W20 DIGITAL INCLUSION BACKGROUND PAPER
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Summary

- Women's empowerment and gender equality are crucial to development. As the United Nations agreed in its *2030 Agenda for Sustainable Development*, 'The achievement of full human potential and of sustainable development is not possible if one half of humanity continues to be denied its full human rights and opportunities. Women and girls must enjoy equal access to quality education, economic resources and political participation as well as equal opportunities with men and boys for employment, leadership and decision-making at all levels.'[1] The importance of gender equality and empowerment are emphasised in the *Agenda*'s fifth Sustainable Development Goal (SDG5[2]) which aims to 'achieve gender equality and empower all women and girls.'

- Digital technologies have become a powerful force for social and economic development, delivering substantial benefits for both individuals and society. They enable people to access information and services that were previously unavailable to them, opening new opportunities for income generation, personal development and engagement with community and political decision-making. Digital technologies have also challenged existing norms and legal frameworks, sometimes posing new risks, including specific risks to women, which need to be addressed alongside opportunities.

- This paper draws together these two threads, encompassing both the potential and the risks of digital inclusion for women. Digital technologies form a vital part of the *2030 Agenda*'s call for the full development and active participation of women in today's world. One of the targets in the fifth Sustainable Development Goal (SDG5) calls on the international community 'to enhance the use of enabling technology, in particular information and communication technologies (ICTs), to promote women's empowerment.'[3] The W20 can play an important role towards achieving this.

- As things stand, however, women are not as fully engaged in the Information Society as men. In many countries they enjoy less access to digital technologies and the Internet than men, make less use of them, and gain less benefit from them than do men. The root causes of digital gender gaps lie in a complex set of interrelated social, economic and cultural barriers, including lack of available infrastructure, the cost of the Internet, devices and usage, the design and usability of devices, lack of digital skills, concerns related to safety and security, lack of awareness and relevant content, and, cultural factors that impact women's ability to access and use digital technologies.

- Access and use are not the only ways in women interact with digital technologies. They should also be as much involved as men in their design, development, production and governance. Women's participation in these aspects is also limited and unequal. Women are under-

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represented at senior levels in high-technology industries, including the digital sector, and there is a substantial gender gap, in both developed and developing countries, in skills, jobs and careers involving science, technology, engineering and mathematics (known as STEM subjects). These gender gaps begin in education and continue in the workplace.

- Unless the challenges described above are addressed, the increasing economic and social importance of digital technologies means that disparities in access, use and impact could exacerbate existing inequalities experienced by women rather than reduce them. Tackling digital gender gaps should help empower women and reduce the impact of the structural inequalities they face. But the digital gender gaps in access and use of digital technologies, and in participation in the design, development, production and governance of digital technologies, will not close on their own.

- G20 Member States already play a leading role in digital transformation and digital development.[4] Concerted action and cooperation amongst them and in partnership with other stakeholders can address the gender gap and ensure that women participate and gain fully from the emerging Information Society.

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[4] c.f. W20, 2017.

1.   Introduction

It is widely acknowledged that digital technologies – including the Internet, mobile and broadband communications and other rapidly evolving information and communication technologies (ICTs)[5] – contribute positively to economic, social and political development and facilitate the enjoyment of civil and political, economic, social and cultural rights.[6]

They have the potential, in particular, to empower women[7] and help overcome some of the inequalities and barriers to opportunity and achievement that they face. That potential, however, will only be realised if women have the same opportunities to access and use digital technologies, and benefit from them, as men.

Women's participation in the Information Society[8] is constrained at present by two main factors:

- too many women face barriers to access and use digital technologies;
and, underpinning this,
- too few women are involved in the design, development, production and governance of digital technologies.

If these digital gender gaps are not addressed, digital technologies may exacerbate gender inequalities rather than helping to reduce them.

Digital inclusion matters to women, because it makes it less costly to communicate and gives them access to information that is valuable in many ways, facilitates their financial independence and enables them to live independent lives and enjoy independent livelihoods.[9] Such positive impacts do not extend only to women as individuals, but to their communities, economies and development more generally.[10] By contrast, digital exclusion, the potential consequence of continued digital divides, will increase the gap in information access between women and men, reinforcing existing patriarchal power structures[11] and losing opportunities for developmental gains.

Statistics show that women worldwide are less likely to have access to digital technologies and to be involved in their design, development, production and governance than men. Recent research, summarised in this paper, shows that women globally are 12% less likely to use the Internet.[12] In low- and middle-income countries, women are 26% less likely to use mobile Internet than men, and 10% less likely than men to own a mobile phone[13] (the primary means to access the Internet in

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[5] '**Digital technologies**' are all types of electronic equipment and applications which use information in the form of binary code (strings of only two numeric characters, usually 0 and 1). Such technologies include computers, personal computers, calculators, cellular telephones, communications satellites, and high-definition television sets. This paper adopts a broad definition of 'digital technologies' to encompass current and future technologies; including ICTs, cloud computing, big data, artificial intelligence etc.
[6] World Bank, 2016.
[7] Note that all references to women in this paper should be construed as including 'girls' and anyone identifying as women, unless otherwise specifically noted.
[8] The '**Information Society**' usually refers to a society in which the creation, distribution, use, integration and manipulation of information is a significant economic, political, and cultural activity. In 2003 in its *Declaration of Principles*, the World Summit on the Information Society (WSIS) expressed the 'common desire and commitment' to 'build a people-centred, inclusive and development-oriented Information Society, where everyone can create, access, utilize and share information and knowledge, enabling individuals, communities and peoples to achieve their full potential in promoting their sustainable development and improving their quality of life' (WSIS, 2003).
[9] e.g. Alliance for Affordable Internet (A4AI), 2016; UN Secretariat of the Internet Governance Forum (IGF), 2016; World Bank, 2016; UNCTAD, 2015; Web Foundation, 2015; etc.
[10] Chair, 2017:39; GSMA, 2015a:7; Gillwald, Milek & Stork, 2010:i.
[11] These **power structures** generally relate to the ways in which certain social systems enable men to hold and retain power and to dominate in familial, political, moral, economic and social positions.
[12] ITU, 2017.
[13] GSMA, 2018:3.

developing regions[14]). The gap is most pronounced in Least Developed Countries (LDCs), where women are 33% less likely to use the Internet and where only one in every seven women uses the Internet compared with one in every five men.[15]

As societies become increasingly dependent on digital technology, women, their broader communities and national economies are at risk of losing out on the positive promise of full participation in digital economies. Recognising this, in 2017 the W20 called on the G20 to pay special attention to narrowing and removing the digital gender gap with regard to the access, use, and impact of ICTs.[16] This paper summarises the present situation, describes some of the challenges involved, and reviews existing initiatives and recommendations from various stakeholders which may provide a way forward for coordinated and effective action by the G20 in support of women's empowerment and equality.

