The State of Broadband:

Leveraging AI for Universal Connectivity

Part One - June 2024

BROADBAND COMMISSION
FOR SUSTAINABLE DEVELOPMENT

ITU

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ITU and UNESCO. 2024. The State of Broadband 2024: Leveraging AI for Universal Connectivity

ISBN:

978-92-61-39221-5 (electronic version)
978-92-61-39231-4 (eBook version)
978-92-61-39241-3 (MOBI version)

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Acknowledgements

This report has been written collaboratively, drawing on insights and contributions from Commissioners and their organizations, as listed below. As such, the views expressed here are not attributed to any one organization or individual. The report has been written by Phillippa Biggs. From the International Telecommunication Union (ITU), Nur Sulyna Abdullah provided direction, guidance and input, and Leah Mann, Julia Gorlovetskaya, Sadhvi Saran, and Maria Victoria Sukenik provided editorial review. From the United Nations Educational, Scientific and Cultural Organization (UNESCO), editorial review and input was provided by Davide Storti, Sonia Tara Savci, Juliette Norrmén-smith, Elspeth McOmish, Jaco Du Toit, Bhanu Neupane, Adeline Hulin, Laura Stipanovic Ortega, Katherine Redman, Marina Paraï, and Leona Verdadero.

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Introduction

The rapid evolution of digital technologies is continuing apace. Digital technologies the relatively well-known sector of telecommunication networks, the evolving domain of data and information, and now the dawning era of Artificial Intelligence (AI) applications.

Several decades ago, telecommunication technologies began to permeate our lives, as networks were standardized to improve coverage and interoperability. The ability to access basic telecommunications was recognized as an important need for citizens by many countries. Many governments and regulators promoted network expansion, coverage, universal service, market liberalization and privatization and, over time, recognized the significance of different types of digital divides.

Mobile telephones then started to accompany us wherever we went, followed by a growing array of laptops and portable devices, widely used to inform and organize our work and leisure. Information & Communication technologies (ICTs) transformed our lives and our economies, with the birth of the 'digital economy', served by growing numbers of 'knowledge workers' and data-rich monitoring techniques.

Human activities, as well as entire economic sectors – such as banking, shipping, logistics and transport – are now organized around real-time data feeds. Data itself has become a huge asset class – stored, exchanged, sold and traded. Data standards, data formats and data sharing have now become significant issues for the attention of regulators and policy-makers alike.

Today, unprecedented innovation and massive leaps forward in AI technologies look set to reshape many aspects of our lives, as well as our societies. AI stands to revolutionize the way in which services are provided and decisions taken. It offers vital opportunities, as well as some unforeseen risks. Regulators and policy-makers are racing to identify all-important considerations in governance, policy and standards, for the ethical use of AI tools and applications, as well as the data used to train them.

The ITU/UNESCO Broadband Commission for Sustainable Development is investigating and considering how AI can best be used to enhance people's lives, improve development outcomes and achieve the Sustainable Development Goals (SDGs). This year's State of Broadband 2024 report offers an initial overview of some of the ways in which AI applications are already being used to benefit development, across a number of fields, as well as some of the risks.

This report considers some of the implications of the digital divide, as well as the impact of AI across fields of e-government, education, digital health, digital finance and the environment. It tracks progress in the Broadband Commission's Advocacy Targets on the road to the UN Summit of the Future and the SDGs.

At the current crossroads, as broadband and computing infrastructure provides the basis for changes brought about by AI, policy responses are in the early stages of development. The State of Broadband report aims to inform policy-makers about developments in AI and their effects on the goals of the Broadband Commission, as policy-makers engage with the development of digital technologies and their impact on the policy landscape.

Chapter 1

The State of Broadband

The number of Internet users grew to 5.4 billion in 2023, and is projected to hit 5.5 billion by the end of 2024. Still, 2.6 billion people remain offline, with an estimated 38% of the global population living within mobile broadband coverage and not using it and 5% of the population still not covered by mobile broadband.

WSIS Forum 2024 Photo Contest Finalist:
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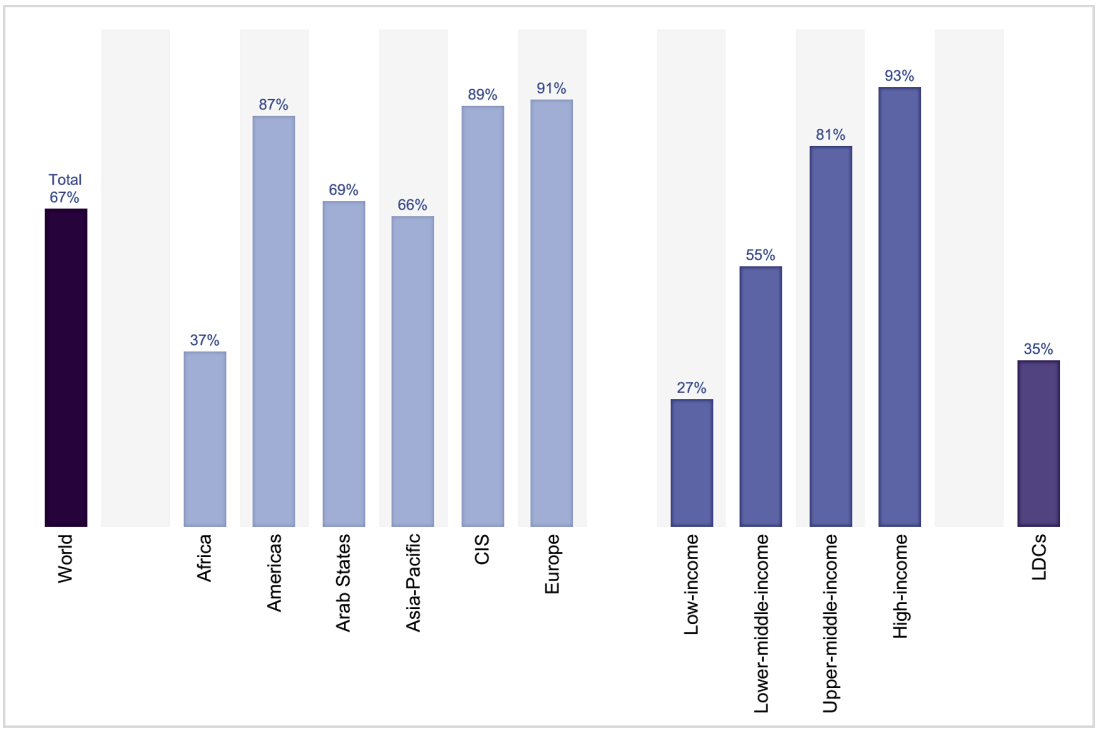
Chapter 1 – The State of Broadband

The world has experienced unprecedented turmoil since 2020, with a succession of crises, growing economic instability, conflict, and climate challenges. The global population has increased, from 8 billion in mid-November 2022 to 8.05 billion today[1]. The number of Internet users continues to grow, adding 280 million people last year over 2023 to reach 5.4 billion people by end-2023 (approximately 2.8 billion male and 2.6 billion female Internet users), and projected to reach 5.5 billion by end 2024, equivalent to 67% of the total global population (Figure 1). However, some 2.6 billion people still remain offline, around 33% or one-third of the global population[2]. By the end of 2022, an estimated "usage gap" of 38% of the global population lived within mobile broadband coverage but were not using it, while 5% of people are still not covered by mobile broadband (coverage gap)[3].

As new and more advanced services become available, the digital divide is now far from just a numerical disadvantage – powerful new services and opportunities are now available to 'digital haves', compared to 'digital have-nots' in offline populations and communities.

Figure 1: Percentage of individuals using the Internet by region and country grouping, 2023



Source: ITU, https://www.itu.int/itu-d/reports/statistics/2023/10/10/ff23-internet-use/

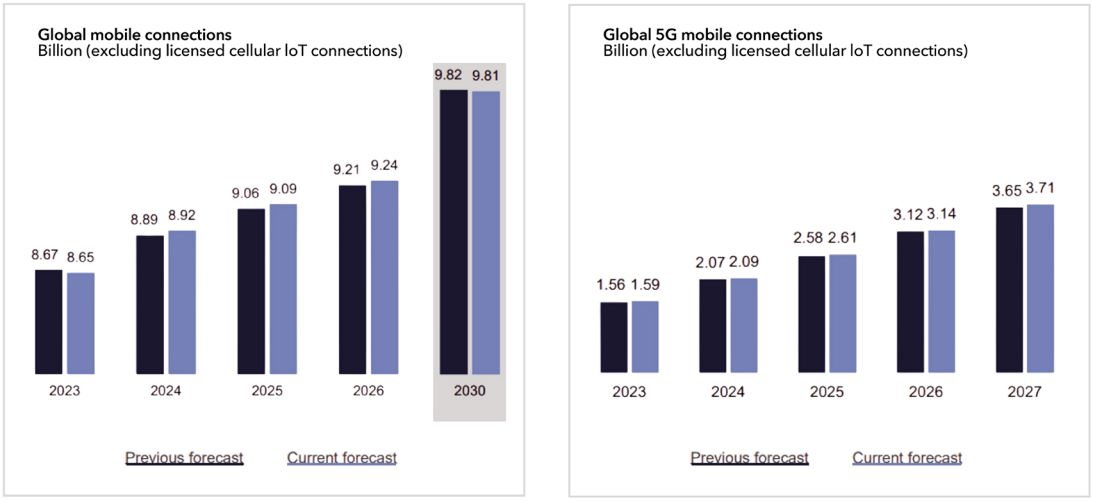
Mobile communications continue to grow steadily. The GSMA estimates that globally, there will be 8.9 billion mobile connections by the end of 2024, projected to reach 9.8 billion mobile connections in 2030 (Figure 2, left graph). The total number of 4G mobile connections is expected to peak this year at 5.11 billion in 2024, before 4G gradually starts to decline from next year onwards, as 5G takes off rapidly. Ericsson estimates that globally, 5G accounted for

some 1.6 billion mobile subscriptions by the end of 2023[4] (Figure 3, left graph). 5G is scaling faster than previous generations and is expected to surpass 2 billion connections this year, and to climb quickly to 3.7 billion connections by 2027 (Figure 2, right graph).

