

Background Paper on Technologies and Older Persons

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The age of Information and Communication Technologies (ICTs) has changed the lives of millions of persons who connect daily to work, get informed, educate, buy essential products and services, socialize and entertain. These rapid changes in the digitalisation process are likely to accelerate due to the development of “frontier technologies” such as artificial intelligence (AI), the Internet of things (IoT), big data, blockchain, 5G, 3D printing, robotics, virtual and augmented reality, drones, gene editing, nanotechnology and solar photovoltaic (Solar PV), among others.

According to United Nations Conference on Trade and Development (UNCTAD) [Technology and Innovation Report 2021](#), these technologies can be used to boost productivity and improve livelihoods as they take advantage of digitalisation and connectivity which enable them to combine to multiply their impacts. A wide range of possibilities open to impact our everyday lives, but several challenges and risks also arise if these changes outpace the ability of societies to adapt, as these technologies can also widen and reinforce existing inequalities and even create new ones¹. They can also risk excluding the people who are most in need, particularly older generations, as there is, at a global level, a digital divide across population groups in the access to, use of and benefit from digital technologies².

The pandemic has highlighted how technology has been key in supporting older adults who can stay at home and still get their basic products and services, get in contact with family members to avoid loneliness and isolation, or even get monitored by professionals in case of illness. Nevertheless, it has also proved that these enormous benefits are not equally

¹ United Nations Conference on Trade and Development (2021), [Technology and Innovation Report 2021](#), p. 29. Available at: <https://unctad.org/webflyer/technology-and-innovation-report-2021>

² Digital technology is the term used to describe the systems, hardware, and processes used to collect, store and process data. These can include devices such as smartphones, tablets, and robotics, or services and applications such as the Internet, healthcare applications, e-banking, online shopping, or online gaming. United Nations Economic Commission for Europe (2021), Ageing in the Digital Era, Policy Brief on Ageing No. 26, p. 2. Available at: https://unece.org/sites/default/files/2021-07/PB26-ECE-WG.1-38_0.pdf

present as older persons are more likely to be digitally excluded and to experience barriers accessing goods and services that are increasingly provided online³. In general, older age groups are less digitally connected, and age adds to other factors such as gender, socioeconomic background, educational attainment, profession and location, among others, to explain the different levels of digital technology adoption across and within generations⁴.

If governments, industries, manufacturers, academia and other stakeholders do not take measures to ensure that all people, regardless of age, gender, abilities, culture, socioeconomic background or location are empowered by technology and are not specifically prepared to tackle the challenges and opportunities behind the technological and digital inclusion of older persons, serious inequalities that can lead to social and economic exclusion, power imbalances, and threats to privacy and security will continue to grow.

This paper will review available data on technological and digital inclusion of older adults, will develop the key components which need to be present in a process of ensuring technological and digital inclusion of older generations from a human rights perspective, will identify the opportunities that exist in using technology to create healthy living environments and the challenges that need to be taken into consideration to achieve an equal process where no one is left behind. It will also share best practices and offer recommendations to ensure that older generations have access to technology, have the digital competence to use it and to ensure that the digital environments are accessible, ageist-free, ethical and safe and take into consideration the diversity of older generations needs and characteristics.

³ United Nations Economic Commission for Europe (2021), Ageing in the Digital Era, Policy Brief on Ageing No. 26, p. 2. Available at: https://unece.org/sites/default/files/2021-07/PB26-ECE-WG.1-38_0.pdf

⁴ United Nations Economic Commission for Europe (2021), Ageing in the Digital Era, Policy Brief on Ageing No. 26, p. 6. Available at: https://unece.org/sites/default/files/2021-07/PB26-ECE-WG.1-38_0.pdf

1. Demographics: Technological and digital inclusion of older adults

Evaluating the level of technological and digital inclusion of older adults is difficult as gaps in data and statistics on this demographic group are present, which affects how policy and decision makers get information regarding the challenges they face and the needs they have, but also risks to exclude them from basic digital information and services to which older women and men are entitled.

The digital and technological age gap exists. According to findings of the [2019 Fundamental Rights Survey in the European Union](#), only one in five survey respondents aged 75 and older at least occasionally engaged in Internet activities, compared to 98 percent of those aged 16 to 29 years⁵. [Pew Research Center](#) data show that in 2021 the percentage of US adults who say they use the Internet fell from 96 percent between the ages of 50 to 64 to 75 percent in persons aged 65 and above⁶. In Latin America, according to the [Economic Commission for Latin America and the Caribbean](#) in 2015 the use of Internet among persons aged 15 to 29 was seven times higher than the one of older adults aged 60 or above in El Salvador and Honduras, eight times higher in Mexico and almost nine in Ecuador⁷. In Japan, the rate of Internet access among ages 60 to 69 was 23.5 percent lower than for ages 20 to 29 in 2016⁸. The gap is particularly severe for persons aged 75 or above. In Kazakhstan the difference between usage in adults aged 15 to 24 and adults aged 75 and above was 89.4 percent in 2019, in Ukraine 84.7 percent in 2018 and in Singapore 84.6 percent in 2017. The data also shows wide differences between countries and regions as these percentages were

⁵ United Nations Economic Commission for Europe (2021), Ageing in the Digital Era, Policy Brief on Ageing No. 26, p. 3. Available at: https://unece.org/sites/default/files/2021-07/PB26-ECE-WG.1-38_0.pdf

⁶ Pew Research Center (2021), Internet /Broadband Fact Sheet, available at: <https://www.pewresearch.org/internet/fact-sheet/internet-broadband/>

⁷ Sunkel and Ullman (2019), Las personas mayores de América Latina en la era digital: superación de la brecha digital, Revista de la CEPAL no. 127, p. 6, available at: <https://www.cepal.org/es/publicaciones/44580-personas-mayores-america-latina-la-era-digital-superacion-la-brecha-digital>

⁸ Asian Development Bank (2018), Tapping technology to maximize the longevity dividend in Asia, p. 32, available at: <https://www.adb.org/sites/default/files/publication/418301/tapping-technology-dividend-asia.pdf>

significantly lower in the United Kingdom 27.3 percent, 27.7 percent in Oman and 22.1 percent in Denmark in 2020.⁹

Nevertheless, data is also showing that in many countries and regions, older adults have increased their contact with technology and their connection to the Internet, although there are also clear differences between regions and countries. According to Eurostat, the gap between age groups in terms of their access to and use of modern information and communication technologies is closing. In the European Union countries, 83 percent of older persons aged between 65 and 74 had never used a computer in 2007, while this was the case for only 32 percent by 2020¹⁰. In the United States, according to the [Pew Research Center](#), Internet adoption among older adults has risen steadily over the last two decades. In 2000, just 14 percent of older adults ages 65 and older were Internet users, in 2017 the percentage rose to 67 while in 2021, 25 percent of adults ages 65 and older reported never going online¹¹.