2.   What is the digital gender divide?

This first section of the paper summarises evidence that is currently available about the digital gender divide in two key areas:

a) access and use; and
b) participation in the design, development, production and governance of ICTs.

a)   Access and use

The extent to which data are available on access and use of digital technologies by women and men varies between countries. Better data needs to be gathered, in more countries, in order to enhance our understanding of the digital divide (see box). Nevertheless, the evidence that is available is clear. It indicates that there are major differences in most countries between women and men in the extent, frequency, and quality of access; that these differences are greater in developing countries than in developed countries, and that they are greatest in LDCs.

Measuring the digital gender divide

Measuring the digital divide is challenging. The data sets that are compiled by international organisations from national sources are of variable quality, while estimates often have to be made for individual countries based on older data or data from comparable countries. Gender-disaggregated data on Internet access and use are rarely gathered at a national level, although there have been noteworthy efforts by research organisations and others to measure the gaps in access and usage across countries, especially in developing markets.[17]

The availability of gender-disaggregated data is still very limited, especially in low and middle-income countries and in different national (for example, urban/rural) contexts.[18] National statistical offices often lack the resources to collect such data, while reasons ranging from data protection to commercial confidentiality may limit private companies' ability to share data.[19]

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[14] GSMA, 2015b.
[15] ITU, 2017b.
[16] W20, 2017.
[17] e.g. the efforts of GSMA, APC, DIRSi, LIRNE*asia*, Research ICT Africa, etc.
[18] Sylvester, 2016:viii; Galperin, Mariscal & Barrantes, 2014.
[19] e.g. A4AI, 2016:34; GSMA, 2015a: 2; Broadband Commission, 2013:7.

As a result, available statistics fail to reflect the true extent of gender discrepancies in access in different countries around the world,[20] there are limited data distinguishing how women and men use the Internet, and more information is needed about how women living in different circumstances experience the challenges involved. Calls for the improvement of gender-related data gathering and analysis have been made by many organisations, including the UN Broadband Commission for Sustainable Development.[21] They will require both capacity building and financing.

The gender digital divide is calculated by subtracting the access rate for women from that for men, and then dividing this by the access rate for men.[22] Latest (2017) estimates from the ITU suggest that 51% of men worldwide have Internet access compared with 45% of women. Women globally are 12% less likely than men to have Internet access, so this percentage represents the gender digital divide where Internet access is concerned.

Substantial differences are evident in data gathered by the ITU between the world's different development categories. These are illustrated in Figure 1. The digital gender gap for Internet access in developed countries (as defined by the United Nations) is estimated to be 3%, while in LDCs, where Internet access tends to be very low, the gap is estimated at 33%. There are also significant differences between regions. In Africa, women are 25% less likely to use the Internet than men; in the Arab States region, 17% less likely to make use of it, and in the Asia and Pacific region 17% less likely to do so. The only region where a higher percentage of women than men use the Internet is the Americas. [23]

Figure 1: Internet penetration rates by region and development status
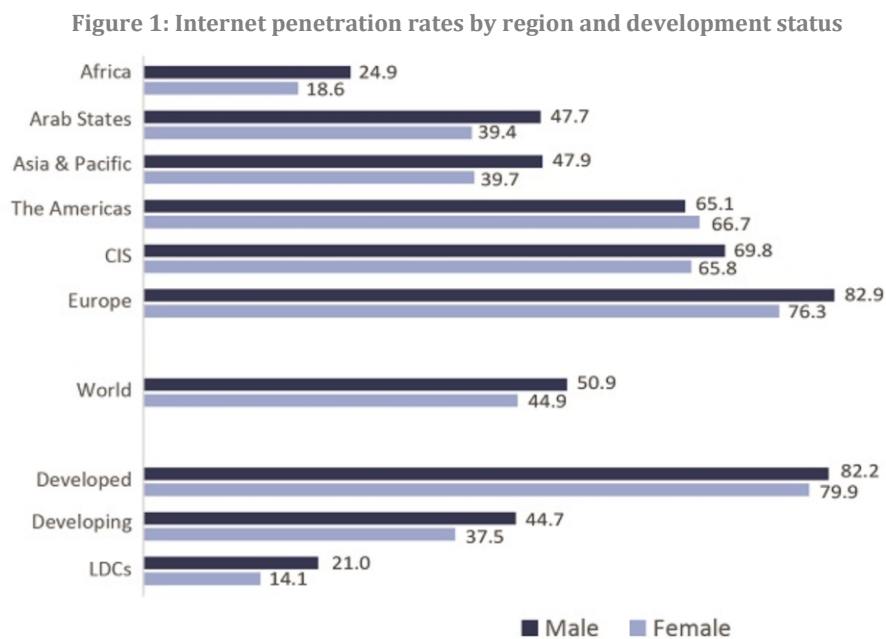
Source: ITU[24]

These regional averages should not, however, obscure different outcomes in different countries, geographic districts and demographic groups. More detailed household surveys in six Latin American countries indicate that Internet access is approximately equal between women and men in

[20] APC, 2015d.
[21] Broadband Commission, 2017.
[22] A positive figure therefore means that more men than women are included; a negative figure more women than men.
[23] ITU, 2017.
[24] ITU, 2017b:19.

Colombia and Argentina, but that men are significantly likelier to be online than women in Guatemala, Peru and Paraguay.[25]

Women are also less likely than men to own or use a mobile phone, the most common means of personal communications and Internet access in developing countries.[26] A 2018 study by the GSM Association (GSMA), illustrated in Figure 2, found that women who live in low- and middle-income countries are on average 10% less likely to own a mobile than men – which adds up to 184 million fewer women than men owning one – and 26% less likely to use mobile internet. Like that for the Internet, this gender gap is also wider in some parts of the world. GSMA evidence suggests that women who live in South Asia are 26% less likely to own a mobile than their male peers, and 70% less likely to use mobile Internet.[27]

More detailed information from sixteen countries in Africa, Asia and Latin America can be found in recent household and individual surveys undertaken in 2017 by three leading regional research centres.[28] These showed that women are less likely to have mobile phone or Internet access in almost all of the African and Asian countries surveyed. In some Latin American countries surveyed, however, where mobile phone ownership is higher, women are more likely than men to own a mobile phone but less likely in most cases to own a smartphone.[29]