GSMA estimates that China alone accounts for one billion 5G subscriptions in 2024. By January 2024, India had 140 million 5G subscribers, 420,000 5G base stations and 8% of data traffic carried over 5G a year after the launch of commercial services[5].

Voice over Long-Term Evolution (VoLTE) subscriptions reached 5.7 billion at the end of 2023[6]. Based on a study by LSTelcom, GSOA estimated that the number of people connected via satellite communications will double to 500 million by 2030[7].

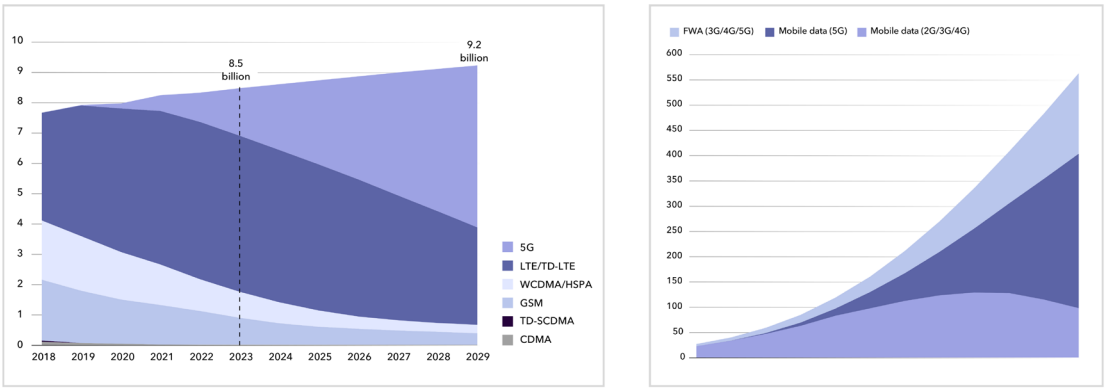
Figure 2: Growth in Global Mobile Connections, 4G and 5G, 2023-2030



Source: GSMA Mobile Intelligence, Global Mobile Forecasts, Q4 2023 Review: capturing the changes, discussing the drivers (gsmaintelligence.com).

Figure 3: Growth in Global Mobile Connections and data traffic: FWA, 4G and 5G, 2023-2030

Total number of mobile connections, billions (left graph); Data traffic in Exabytes per month (right graph)



Source: Ericsson Mobility Report, Nov 2023: Latest data and forecasts – Mobility Report - Ericsson

Meanwhile, growth in demand on networks (including from fixed wireless access solutions) is fuelling massive traffic growth. Total mobile data traffic is estimated to treble between 2023

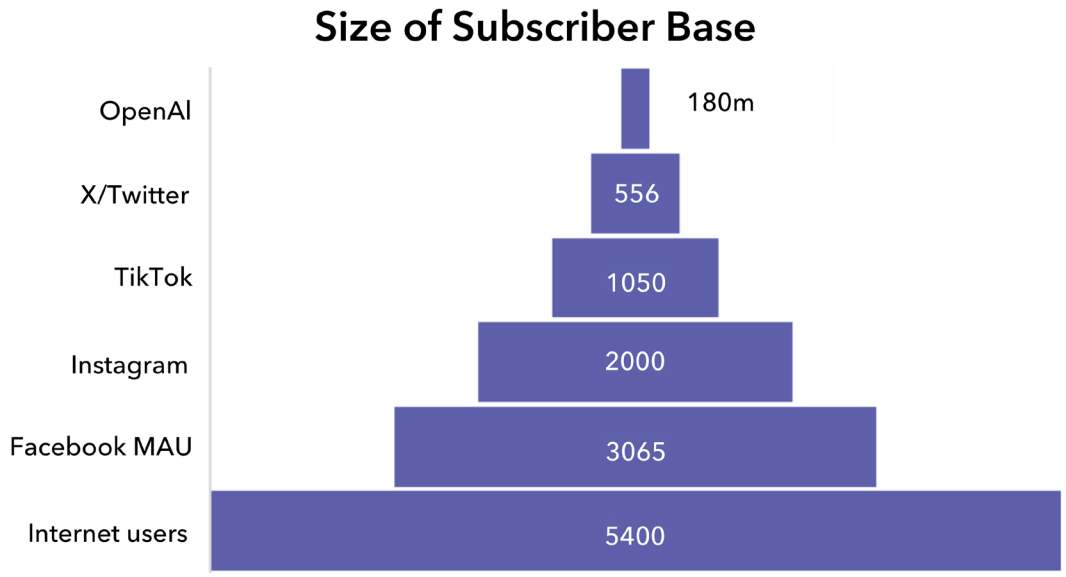
and 2029. Total mobile network traffic was estimated at around 160 EB per month at the end of 2023, rising to an expected 563 EB per month by the end of 2029 (Figure 3, right graph).

Globally, average mobile data usage per smartphone will more than double, from 21 GB in 2023 to 56 GB in 2029. 5G's share of mobile data traffic is estimated at around a quarter or 25% at the end of 2023, up from 15% at the end of 2022, and is forecast to grow to three-quarters or 76% by 2029. Meanwhile, the advent of 5G also enables open programmability, including network APIs to allow developers easy access to tap into 5G network capabilities to catalyze new applications and innovations[8].

And it is not just the technologies which are evolving fast – the digital landscape is changing rapidly. Old services have evolved, while new services and tools have appeared, such as generative Artificial Intelligence (AI) – tools enabling automated production of text, sound, images or videos. Crypto-currencies (and crypto-exchanges) came into and fell out of favour, before Bitcoin staged a comeback in early 2024.

Organizations, enterprises, schools, healthcare providers, public institutions and citizens are all struggling to grasp the impact of AI, while there is more public demand than ever for digital products and services, and more time than ever spent online. Concerns over the impact of generative AI triggered a series of labour disputes in California, United States, throughout the second half of 2023. OpenAI's potential impact (including on jobs) seem out of proportion to its actual user base of 150 million users (excluding casual users). Indeed, the extent of a platform's influence and its coverage in the media are not correlated with the size of its subscriber base (Figure 4).

Figure 4: Size of Subscriber Base is no Indicator of Size of Influence



Source: Various. Note: Monthly Average Users (MAU) for Facebook and Instagram. Based on registered users for Tiktok, X and Open AI (https://explodingtopics.com/blog/chatgpt-users). There is considerable uncertainty surrounding the number of regular users of X, cited by a variety of sources as ranging from 330 million to 556 million monthly active users – see www.bankmycell.com/blog/how-many-users-does-twitter-have

Today, digital technologies offer huge opportunities, but carry broad implications for traditional operations across government, education, healthcare, finance and energy consumption, to name only a few sectors.

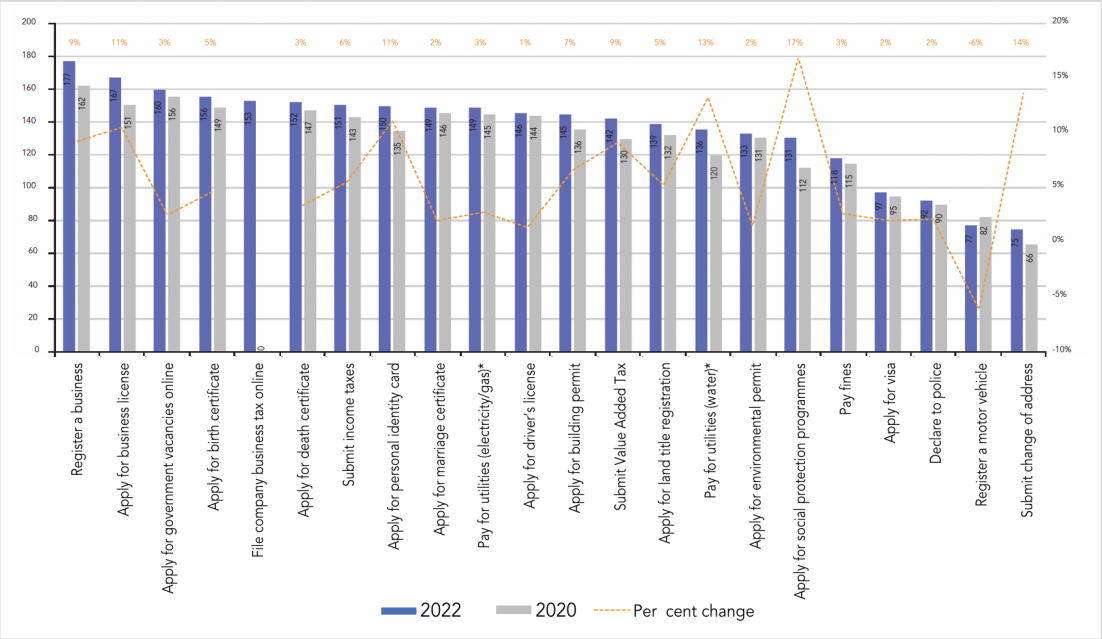
Transformation 1: Digital technologies are transforming government services and service delivery

Digital technologies contribute to national and local development, facilitate the sharing of knowledge and guidance, and enable the provision of online services and solutions. Many countries have introduced e-government services, with some countries and municipalities moving to introduce AI tools and services.

According to the UN Department for Economic and Social Affairs (UNDESA), the proportion of UN Member States providing different online transactional services rose from 66% overall in 2020 to 71% in 2022. There was a broad increase in the demand for and take-up of citizen services across all different types of services between 2020 and 2022 (Figure 5), driven by the establishment of foundational digital government products and services such as citizen digital identity management, the ability to access government services online (including tax), and interoperable databases. In both years, the most popular services for countries included business registration and licensing and digital identity; the least popular services were online police declarations, motor vehicle registration and changes in address.