Clear geographical disparities also prevail between older adults in advanced and emerging economies. As the [Pew Research Center](#) report shows, the age gap in smartphone ownership has been closing globally since 2015 but has been more important in advanced economies.

⁹ International Telecommunication Union database, annex 1.

¹⁰ United Nations Economic Commission for Europe (2021), Ageing in the Digital Era, Policy Brief on Ageing No. 26, p. 4. Available at: https://unece.org/sites/default/files/2021-07/PB26-ECE-WG.1-38_0.pdf

¹¹ Pew Research Center (2017), [Tech adoption climbs among older adults](#). Available at: <https://www.pewresearch.org/internet/2017/05/17/tech-adoption-climbs-among-older-adults/>

Smartphone ownership by age over time¹²

	2015			2018		
	18-34	35-49	50+	18-34	35-49	50+
Argentina	71%	56%	20%	84%	77%	42%
Australia	95%	91%	58%	97%	89%	68%
Brazil	23%	16%	4%	85%	63%	32%
Canada	94%	79%	46%	90%	85%	43%
France	85%	59%	22%	97%	91%	53%
Germany	92%	74%	40%	98%	90%	64%
India	16%	10%	7%	37%	21%	8%
Indonesia	17%	8%	3%	66%	32%	13%
Israel	87%	89%	50%	91%	94%	80%
Italy	88%	83%	35%	98%	91%	48%
Japan	77%	62%	18%	96%	93%	44%
Kenya	25%	14%	4%	51%	27%	18%
Mexico	29%	22%	7%	66%	53%	30%
Nigeria	23%	18%	1%	48%	31%	20%
Philippines	21%	20%	9%	74%	50%	27%
Poland	75%	46%	13%	93%	87%	35%
Russia	76%	50%	17%	91%	76%	26%
South Africa	39%	36%	17%	73%	59%	35%
South Korea	100%	96%	74%	99%	100%	91%
Spain	91%	83%	51%	95%	93%	60%
United Kingdom	91%	88%	44%	93%	90%	60%
United States	92%	84%	53%	95%	92%	67%
Tunisia	22%	6%	3%	75%	35%	18%

Source: Spring 2018 Global Attitudes Survey

As mentioned before, age adds to other factors such as gender, socioeconomic background, educational attainment, disability, profession and location, among others, to explain the different levels of digital technology adoption. This intersectionality between conditions can lead to multiple discrimination and exacerbating social inequalities. For example, older persons with higher education are more active Internet users than those with lower levels of formal education and use the Internet more frequently to access information and

¹² Pew Research Center (2019), Smartphone Ownership Is Growing Rapidly Around the World, but Not Always Equally, Available at: <https://www.pewresearch.org/global/2019/02/05/smartphone-ownership-is-growing-rapidly-around-the-world-but-not-always-equally/>

services¹³. There is also divide between older men and older women regarding the use of digital technologies. Due to disparities in the labour market participation between women and men and to professional choices, older men seem to be more open towards digital technologies than women¹⁴.

Accurate and up-to-date data collection regarding how older adults use technology including frontier technologies, as well as the kind of products and services they have access to or are interested in, remains a challenge. It is crucial to better understand their needs as well as the challenges that they face to adopt technology if we are to achieve not leaving anyone behind. Currently the information is limited, and all stakeholders should join efforts to gather more statistics to identify better strategies to achieve technological and digital inclusion among older generations.

2. Key elements to ensure a human rights-approach in the digital and technological inclusion of older persons

ICTs and new technologies can have a fundamental role in creating environments suitable for the promotion of healthy conditions, tackling the challenges that accompany ageing. Human centred robotics for example can lead to important advances for the autonomy and active participation of older persons. Technologies can become an effective and scalable means to encourage and enable healthy ageing, considered by the [World Health Organization](#) as the process of developing and maintaining the functional ability that enables well-being in older age¹⁵. This includes being able to:

- Independently secure basic needs
- Learn, grow, make decisions
- Maintain mobility
- Build and maintain relationships and

¹³ United Nations Economic Commission for Europe (2021), [Ageing in the Digital Era](#), Policy Brief on Ageing No. 26, p. 6. Available at: https://unece.org/sites/default/files/2021-07/PB26-ECE-WG.1-38_0.pdf

¹⁴ Eurostat (2020), [Ageing Europe: Looking at the lives of older people in the EU](#), p. 153. Available at: <https://ec.europa.eu/eurostat/en/web/products-statistical-books/-/ks-02-20-655>

¹⁵ World Health Organization, [Decade of healthy ageing](#), available at: <https://www.who.int/initiatives/decade-of-healthy-ageing>

- Contribute to society

Nevertheless, to ensure that everyone, regardless of age, ability, gender or location can use technology, some important elements, challenges and opportunities need to be taken into consideration.

According to the International Telecommunication Union, digital inclusion for all requires three main building blocks¹⁶:



a. Access / Digital infrastructure

The first building block to achieve technological and digital inclusion for all involves infrastructure and connectivity. If a country or region does not have infrastructure and access to mobile-broadband networks or is not prepared to implement technology 4.0, older generations will not be able to have access to the benefits of technology.

¹⁶ International Telecommunication Union, [Ageing in a digital world: from vulnerable to valuable](https://www.itu.int/en/myitu/Publications/2021/05/17/12/55/Ageing-in-a-digital-world--from-vulnerable-to-valuable), available at: <https://www.itu.int/en/myitu/Publications/2021/05/17/12/55/Ageing-in-a-digital-world--from-vulnerable-to-valuable>

According to the ITU report [Measuring Digital Development: Facts and Figures 2020](#) the rollout of communications infrastructure is slowing, and mobile cellular subscriptions have been declining for the first time in history. Furthermore, people in rural areas continue to face the greater challenges in terms of remaining connected, especially in developing economies. While virtually all urban areas in the world are covered by a mobile-broadband network, many gaps subsist in rural areas. In Least Developed Countries (LDCs), 17 percent of the rural population has no mobile coverage at all, and 19 percent of the rural population is only covered by a 2G network. Globally, about 72 percent of households in urban areas had access to the Internet at home in 2019, almost twice as much as in rural areas (nearly 38 percent)¹⁷.

Rural and remote areas experience more pronounced population ageing than urban areas and subsequently, have a higher share of older residents who will not be connected¹⁸. For example, in two out of three countries in the United Nations Economic Commission for Europe (UNECE) region¹⁹, rural areas are more strongly affected by population ageing and in almost every one of them, there are more older women than men²⁰.

Inadequate connectivity prevents access to the most promising broadband applications for education, health, long-term care, independent living, finance and other sectors. In fact, many individuals and households are also 'marginally connected', able to access basic levels of connectivity, but at insufficient levels to fully transition to full-scale remote work and learning activities²¹.