Figure 2: Mobile phone ownership in low- and middle-income countries
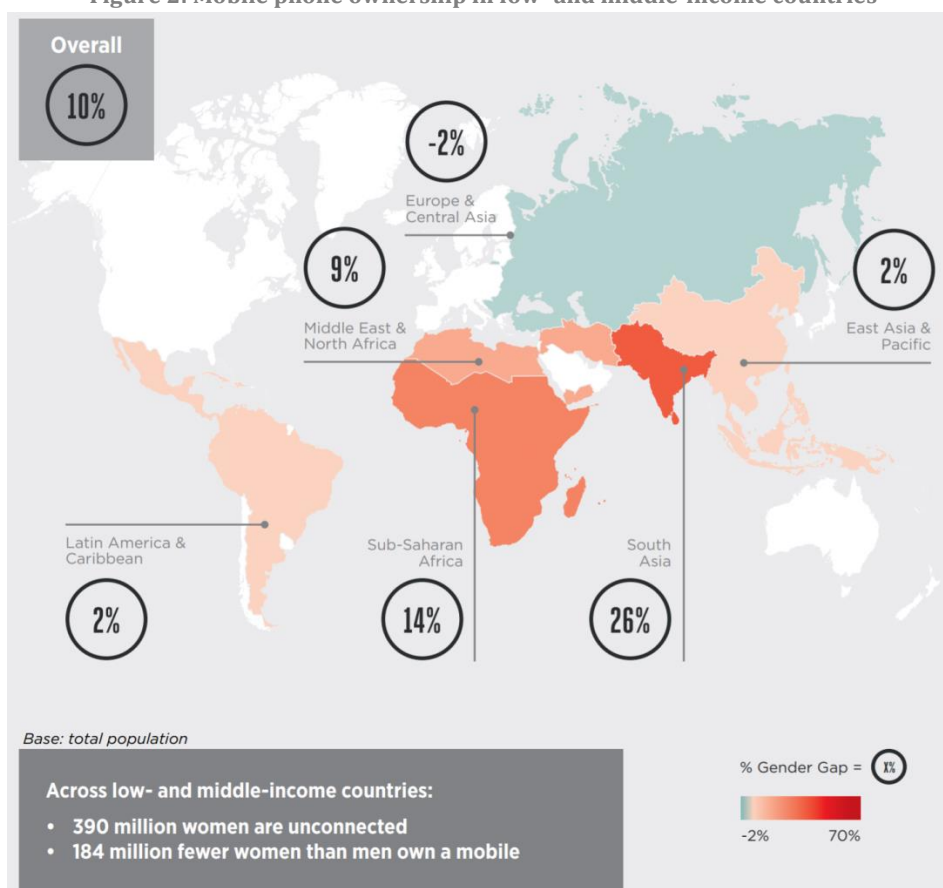
Source: GSMA[30]

[25] Research ICT Africa, 2017.
[26] A4AI, 2016:19.
[27] GSMA, 2018.
[28] See: http://afteraccess.net.
[29] Research ICT Africa, LIRNE*asia* & DIRSi, 2017.
[30] GSMA, 2018.

All of this evidence shows, amongst other things, that the digital gender divide is more severe in lower-income than in higher-income countries. Most adults, irrespective of gender, now own a mobile phone and access the Internet in most developed countries. Access to ICTs in many developing countries, however, and especially in LDCs, is much less universal and more dependent on income, location, and other factors. In Brazil, for example, the mobile Internet gender gap in urban areas is only 2%, compared to 32% in rural areas.[31]

Economic modelling has demonstrated that the principal drivers of gender inequality in most countries arise from structural inequalities between women and men, particularly inequalities in income and educational attainment. This is as true of digital inequality as it is in other areas. Where men have higher incomes than women do, they are generally better able to afford mobile phones and the Internet; where they have higher literacy and educational attainment levels, they are more likely to adopt them and to have more confidence to use them. Women who have both low income levels and low educational attainment levels are most likely to experience digital, as well as other forms of marginalisation, particularly if they live in remote or rural areas. Women's digital disadvantage may also be exacerbated by social and cultural factors (see section 5 below). [32]

The data sets outlined above are useful in establishing the scale of the gender digital divide, but they only tell part of the story. It is important, too, to assess how access and use are experienced by particular groups of women (for example young women and elderly women, women who live in rural areas, those who live with disabilities, those who face discrimination because of their sexuality, those who are refugees). Some groups of women are relatively well-served in the digital environment, while others experience multiple disadvantages. The contexts in which women live are important to understanding how the digital gender divide should be addressed.

b)   Participation in design, development and production of digital technologies

Access and use are not the only ways in which women interact, or should interact, with digital technologies. Women should also be as much involved as men in the design, development, production and governance of digital technologies. Women's participation in this context too, however, is both limited and unequal. This must also be addressed if we are to tackle the digital gender divide.

It is widely recognised that women are under-represented at senior levels in high-technology industries, including the digital sector.[33] There is a substantial gender gap, in both developed and developing countries, where skills, jobs and careers involving science, technology, engineering and mathematics (known as STEM subjects) are concerned.[34]

The problem here begins with education. Gender differences are present at all levels of STEM education, but particularly higher levels. Although data on subject selection in secondary education are limited, those available show that in most countries, the majority of students taking advanced

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[31] *ibid.*

[32] Gillwald & Deen-Swarray, 2018 (forthcoming).

[33] ISACA, 2017; World Bank, 2016:100; AkiraChix, 2015: 41; Microsoft, UNESCO, UN Women & ITU, 2014:2.

[34] Broadband Commission, 2016:48; UNDESA, 2015:30; APC, 2015d:13.

courses in mathematics and physics are boys. Globally, young women represent just 35% of all students enrolled in STEM-related disciplines in higher education.[35]

Although more women than men enrol in tertiary courses now in almost all regions, women lag behind men in completing STEM degrees. Only 4% of countries have achieved gender parity in STEM subjects at tertiary level. Relatively high proportions of women are enrolled in engineering, manufacturing and construction in South-East Asia, the Arab States, and some European countries, but the figures in sub-Saharan Africa, North America and Europe are less positive.[36] The proportion of female students enrolled in natural science, mathematics and statistics courses ranges from 16% in Côte d'Ivoire to 86% in Bahrain. In Chile, Ghana and Switzerland, women account for less than one-quarter of all STEM degrees.[37]

There are many reasons for these discrepancies, starting with persistent stereotyping of the roles of girls and boys in school. The problem continues, not surprisingly, within employment. Women are less likely than men to enter STEM careers and more likely to leave them.[38] In the technology sector, men outnumber women at every level, with the starkest differences at the top of the industry, where women make up just 21% of technology executives.