Figure 5: Trends in the provision of online transactional services, 2020-2022

Number of countries and percentage change



Source: Page 26, United Nations E-Government survey 2022, available at: https://desapublications.un.org/sites/default/files/publications/2022-11/Chapter%201.pdf.

According to UNDESA's E-Government Survey 2022[9], governments are now moving to provide specialized portals for e-services, e-participation, open government data and public procurement. Many governments are reviewing and updating their legal frameworks, laws and regulations for digital procurement, digital identity, digital signatures, online voting, taxation, data sharing, interoperability across public agencies, and access to information. Governments will also need to have top-of-class technical and operational measures in place to promote cybersecurity and cyber-resilience, including data protection.

The United Nations Development Programme (UNDP) has also developed a Digital Readiness Assessment as a survey-based tool to provide rapid, high-level insights into a country's digital strengths and opportunities. It is intended to serve as an "entry point" for increased engagement between governments, UNDP Country Offices, a broad range of experts, and other international development partners. Box 1 explores innovative programmes in three developing countries which have successfully introduced inclusive, user-centric online government services, according to UNDESA.

Today, some governments and municipalities are also moving to introduce Artificial Intelligence (AI) tools for e-government services. AI use in the public sector span from simple redundant task automation, to more advanced chatbots to serve citizens and to decision support tools to improve public policies, investment and services. For example, in India, the Civil services' Capacity Building Commission is developing 'Amrit Gyaan Kosh', a repository of best practices in public administration in the form of case studies[10]. Various civil servants training efforts are being undertaken by the Indian government, as part of wider remit in capacity-building[11].

The UNDP AI Landscape Assessment (AILA) is a tool to evaluate a country's readiness to integrate AI technologies within governmental frameworks. The framework focuses on the dual role of governments as both facilitators of technological advancement and users of AI in the public sector. Critically, it prioritizes ethical considerations surrounding AI use through key elements like policies, infrastructure and skills. This assessment can serve as a useful first step to developing national digital or AI strategies or other policies around those topics.

However, the introduction of AI tools in e-government services does not always go smoothly – see the example of New York, United States (Box 2). The Broadband Commission Working Group on AI Capacity Building has also investigated the skills needed by civil servants to adopt new digital technologies (Box 3). Governments have to ensure that AI applications in the public sector (especially in areas where sensitive healthcare, civil and criminal data is being processed) adhere to ethical and legal standards, protect the rights of citizens (including data privacy) and promote transparency and accountability.

Box 1: Three developing countries providing inclusive, user-centric online services

Three countries—Rwanda, India and Ecuador—stand out for their efficacy in strengthening the provision of inclusive, user-centric online services.

In Rwanda, public institutions offered 98 online services in 2022. Rwanda has become a leader among the LDCs in e-government. Aiming to address challenges and improve user-centricity in services provision, Rwanda is focusing on collecting real-time information for internal and strategic public planning, to guide decision-making processes, and to inform the development of targeted solutions. Rwanda uses real-time specific, measurable, attainable, relevant and time-bound (SMART) analytics to track services delivery performance, including through heat maps and location-referenced quick performance reviews of public entities (e.g. schools, hospitals and farms). With financing from the World Bank, Rwanda has launched several digital inclusion initiatives to help 250,000 households acquire digital devices and to provide 3 million people with opportunities to improve their digital literacy. As part of its ICT for Governance Cluster Strategy 2020-2024, Rwanda is expanding inclusive digital services and ICT-enabled empowerment.

The Digital India initiative aims to provide people-centric services for marginalized groups, including:

- The Accessible India Campaign and mobile app, as a flagship initiative for achieving universal accessibility and enabling people with disabilities to have access to equal opportunities, live independently, and participate fully in civic life. The mobile app is a crowdsourcing platform that allows administrators to obtain information on inaccessible places across the country and to respond to relevant needs. 1,250 sign language interpreters have been trained, and 588 State and 95 central government websites are now accessible for persons with disabilities.
- The AgriMarket app informs farmers about crop prices and seeks to avoid distress sales. Farmers can obtain crop price information for markets within 50 km. So far, 80m farming families have registered.
- MyGov is a platform created to promote and support public engagement in decision-making processes. The platform has 24.5 million registered users and offers many e-participation tools to facilitate the formation of online groups and thematic discussions, polls, surveys, blogs and talks.

Ecuador's political commitment to reducing inequalities through investment in digital transformation is set out in its 2021-2025 Opportunity Plan. Particular attention is given to bridging existing gaps in Internet access. Ecuador has signed an agreement with ITU to move forward with plans to expand the 4G network and connect schools and healthcare facilities, including in rural areas.

Source: Adapted from UNDESA E-Government Survey 2022, available on pages 21-22 at: https://desapublications.un.org/sites/default/files/publications/2022-11/Chapter%201.pdf

Box 2: New York City's Plan to Use AI to facilitate the Delivery of E-Government Services

New York City was the first major city in the United States to announce its plan to use AI tools to improve government services in October 2023. New York City plans to use AI to help its residents and businesses by:

- developing a framework for city agencies to carefully evaluate AI tools and associated risks;
- helping city government employees build AI knowledge and skills; and
- supporting responsible implementation of AI technologies to improve quality of life for citizens.

To date, thousands of citizens have used pioneering tools such as New York City's chatbot to access information about government services, online and offline.

However, introducing AI to facilitate the delivery of e-government services doesn't always go smoothly. There was some pushback when seemingly personal robocalls were made to residents by the Mayor in a number of languages the Mayor does not speak – including Spanish, Yiddish, and Mandarin. There were some suggestions this might give a misleading impression to voters. As a consequence of increasing concerns about AI generated robocalls, in February 2024, the Federal Communications Committee (FCC) ruled that AI-powered robocalls are illegal under a 1991 law banning unwanted calls using fake or pre-recorded voices.

Users have also cited instances when the information given out by the chatbot contained outdated erroneous and/or misleading. The non-profit investigative outlet The Markup found that New York's AI chatbot may give users false and misleading business advice. (The chatbot now returns the correct information, according to Quartz).

When asked whether a boss can take a cut of their worker's tips, the chatbot reportedly responded to The Markup affirmatively, and cited NYC's Payroll and Tip Reporting information. In fact, New York's Department of Labor states that employers are prohibited from taking any part of an employee's tip. Introducing AI tools into e-government is not therefore entirely straightforward and will require constant testing, verification and modification afterward.

Source: Adapted from https://www.nyc.gov/office-of-the-mayor/news/777-23/mayor-adams-releases-first-of-its-kind-plan-responsible-artificial-intelligence-use-nyc#/0 and New York's AI chatbot tells people to break laws and do crimes (qz.com); Quartz.

Box 3: AI and Digital Transformation: Competencies for Civil Servants

The Broadband Commission's Working Group on AI Capacity Building explored the impact of digital transformation on the skills and competencies needed for civil servants. The Working Group was co-chaired by Audrey Azoulay, Director General, UNESCO, and Pekka Lundmark, President and CEO of Nokia, and consisted of Commissioners and External Experts.

The AI and Digital Transformation Competency Framework includes 3 competency domains:

1. **Digital planning & design**: understand the complexity of today's problems, anticipate unexpected events, and recognize strategic opportunities to use digital solutions.
2. **Data use & governance**: understand the fundamental role and value of data, as well as the inherent risks, and the ability to use, analyze and share data, taking into consideration ethical, privacy and security concerns.
3. **Digital management & execution**: understand innovative project-management and collaboration practices.

The report also explores five 'attitudes' that enable civil servants to pursue digital transformation effectively: 1. Trust 2. Creativity 3. Adaptability 4. Curiosity 5. Experimentation.

Source: www.broadbandcommission.org/publication/artificial-intelligence-and-digital-transformation/

Transformation 2: Learning outcomes and education systems

The education sector is being revolutionized by digital technologies in many countries. The COVID-19 pandemic and related shutdowns disrupted education for an estimated 1.6 billion students at its peak (UNESCO, 2021[12]), with some pupils resorting to the Internet to continue learning, where possible. The pandemic saw a massive and rapid expansion of online learning platforms and their growth, but increases in digital skills for teachers or digital educational teaching standards or policies are slower to achieve over a longer-term timescale. UNESCO has also pointed out that remote learning failed to reach at least half a billion or 31% of students worldwide – and 72% of the poorest students, potentially deepening social inequalities at both local and national levels.

The benefits of digital technologies are usually cited in personalized learning strategies and intelligent tutoring applications offering opportunities to improve learning. In developing countries, learning apps are helping cope with large class sizes, enhance teaching techniques and materials, and improve learning outcomes. In developed economies, teachers and schools can tailor learning to students' individual progress, along with opportunities to practise existing learning or acquire new knowledge.

Even basic access to the Internet can enable students to search for and access knowledge and facts online; acquire, practise and apply new knowledge; and explore new approaches, perspectives and different ways of doing things, both at school and often at home.

And it is not just the students who benefit directly, but also teachers. Digital technologies have increased access to teaching and learning resources. Examples include the National Academic Digital Library of Ethiopia and National Digital Library of India. The Teachers Portal in Bangladesh has nearly 640,000 users in mid-2024 (https://www.teachers.gov.bd/). However, UNESCO acknowledges that teachers may feel unprepared and lack confidence teaching with technology, and points out that only half of countries have standards for developing teacher ICT skills (UNESCO, 2023[13]).

Since 2023, UNESCO has monitored school connectivity to capture some of the dimensions of digital transformation in education. Richer countries are more likely to report data on Internet connectivity in primary schools and to have achieved nearly universal coverage. However, two-thirds of low-income countries have no data to report for school connectivity and none achieve their national benchmark.