¹⁷ International Telecommunication Union (2020), [Measuring Digital Development: Facts and Figures 2020](#), available at: <https://www.itu.int/en/ITU-D/Statistics/Pages/facts/default.aspx>

¹⁸ Currie M., Philip L. (2019) Rural Ageing. In: Gu D., Dupre M. (eds) Encyclopedia of Gerontology and Population Aging. Springer, Cham, p. 2. Available at: https://www.researchgate.net/publication/335272764_Rural_Ageing

¹⁹ UNECE region covers [56 member States](#) in Europe, North America and Asia.

²⁰ UNECE (2017), [Older persons in rural and remote areas](#), pages 1 and 20. Available at: https://unece.org/fileadmin/DAM/pau/age/Policy_briefs/ECE-WG1-25.pdf

²¹ ITU/UNESCO Broadband Commission for Sustainable Development, [The State of Broadband 2021: People-Centred Approaches for Universal Broadband](#), p. 40, available at: <https://www.broadbandcommission.org/publication/state-of-broadband-2021/>

According to the [United Nations Roadmap for Digital Cooperation 2020](#), achieving universal connectivity is a target for 2030²². Collective efforts among governments, industry, private sector and all relevant stakeholders need to be enforced to provide universal access to information and communications technology in all regions and to all people regardless of their age, gender, condition or location.

b. Affordability

Technological products and services designed with and for older adults, have been growing worldwide as innovation and smart technologies have proven to be very effective to serve older generation's needs. Nevertheless, costs are still an issue that needs to be taken into consideration. Affordability is the second building block to achieve digital inclusion for all.

According to the [ITU Policy Brief on the affordability of ICT Services 2020](#), although globally ICT prices have been falling over the last decade, a significant affordability gap remains between developed and developing countries. In fact, ICT services in most of LDCs remain prohibitively expensive²³. As a result, the price of frontier technologies, Internet services and equipment to access ICTs (mobiles, computers, tablets) is regularly cited as one of the major barriers for technology adoption, including for older adults. In many countries and regions, connectivity is available but the cost of having a broadband connection at home leaves older adults behind²⁴.

²² United Nations (2020) Report of the Secretary-General Roadmap for Digital Cooperation, [United Nations Roadmap for Digital Cooperation 2020](#), available at: <https://www.un.org/en/content/digital-cooperation-roadmap/>

²³ International Telecommunication Union (2020), [Policy Brief on the affordability of ICT Services 2020](#), available at: <https://www.itu.int/en/ITU-D/Statistics/Pages/ICTprices/default.aspx>

²⁴ Older Adults Technology Services (2021), [Aging connected: Exposing the hidden connectivity crisis for older adults](#), available at: <https://oats.org/wp-content/uploads/2021/01/Aging-Connected-Exposing-the-Hidden-Connectivity-Crisis-for-Older-Adults.pdf>

People's health trust (2021), Digital inclusion and older people, Available at:

<https://www.peopleshealthtrust.org.uk/news/blog/digital-inclusion-and-older-people>

Pew Research Center (2021), Digital divide persists, even as Americans with lower incomes make gains in tech adoption, <https://www.pewresearch.org/fact-tank/2021/06/22/digital-divide-persists-even-as-americans-with-lower-incomes-make-gains-in-tech-adoption/>

Citizens Advice Scotland, [Disconnected: Understanding digital inclusion and improving access](#), https://www.cas.org.uk/system/files/publications/cas_disconnected_report.pdf

Even though the longevity or silver economy, defined as the sum of all economic activity serving older adults, has also grown in recent decades at a significant pace²⁵, older generations across the world tend to have higher poverty levels. According to the [World Population Ageing Report 2020](#), the risk of poverty at older ages is generally more pronounced in less developed countries and in older women who receive on average lower pension payments, sometimes too low to fully meet their basic needs²⁶.

According to the ITU/UNESCO Broadband Commission for Sustainable Development, one of its seven advocacy targets involves making broadband affordable²⁷. Telecom operators, ICT regulators and governments need to continue their efforts to provide affordable telecom packages and services, as well as affordable devices and technologies for all consumers including older adults. Measures to support low-income households with the costs of broadband connections can make an important contribution to ensuring equal access and digital inclusion irrespective of socioeconomic background, especially during emergency situations. In the United States, for example, an [Emergency Broadband Benefit Programme](#) (EBBP) was introduced in 2021 by the Federal Communications Commission to help households struggling to pay for Internet service and devices during the pandemic by providing discounts²⁸.

c. Accessibility

Accessibility is the third building block which ensures that technology is human centred and inclusive, designed to meet the needs and abilities of as many people as possible, including

²⁵ InterAmerican Development Bank, [The Silver Economy in Latin America and the Caribbean: aging as an opportunity for innovation](#), entrepreneurship and inclusion, available at: <https://publications.iadb.org/en/Oxford-Economics-The-Longevity-Economy-Generating-economic-growth-and-new-opportunities-for-business>, available at: <https://www.aarp.org/content/dam/aarp/home-and-family/personal-technology/2013-10/Longevity-Economy-Generating-New-Growth-AARP.pdf>

²⁶ United Nations Department of Economic and Social Affairs, [World Population Ageing Highlights 2020](#), p. 12, available at: https://www.un.org/development/desa/pd/sites/www.un.org.development.desa.pd/files/undes_a_pd_2020_world_population_ageing_highlights.pdf

²⁷ ITU/UNESCO Broadband Commission for Sustainable Development, [The State of Broadband 2021: People-Centred Approaches for Universal Broadband](#), p. 39, available at: <https://www.broadbandcommission.org/publication/state-of-broadband-2021/>

²⁸ US Federal Communications Commission, [Emergency Broadband Benefit Programme](#), available at: <https://www.fcc.gov/broadbandbenefit>

the ageing population. To achieve so, policies and standards need to be adopted, accessibility needs to be implemented in devices and new technologies, as well as in platforms, digital products and services, and older adults need to have adequate digital skills to benefit of technology while mitigating possible associated risks.

c.1. Adoption of policies, regulations and standards

To implement ICT accessibility, governments need to define and establish a systematic mechanism to secure the development and availability of accessible ICTs. ICT accessibility is included in several international, regional and national instruments²⁹. Standards such as the Web Content Accessibility Guidelines (WCAG) are particularly important as they represent the guidelines of universal design applied in the digital world. They also describe the design and programming characteristics that ICTs should have in order to ensure they are easy to use by people with a broad range of characteristics and capabilities. A lack of clear definitions and an absence of standards can inhibit implementation. It is therefore fundamental that manufacturers, developers, procurers and government officials understand what is meant by accessible ICTs and what is expected from products and services.