These differences are important both in principle and practice. UNESCO has described STEM careers as "'jobs of the future,' driving social and personal well-being, inclusive growth and sustainable development, through innovation and creativity."[39] Recent analysis shows that, at least within developed economies, 90% of jobs require some level of digital skills.[40] Women's under-representation in these areas reflects and reinforces their under-representation in senior decision-making roles in government and other areas of business. More participation by women in leading this dynamic sector would help to redress this wider deficit in female leadership and provide much-needed role models for girls in education and early careers.[41]

Women's under-representation in decision-making roles has practical implications too. More than half of global executives say they face a shortage of capable tech workers – a shortfall that is preventing businesses from growing as rapidly as they would like.[42] More opportunities for women in STEM education and in STEM careers would help address this shortfall.

New ICT services and applications are sometimes criticised for focusing mostly on men's priorities or paying too little attention to women's needs – for example, for safe access to public Internet facilities, private access to information on reproductive health, and protection from online abuse. It is widely felt that these deficiencies would be less apparent if women were more involved at senior levels in the sector.

Discussion of women's role within the sector should not, however, be confined to senior STEM levels. Women play a significant part at less senior levels in the workforce that produces digital technologies, content and services, particularly junior levels. Many women work in low-skilled, low-paid occupations relevant to digital technologies, including mining, manufacturing and online

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[35] UNESCO, 2017b
[36] *ibid.*
[37] Global Education Monitoring Report, 2018.
[38] UNESCO, 2017a & b; ISACA, 2017.
[39] UNESCO, 2017b.
[40] Global Education Monitoring Report, 2018.
[41] ISACA, 2017:3.
[42] *ibid.*

services such as call centres.[43] Women's experience in these roles is often tedious, stressful, exploitative or dangerous.[44] Gender equity demands that this be given greater recognition and attention, particularly concerning their employment rights.

The emergence of platform businesses,[45] which leverage online resources to match supply and demand for services such as accommodation, local transport or delivery and online piecework, is a recent phenomenon whose lasting impact on employment is unclear, already different in different sectors and in different countries, and very likely to increase. This also has important implications. One recent study, for example, examined earnings data from over 1.8 million drivers in the so-called 'gig economy', 27% of whom were women. Its findings suggested that men surveyed earned more than women did per hour and worked shorter hours, which researchers concluded could lead to gender earnings gaps. More evidence needs to be gathered on the experience of women and men working in these new types of employment, in developed and developing countries, in order to understand what impact they are having on earnings, experience and employment rights.[46]

3.   Why is it important to overcome the gender digital gap?

As mentioned in the introduction, the positive impact of digital inclusion extends not only to women as individuals, but also to their communities, economies and development more generally.[47] By contrast, digital exclusion increases the gap in information access between women and men and leaves women behind when it comes to 'jobs of the future', [48] reinforcing existing patriarchal power structures and losing opportunities for developmental and economic gains.

The importance of digital inclusion for promoting women's rights and development was recognised in the *2030 Agenda for Sustainable Development*,[49] which was adopted by the United Nations General Assembly in 2015. Goal 5 of the Agenda sets targets for gender equality and for empowering women and girls, including a target to enhance the use of digital and other enabling technologies to promote empowerment. Goal 9, meanwhile, urges the international community to '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.'

The General Assembly reiterated this message concerning gender and digital technologies later the same year. Its ten-year review of implementation of WSIS (World Summit on the Information Society) outcomes encouraged stakeholders to ensure 'the full participation of women in the information society and women's access to new technologies', and emphasised the need for measures to achieve gender equality amongst Internet users by 2020.[50]

Many other international organisations have stressed that women's digital inclusion will help to catalyse developmental benefits not just to women themselves, but also to their communities and

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[43] e.g. Nakamura, 2017; 2015; Gurumurthy & Chami, 2017.
[44] For example, several women have committed or attempted suicide by leaping out of factory dormitory windows of an electronics producer (Nakamura, 2017:3).
[45] Examples of platform businesses are Airbnb (short-term accommodation rentals), Uber (a transport ride-sharing service) or SweepSouth (cleaning services).
[46] Graham, 2018; Cook, Diamond, Hall, List & Oyer, 2018.
[47] Chair, 2017:39; GSMA, 2015a:7; Gillwald, Milek & Stork, 2010:i.
[48] UNESCO, 2017.
[49] UNGA, 2015a.
[50] UNGA, 2015b.

national economies.[51] The UN Broadband Commission for Sustainable Development, for example, has asserted that:[52]

> *Expanding women's access to ICT can enhance the reach of policymakers to a far broader population base, as women are more likely to take the time to inform others and reflect such knowledge in family and community planning. By the same token, increased access will ... give women distinct voice in development planning and allow them to be active participants in having gender-aware policies and programmes at the local and national levels.*

The World Bank has declared that digital technologies should 'contribute positively to protecting women's human rights, and to their economic, social and political empowerment and development'.[53]

While these positive impacts on women's lives and prospects have been widely documented, it is important to recognise that the developmental potential of digital technologies depends on how and how far women can access and use them.[54] To be beneficial to women, access to and use of digital technologies must be universal, affordable, unconditional, meaningful and equal.[55] It must meet women's varying circumstances, needs and priorities, in the different countries and different contexts in which women live their lives and earn their livelihoods.

A number of barriers to digital inclusion are often raised when talking about ''meaningful''[56] access. These are discussed in the next section. Before considering these barriers, however, it is important to consider how and to what extent women are able to access and use the Internet.

One aspect of this concerns the different levels of connectivity which can be found in different contexts, ranging from its total absence in remote and rural areas to high-speed, unlimited bandwidth in some wealthy cities.[57] The capabilities of devices also have significant impact on digital experience, with smartphones, for example, offering much greater and much faster access to the Internet than other mobile handsets.

The impact of these differences can be seen in evidence from household surveys undertaken in 2017 and other recent research. In Myanmar, for example, 78% of mobile owners used smartphones in 2016, with the gender gap in smartphone ownership among mobile owners being only one percent.[58] In Rwanda, by contrast, where only 5% of women use the Internet compared with 12% of men, the smartphone adoption rate for both women and men is below 10%.[59] In South Africa, 60% of male mobile users have access to a smartphone compared with 52% of women mobile users; 54% of men use the Internet compared with 46% of women.[60] These gender gaps may well be linked.