Based on the data available, globally, only 40% of primary, 50% of lower secondary and 65% of upper secondary schools were connected to the Internet in 2023 (UNESCO, 202314). 85% of countries have policies to improve school or learner connectivity, but only 16% of countries explicitly guarantee data privacy in education by law (UNESCO, 202315). The ITU/UNICEF Giga project aims to connect schools to the Internet and open up online learning opportunities for both students and communities. To date, the Giga project has mapped some 2.1 million schools in 140 countries, out of approximately 7 million schools worldwide. Based on the data available, only Rwanda achieved an average rate of progress towards its SDG 4 school connectivity benchmarks (UNESCO 2024 SDG 4 Scorecard).

School mapping has been used to foster diversity and reduce inequality of opportunity, while geospatial data have been used to identify areas where children live too far from the nearest school. Learning analytics can help increase formative feedback and enable early detection systems; however, not all actors are sufficiently data literate. Successful education systems

typically have absorptive capacity, including strong school leaders and confident teachers willing to innovate. Often, seemingly trivial issues, such as maintenance and repair, are ignored or underestimated (UNESCO, 2023).

UNESCO (2023) found that countries are starting to define the digital skills they want to prioritize in curricula and assessment standards. Globally, over half (54%) of all countries have digital skill standards, but some of these have been defined by non-state, even commercial, actors (e.g. by 2017, Google Classroom served around half of all American primary and secondary schoolchildren[16] and is also used in a number of other countries).

Digital skills are increasingly important to participate in society, emphasizing lifelong learning and employment opportunities. The adoption of openly licensed content and Open Educational Resources (OER) is a pivotal strategy to ensure continued access to learning. According to UNESCO, 82% of Member States used OER to mitigate the disruptions to learning caused by the COVID-19 pandemic. Greece and Uruguay experienced significant surges in OER usage during the pandemic. Leveraging existing online platforms and simplifying licensing processes can facilitate the expansion of OER. For instance, Colombia's Aprende Portal saw a substantial increase in resources, while Ireland's Scoilnet portal became a hub for educators to upload class-specific materials and develop guided learning paths using OERs. OER can help build more inclusive and resilient education systems and promote collaboration, innovation, accessibility and digital equity in education. The UNESCO/UNICEF Gateways Initiative on Public Digital Learning Platforms seeks to provide high-quality, free, inclusive OER over digital learning platforms.

A study by LSTelcom published in 2023 identified a potential growth opportunity of 147% of satcom tele-education users in Africa and the Middle East and 109% growth of satcom tele-education users in Asia-Pacific by 2030 as the regions that will see a larger benefit from satellite broadband in tele-education[17].

Today, AI can enhance and take online search-and-apply techniques further, by generating comprehensive answers to questions or crafting essays, poetry and articles in different styles. Generative AI can enhance personalized learning, provide virtual tutoring, and create immersive educational experiences could make the content more engaging and pertinent. It can also help teachers by drafting lesson plans, freeing up their time for other activities (Box 4).

However, AI presents challenges and risks, for both schools and schoolchildren. Teachers seek safeguards against student distraction with technology and try to prevent plagiarism; some parents worry about screen addiction, privacy and bullying. Social scientists point to risks of deepening social inequalities among marginalized communities, while educators fret about the integrity of exams and curricula. The accuracy and authenticity of online knowledge and sources may be jeopardized (including for serious academic sources), as deepfakes become easier and cheaper to generate. Most existing Large Language Models (LLMs) have been initially created in English, for the Global North. Some stakeholders are calling for training data in other languages.

In addition, significant issues related to intellectual property protection have arisen. For example, Praxis, a Danish textbook publisher is investigating ChatGPT Store to identify whether its textbooks have been used to train chatbots without its permission[18]. The magazine WIRED reports that publishers, authors and newspapers are testing how ChatGPT Store is subject to

the Digital Millennium Copyright Act, part of US copyright law that allows copyright holders to file complaints if their intellectual property is disseminated without their permission.

In its most recent Gender Report 2024, UNESCO found that the influence of social media, and the design of AI algorithms on girls' education are also of concern. Greater interaction on social media since the age of 10 has been found to be associated with worsening socioemotional difficulties with age among girls, although no cross-associations were found among boys. Emotional well-being is generally associated with better academic outcomes (GEM Gender Report 2024, Technology on her terms[19]).

Box 4: AI in Education in India

Shiksha copilot is part of Project VeLLM, Microsoft Research India's platform to develop specialized generative AI copilots that are accessible to everyone from teachers to farmers to small business owners. Shiksha means education in Sanskrit. It is built on Microsoft Azure OpenAI Service and combined with the school curriculum and learning objectives. Azure Cognitive Service is used to ingest the text in textbooks including how the content is organized.

Sikshana Foundation's mission is to raise the quality of education – permanently. Sikshana is known for its low-cost, effective interventions that can be adopted by the government. It now works in six states across India, covering 50,000 schools and impacting three million students.

Generative AI tools are built on foundation models that synthesize massive amounts of data to generate text, code, images and more (e.g. Large Language Models or LLMs for text). However, results can be imperfect. In recent months, researchers have sought to improve accuracy by adding specific domain knowledge – in this case, the education curriculum of Karnataka state.

Retrieving information from the education curriculum reduces the risk of errors. The copilot is multimodal, so it includes images, video and text, and draws publicly available videos from the Internet. Azure OpenAI Service content filters and built-in prompts keep out inappropriate content, for example, racial or caste-related issues. It is the teacher who remains the "expert in the loop", with students having no direct contact with Shiksha copilot.

The Sikshana Foundation surveyed the teachers on their experience in 2023. Five were from urban schools and 25 from rural schools. The majority were teaching in Kannada, with just six teaching in English. The vast majority of respondents said Shiksha copilot cut their lesson plan preparation from 1hour or more to 5-15 minutes and 90% said they only needed to make minor modifications, if any, to the plans generated. Each teacher generated 3-4 lesson plans each week. Teachers do much more than just teaching – they help the students learn, but also have to check uniforms, distribute meals, conduct registration, etc. The Shiksha copilot can help teachers deliver better within the time constraints.

Source: "India's schoolteachers are drafting better lesson plans faster, thanks to a copilot", Chen May Yee, Microsoft, 8 Feb 2024, available at: India's schoolteachers are drafting better lesson plans faster, thanks to a copilot - Source Asia (microsoft.com)

Transformation 3: Digital Health

Healthcare systems and health insurance are being progressively transformed by digital technologies. Strategic and innovative use of digital and cutting-edge ICTs can help ensure that 1 billion more people benefit from universal health coverage, that 1 billion more people are better protected from health emergencies, and that 1 billion more people enjoy better health and well-being[20].

Digital health can help people overcome healthcare challenges such as equitable access, chronic disease management and prevention and the increasing costs of healthcare, vaccine and drugs research and development. Greater use of digital technologies and data can enable informed decision-making, provide people with better access to health information, improve quality of care, and personalize health outcomes.

The positive effects of digital technologies such as mobile were seen most starkly during the COVID-19 pandemic when mobile and mobile-related data were used by governments to address the medical, economic, sociocultural, and political aspects of the pandemic. Around the world, mobile operators worked with governments to design, implement, and monitor policy responses such as providing public health advice or financial support to citizens[21]. For example, in Nigeria, the mobile operator MTN collaborated with the government to develop data-driven insights using mobile big data, to help shape the planning and response to the pandemic[22].

Technologies such as the Internet of Things (IoT), AI, blockchain and smart wearables are enabling remote data capture and the exchange of data and sharing of information across the health ecosystem that can help enhance health outcomes. Digital technologies can improve medical diagnosis, data-based treatment decisions, digital therapeutics, clinical trials, self-management of care and person-centred care while creating more evidence-based knowledge, skills and competencies for professionals.

Digital transformation of healthcare can be disruptive, however. Many countries still need institutional support for the development and consolidation of national eHealth and/or digital health strategies and the implementation of their action plans, necessitating more resources and expertise. Digital health is part of overall health priorities and needs to benefit people in ways that are ethical, safe, secure, reliable, equitable and sustainable. It should be developed with principles of transparency, accessibility, scalability, replicability, interoperability, privacy, security and confidentiality.

Following the pandemic, the Broadband Commission launched the Working Group on Virtual Health and Care[23]. This Working Group convened industry leaders, government officials, and civil society to address prominent issues affecting broadband access, affordability and use in healthcare. It defined "virtual health" as digital solutions that integrate medical, social, and environmental factors to enable holistic well-being, while "virtual care" describes solutions that health systems and providers can employ remotely to help patients manage health conditions at a lower cost than traditional care. When combined with in-person services, virtual health and care present a valuable opportunity to expand access to quality, person-centred health services and drive progress toward universal health coverage (UHC).

The WHO records that at least 134 countries had published National Digital Health Strategies by 2020[24]. Other research identifies at least three additional African countries with National Digital Health Strategies, and points to the need to focus on young people and children's

health issues in a continent where typically around two-thirds of the population is under 25[25]. By 2030, almost one-third of the world's children will live in Africa[26].

The WHO approved its Global Strategy on Digital Health 2020-2025[27], setting out a vision, guiding principles and strategic objectives to help UN Member States navigate digital health issues. The WHO's Global Strategy emphasizes that health data are to be classified as sensitive personal data, or personally identifiable information, requiring high safety and security standards. It stresses the need for a strong legal and regulatory basis to protect privacy, confidentiality, integrity and availability of data and its processing. It seeks to address issues with cybersecurity, trust building, accountability and governance, ethics, equity, capacity-building and literacy, while ensuring good quality data are collected and shared to support planning, commissioning and the transformation of health services.

At the start of 2024, WHO has released new guidance on the ethics and governance of large multi-modal models (LMMs) – a type of fast-growing generative AI with applications across healthcare (Box 5).