Including ICT accessibility standards in public procurement processes has proven to be effective for the implementation of ICT accessibility³⁰, best practices include [Section 508 of the Rehabilitation Act in the United States](#) which governs the US federal government purchase, development, maintenance, and use of technology and [ETSI EN 301 549](#), the European standard for the public procurement of ICT products and services in the region. These processes are both aligned to ICT accessibility and to the recognition of accessibility standards such as the WCAG.

²⁹ ITU, [Towards building inclusive digital communities: ITU toolkit and self-assessment for ICT accessibility implementation](#), available at: <https://www.itu.int/pub/D-PHCB-TOOLKIT.01-2021>

³⁰ Global Smart Cities Alliance (2021), Model Policy, [ICT Accessibility](#), available at: <https://globalsmartcitiesalliance.org/?p=244>

c.2 Accessible ICTs

The ageing population represents a very attractive business opportunity, particularly for the technology industry³¹. [BCC Research](#) estimated in 2017 that the global market for older care technology was worth USD 5.6 billion and that it will reach a value of 13.6 billion by 2022³². The Silver Economy has been considered as “the new green” by the [Global Coalition on Aging](#), which estimates that its market value amounts to USD 17 trillion³³.

Governments, industries, academia, private companies, including micro, small and medium-sized enterprises and start-ups need to be aware of the economic opportunities and the potential that exists in considering the ageing population while developing their products and services.

To ensure accessibility and usability of devices, new technologies, products and services, stakeholders need to go beyond accessibility standards, and involve older persons in their design, testing and validation. Their participation would translate in better products and services that they would engage with.

It is important to note that including older adults or persons with disabilities to legitimize a design process and not taking into consideration their feedback is counterproductive. Stakeholders should encourage user involvement through strategies such as co-design, co-creation of participatory design which can enhance the likelihood that a technology will eventually be accepted and used, as well as can identify accessibility and usability barriers from the beginning achieving the ultimate goal of designing for all³⁴.

Technological biases: Older adults have heterogenous characteristics and needs and generally stakeholders are not aware of them. One main challenge to address this is directly

³¹ International Telecommunication Union, [Ageing in a digital world: from vulnerable to valuable](#), available at: <https://www.itu.int/en/myitu/Publications/2021/05/17/12/55/Ageing-in-a-digital-world--from-vulnerable-to-valuable>

³² BBC Research, [Technologies for Long-term Care and Home Healthcare](#), Available at: <https://www.bccresearch.com/market-research/healthcare/long-term-care-home-healthcare-technologies-markets-report.html>

³³ Global Coalition on Aging, available at: <https://globalcoalitiononaging.com/>

³⁴ United Nations Economic Commission for Europe (2021), Ageing in the Digital Era, Policy Brief on Ageing No. 26, p. 14. Available at: https://unece.org/sites/default/files/2021-07/PB26-ECE-WG.1-38_0.pdf

related on the inclusiveness of the data collection process as many technologies are replicating biased algorithms that are leaving many people behind. For example, artificial intelligence (AI) can perpetuate stereotypes and reduce opportunities as well as benefits of products and services for older adults. Research has shown for example that algorithmic hiring systems are increasing in many industries and even if some present opportunities to reduce systemic biases, others are creating new forms of discrimination, including ageism, reducing working opportunities for older adults³⁵.

According to UNCTAD, “technologies are likely to have an effect on disparities, but inequalities can also shape technologies – so that they reflect, reproduce and perhaps amplify systemic bias and discrimination. Currently most technologies are created by firms in the global North and predominantly by men. They tend to focus on the demands of the rich, crowding out innovations that might benefit the poor. Technological change is also shaped by gender inequalities, partly because men have been more likely than women to study STEM subjects”³⁶.

To prevent these biases, all stakeholders need to be aware of the risks of discrimination and, as mentioned before, should improve their processes to include older generations in their design protocols³⁷.

Ageism: Paternalistic and ageist stereotypes should also be avoided as they create a barrier to digital technology adoption and use. As the [Global report on ageism](#) explains, older adults risk to internalize the stereotype that older people cannot master technology and may not even try to adopt technologies. Ageist stereotypes may also explain why older adults are seldom included in focus groups assessing the design of new digital technologies³⁸. Designers targeting older users or persons with disabilities often follow those stereotypes.

³⁵ Brookings Institution, [Auditing employment algorithms for discrimination](https://www.brookings.edu/research/auditing-employment-algorithms-for-discrimination/), <https://www.brookings.edu/research/auditing-employment-algorithms-for-discrimination/>

³⁶ UNCTAD, [Technology and Innovation Report 2021: Overview](https://unctad.org/webflyer/technology-and-innovation-report-2021), p. 21, available at: <https://unctad.org/webflyer/technology-and-innovation-report-2021>

³⁷ United Nations Economic Commission for Europe (2021), Ageing in the Digital Era, Policy Brief on Ageing No. 26, p. 14. Available at: https://unece.org/sites/default/files/2021-07/PB26-ECE-WG.1-38_0.pdf

³⁸ World Health Organization, [Global report on ageism](https://www.who.int/publications/i/item/9789240016866), p. 29, available at: <https://www.who.int/publications/i/item/9789240016866>

The fact that most technology directed to older persons is over-proportionally targeted on health care technologies and rarely on leisure is an example³⁹.

c.3. Appropriation and digital skills

Lack of adequate skills is one of the main barriers to technology adoption and use among older generations. For example, in 2019 in the EU-27 countries, 55 percent of people aged 45 to 54 had basic or above basic overall digital skills. This percentage fell to 40 percent in the age group of 55 to 64 and to 24 percent among those aged 65 to 74.⁴⁰

To tackle that, the [UN Roadmap for Digital Cooperation](#) has considered ensuring digital inclusion for all, including the most vulnerable, as well as strengthening digital capacity building as two of the eight key areas for action.

Appropriation of ICT is turning technology to one's own purposes, using new and creative ways to accomplish one needs. The main goal is that older generations reach the appropriation stage in their use of ICT. To achieve this, older adults need digital literacy, which includes basic technology or computer literacy skills, as well as creative abilities to fully and carefully take advantage of the digital world⁴¹.