Research has also shown that the gender gap grows larger as devices and services grow more complex. GSMA research in 23 countries found that while women and men use simple services such as voice calls at similar levels, texting, or SMS use, was lower for women in around half the countries

[51] Chair, 2017:39; GSMA, 2015a:7; Gillwald, Milke & Stork, 2010:i.
[52] 2017.
[53] Broadband Commission, 2017; Scott *et al.,* 2017:3; Web Foundation, 2016:1.
[54] Chair & Deen-Swarray, 2015:8.
[55] Gurumurthy & Chami, 2017:8; Adera, Waema, May, Mascarenhas & Diga, 2014; Thas, 2005.
[56] e.g. IGF, 2016.
[57] APC, 2015b.
[58] Zainudeen, Galpaya, Hurulle & Suthaharan, 2017:15.
[59] Research ICT Africa, LIRNE*asia* & DIRSI, 2017.
[60] Research ICT Africa, 2017.

surveyed. The gender gap in mobile Internet use, in turn, was found to be greater than the mobile ownership gap in 19 of the 23 countries surveyed. In India, for example, 77% of female mobile owners and 78% of male phone owners make or receive voice calls at least once per month, while only 13% of female mobile owners had used mobile Internet in the past three months compared with 31% of males.[61]

Another factor which impacts the intensity of women's use is whether they have private access, borrowed access or have to use public access facilities (such as cybercafés, libraries or schools) to go online. Many women rely on sharing and borrowing devices because, for one reason or another, they cannot afford or otherwise obtain their own (see section 5 below). Borrowing devices limits the quality of access. Research has shown that owners are often hesitant to share handsets with women because of concerns about privacy or payment.[62] When women do borrow them, they may be unable to use them with sufficient privacy to access information that they need (for example, on sexual or maternal health). Borrowing devices also gives women fewer opportunities to develop the digital literacy skills they need to take fuller advantage of online resources.[63]

When women cannot own or borrow devices to gain access, and/or live in areas where there is poor network deployment, they may rely on public access facilities. While these play an important part in providing meaningful access for many women,[64] basic requirements - including location (safe and accessible areas with suitable operating hours), privacy (including separate areas for men and women), and cultural sensitivity (the availability of female staff, childcare capacity) – are often absent.[65]

Even when high-speed connectivity and devices with high functionality are available, women's access to information, including access to information about reproductive rights, safe sex and birth control, can be restricted by legislators or private sector actors implementing regulatory, commercial or cultural constraints. Digital technologies can also pose problems that affect women disproportionally. These include, for example, problems of online abuse and harassment; the risk of theft and identity fraud; and the ways in which the Internet and online services, such as social media, have changed relationships between individuals, between women and men, and between different generations. Mothers are often especially concerned about their children's use of digital technologies. While these risks pose a barrier to use, women also know that digital technologies can act in ways that enhance their safety (see section 5 below).

If these complex and multifaceted challenges arising from digital technologies are to be addressed effectively, it is vital that women and their experiences are included, not just as consumers but also as designers, developers and producers of digital technologies.

5.   What are the barriers to digital inclusion?

As described in the previous section, leveraging the developmental value that digital technologies can offer women depends on how and how far women are able to access and use them[66] and the extent to which women participate in the design, development, production and governance of digital technologies.

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[61] GSMA, 2018:10.
[62] GSMA & LIRNE*asia*, 2015:42.
[63] GSMA, 2015a:34.
[64] A4AI, 2016:25; APC, 2015d; Broadband Commission, 2013:40.
[65] A4AI, 2016:9 & 2015:21; APC, 2015d; Cummings & O'Neil, 2015:9; Adera *et al.*, 2014; Galperin *et al.*, 2014:26; ITU, 2011.
[66] Chair & Deen-Swarray, 2015:8.

This section of the paper describes the principal barriers to women's inclusion that have been identified through research and analysis. Addressing these is the principal target of a number of ongoing policy interventions and programmes concerned with gender and digital technologies, some of which are summarised in Section 6. Recommendations concerning potential G20 support for these initiatives and other work are highlighted in Section 7.

Barriers to access and use

The barriers to women's digital access and use are interrelated and it can be difficult to separate one from another. They can, however, be divided into the following six categories for ease of interpretation:

a) the availability of relevant infrastructure;
b) cost and affordability;
c) design, usability and skills;
d) safety and security,
e) awareness and relevant content, and
f) cultural norms which inhibit women's full participation in society.

These barriers are often deeply rooted in social and economic structures that constrain women's ability to benefit from the potential 'digital dividends' of access and use.[67] While men also experience these barriers,[68] structural inequalities such as those in income, education and employment opportunities mean that, on average, women are likely to experience them more severely. These in turn may be reinforced by social norms which, for example, may prioritise boys' education over that of girls', restrict women's opportunities to access jobs, or constrain the social and cultural environments available to them.

a)   The availability of relevant infrastructure

The most straightforward access barrier faced by many people, men as well as women, results from the physical unavailability or inadequacy of infrastructure, including network coverage (including coverage with the capacity required for smartphone usage) and the electricity required to power them. Women who live in poor and remote areas often find the Internet particularly difficult to access because of limited connectivity. Public access facilities may offer an alternative where there is a lack of mobile networks. However, such facilities may only be available in locations that women find unsafe or inaccessible, or where social norms and safety concerns curtail freedom of movement.

Other infrastructure barriers to access and use include the limited availability and high cost of electrical power,[69] which women need to charge devices.[70] In some societies, women also experience difficulties in obtaining proof of identification which is required to open accounts or register SIM cards.[71]

b)   Cost and affordability

[67] *ibid.*
[68] c.f. Research ICT Africa, LIRNE*asia* & DIRSi, 2017.
[69] APC, 2015d.
[70] Ya'u & Aliyu, 2017:25.
[71] GSMA, 2015b.

Cost remains the greatest barrier to mobile phone ownership for many men and women.[72] There are two aspects of this: the cost of devices and the cost of usage (which is almost always prepaid in developing countries).[73] The cost of usage is generally higher, as a proportion of income, in poorer countries than it is in those which are more prosperous. For example, the Alliance for Affordable Internet (A4AI) has calculated that to buy 1GB of data in Africa cost on average nearly 18% of average monthly income.[74]

Cost typically affects women more than it does men because women's income is generally lower than men's.[75] In addition, women often have less financial independence and find it more difficult to access capital than men.[76] Women are therefore more sensitive to price than men when buying mobile phones, and often choose those with poorer quality and connectivity, enabling lesser access to the Internet and other information sources.

Regulatory interventions might help address the costs of usage. A lack of competition in telecommunications markets and poor allocation of radio spectrum tend to increase the cost and lower the quality of connectivity.[77] Regulatory interventions might also help where costs of usage are concerned. Thanks to legislative reforms like the creation of an independent regulator and improved market competition which reportedly led to more transparency and openness in regulatory decision-making, Mexico's ranking on A4AI's Affordability Drivers index[78] improved significantly.[79]

The price of equipment, particularly higher-cost devices which enable better connectivity, may be inflated as a result of taxes, duties and royalties on ICT devices.[80] Price cuts for devices and connectivity would make it easier for women to gain access with better quality.[81]

c)   Design, usability and skills

The design of digital technologies impacts on women's ability to use them.[82] Unfortunately, because too few women are involved in the design and development of digital technologies, women's needs and priorities are insufficiently considered when innovations are developed into new devices and services.