Box 5: World Health Organization (WHO) Guidance on AI in Health

The WHO has released new guidance on the ethics & governance of large multi-modal models (LMMs) – a fast-growing generative AI technology with applications across healthcare (e.g. ChatGPT, Bard and Bert). LMMs accept one or more type of data inputs (such as text, videos and images) and generate diverse outputs. They are able to carry out tasks they were not explicitly programmed to perform. The new WHO guidance outlines five broad applications of LMMs for health:

- Diagnosis and clinical care (such as responding to patients' written queries);
- Patient-guided use (such as for investigating symptoms and treatment);
- Clerical and administrative tasks (such as documenting and summarizing patient visits within electronic health records);
- Medical and nursing education (including simulated patient encounters for trainees);
- Scientific research and drug development, including to identify new compounds.

LMMs are starting to be used for specific health-related purposes, but there are documented risks of producing false, inaccurate, biased, or incomplete statements, which could harm people using such information in making health decisions. LMMs may be trained on poor-quality and/or biased data (e.g. by race, ethnicity, ancestry, sex, gender identity or age). The guidance also details broader risks to health systems, such as accessibility and affordability of the best-performing LMMs.

The guidance includes recommendations for governments, who have the primary responsibility to set standards for the deployment and integration of LMMs for public health. Governments should:

- Invest in or provide not-for-profit or public infrastructure, computing power and datasets accessible to developers in the public, private and not-for-profit sectors.
- Use laws and regulations to ensure LMMs meet ethical obligations and human rights standards.
- Assign an existing or new regulatory agency to assess and approve LMMs and applications intended for use in health care or medicine – as resources permit.
- Introduce mandatory post-release auditing and impact (A&I) assessments, including for data protection and human rights, by independent third parties when LMMs are deployed. A&I assessments should be published, disaggregated by user type (e.g. by age, race or disability).

The guidance also includes recommendations for developers of LMMs, who should ensure that:

- LMMs are designed not only by scientists and engineers. Potential users and all direct and indirect stakeholders, including medical providers, scientific researchers, health care professionals and patients, should be engaged from the early stages of AI development in structured, inclusive, transparent design and given opportunities to raise ethical issues, voice concerns and provide input for the AI application under consideration.
- LMMs are designed to perform well-defined tasks with the necessary accuracy and reliability to improve the capacity of health systems and advance patient interests. Developers should be able to predict and understand potential secondary outcomes.

The guidance presents over 40 recommendations for consideration by governments, tech companies, and healthcare providers to ensure appropriate use of LMMs to protect the health of populations.

Source: "WHO releases AI Ethics & Governance Guidance for LLMs", WHO, 18 Jan 2024, available at: https://www.who.int/news/item/18-01-2024-who-releases-ai-ethics-and-governance-guidance-for-large-multi-modal-models

AI has been used for health-related purposes for some time, but there are documented risks of inaccurate outcomes (including 'hallucinations'). LMMs may be trained on poor-quality and/or biased data, disadvantaging certain populations (e.g. by race, ethnicity or sex). However, there are a number of considerations relating to the use of AI applications in healthcare (Box 6).

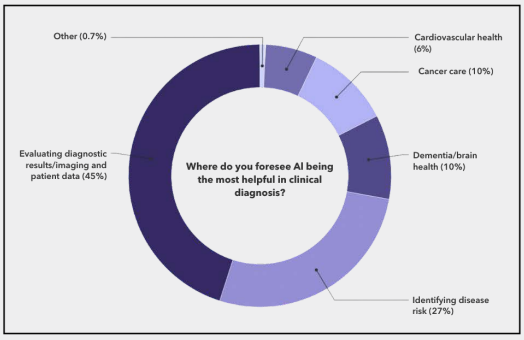
Box 6: Considerations relating to AI in Healthcare in the United States

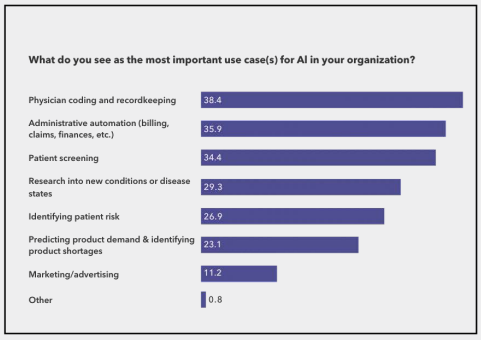
In March 2024, the White House outlined new policies for federal agencies' use of AI, including federal healthcare systems. It includes a directive that all agencies establish AI governance boards. Agencies must "implement concrete safeguards when using AI in a way that could impact Americans' rights or safety". Federal healthcare systems need to examine AI diagnostic tools to ensure that "a human being is overseeing the process to verify the tools' results and avoids disparities in healthcare access".

AI is already being deployed for healthcare in the United States and is being evaluated by the FDA for:

- Aggregating data from clinical trials, genomic data banks, hospital systems and other sources to train algorithms to pinpoint which people are most likely to respond to treatments (especially in oncology);
- A digital stethoscope with an AI algorithm to find heart failure has secured FDA clearance;
- The documenting and summarizing of electronic health records;
- Analysis of medical imagery;
- Google's research bot, AMIE, talks to actor patients following a standard interview technique in an effort to reach a diagnosis;
- Google has partnered with Apollo Radiology to use AI to fight tuberculosis (abroad in India);
- A new open access data set of 10,000 images of dermatological conditions was developed by Stanford Medicine.
- The FDA has cleared a digital treatment for depression developed by Otsuka Pharmaceutical and Click Therapeutics, Rejoyn is a six-week program focused on "cognitive-emotional training".
- Chatbot apps for dealing with addiction (e.g. reSET, which was approved by the FDA in 2017) or mental health in teens (e.g. Earkick).
- By feeding CT, MRI, x-ray, biopsy, and other data into deep learning algorithms, clinicians can identify cancer risk, detect diabetic retinopathy, identify skin conditions and treat patients.

According to a survey carried out by STAT Health and Premier Inc of 752 healthcare decision-makers, AI could prove the most helpful in clinical diagnosis in evaluating results & imagery, identifying disease risk and dementia and brain health. They saw physician recordkeeping as the most important use case, followed by administrative automation, patient screening and research.





Source: STAT Health newsletter, magazine and website, and the STAT/Premier Inc. survey of 752 healthcare business decision-makers, November 2023: www.statnews.com/wp-content/uploads/2024/02/Premier-Pulse-Check-Lite-Report-final.pdf

Transformation 4: Digital Finance for Consumers

In its simplest form, digital financial inclusion refers to giving access to affordable financial services and products by digital means in underserved or financially marginalized communities. Digital financial services (DFS) extend far beyond just online e-banking – such services can include: banking, remittance transfers and payments; savings; credit; insurance; and investments.

The underlying principle is that everyone should have access to financial services, regardless of their socio-economic status, location, or access to a traditional banking infrastructure. Trust, confidence and digital literacy are vital prerequisites for using digital financial services, as well as responsible behaviour – DFS does not typically include speculation in digital financial assets.

For individuals, DFS can help smooth out lumpy or seasonal income, set aside savings, improve choice, flexibility and resilience in shocks. At the national scale, DFS are important for bringing workers into the formal economy, boosting flexibility in enabling better and safer transfer and storage of money (e.g. through international remittances), boosting spending and helping withstand shocks or economic crises.

The World Bank's latest Global Findex survey was conducted in 2021 in 123 countries with over 125,000 respondents. It showed that the use of digital payments has grown exponentially, especially during the pandemic. In 2021, some 1.4 billion adults worldwide remained unbanked. Global account ownership reached 76% of the global population, and around 71% of people in developing countries. According to the World Bank, some 40% of adults in developing economies (excluding China) made a digital payment for the first time using a card, phone, or the Internet for the first time during the pandemic, while over one-third of adults in developing economies paid a utility bill directly from an account for the first time. In Kenya, for example, there was a 54% increase in mobile banking transactions, a 19.6% increase in mobile banking agents, and a 14.6% increase in the number of mobile banking accounts during the pandemic (Tut, 2023[28]).

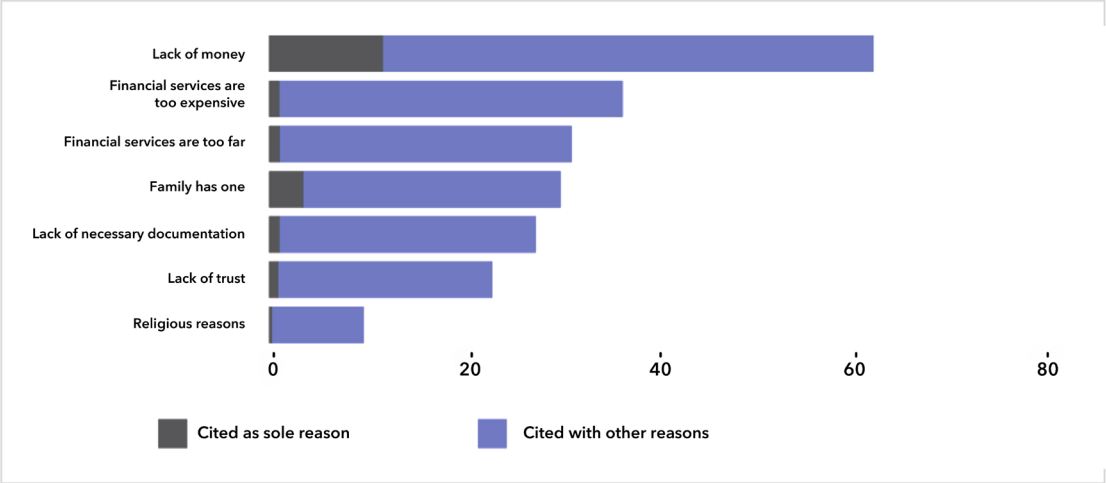
However, there is a range of barriers to not having an account with a financial institution, including lack of money, the cost of financial services, barriers in access and lack of documentation or trust (Figure 6).