The European Commission has recently defined standards of basic Internet skills. According to the [European Digital Competence Framework](#) there are five areas in digital literacy, with 21 related competences:

1. Information and data literacy,
2. Communication and collaboration,
3. Digital content creation,
4. Safety and

³⁹ United Nations Economic Commission for Europe (2021), Ageing in the Digital Era, Policy Brief on Ageing No. 26, p. 10. Available at: https://unece.org/sites/default/files/2021-07/PB26-ECE-WG.1-38_0.pdf

⁴⁰ United Nations Economic Commission for Europe (2021), Ageing in the Digital Era, Policy Brief on Ageing No. 26, p. 9. Available at: https://unece.org/sites/default/files/2021-07/PB26-ECE-WG.1-38_0.pdf

⁴¹ International Telecommunication Union, [Ageing in a digital world: from vulnerable to valuable](#), available at: <https://www.itu.int/en/myitu/Publications/2021/05/17/12/55/Ageing-in-a-digital-world--from-vulnerable-to-valuable>

5. Problem solving

Governments, academia, industries, manufacturers and all stakeholders need to take into consideration that older adults characteristics and needs are heterogenous. Digital training should reflect those differences. Digital capacity building has generally been supply-driven as opposed to needs based. To ensure appropriation of technology, policymakers should develop tailored capacity building programmes that meet the specific needs of their target populations.

Social factors should also be taken into consideration when considering digital abilities and appropriation of technology as studies have suggested that older adults with good social and family support have higher motivation to learn and can significantly increase Internet use. Participation in activities with family and friends is also likely to increase the need and perceived usefulness of Internet connectivity to maintain social integration and ties. Nevertheless, in some countries and regions social norms can leave older adults, and especially older women behind the use of technology even within the same household⁴². Peer learning has also proven to be effective for older generations and can be a method worth considering.

Security: All over the world cyber-attacks continue to grow and government systems are becoming more vulnerable to them. The COVID-19 pandemic has exposed the collective vulnerability to disruption and abuse, while data shows that older persons tend to fall victim of digital frauds. According to the [Federal Bureau of Investigation](#) in the United States, in 2020 the reported scams exceeded losses of 4.1 billion USD and approximately 28% of the total fraud losses were sustained by victims over the age of 60. These episodes have been increasing during the pandemic as many older adults have been shopping online for the first time ever. Training and capacity building need to include fraud prevention and providing older adults with the tools to be able to securely use technology.

⁴² United Nations Conference on Trade and Development (2021), [Technology and Innovation Report 2021](#), p. 18. Available at: <https://unctad.org/webflyer/technology-and-innovation-report-2021>

Digital training programmes should cover aspects of Internet security such as recognizing and avoiding online scams, choosing strong passwords, protecting computers and devices from viruses and keeping systems up to date, among other aspects⁴³.

Human rights and dignity protection: Digital technologies provide new means to advocate, defend and exercise human rights, but they can also be used to suppress, limit and violate human rights⁴⁴. This is particularly important to note for older adults. As the [Report of the Independent Expert on the Enjoyment of All Human Rights by older persons](#) pointed out since 2017, all stake holders need to reflect and take actions to protect the human rights of older persons, including their right to dignity, autonomy, privacy and informed consent.

Privacy: Older adults are particularly concerned with privacy and might not use a technology because of fear of sharing data. A [recent survey from AARP](#) revealed that 34 percent of people age 50 and older in the United States cited privacy concerns as a top barrier to adopting new technology, behind only cost (38 percent) and lack of knowledge (37 percent). More than 8 in 10 (83 percent) indicated they are not confident that what they do online remains private⁴⁵. Studies have also shown that there is a lack of understanding among the general population of what governments and companies do with the data they collect as well as a struggle to understand the privacy laws that govern the use of data⁴⁶.

Their trust in how privacy is protected is a critical requirement for success in older people adoption of technology and an element that needs to be taken into consideration by all stakeholders that should recognize the importance of privacy and data protection and plan

⁴³ United Nations Economic Commission for Europe (2021), Ageing in the Digital Era, Policy Brief on Ageing No. 26, p. 19. Available at: https://unece.org/sites/default/files/2021-07/PB26-ECE-WG.1-38_0.pdf

⁴⁴ United Nations (2020) Report of the Secretary-General [Roadmap for Digital Cooperation 2020](#), available at: <https://www.un.org/en/content/digital-cooperation-roadmap/>

⁴⁵ AARP, Personal Tech and the Pandemic: Older Adults are upgrading for a better online experience, available at: <https://www.aarp.org/research/topics/technology/info-2021/2021-technology-trends-older-americans.html>

⁴⁶ Pew Research Centre, [Americans and Privacy: Concerned, confused and feeling lack of control over their personal information](#), <https://www.pewresearch.org/internet/2019/11/15/americans-and-privacy-concerned-confused-and-feeling-lack-of-control-over-their-personal-information/>

for community engagement and transparency to build trust and overcome these concerns among older adults.

It is also important to stress that even if digitalisation should continue to be encouraged, non-digital services should be maintained in particular in public services such as health, social and long-term care services. A human rights approach ensures the possibility of older adults choosing, in an autonomous way, whether to use or not digital technologies that is why backup through maintaining continued offline access to goods and services needs to be ensured.

ICTs use and adoption by older persons should be a priority for all stakeholders and should comprise the fact that technology responds to their specific needs, provides support and facilitates their independent living.

3. Technology as enabler to create healthy ageing environments

Technology, if built with accessible and inclusive design in mind, can be an effective enabler to create healthy ageing environments. The following are examples of different life spheres, relevant to older adults, where there are several opportunities and challenges to introduce ICTs to respond to their needs.

a. Health care

Smart health care is tackling modern day health problems using new frontier technologies. While promoting interaction between all parties, it is transforming the traditional medical system to make it more efficient, convenient, and personalised⁴⁷.

Older adults might use medication apps or pill dispensers that ensure they are following their medication schedules or can have a medical appointment through video conferencing without the need of leaving the conform of their home, not only saving time but also reducing costs to all the parties involved. They can also use devices such as wearable fall alarms, GPS trackers and portable heart rate monitors which provide information to health

⁴⁷ Shuo Tian, Wenbo Yang, Jehane Michael Le Grange, Peng Wang, Wei Huang, Zhewei Ye, [Smart healthcare: making medical care more intelligent](https://www.sciencedirect.com/science/article/pii/S2414644719300508), Global Health Journal, Volume 3, Issue 3, 2019, Pages 62-65, available at: <https://www.sciencedirect.com/science/article/pii/S2414644719300508>

care professionals who can improve their diagnosis while providing a more personalized service. Health care institutions can also use the data to make more informed decisions and allocate resources effectively and efficiently. Policy-makers can improve programmes, from early intervention and prevention to diagnosing and treating sickness and policies to better respond to the needs of all potential users.

Even though smart health care opens a wide range of opportunities to include unserved communities, it is also putting in evidence the existing digital gap. Especially during COVID-19 pandemic, there has been an accelerated adoption of health technology which has been crucial to mitigate the outbreak⁴⁸. Nevertheless, this digital acceleration and development has evidenced the gap between those who can benefit from digital tools and those who cannot.