Where Internet access is concerned, relatively simple design changes can make connectivity and services such as those offered by e-government more attractive to women. Digital tools that are designed with women's specific needs and priorities in mind are more likely to be used by women and more likely to encourage women to use other online services.[83]

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[72] GSMA, 2018.
[73] *ibid, 19.*
[74] A4AI, 2017.
[75] Web Foundation, 2016.
[76] e.g. A4AI, 2016:19; APC, 2015d; GSMA, 2015a:44; UNCTAD & ILO, 2014:4-5.
[77] e.g. IGF CENB, 2016.
[78] The ADI assesses the extent to which countries have implemented a number of factors that can lower the overall cost structure for broadband (i.e., affordability drivers).
[79] A4AI, 2017.
[80] Broadband Commission, 2013:40.
[81] GSMA, 2015a:44.
[82] e.g. Adera *et al.,* 2014:116; Kee, 2005; Thas, 2005.
[83] Cummings & O'Neil, 2015:6.

But even with better design, women still need the skills and confidence to engage with digital technologies effectively at every level, from basic usage to professional work and governance. Structural inequalities between women and men underpin many of the challenges women face in this respect. In many countries, girls have poorer access to education than boys and, as a result, more are illiterate.[84] Limited literacy all too easily leads on to lack of digital and media skills and literacy, reducing women's ability to take advantage of online resources and to access employment in the digital economy.[85] Some countries have taken positive steps to improve digital literacy skills, like Turkey, in which the Fatih programme offers ICT training to students in classrooms across the country.[86] Many countries still have a long way to go, however.

There is strong evidence that lack of digital skills inhibits online activity.[87] GSMA has found that women who have limited digital skills tend to limit their use of mobile devices to so-called 'application islands', a small selection of services or applications with which they feel more confident.[88] Women are less likely than men to use transformational services if they lack confidence, preventing them from reaping the full benefits of innovations. Women are often unfamiliar with the safety and privacy settings that they could use to make online resources easier and safer for them to use. When seeking guidance in such circumstances, women tend to rely for guidance on friends and family members who may themselves have limited skills. The World Bank has suggested that a combination of these factors contributes to many women feeling that they lack control over technology.[89]

d) Safety and security

Digital technologies both empower women, on the one hand, and, on the other, can foster abuse that disempowers them.[90] Online harassment, abuse and violence can represent significant barriers to access for many women, in different ways in different contexts.[91] Those women who live in poor and remote areas may only be able to access the Internet at schools, where privacy is limited, or public access facilities, which may be unsafe or inaccessible. Those women who own or wish to own devices often feel vulnerable to theft, online harassment and fraud.[92] Applications and services intended to promote women's safety have also been used to track and harm them.[93] In many countries, women have experienced online abuse – from petty harassment and trolling to stalking and sexual intimidation. Women in public life in many countries experience attempts to drive them out of political debate through intimidation and abuse.[94]

It is increasingly recognised that online abuse should be considered an aspect of gender-based violence[95] that limits women's freedoms and human rights, and violates the Convention on the

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[84] e.g. UNESCO, 2015a:20; Galperin *et al.*, 2014; Thas, 2005; UN CSTD, 1995.
[85] Ya'u & Aliyu, 2017:24; Perampalam, Zainudeen & Galpaya, 2016; Rajapakse, Zainudeen, Galpaya & Perampalam, 2016; Web Foundation, 2016; A4AI, 2015:14; Galperin *et al.*, 2015; Deen-Swarray *et al.*, 2012:1. de Silva, Ratnadiwakara & Zainudeen, 2011; Hilbert, 2011; Zainudeen & Ratnadiwakara, 2011.
[86] A4AI, 2017.
[87] GSMA & LIRNE*asia*, 2015:15; GSMA, 2015b:4; Web Foundation, 2015:4.
[88] GSMA, 2015b.
[89] World Bank, 2016:134
[90] Gomberts, 2016:2.
[91] e.g. Scott *et al.*, 2017:10; Ya'u & Aliyu, 2017:3; Chair, 2017; Web Foundation, 2016; IGF BPF, 2015; GMSA, 2015:50; Pasricha, 2016; IGF BPF 2015; Broadband Commission, 2015; APC, 2015a; Lyndon, Bonds-Raacke & Cratty, 2011; APC & Hivos, 2013; Madanda *et al.*, 2009.
[92] Broadband Commission, 2017; UNESCO, 2017b.
[93] Shephard, 2016; HarrassMap, n.d.
[94] e.g. the online abuse faced by Caroline Criado-Perez when she campaigned for having a female figure on British Pound notes (Kenny, 2015).
[95] Briones & Sulathireh, 2016:34; Chair, 2016; Doria, 2015; APC & Hivos, 2013; Kee, 2005.

Elimination of All Forms of Discrimination against Women (CEDAW).[96] Many governments and legal systems fail to deal adequately with infringements of these rights, offline or online. National laws are often insufficient to deal with online abuse.[97] More needs to be done to address these important barriers to women's inclusion, including in design of handsets and online applications.

The picture is not entirely negative, however. Studies also show that women can use mobile ownership and access to services in ways that protect and enhance their personal security.[98] Some examples of mobile-related services that aim to address women's safety concerns include anonymous top-up services where women do not have to disclose their mobile phone number to the agents, panic button apps, emergency credit and helplines, and harassment mapping apps.[99] As in many other aspects of women's experience with ICTs, positive and negative dimensions coexist, providing opportunities for improvement through public policy and business innovation.

e)   Awareness and relevant content

Surveys of Internet users and non-users in developing countries show that many women are unsure or unaware of the potential of communications services to benefit their lives. Recent household surveys conducted by LIRNE*asia*, for example, illustrated in Figure 4 below, found much lower levels of awareness of the Internet and its potential among women than men.