Operators and mobile money service providers continue to invest, innovate and work toward financial inclusion, but enabling laws and regulations are also needed in order to ensure that the unbanked population is included in a meaningful way. One example is the Ericsson Wallet Platform, a fintech platform that enables telecom operators and financial service providers to offer fast, secure, personalized, and easy-to-use mobile financial services to their customers. With over 400 million registered mobile wallets, this platform drives financial inclusion and wellbeing by enabling its consumers to transfer, pay, save, grow, receive, and borrow money[29]. Meanwhile, for remote areas, satellite communications are now providing affordable, high-quality solutions to enable money transfer and connect bank agencies and ATMs. These services can help transform the socio-economic lives of citizens through financial literacy and access.

More recently, cryptocurrencies and cryptoassets have been extending the horizons of digital finance. These sophisticated digitized assets need significant financial expertise and familiarity. This area is subject to nascent regulation, as lawmakers consider how to apply existing regulations to new classes of assets, which have proved popular among speculative investors online. The United States recently ruled that most forms of cryptocurrency, including

Figure 6: Barriers to not having a financial institution account, 2021

Adults with no account (%) citing a barrier as a reason for having no financial institution account, 2021



Source: Findex database, 2021, available at: https://thedocs.worldbank.org/en/doc/34613c6edce58006c0c1fd0efbce77f0-0050022022/original/DECPRT-Findex-F.pdf

Note: Respondents could choose more than one reason.

bitcoin, could be classified as commodities under the regulatory purview of the Commodity Futures Trading Commission, rather than securities.

The magazine Quartz reports that shady trading apps have been on the rise since the pandemic. Recently, Google has filed a lawsuit against two developers who put 87 fake investing and crypto apps on Google Play[30]. Google has suggested some 100,000 users were lured to the apps. 'Starlight' was marketed in videos on TikTok and Instagram as a way to earn money by watching videos and completing tasks. Starlight asked people to invest money before earning returns, but allegedly did not return money to users. 'SkypeWallet' and 'TionRT' posed as crypto-exchanges, but also failed to reimburse customers.

In 2023, a few high-profile bank collapses[31] reflected the risks, lack of liquidity and lack of transparency about the operations of some highly geared banks, heavily invested in tech start-ups and digital assets. In January 2024, the US Securities and Exchange Commission (SEC) approved the listing and trading of a number of spot bitcoin exchange-traded product (ETP) shares, including exchange-traded funds (ETFs)[32]. The implications of this move for investments and pension funds remain to be seen.

Transformation 5: Energy Consumption & Climate

Historically, it has been estimated that the telecom sector was responsible for up to 2% of global GHG emissions, but has an outsized influence on the aim of some industries and societies to cut carbon emissions because digitalization will disrupt all parts of the global economy over the next decade[33]. Industrial digitalization (enabled by 5G and other disruptive technologies such as AI, IoT, XR and robotics), could help mediate a shift towards more efficient, low-carbon industrial operations.

The introduction of new digital technologies and the explosion in data traffic (Figure 3 right graph) are driving a surge in demand for and consumption of energy. The electricity consumption of data centres alone was estimated to amount to 2% of global electricity consumption in 2022, which could more than double to nearly 6% by 2026 (Electricity 2024 report, IEA[34]).

As long as these energy needs are sourced responsibly and in a sustainable way, the growing energy requirements of ICTs and digital technologies need not spell environmental doom. The International Energy Agency (IEA) and International Atomic Energy Agency (IAEA) are calling for an urgent and immediate clean energy transition. The industry needs to minimize its energy use and emissions – for example, through network upgrades, equipment modernization and increased utilization of renewable energy sources.

Broadly speaking, modern technologies are generally more energy-efficient than older technologies. 5G sites, for example, provide 10 times more capacity with 30% less energy consumption compared to 4G sites. However, this assumption does not always hold – for example, the move from 4G to 5G networks has unclear consequences overall for energy consumption. Although some parts of networks are becoming more energy-efficient, there may be an increase in the energy consumption of other parts of the networks and associated equipment (e.g. data centres), as the industry moves from 4G to 5G.

Where this growth in energy requirements is sourced from fossil fuels or where the growth in energy needs outstrips the growth in renewables globally, the expansion of digital technologies could have significant implications for the environment and climate change.

AI looks set to change already complicated patterns of energy consumption. An early investigation into this topic from the University of Massachusetts Amherst suggested that improving the accuracy of a machine learning model could substantially increase energy requirements and estimated that "training a single AI model can emit as much carbon as five cars in their lifetimes". However, this paper estimated and described the carbon footprint of only one training run.

Many large machine learning models have multiple training runs and are trained repeatedly, increasing their energy usage significantly. Large companies can train tens of thousands of models daily. For example, a paper by Meta researchers explores AI's environmental impact, including the lifecycle of system hardware, the operational and manufacturing carbon footprint of AI computing. The paper proposes ways to reduce the environmental impact of AI, with a call to action. The energy usage of Chat GPT-4 has not been disclosed. However, it been estimated that GPT-4 consumed between 51,773 MWh-62,319 MWh[35], over 40 times higher than its predecessor, GPT-3.

Conversely, in telecom networks, AI could have an important sustainability role. Telcos are using AI to optimize and automate networks, so operators can ensure that they use the

optimum of energy required to deliver desired levels of performance. For example, Telenor uses advanced data analytics techniques to reduce power consumption and CO2 emissions in its radio networks because it aims to become carbon-neutral by 2030. For its Green Radio project, Telenor developed algorithms that use data to profile and predict the load for each of the thousands of individual radio units in a network. These predictions are then used to put radios in low power 'sleep-mode' in areas where there is likely to be low demand[36].

AI-driven software and hardware help monitor and take action to conserve network energy. Shutting down unused network elements during periods of low traffic is an excellent way for operators to realize significant energy savings. In a pilot project with Nokia, KDDI used the AI-based solution *AVA for Energy Efficiency* to perform the precise predictions needed to balance power consumption, network performance and customer experience requirements. KDDI was able to analyze and anticipate changing traffic volumes in the sites and radio cells to determine when radio resources can be powered down to reduce energy consumption and achieve the best overall power savings. On average, KDDI reduced power consumption by up to 50% in low-traffic environments and by up to 20% per cell.

Extensive research is underway in universities and research centres to investigate, model and better protect and preserve the environment (Box 7). AI is already impacting the telecom industry, enabling mobile operators to improve both connectivity and their customers' experience in a sustainable way. By using AI to optimize and automate networks, mobile operators can ensure that they use appropriate levels of energy required to deliver the desired performance.

Box 7: Uses of Artificial Intelligence to Protect the Environment

AI can and has been used to model climate change and the environmental impact of human activities. Examples include:

- Simulations of the melt rates and retreat of ice from glaciers and polar icecaps;
- Tracking and modelling deforestation in the Amazon;
- Computer simulations of the ozone hole and its development;
- Computer simulations modelling climate change and ocean temperatures and ocean heat content[37] (e.g. work by Brian McNoldy at the University of Miami);
- Energy-efficient, smart AI-enhanced weather stations that can accurately measure and report real-time environmental data, as well as temperature, humidity, pressure, and/or air quality.
- Scientific research, including new compounds to 'soak up' pollution or eat plastic.
- Machine learning approaches (such as deep neural networks), are helping find patterns and relationships in large datasets for predicting agricultural yields in changing climates.

For example, UNDP has developed the Data in Climate Resilient Agriculture (DiCRA) programme in partnership with state governments of India, the Government of Japan, the Rockefeller Foundation, ICRISAT and various international research labs. It is an open innovation digital public good that provides satellite data and analytics for climate action in agriculture. It uses satellite data and machine learning to provide insights on 20 agriculture parameters that help in understanding crop health, crop stress and soil conditions across all the villages of seven states of India. The data and insights on DiCRA are generated by a collaborative set of stakeholders with over 100 data scientists, ten partner organizations and around 4,000 users have joined since the platform went live.

By delivering valuable data-driven insights as open source, DiCRA is driving sustainability, collective action and long-termism in agriculture. These insights are being used to inform the design of agriculture programs on climate resilience, directing more investment towards areas of high vulnerability while learning from successful resilient geographies and farms.

Robots have also been developed to help deal with climate disasters and environmental monitoring. Animal-inspired robot design methods can integrate adaptive morphologies, functional materials and energy-efficient locomotion principles to enable this new class of environmental robotics. For example, different applications include flying robots that can place sensors in forests, aerial-aquatic drones for autonomous water sampling, drones for aerial construction and repair, and impact-resilient drones for safe operations in underground and tunnel systems.

Autonomous machines can also perform vital monitoring and research tasks, gathering samples of microbial life and filming underwater without disturbing the delicate environment. They provide essential data to better understand marine ecosystems, including coral reef recovery from bleaching or cyclones, marine organism behaviors, and the impact of climate change on the ocean.

Source: ITU AI for Good Summit and UNDP.

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Chapter 2

Mapping Connectivity Gaps

Broadband as Key Digital Infrastructure

The Broadband Commission Advocacy Targets assess progress in broadband access and identify remaining gaps.

WSIS Forum 2024 Photo Contest Finalist:
Cheizer Yniego, Philippines (Republic of the)

Chapter 2: Mapping Connectivity Gaps – Broadband as key Digital Infrastructure

The Broadband Commission Advocacy Targets assess progress in broadband access and identify remaining gaps.

Advocacy Target 1: Make broadband policy universal[1]

Rationale and Status

By 2025, all countries should have a funded National Broadband Plan (NBP) or strategy in place or include broadband in their Universal Access and Service (UAS) Definition. A sound policy approach should also promote action to enhance broadband access and/or when broadband is included in countries' Universal Access/Service (UAS) definitions.

Broadband policy-making came to the fore around 2009/2010, when over fifty countries made broadband infrastructure a key part of their stimulus plans to promote economic recovery in response to the 2007/2008 financial crisis. Broadband infrastructure planning is complex, takes time and investment.

Despite documented increases in broadband coverage globally, several National Plans have expired and not been renewed (ITU, 2023). In 2022, 155 countries had a national broadband plan or other strategic document emphasizing broadband, down from 165 in 2021 (Broadband Commission, 2023). More work needs to be done to monitor and evaluate the current state of implementation of existing national plans. Operationalization and implementation are key to boosting access to broadband, especially in rural areas.