Digital health inclusion needs to be a priority. To achieve so, tackling challenges and taking advantage of the opportunities, the Edison Alliance and the World Economic Forum published the [Principles for Digital Health Inclusion](#) which include the following⁴⁹:

Principle 1: Inclusive by design, prioritizing equity and access: Multiple international organizations call for health care as a fundamental human right. For digital health care, this means embedding inclusion and equitable access as a principle in the design of all products, services, policies, regulations, supervisory practices, security procedures, technologies and infrastructure.

Principle 2: Putting trust first: Building trust by putting ethics first in product design, understanding users' needs, priorities and preferences, and ensuring transparency and inclusion.

⁴⁸ Ernst and Young, [How COVID-19 has triggered a sprint toward smarter health care](https://www.ey.com/en_gl/health/how-covid-19-has-triggered-a-sprint-toward-smarter-health-care) available at: https://www.ey.com/en_gl/health/how-covid-19-has-triggered-a-sprint-toward-smarter-health-care

⁴⁹ The Edison Alliance and World Economic Forum, [Shared Guiding Principles for Digital Health Inclusion](https://www3.weforum.org/docs/WEF_Shared_Guiding_Principles_for_Digital_Health_Inclusion_2021.pdf), November 2021, available at: https://www3.weforum.org/docs/WEF_Shared_Guiding_Principles_for_Digital_Health_Inclusion_2021.pdf

Principle 3: Creating connected care through integration. Interoperability and health identity: Enabling the integration of digital health products on platforms that allow providers and patients to access each individual's health record with checks and balances in place.

Principle 4: Focusing on the health needs of women and girls. Gender equity: Placing women at the centre of societal growth. Women are, in most cases, society's primary caregivers, but experience to date indicates women are left out of the development and funding of new companies, and women's issues are often neglected when it comes to technology-based products for their virtual care.

Principle 5: Developing responsible, long-lasting solutions. Ensuring that new health care programmes are resilient and scalable, as well as financially sustainable, preventing the sudden cancellation of medical programming on which people have become dependent.

Principle 6: Evidence based and data secure. Using health data safely and responsibly to ensure inclusion while safeguarding informed consent, privacy and confidentiality. Caregivers and patients should remain in control of medical decisions. Machine-learning tools should augment medical decision-making, not replace it.

Principle 7: Effectively regulated. Adopting a non-discriminatory technology-neutral, principle-based and risk-based approach to regulation and supervision that is committed to the standard of proportionality and transparency.

b. Long-term care

As technology has the potential to impact the health care industry, long-term care has also taken advantage new technologies. Research and innovation, including digital solutions and assistive products is a key strategy recommendation from the World Health Organization within the Framework for countries to achieve an integrated continuum of long-term care, as they can lead towards the provision of equitable, sustainable and effective care.⁵⁰

⁵⁰ World Health Organization, [Framework for countries to achieve an integrated continuum of long-term care](https://www.who.int/publications/i/item/9789240038844), available at: <https://www.who.int/publications/i/item/9789240038844>

For example, in [Canada](#), making greater use of technology has been identified as a potential solution to help address some of the biggest problems in long-term care during COVID-19 with solutions such as:

- helping residents who travel around the facility with door sensors;
- promoting social interaction among residents by delivering social programming online;
- facilitating virtual visits with care providers, caregivers, families and friends;
- facilitating communication between facilities and care providers, through electronic health-record systems;
- helping to monitor the safety of residents, with the use of global positioning systems;
- using touchless hardware and voice-activated devices, for example, asking “Google” or “Alexa” to call the nurse and/or front-desk staff, and activate features in rooms such as lights, blinds, heating, ventilation and air conditioning, and entertainment; and
- artificial intelligence to support early disease detection, more precise diagnosis, and personalized treatments, or to continuously detect changes in activity and behaviour patterns for early detection of health issues.

However, considering the use of technology in long-term care needs to have a human centered approach for residents and their caregivers, family and friends, rather than only for enhancing efficiency and reducing costs. “For example, this can mean ensuring that technology is not used to substitute for human interaction and instead used in a way that can free up staff and care providers for more time for such interactions, thereby supporting enhancements in client experiences and outcomes while also achieving manageable costs and positive provider experiences”⁵¹.

⁵¹ McMaster University, [Evidence Brief Identifying and Harnessing the Potential of Technology in Long-term Care Settings in Canada](https://www.mcmasterforum.org/docs/default-source/product-documents/evidence-briefs/tech-in-ltc-eb.pdf?sfvrsn=9bcb0fb_4), available at: https://www.mcmasterforum.org/docs/default-source/product-documents/evidence-briefs/tech-in-ltc-eb.pdf?sfvrsn=9bcb0fb_4

c. Mobility and transportation

54 percent of cities around the world are rethinking their mobility and transportation approaches because of COVID-19 and the vulnerabilities associated with climate change according to the survey [Smart City Solutions for a Riskier World](#)⁵². Consequently, there has been an increase in technology investments targeting public transportation. Mobility as a Service (MaaS) digital platforms are an example as users can access a range of public, shared and private transport options including real-time transport information, bookings and single payment system for their journey.

In Japan, for example, MaaS platforms have been implemented to provide a solution to mobility and transportation for older adults in rural areas. The [World Economic Forum](#) has documented how the country has adapted transportation systems to the needs of older generations. For example, Shobara, a depopulated town in the mountains of Hiroshima prefecture, has bucked a trend toward reduced bus service by incorporating MaaS-based solutions. The town has added new bus stops, cutting the distance that older people must walk to catch the bus. To make the expanded service financially and logistically viable, it has introduced smaller vehicles and a reservation system: buses stop only when users have booked in advance⁵³.

Older people, particularly when their physical mobility is limited in some way, might need additional support to be able to live independently. Infrastructure modifications, especially in the areas of mobility and transportation, provide a wide range of opportunities to be more age friendly.

Technological solutions to those challenges and opportunities can be inclusive and can respond to the needs of older adults but only if they are developed with universal design

⁵² ESIThoughtlab, [Smart City solutions for a Riskier World](#), available at: <https://econsultsolutions.com/wp-content/uploads/2021/03/ESITL-Smart-City-Solutions-eBook-Final.pdf>

⁵³ World Economic Forum, [Ageing is changing the way we move. Japan shows how transport systems can adapt](#), available at: <https://www.weforum.org/agenda/2021/04/japan-ageing-population-transport/>

principles in mind, if end users are considered in the planning, design and testing phases and if they are informed on how to use these services in their everyday lives.

d. Financial wellness

The banking industry is among the early adopters of mobile technological innovations. However, older adults are not benefiting from those services. For example, and according to 2020 data, in the EU-27, 57 percent of people in the age group 45 to 54 used the Internet for online banking, compared to less than a third (31 percent) of persons between 65 and 74 years old⁵⁴. According to the World Bank report [The Role of Digital Financial Inclusion in Preparing for Older Age and Retirement](#), the leading causes for financial exclusion among older adults are low digital capability and the absence of financial products covering their needs, which leads to vast numbers of people lacking the tools needed to prepare for the financial challenges of older age⁵⁵. For example, in Latin America, the InterAmerican Development Bank reports that only a few countries give financing to older people to look for business opportunities and most loans to this segment of the population must be very well secured⁵⁶.

