

- Identify different forms of harassment and gender-based violence online, review existing regulatory frameworks and mechanisms through a gender lens and develop legislation that can serve as basis to prosecute perpetrators of gender-based cyberviolence and protect survivors.

- Ensure that women and girls can report and receive support for online abuse, provide training on gender-based cyberviolence for law enforcement bodies and adopt initiatives to change patriarchal attitudes and practices in security sector institutions.

- Create measures and initiatives to help women experiencing e-GBV, including by providing legal and psychological counselling, and support the development of digital tools to increase women's security online and offline.

- Ensure better accountability, compliance with local laws and implementation of ethical and privacy standards and protocols in the digital space, including by enhancing the involvement of women leaders and activists in the development of standards and regulations.[110]

- Foster partnerships among UNDP, the public and private sectors and civil society to provide women interested in cybersecurity with training programmes, including by establishing cyber skills development academies.[111]

- Increase the collection and use of gender-disaggregated data on employees in cybersecurity to understand and compare how and by whom cybersecurity needs are being addressed.[112]

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110 Verveer and Di Meco, Gendered disinformation, democracy and the need for a new digital social contract.
111 M. Khan, Overcoming gender disparity in cybersecurity profession, G20 Insights, 24 July 2020.
112 Dorokhova et al., Cyber violence against women and girls in the Western Balkans: selected case studies and a cybersecurity governance approach.

IV. KEY RESOURCES AND STATISTICS

IV. Key resources and statistics

Cross-sectoral

- Bridging the digital gender divide. Include, upskill, innovate, Organisation for Economic Co-operation and Development, 2018.

- Bridging the gender gap: Mobile access and usage in low- and middle-income countries, Global System for Mobile Communications Association, 2015.

- Connected Women. The Mobile Gender Gap Report 2021, Global System for Mobile Communications Association, 2021.

- Connected Women. The Mobile Gender Gap Report 2020, Global System for Mobile Communications Association, 2020.

- Connected Women. The Mobile Gender Gap Report 2019, Global System for Mobile Communications Association, 2019.

- Digital Inclusion Benchmark: Scoping Report 2019, World Benchmarking Alliance, 2019.

- Gender and ICTs: Overview report, Anita Gurumurthy, 2004.

- New Insights on Women's Mobile Phone Ownership, Consultative Group to Assist the Poor, 2018.

- Resource center on gender and data, Data2X.

- Taking stock: Data and Evidence on Gender Equality in Digital Access, Skills and Leadership, United Nations University Institute on Computing and Society, International Telecommunication Union, 2019.

- The deal we always wanted. A feminist action framework for the digital economy, FES working group on feminist visions of the future of work, 2020.

- The digital gender gap, Global System for Mobile Communications Association, 2019.

- The digital revolution: implications for gender equality and women's rights 25 years after Beijing, UN Women, 2020.

- The underlying causes of the digital gender gap and possible solutions for enhanced digital inclusion of women and girls, Policy Department for Citizen's Rights and Constitutional Affairs, European Parliament, 2018.

- Women's Rights Online. Closing the digital gender gap for a more equal world, World Wide Web Foundation, 2020.

- Women's Rights Online. Translating Access into Empowerment, World Wide Web Foundation, 2015.

Partnerships for digital equality

- Reaching 50 Million Women with Mobile: A Practical Guide, Global System for Mobile Communications Association, 2020.

- Working Group on the Digital Gender Divide. Recommendations for action: bridging the gender gap in Internet and broadband access and use, Broadband Commission for Sustainable Development, 2017.

E-governance

- E-Government for Women's Empowerment in Asia and the Pacific, United Nations Economic and Social Commission for Asia and the Pacific, 2016.

- E-Government Survey 2020. Digital Government in the Decade of Action for Sustainable Development. With addendum on COVID-19 response, United Nations Department of Economic and Social Affairs, 2020.

- Gender Responsive E-governance: Exploring the Transformative Potential, United Nations Development Programme, 2008.

- Towards gender equality in digital welfare, Digital Future Society, 2020.

Digital entrepreneurship and e-commerce

- New pathways to e-commerce. A global MSME competitiveness survey, International Trade Centre, 2017.

- Overcoming Gender Challenges in E-Commerce. What is being done to support women-owned MSMEs?, Consumer Unity and Trust Society International, 2018.

- Working Group Report. Digital Entrepreneurship, Broadband Commission for Sustainable Development, 2018.

Work in the digital era

- Regulations to address work–life balance in digital flexible working arrangements, European Foundation for the Improvement of Living and Working Conditions, 2020.