Other factors are also at work. Rising interest rates and a spiralling debt crisis in many developing countries have reduced the funding available for national infrastructure projects, meaning that it may become harder to fund and implement the broadband projects foreseen by some national broadband plans. By April 2024, the IMF identified around sixty countries in some degree of external debt distress[2], up from over forty in 2023. This makes large national infrastructure projects more costly and difficult to contemplate. Higher interest rates may also have put the brakes on private sector investment, making loans more expensive to bear over longer periods

of time. Although early suggestions that telecom firms faced a credit crunch have not been borne out more broadly, funding programmes are clearly more difficult to put in place during an era of high interest rates and greater economic uncertainty.

Impact of AI on Policy-Making – opportunities and risks

Digital policy-making continues to evolve. The speed of technological developments continues to accelerate and expand to all aspects of life. Policy-makers are looking beyond regulating network infrastructure to broader questions around the digital economy. Policy debates about communication services and network infrastructure have evolved into debates about regulation of other activities and services, as the use of digital technologies continues to expand.

AI adds a new dimension to policy-making, and policy-makers are racing to catch up. With the roll out of more AI systems, policy-makers may be faced with growing questions of how AI is used, as well as the societal and economic impacts of those uses. For example, AI used in content generation may have implications for media, copyright, and principles around diversity and freedom of expression.

Cybersecurity and online content regulation are increasingly being prioritised by legislators. Policy-makers are having to consider how media funding models, freedom of expression, copyright protections can all be adapted to cope with the impact of digital technologies. The governments of Australia and Canada are considering ways to negotiate with digital platforms over publishing and news dissemination rights in relation to AI (for example, NewDaily in Australia; Canada's Online News Act[3]).

In terms of AI governance, a number of countries and regions are starting to issue guidance or regulations on the use of AI. Policy-makers and legislators are trying to find the proper balance that promotes the benefits of AI while managing possible risks. For example:

- China was among the first countries to introduce regulations governing AI, including the Government's 2021 regulation on recommendation algorithms[4], the 2022 rules for deep synthesis[5] (synthetically generated content), and the 2023 rules on generative AI services[6]. Further draft regulations followed, the Basic Security Requirements for Generative Artificial Intelligence (AI) Service in May 2024[7]. It has also established an 'algorithm registry', a government repository that gathers information on how algorithms are trained, with a security self-assessment evaluation mechanism.
- United States President Joe Biden issued an Executive Order on the Safe, Secure, and Trustworthy Development and Use of Artificial Intelligence (AI) in October 2023.
- The European Union has adopted its AI Act, approved by the European Parliament in March 2024 to 'ensure safety and compliance with fundamental rights, while boosting innovation'.
- In India, NITI Aayog, government's apex public policy think tank, released the National Strategy for Artificial Intelligence #AIForAll strategy in 2023, including AI R&D guidelines focused on healthcare, agriculture, education, smart cities, smart mobility and transformation. The government of India also enacted the Digital Personal Data Protection Act in 2023 to address some of the privacy concerns concerning AI platforms.

Policy-makers are very active in discussing the implications of AI from cyberdefence to online content, AI governance and the implications of generative AI for election campaigns. A number of countries are setting up safety agencies. At least 64 countries (as well as the European Union) are due to hold elections in 2024, representing a combined population of half the global population[8]. Many countries are focused on hosting elections successfully.

In response to the challenges posed by AI, UNESCO published its "Guidelines on the Governance of Digital Platforms" in November 2023. These Guidelines aim to protect freedom of expression and access to information while addressing mis-disinformation, hate speech and conspiracy theories. They also cover future challenges, particularly those arising from generative AI. The Guidelines define the roles and responsibilities of different stakeholders, including States, digital platforms, intergovernmental organizations, civil society, media, academia, and the technical community. By doing so, they seek to ensure that freedom of expression and information remain central to the governance of digital platforms.

The Guidelines serve as a tool for stakeholders to advocate for human rights-based regulation and hold governments and digital platforms accountable. To support the implementation of these Guidelines, UNESCO coordinates the "Global Forum of Networks" of regulators, uniting international networks of audiovisual, electronic media, and online regulators. This Forum plays a crucial role in fostering a global understanding of a rights-based approach to digital platform governance.

The OECD maintains a live repository of AI strategies & policies[9]. There is also a Global AI Legislation Tracker (https://iapp.org/resources/article/global-ai-legislation-tracker/). ITU hosts the AI for Good platform, supported by 40 UN partners, which aims at employing AI to progress the SDGs.

Case Study – Developing a National AI Strategy for Sri Lanka

Since 2023, Sri Lanka is working on developing a National AI Strategy[10] in conjunction with UNDP. In May 2023, Sri Lanka's Education Ministry already revealed plans to incorporate artificial intelligence (AI) into the school curriculum by 2024[11], focusing on areas such as robotics, machine learning, data mining, computer vision, and related technologies. In 2023, the Sri Lankan government appointed a dedicated committee under the Presidential Secretariat[12], to steer the country's AI strategy. UNDP undertook an AI Landscape Assessment (AILA) for Sri Lanka.

AILA comprises a comprehensive survey within the public sector and interviews and a workshop were conducted with key stakeholders, including non-governmental sectors, academia, development partners, and the private sector. Over 80 public sector officials were involved in a survey.

Emphasizing the significance of this assessment, Technology State Minister Kanaka Herath highlighted its role in establishing a robust National AI Strategy. Meanwhile, UNDP Sri Lanka's Deputy Resident Representative, Malin Herwig, underscored AI's potential to enhance public services, foster economic growth, and generate employment, underscoring the need for preparation and ethical utilization of AI.

Advocacy Target 2: Make broadband more affordable[13]

Rationale and Status

This Advocacy Target specifies that by 2025, entry-level broadband services should be made more affordable in low- and middle-income countries (LMICs). Making broadband more affordable is key to achieving universal and meaningful connectivity. This target specifies that prices for entry-level broadband services should be below 2% of monthly GNI per capita in developing countries[14] by 2025. It is important that the total cost of ownership and use of broadband devices and connectivity is considered.

According to ITU's 2023 Facts and Figures report, fixed and mobile-broadband services continued to become more affordable in 2023. The data-only mobile-broadband basket and the fixed-broadband basket became more affordable in all regions and for all income groups.

Nonetheless, lack of affordability continues to be a key barrier to Internet access, particularly in low-income economies. A wide gap persists between high-income economies and the rest of the world. Compared to prices in high-income economies, the mobile-broadband basket is 5.5 times less affordable in lower-middle-income economies and more than 20 times less affordable in low-income economies, where a fixed-broadband subscription, if available at all, costs the equivalent of a third of the average monthly income. Clearly, levels of economic development and incomes are important factors in affordability.

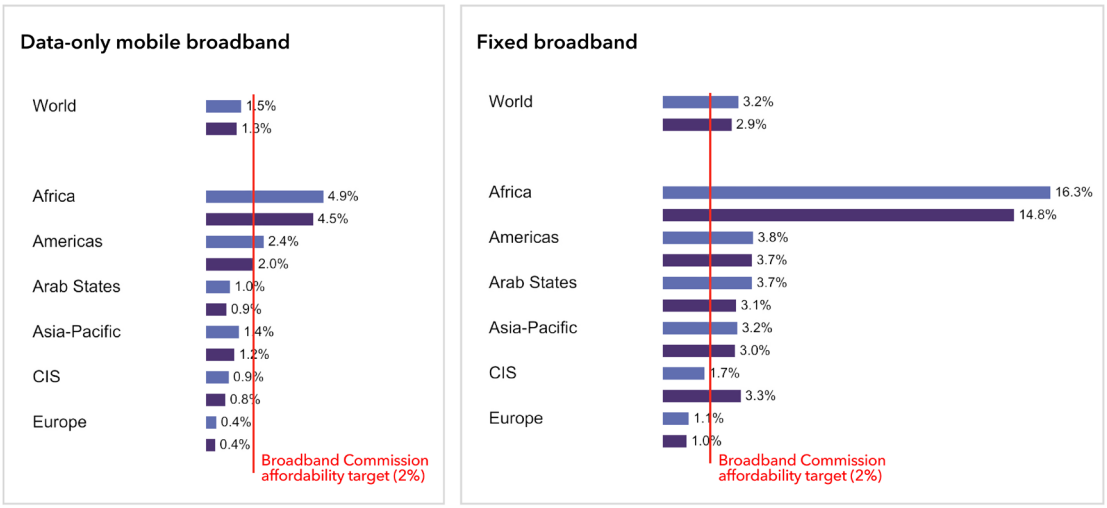
114 economies out of 188 met the affordability target with respect to the data-only mobile-broadband basket in 2023 (11 more than in 2022 and 18 more than in 2021). 71 economies out of 178 met the target with regard to the fixed-broadband basket (the same number as in 2022). Sixty-two of the low- and middle-income economies met the target in 2023, with either one of the two baskets (Figure 7). However, with the majority of the 134 low- and middle-income economies still above it, reaching the target remains a challenge.

After an uptick in 2021, the cost of fixed and mobile Internet services resumed its downward trend in 2022. An ITU/Alliance for Affordable Internet (A4AI) report in 2022 found that, after years of improvement, the affordability of broadband services had worsened in 2021. This is largely due to a sharp drop in incomes (i.e. per capita income) brought about by the COVID-19 pandemic, rather than an increase in service charges, which continued to drop. Only 96 countries met the target for mobile broadband, down from 103 in 2020 while 64 countries met the target for fixed broadband, down two from 2020.