Evidence from these surveys concerning rural areas is particularly interesting. Mobile phone ownership amongst adults (aged 15 to 65) in rural areas was as high as 72% in Bangladesh and 55% in India, while rural Internet access in these countries was very much lower, just 11% and 14% respectively. This is partly because of the low rate of smartphone adoption, which would offer better Internet access than older mobile phones. Awareness of the Internet, however, was also very low, particularly amongst women, as shown in Figure 4. Many Internet users, particularly in developing countries, also equate the Internet with social media services like Facebook rather than the more diverse services it offers.[100]

Figure 4: Awareness of Internet in selected Asian countries by gender

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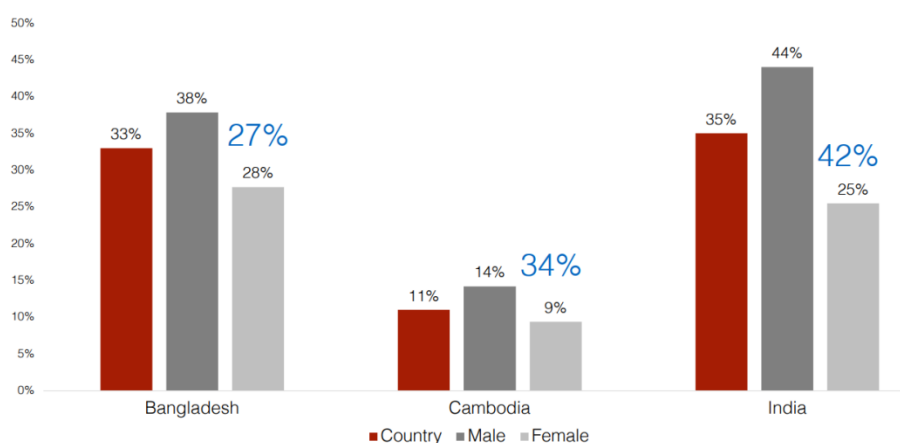
[96] e.g. Scott *et al.*, 2017:10; Khan, 2017a & b; Broadband Commission, 2017; Web Foundation, 2016; Sullivan, 2016; Pasricha, 2016; Dhatta, 2016; Doria, 2015; Garcia & Manikan, 2014; Broadband Commission, 2015:1; IGF BPF, 2015; GSMA, 2015a:50; APC, 2015d; Dhatta, 2015:35; Kovacs, Richa & Shobha, 2013; APC, 2011; Liddicoat, 2011.
[97] c.f. APC/GenderIT.org, 2016 & 2015 (various); APC & Women's Legal and Human Rights Bureau, 2015; Naranjo/Colnodo, 2013.
[98] GSMA, 2018.
[99] For more exmaples of these type of initiatives and others that address mobile-related safety concerns, please refer to GSMA, 2018c.
[100] Research ICT Africa, 2017; Chair & Deen-Swarray, 2016; GSMA & LIRNE*asia*, 2015; Mirani, 2015.

Women in developing countries are often insufficiently aware, therefore, of the range of potentially useful content and applications which could become available to them through mobile apps or mobile Internet – though it should be recognised that there is also, in some countries, a lack of relevant *local* content for them to find. Women with little disposable income, time, literacy, familiarity with the Internet or awareness of relevant content have little incentive to spend time and money to gain access.[102]

Greater awareness of the opportunities the Internet presents is needed to address this. The development of more content relevant to the different circumstances of women's lives, particularly content in local languages women understand, would also stimulate demand.[103] Policies, products, content and services should clearly meet women's needs as well as men's and should be shaped by women's involvement in their design, development and deployment.

f)   Cultural norms

A final factor inhibiting women's access to and use of digital technologies concerns the cultural norms concerning women's lives that prevail to different degrees in different countries. As mentioned, culture and social norms have a significant impact on women's ability to access and use digital technologies and tend to affect women more than men. Cultural factors which act as barriers to digital technologies are difficult to address, deeply entrenched, and often so subtle that women fail fully to recognise their impact. Stereotypes, gender discrimination and social norms can be difficult to measure and address because they are deeply ingrained within societies.

For example, some women are prevented from obtaining full access to digital technologies by family members or social restrictions within their communities. Others are fearful of the Internet because they believe content may be inappropriate, offensive or harmful to them.[104] These barriers may exacerbate other inequalities women face, including those arising from lower incomes and educational attainment levels. Young women, in some countries, are particularly likely to experience barriers to access, use, adoption and participation, which may differ from those affecting older women. The evidence base enabling greater understanding of these differences amongst women's experiences remains weak and needs to be developed.

Barriers to women's participation in design, development, production and governance

This section of the paper has mostly focused on the barriers women face in gaining access to and using digital technologies. As previously discussed, it is also important to consider the barriers women face to participating in the design, development, production and governance of those technologies.

The gender gaps affecting skills and access to jobs and careers in STEM disciplines and workplaces, including digital technologies, begin with barriers women face in education. Some teachers and

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[101] Research ICT Africa, LIRNE*asia* & DIRSI, 2017.

[102] e.g. GSMA, 2017; Web Foundation, 2016; GSMA & LIRNE*asia*, 2015; Jouhki, 2013; Wang & Wang, 2010.

[103] e.g. Cummings & O'Neil, 2015:18; APC, 2015d:3; Broadband Commission, 2013:7.

[104] GSMA, 2017.

parents, for example, and indeed some students, believe that STEM subjects are more appropriate to boys than girls, discouraging girls from choosing them as options when choices must be made. Other issues are more general. Parents who, for financial reasons, need to prioritise the education of one child over another, often choose to favour boys. Curricula, textbooks and teacher education programmes frequently reflect stereotypical perceptions of women's roles in society.[105] School-related violence (including offline and online bullying) and safety considerations on the way to and from school inhibit girls remaining in full-time education, as do early marriages and pregnancies.[106] Factors such as these, most of which are outside their control, result in many countries in girls having less educational experience, and so fewer employment opportunities, than boys.

Without relevant skills, many women are less able to benefit from the potential of digital technology for employment, enterprise and business.[107] New opportunities are often accompanied today by a demand for more advanced skills which can further marginalise women who have not developed them.[108] The World Bank warns that digital technologies could, as a result, circumvent rather than eliminate some of the barriers women face and delay fundamental gender equality reforms.[109]

In addition to the lack of skills undermining women's opportunities to access STEM careers, stereotypes and assumptions about types of work that are appropriate for men and women are widespread. There is also often gender bias in recruitment and promotion. Women experience gender bias that affects their ability to participate fully in the design, development, production and governance of digital technologies. One study found that approximately 66% of women surveyed had experienced some form of bias against them in the workplace as well as uneven progression opportunities.[110]

It is unsurprising, in light of these factors, that technical departments in digital businesses are predominantly staffed by men. Male-dominated workplaces may also be unattractive to many women because of the risk of harassment and inappropriate behaviour. As things stand, these factors tend to reinforce the gender bias in STEM and ICT employment. For reasons discussed earlier, however, this both weakens the quality of the digital workforce and reduces the extent to which digital applications and services address women's needs and priorities as consumers. Any attempt to address digital gender divides must pay attention to these contextual and cultural dimensions.