The [Age-friendly banking report](#) describes some of the challenges that older people face while using banking and payment systems and how some banks in the UK and USA have begun to address them through careful design and good implementation, such as⁵⁷:

- [Oregon Bankers Association](#) (OBA) collaborated with ageing advocates and developed a toolkit to help banks protect their older customers. The anti-exploitation toolkit has a video and online component. The first part teaches bank employees to better recognise and prevent fraud and to build reporting systems.

⁵⁴ United Nations Economic Commission for Europe (2021), Ageing in the Digital Era, Policy Brief on Ageing No. 26, p. 15. Available at: https://unece.org/sites/default/files/2021-07/PB26-ECE-WG.1-38_0.pdf

⁵⁵ World Bank, [The Role of Digital Financial Inclusion in Preparing for Older Age and Retirement](#), available at: <https://www.financialcapability.gov.au/files/the-role-of-digital-financial-inclusion-in-preparing-for-older-age-and-retirement.pdf>

⁵⁶ InterAmerican Development Bank, [The Silver Economy in Latin America and the Caribbean: aging as an opportunity for innovation](#), entrepreneurship and inclusion, available at: <https://publications.iadb.org/en/>

⁵⁷ Age UK and AARP, [Age-friendly banking report](#), https://www.ageuk.org.uk/globalassets/age-uk/documents/reports-and-publications/reports-and-briefings/money-matters/rb_april16_age_friendly_banking.pdf

The second part provides materials to help bankers make presentations to their customers about how to avoid scams and exploitation.

- [Nationwide Building Society](#) –Every Nationwide branch contains a Helping Hand unit, which is a kit that has been designed to help customers who may need additional assistance as a result of conditions such as arthritis, sight loss and restricted mobility. Each Helping Hand unit includes: Pen grips to enable greater control when writing, A4, passbook and pen magnifiers to increase visibility of written documentation, cheque book templates to help customers correctly complete each section of a cheque, credit card templates to help ensure signatures on the back of cards are contained within the signature strip, bank note gauges to help identify the denomination of a bank note through size and Braille, lap-pads and clipboards to provide writing places away from the main counter.

Older generations open opportunities for new financial services and products in many areas such as savings, insurance, reverse mortgages, and pensions which should come from both the private and the public sector⁵⁸. Technology can allow more financial freedom and security in older ages, but only if all stake holders consider older adults needs.

e. Employment and work environments

Working age is increasing as population is ageing. For example, across the [OECD](#), the median age of the population is projected to increase from 40 years to 45 years in the mid-2050s, and the ratio of older people aged 65 and over to people of working age (15-64) is projected to rise from 1 in 4 in 2018 to 2 in 5 in 2050⁵⁹.

People are living longer and, if better working conditions and age-friendly workplaces are ensured, many will also be working longer. Age friendly working environments promote longer and healthier lives as well as improvements in living standards including financial security and freedom for older generations. Multigenerational workforces can also leverage

⁵⁸ InterAmerican Development Bank, The Silver Economy in Latin America and the Caribbean, available at: <https://publications.iadb.org/en/>

⁵⁹ OECD, Ageing and Employment Policies: Working better with age, available at: <https://www.oecd.org/els/emp/Brochure%20OW%2028-08.pdf>

the accumulated experience and skills of older adults, and promote intergenerational dialogue empowering all workers to be productive at all life stages⁶⁰.

Governments and employers should be able to offer better incentives and choices to work for older adults through inclusive policies such as providing more flexible work and retirement options and promoting lifelong learning. Technology can help to achieve this goal; the following are some examples:

- In India, the Ministry of Social Justice and Employment announced in 2021 the [Senior Able Citizens for Re-Employment in Dignity \(SACRED\)](#) programme which is based in a new online platform which will bring together older adults looking for employment and businesses interested in attracting their talent. The platform will allow virtual meetings and online training.
- To boost the employment of older adults in France, the web platform [EmploiSenior.net](#) was created offering employment split in three themes: jobs proposed by private individuals, jobs proposed by professional and seniors' applications. The type of job offers are very wide: it ranges from childcare to corporate counselling. The use of this service is free for applicants and private individual employers; only professionals are charged⁶¹.

Many opportunities open to take advantage of the technical knowledge and business experience of older generations. Technology can facilitate if solutions are thought to be inclusive.

f. Education and lifelong learning

Education and lifelong learning activities can improve health and well-being in older adults. As older adults engage in such activities, they can achieve personal fulfilment, improve their

⁶⁰ World Economic Forum, [How can we best engage older workers in reskilling efforts?](https://www.weforum.org/agenda/2021/05/how-can-we-engage-older-workers-in-reskilling-efforts-jobs-reset-summit-ageing-workforce-longevity-upskilling/), available at: <https://www.weforum.org/agenda/2021/05/how-can-we-engage-older-workers-in-reskilling-efforts-jobs-reset-summit-ageing-workforce-longevity-upskilling/>

⁶¹ Age Platform Europe, available at: <https://www.age-platform.eu/good-practice/emploiseniornet-online-platform-senior-workers>

self-esteem, develop new skills, adapt to new circumstances, and stay active. According to the OECD, “lack of time, scheduling conflicts and distance constraints are among the key barriers reported by those who do not undertake any training, along with a lack of financial resources”. Online learning has the potential to address these barriers⁶².

- In Singapore, [Skillsfuture](#) is a national movement to provide Singaporeans with the opportunities to develop their fullest potential throughout life, regardless of their starting points including schooling years, early career, mid-career or silver years. The program includes [Myskillsfuture](#), a one-stop portal that enables Singaporeans of all ages to make informed learning and career choices, so that they can pursue their skills and career development throughout their lives. The platform provides digital tools to understand career interests, explore industries, find training opportunities to stay relevant, gain knowledge from career tips and explore job opportunities.
- [Older Adults Technology Services](#) (OATS), has the mission to help older adults learn and use technology so they can live better in the digital age. Their courses, programmes, and activities help older adults learn new skills, save money, get in shape, make new friends and age with attitude.
- [123 Digit](#) is a free platform to tackle digital divide. It offers content to train different groups, including older adults, tools to diagnose a learner’s level of abilities, and a forum to exchange information between digital caregivers.

Education and lifelong learning are a key factor that facilitates participation and socialization, security and health as people grow older. Technology solutions should be taken into consideration to provide those programmes to older adults in an inclusive and accessible manner, especially considering content that adequately meets the demands and interests of older adults.