- The architecture of digital labour platforms: Policy recommendations on platform design for worker well-being, International Labour Organization, 2018.

- The 'flexible' gig economy is not such a great option for women after all, Open Democracy, 2019.

- Women, Technology, and the Future of Work, International Monetary Fund Blog, 2018.

Cyberviolence, women's safety and online tools combating gender-based violence

- "Be Safe"—A mobile app to protect victims of violence, United Nations Development Programme, 2020.

- Connected women. A framework to understand women's mobile-related safety concerns in low- and middle-income countries, Global System for Mobile Communications Association, 2018.

- Cyber violence against women and girls, European Institute for Gender Equality, 2017.

- Cyber violence against women and girls in the Western Balkans: selected case studies and a cybersecurity governance approach, Geneva Centre for Security Sector Governance, 2021.

Education

- I'd blush if I could: closing gender divides in digital skills through education, United Nations Educational, Scientific and Cultural Organization, 2019.

- Special report on digital literacy for women & girls, International Telecommunication Union, 2011.

- The role of education and skills in bridging the digital gender divide. Evidence from APEC economies, Organisation for Economic Co-operation and Development, 2019.

- Towards an equal future: reimagining girls' education through STEM, United Nations Children's Fund, Equals Global Partnership, International Telecommunication Union, 2020.

Innovation and ICT

- AI Now 2019 Report, AI Now Institute, 2019.

- Gender Equality in STEM in Europe and Central Asia—STEM4All Regional Platform, United Nations Development Programme, 2021.

- ICT specialists in employment, EUROSTAT, 2021.

- Is ICT the future for everyone?, Center for Public Policy Providus, 2020.

- More women in ICT: empowering women in the digital world, European Parliament, 2018.

- Toward Bridging Gender Equality & Innovation, The International Development Innovation Alliance, 2018.
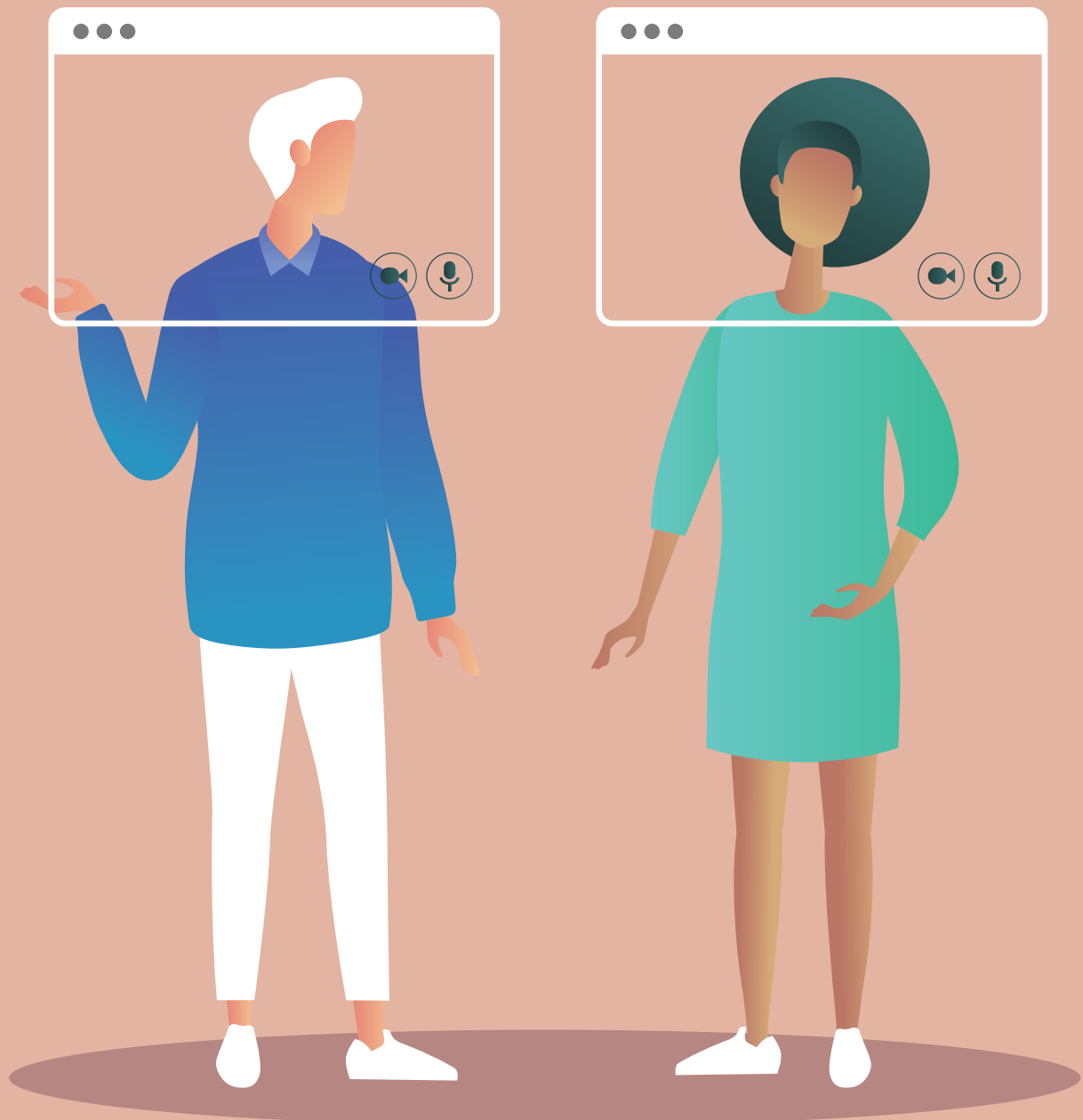
Communication and networking