6.   Ongoing initiatives and existing recommendations

Policy recommendations and practical initiatives to address barriers to gender digital inclusion access increased in scope and number in the past five years. Yet the gender digital divide remains. To have a tangible effect on promoting digital inclusion, W20/G20 members should focus their attention on concrete actions to implement policies, drawing on existing recommendations and working with initiatives that have already been developed.

The following paragraphs briefly summarise some of the more important recent recommendations and initiatives.

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[105] UNESCO, 2017b.
[106] UNESCO, 2017b.
[107] ISACA, 2017; World Bank, 2016; World Bank, 2015; UNESCO, 2015:11; Cummings & O'Neil, 2014:7; Galperin *et al.,* 2014; UNCTAD & ILO, 2014:iii; Moyo & Deen-Swarray, 2013.
[108] World Bank, 2016:100; UNESCO, 2015b:11.
[109] 2016:134.
[110] ISACA, 2017.

Recommendations

In 2017, the W20 highlighted issues related to women's involvement in the design, development and production of ICTs. It called on the G20 to:[111]

- tackle gender segregation, especially in the area of STEM, addressing this in the education system, in corporate development and by appointing sufficient mentors;
- set up an action plan for women to gain equal access to ICT, providing effective digital skills training, setting targets for women and girls to study STEM, and supporting women-owned enterprises and innovation in the ICT sector;
- strengthen the capacity of women for ICT-based entrepreneurship and employment, for example by establishing funds for female start-ups and tax incentives for businesses run by women;
- invest in the research and development of digital tools helping to achieve a sustainable livelihood in addition to the work life balance needed for increasing the labour force participation of women and the quality of work;
- support women's social entrepreneurship;
- set up gender inclusion/equality criteria in science and development; and
- strengthen women's economic, social and political networks.

Other recent initiatives, such as those led by the Broadband Commission, the EQUALS initiative, the Internet Governance Forum (IGF), and GSMA have focused on recommendations to promote access to and use of digital technologies by women.

The Broadband Commission's Working Group on the Digital Gender Divide (established in 2016) has recommended a set of actions designed to address the gap in access.[112] These fall into four overarching groups:

- promoting a better understanding of relevant contexts by supporting the collection, tracking and analysis of sex-disaggregated data on Internet access and use;
- integrating gender perspectives in relevant strategies, policies, plans, and budgets;
- addressing barriers related to affordability, threats that hamper access and use, digital literacy and confidence, and the availability of relevant content, applications and services; and
- supporting stakeholders to collaborate more effectively in addressing digital gender gaps by sharing good practices and lessons learned.

The ITU/UN Women *Action Plan to Close the Digital Gender Gap*[113] sets out a framework for critical actions to foster and accelerate inclusive and sustainable development by closing the digital gender gap and harnessing the transformative potential of digital technologies for women's empowerment. Its action areas focus on:

- developing gender-responsive strategies and policies;
- ensuring access to ICTs by women and girls and mitigating or responding the threats online that hinder women's access to and use of technology;

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[111] See: http://www.w20-germany.org/focus/digital-inclusion/.
[112] UNGA, 2015b.
[113] 2015.

- building digital capacities of girls and women and support development of content, applications and services that meet women's needs;
- promoting women in the technology sector, including into positions of decision-making; and
- establishing multistakeholder partnerships.

Other initiatives

Other initiatives and ongoing work tend to focus on specific barriers to gender inclusion, such as affordability, safety and women's rights. This includes work by a number of civil society organisations and advocacy groups (e.g. A4AI, AccessNow, APC, CIPESA, Paradigm Initiative, Web Foundation); research institutions (e.g. LIRNE*asia*, Research ICT Africa, DIRSi), businesses and private sector associations (e.g. Facebook, Google, Intel, Microsoft, GSMA), intergovernmental organizations (e.g. UNCTAD, UNESCO, UN Women, World Bank, World Economic Forum) and others.

GSMA's Connected Women commitment initiative has encouraged mobile operators to accelerate digital and financial inclusion for women. By March 2018, 36 operators across Africa, Asia and Latin America had made 51 commitments to reduce the gender gap in their mobile Internet and/or mobile money customer base by 2020. Initiatives include, for instance, mobile Internet training programmes for female customers, micro-loans for women to purchase Internet-enabled handsets, and anonymous mobile recharge services so that women do not have to disclose their mobile phone numbers to agents and risk later harassment.[114]

USAID's WomenConnect Challenge[115] recently issued a global call for solutions to improve women's participation in everyday life by changing the ways in which they access and use technology. It seeks to identify and accelerate comprehensive solutions that empower women's use of technology to drive positive health, education, and livelihood outcomes for themselves and their families. The main themes of the challenge are summarised as follows:

- women's access to technology is not an end, but a means to help address development objectives;
- there is a need to build evidence for approaches that are working; and
- the scope of the digital gender divide requires local solutions that take into account complex cultural and socioeconomic factors.

There is insufficient scope in this document to discuss these recommendations, action agendas and initiatives in detail. However, they provide a solid basis for recommendations for future action by the W20/G20 which would systematically address the barriers that women face in ensuring effective access to ICTs, enabling effective use of them to achieve personal and developmental goals, and facilitating participation in the design, development, production and governance of ICTs in future.

7.   Summary of proposed areas for W20 discussions

- What are the main challenges to obtaining recent sex-disaggregated data on digital inclusion in your country?

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[114] GSMA, 2018b.
[115] See: http://www.womenconnectchallenge.org.

- Are women as likely as men to gain access to and use digital technologies in your country? If not, why not?
- Are women as likely as men to participate in the design, production, manufacture and governance of digital technologies in your country? If not, why not?
- What are the biggest barriers that women in your country face to digital inclusion? (E.g. the availability of relevant infrastructure (including electricity); cost and affordability of devices and data; design, usability and skills; safety and security; awareness and relevant content; cultural norms which inhibit women's full participation in society; lack of relevant policies to promote women's inclusion)
- What can be done in your country to address these barriers?
- What mechanisms could be used to address the gender bias that affects women's ability to participate fully in the design, development, production and governance of digital technologies?
- Do you have an example from your country or region of initiatives taken to promote gender equality in digital inclusion? For each initiative:
  a) Has this initiative been evaluated and, if so, with what outcome?
  b) In your view, how could this initiative be improved?
- What examples are there of initiatives to improve women's participation in the production, design, development and governance of digital technologies in your country or region? For each initiative:
  a) Has this initiative been evaluated and, if so, with what outcome?
  b) In your view, how could this initiative be improved?

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