⁶² OECD, [The Potential of Online Learning for adults: Early lessons from the COVID-19 crisis](#)

g. Independent living

Technological innovations have helped people living longer and are increasingly promoting active and healthy ageing. With the latest advancements in smart home technology, older adults are achieving a comfortable, independent, and safe life in their own homes. Robotics, smart living applications, artificial intelligence and big data have proven to be cost effective and efficient solutions. “Sensors on taps and toilets to monitor usage; “smart floors” that can detect if a person has fallen; ovens that turn themselves off if they detect burning food; mobility and personal care devices such as a GPS-enabled intelligent walking stick that uses AI to learn its owners’ regular movements; smart hearing aids that can be controlled via a smartphone and connected with a smart smoke alarm or doorbell, are just a few examples”⁶³.

Health and long-term care technologies and applications are closely related to the possibility of ageing at home, but many other areas offer opportunities to contribute to create healthy ageing environments as technology has also proven effective in combatting loneliness and social isolation⁶⁴.

For example, the [Uniper-Care](#) is an accessible tech-enabled program empowering older adults with the ability to remain at home independent, socially & physically active, healthier & happier, in an affordable way. It provides older adults with a daily schedule where they can join live and interactive programs; mental, social and physical meetings and sessions all accessible through any TV-set. The schedule includes a wide variety of programs; daily exercises to help reduce falls, group positive thinking session, morning yoga, afternoon

⁶³ Apello and Good Things Foundation, [The role of technology in combating loneliness and isolation amongst older people](#), available at:

https://www.housinglin.org.uk/assets/Resources/Housing/OtherOrganisation/appello-the-role-of-technology-in-combating-loneliness-and-social-isolation-amongst-older-people_v6.pdf

⁶⁴ Kristina M. Conroy, Srikrupa Krishnan, Stacy Mittelstaedt, Sonny S. Patel, Technological advancements to address elderly loneliness: practical considerations and community resilience implications for COVID-19 pandemic, available at: <https://www.emerald.com/insight/content/doi/10.1108/WWOP-07-2020-0036/full/html>

community meetups and evening mindfulness. Each participant is located at the comfort of his/her home and can see and talk with other participants.

[Rendeever](#) is overcoming social isolation through the power of virtual reality. It brings experiences to older people who have difficulty leaving the house. Using a VR device designed for this service, older adults can enjoy images of places ranging from those associated with personal memories, like houses where they used to live, their favorite parks, wedding ceremonies, to travel destinations like Machu Picchu and Paris.

All stakeholders need to ensure that all these technologies, platforms and solutions are accessible, consider the end users' needs and characteristics and that older adults have the adequate skills to use them to fully take advantage of the benefits of the digital world we are living in.

Recommendations and final thoughts

The UN Roadmap for Digital Cooperation outlines 8 key areas for action:

1. Achieving universal connectivity by 2030
2. Promoting digital public goods to create a more equitable world
3. Ensuring digital inclusion for all, including the most vulnerable
4. Strengthening digital capacity building
5. Ensuring the protection of human rights in the digital era
6. Supporting global cooperation on artificial intelligence
7. Promoting trust and security in the digital environment
8. Building effective architecture for digital cooperation

To ensure that these goals include older generations, their specific needs need to be taken into consideration so that they can fully benefit from accessing and using technologies. Member states, industries, the academia, companies, small and medium enterprises as well as entrepreneurs and end users themselves need to join efforts not to leave anyone behind.

Some key recommendations to achieve so are:

Demographics and data collection

- To better understand the needs as well as the challenges that older generations face to adopt technology, we need data, information and metrics so that all stakeholders can adapt better strategies to achieve technological and digital

Connectivity

- Collective efforts among governments, industry, private sector and all relevant stakeholders need to be enforced to provide universal access to information and communications technology in all regions and to all people regardless of their age, gender, condition or location.
- At the national level, Governments and communities, with the support of multi-stakeholder coalitions, can conduct local and regional assessments of connectivity needs in order to develop comprehensive connectivity plans.
- Risk factors that affect the ability of vulnerable and marginalized groups to have access to connectivity should be specifically identified and addressed. Special attention should also be given to ensuring connectivity in times of crisis and in humanitarian operations.
- Countries should also set their priorities for frontier technologies through national plans for research and innovation. Specific sectors can be strengthened either by encouraging new businesses to form, helping existing businesses to grow, or attracting companies from outside. The plans also should identify changes needed in the regulatory environment and the need for investment in physical infrastructure and in training.
- National plans and strategies can also promote technological applications that could help disadvantaged groups or help stimulate economic development in rural areas or declining regions.
- Smooth technology transfer. The international community can facilitate technology transfer for locally relevant products and services. This may involve liberalizing access to trade and to technologies covered by intellectual property rights.

Affordability

- Telecom operators, ICT regulators and governments need to continue their efforts to provide affordable telecom packages and services, as well as affordable devices and technologies for all consumers including older adults. Measures to support low-income households with the costs of broadband connections can make an important contribution to ensuring equal access and digital inclusion irrespective of socioeconomic background, especially during emergency situations.

Accessibility

- All stakeholders should establish a systematic mechanism to secure the development and availability of accessible ICTs, including the recognition of universal design and accessibility standards, particularly the implementation of the Web Content Accessibility Guidelines (WCAG).
- Revise accessibility and usability standards periodically and include them in policies and regulations so that the industry, while developing new technologies, is not increasing the digital divide. They need to clearly understand what is meant by an accessible ICT and what is expected from products and services.
- Work with academics and industry to create awareness of and training courses on accessibility and usability standards.
- Work with end users as well as with academics and industry in order to ensure the quality and universality of new technologies.
- Develop appropriate training to ensure the use of technology for all potential end users, including tailored capacity building programmes that meet the specific needs of their target populations.
- Service providers should be encouraged to provide offline access to services without additional costs to the end-user and to provide offline assistance in using their online services.

- Access to data to pursue innovation opportunities in technology and analytics should include increasing transparency. Promoting more government accountability, creating an open, common and reliable evidence base are required to support policy development, decision-making and democracy.
- All stakeholders need to be aware of the risks of discrimination and should improve their processes to include all potential users in their design protocols to identify their specific needs which would translate in better products and services that all persons including older persons, persons with disabilities, would engage with.
- Greater efforts are needed to develop further guidance on how human rights standards apply in the digital age.
- Governments need to face the challenge to increase their cybersecurity preparedness and resilience. Cities should define a detailed cybersecurity strategy that is in line with their broader smart city strategy and that can mitigate the risks arising from the ongoing convergence, interoperability and interconnectedness of city systems and processes.
- Policies, legislation, and technology must be aligned continuously to maintain the right balance between protection, privacy, transparency and utility.
- All stakeholders should establish a consistent method for identifying, evaluating and addressing privacy risks. Privacy risks should be addressed in a manner consistent with public expectations.