- Digital activism: empowering women, creating change and demanding human rights, Open Global Rights, 2020.

- Mobile women and mobile phones. Women migrant workers' use of information and communication technologies in ASEAN, International Labour Organization, Spotlight Initiative, 2019.

- The Importance of Mobile for Refugees: A Landscape of New Services and Approaches, Global System for Mobile Communications Association, 2017.

COVID-19

- A case of acute disruption. Digital transformation through the lens of COVID-19, Deloitte, 2020.

- COVID-19 exposed the digital divide. Here's how we can close it, World Economic Forum, 2021.

- COVID-19 exposes the Gender Digital Divide, United Nations Development Programme, pp.39–46, in Emerging science, frontier technology and the SDGs. Perspectives from the UN system and science and technology communities (advance unedited report). Interagency Task Team on Science, Technology and Innovation for the Sustainable Development Goals, 2021

- COVID-19 Response Strategies, Addressing Digital Gender Divides, G20 Insights, 2020.

- The shape of AI governance to come, KPMG, 2020.

ANNEX 1.
ICT, DIGITALIZATION AND THE SDGS

Annex 1. ICT, digitalization and the SDGs

1 NO POVERTY	**Target 1.4:** By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services, including microfinance.
4 QUALITY EDUCATION	**Target 4.b:** By 2020, substantially expand globally the number of scholarships available to developing countries, in particular least developed countries, small island developing States and African countries for enrolment in higher education, including vocational training and information and communications technology, technical, engineering, and scientific programmes, in developed countries and other developing countries.
5 GENDER EQUALITY	**Target 5.b:** Enhance the use of enabling technology, in particular information and communications technology, to promote the empowerment of women.
8 DECENT WORK AND ECONOMIC GROWTH	**Target 8.2:** Achieve higher levels of economic productivity through diversification, technological upgrading and innovation, including through a focus on high value-added and labour-intensive sectors.
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE	**Target 9.a:** Facilitate sustainable and resilient infrastructure development in developing countries through enhanced financial, technological and technical support to African countries, least developed countries, landlocked developing countries and small island developing States. **Target 9.b:** Support domestic technology development, research and innovation in developing countries, including by ensuring a conducive policy environment for, inter alia, industrial diversification and value addition to commodities. **Target 9.c:** Significantly increase access to information and communications technology and strive to provide universal and affordable access to the internet in least developed countries by 2020.

10 REDUCED INEQUALITIES	**Target 10.6:** Ensure enhanced representation and voice for developing countries in decision-making in global international economic and financial institutions in order to deliver more effective, credible, accountable and legitimate institutions.
16 PEACE, JUSTICE AND STRONG INSTITUTIONS	**Target 16.6:** Develop effective, accountable and transparent institutions at all levels. **Target 16.7:** Ensure responsive, inclusive, participatory and representative decision-making at all levels. **Target 16.9:** By 2030, provide legal identity for all, including birth registration. **Target 16.10:** Ensure public access to information and protect fundamental freedoms, in accordance with national legislation and international agreements.
17 PARTNERSHIPS FOR THE GOALS	**Target 17.8:** Fully operationalize the technology bank and science, technology and innovation capacity-building mechanism for least-developed countries by 2017 and enhance the use of enabling technology, in particular information and communications technology.

UNDP