Some countries established dedicated programmes for Internet affordability during the pandemic. In the US, the recently expired Affordable Connectivity Program (ACP) was a federal program that helped connect more than 23 million US households for some

Figure 7: Data broadband (2GB) basket prices as % GNI per capita, 2022-2023

Mobile-broadband (left graph); fixed-broadband (right graph)



Source: ITU, https://www.itu.int/itu-d/reports/statistics/2023/10/10/ff23-affordability-of-ict-services/ Pale blue bars are figures for 2022; dark blue bars present 2023 figures.

59 million low-income people, including veterans, students and older Americans, although this programme has concluded[15].

In Europe, where basket prices are lowest, there is an open debate as to whether affordability begets investment. A few operators are now unable or unwilling to invest in more modern connectivity, as they claim returns are limited, potentially slowing down digitalization and growth[16].

While market competition and regulatory forbearance in telecom services have brought down prices for data usage, adoption challenges still persist. Barriers to device access include:

a) **Handset affordability –** Despite the continued decline in the cost of Internet-enabled handsets, retail prices of smartphones vary significantly across the globe, driven by factors such as distribution costs and taxes. The upfront purchase costs of devices are still significant for many people on low or no incomes.

b) **Device reliability, durability and availability –** non-durability of devices purchased from parallel markets, lack of warranties, limited repair options and the risk of theft of phone data contribute to negative perceptions of smartphones, thereby acting as a barrier to smartphone access.

c) **Device distribution** – There are fewer retailers of smartphones in rural areas, which limits retail options for customers, limits competition and complicates the regulation of retail prices. Apart from the challenge of accessing devices, hard-to-reach remote communities also worry about their ability to recharge their devices due to the prohibitive costs of battery charging.

d) **Concerns regarding refurbished phones** – The market for re-furbished devices is growing, with the goal of creating a 'circular economy.' However, consumers remain concerned that refurbished phones may have short lifespans, which acts as a barrier to device uptake.

e) **Lack of awareness –** Lack of awareness about the Internet or use cases may result in a lack of relevant (that is, local or localized) content and services.

f) **Digital illiteracy** – Lack of digital skills slows the adoption and use of smartphones by instilling fear of using smartphones and the Internet.

Impact of AI on Broadband Affordability – opportunities and risks

The impact of AI on the short-term and long-term costs for broadband access is unknown. There are significant costs relating to the development and deployment of AI (especially cumulatively, over time), which effectively represent a significant barrier to entry to establishing AI platforms and training AI models. Market consolidation may be an issue, with only a relatively limited number of big tech players able to afford investments in AI and associated research & development (R&D) costs.

Development costs for AI include: the costs of R&D (including salaries for highly trained data scientists and Intellectual Property lawyers); costs of computing power and processing; data collection, storage and transmission in data centre costs; time to bring to market; and approval processes with some regulators in some areas. These development costs may or may not ultimately be passed onto or recouped from consumers.

Conversely, AI may potentially make delivery of broadband services more efficient, and potentially less costly. AI could drive innovation opportunities like more efficient (cost effective) network management. For example, in India, Airtel is exploring the use of AI for driving network innovation in the hope of delivering enhanced network optimization, strengthened cybersecurity measures, and the delivery of personalized customer experiences (Box 8).

The major tech players pioneering AI are currently considering how best to monetize consumer AI services. Some consumer AI apps are available freely on the web, but there are already subscription models available for charge. In February 2023, OpenAI introduced a subscription fee for its newest version of ChatGPT[17], with faster response times and priority access to additional features and improvements, such as DALL·E, browsing and Advanced Data Analysis. In early 2024, Google also introduced a US$20 monthly subscription for its chatbot[18]. Such early subscription fees may add to costs of Internet access for consumers, while introducing new capabilities for a tier of privileged consumers.

Case Study – Protecting mobile customers from price increases in Turkey and the UK

High inflation poses a threat to telecom operators' margins and their ability to retain customers and keep them satisfied. Analysys Mason (2022) identifies high inflation as a problem for operators, due to:

(1) Inflation risks eroding margins, ARPU and customer satisfaction.
(2) There is scope for upselling additional services (such as video or gaming services).
(3) Consumers may downgrade to lower value services (such as lower-volume mobile data plans) or leave, resulting in higher customer churn.

Operators may have little choice but to increase retail prices in response to a high inflationary environment, passing on increases in operating costs to customers. Analysys Mason notes that in the UK, operators generally pass on price increases to existing customers once a year (an increase in "back book prices"). However, customer price comparison sites offer online listings

of operators and price increases advice on switching, customer rights and what to do about increases in the price of mobile prices -

However, in Turkey, operators generally maintained prices for existing customers, and then gradually re-contracted with these customers at higher prices, as their old contracts expired (an increase in "front book prices"). They have also tried to introduce 'more-for-more' – for example, Vodafone Türkiye consistently enhanced the elements of its entry-level postpaid mobile plans while increasing price. Analysys Mason notes that this helped address problems of customer satisfaction by offering customers more so, despite high inflation, Turkish operators managed to keep price increases to under 10% per annum in 2022.

Source: Analysys Mason, 2022, available at : https://www.analysysmason.com/contentassets/8e190db214954f289997a16964ff3d8c/analysys_mason_high_inflation_pricing_may2022_rdmm0.pdf

Advocacy Target 3: Get everyone online[19]

Rationale and Status

This Advocacy Target aims to have broadband-Internet user penetration reach: i) 75% worldwide; ii) 65% in low- and middle-income countries; and iii) 35% in least developed countries, by 2025. Internet access is a priority because access to broadband Internet is fundamental to inclusive and sustainable development. The Internet and broadband provide an outlet for digital education, professional development, online business, and global connection.

There are currently 5.4 billion people online (approximately 2.8 billion male and 2.6 billion female Internet users), with another 2.6 billion offline. Internet use grew to an estimated 67% of the total global population in 2023, up from 54% in 2019. This represents an annualized growth rate of around 6% over 2021. There is still much to be done if the target of universal and meaningful connectivity is to be achieved. In 2023, Internet use was 93% in high-income countries, 55% in LMICs but just 35% in the LDCs (according to the most recent ITU estimates[20]).

Gaps in digital inclusion should be identified and monitored. Various indices have been developed by international organizations (such as the Mobile Connectivity Index, Affordability Drivers Index, and the Networked Readiness Index).

While overall Internet use is increasing, some marginalized groups are being left behind, such as the elderly and people with disabilities. Accessible content, design and policy support are crucial to ensure digital inclusion in the country. In April 2022, the GSMA published a report with policy recommendations for the digital inclusion of persons with disabilities[21]. It draws on the insights of policy approaches in 28 countries providing a clear framework for action. Special

efforts are needed to understand and address the specific needs of people in these categories, including content that meets accessibility standards and customized training.

Satellites can provide broadband Internet access directly to locations lacking terrestrial infrastructure. Emerging satellite and direct-to-device (D2D) technologies offer promising solutions to address connectivity gaps in remote and rural areas. D2D satellite capabilities allow satellites to transmit data directly to end-user devices such as smartphones, tablets, and IoT sensors without ground infrastructure. Using 3GPP standards, these space-based systems integrate fully with terrestrial networks to deliver connectivity to areas with no cellular coverage, and extend terrestrial solutions cost-effectively to connect underserved areas. It is important to ensure a level playing-field in licensing and regulatory frameworks for D2D and terrestrial communication networks and services, as both access customers directly.

Impact of AI on Universal & Meaningful Access – opportunities and risks

Telecom operators have used big data and AI for some years – for example, to improve quality of service to customers. However, there is now vigorous innovation in this area supported by new data, modern computer equipment, and new software to develop and automate new products and services.

Operators have been using AI to reduce their costs and optimize deployment and data traffic management across their network, as well as improve operations (e.g. through the detection of fraudulent use of telecommunications such as spambots). Depending on how fast operators adopt AI, and depending on the quality of their data, observability of data, structure and access (e.g. structured data lakes), telcos will be able to reap the benefits of AI faster and gain advantage.

AI tools that leverage network data enable telecom operators to automate network operations and service assurance, cut costs, increase agility, and boost subscriber experience. AI can detect and resolve network, service, and device issues proactively before customers are impacted. It monitors and troubleshoots the network service quality, service usage, and traffic in real time at a network-wide level down to individual cells for subscribers and devices in mobile and fixed networks.

AI can enable visualization of network performance to operations, customer care, marketing, and sales from a subscriber perspective. Network insights show real-time information about network capacity and traffic patterns, preventing network issues from happening. It also shows real-time visibility to subscriber activity across mobile and fixed domains, enabling the operations teams to stay on top of what is happening in the network. AI/ML baseband solutions outperform conventional approaches by up to 3dB in terms of receiver performance with throughput gains of 30%. In Luxembourg, POST Luxembourg used Nokia AVA home and access analytics to turn raw network data into insights to identify and address 97% of network issues, before they affect subscribers.

In India, the operator Bharti Airtel has been using AI-powered speech analytics solutions for customer service[22], for network planning and optimization, and for forging collaborations

with technology partners to provide AI based solutions to businesses (Box 8). Meanwhile, Box 9 explores the use of digital twins for modelling radiofrequency propagation in real-world environments.

Box 8: Bharti Airtel & AI in India

Bharti Airtel, the leading telecom operator in India, has introduced AI-based solutions at various levels. In fraud management, Bharti Airtel has developed a machine learning-based solution to proactively detect, prevent, and eliminate phishing, spam, and fraud through messaging, and is testing it in partnership with HDFC Bank.

Bharti Airtel's award-winning Self-Optimising Network (A-SON) solution has been designed and developed as a machine learning-driven, closed-loop, self-healing platform to detect, analyze and correct network anomalies/degradations with high sensitivity. The system also carries out pre-post analysis and restores network settings to normal values. With future-ready architecture, the platform is already live across India and is addressing the critical business use-cases. It ensures that network teams are able to predict network issues ahead of time and deliver seamless connectivity around the clock.

Bharti Airtel in India has entered into a long-term collaboration with Google Cloud[23] to deliver cloud solutions to Indian businesses wherein the two companies will bring together their unique strengths of connectivity and AI technology to develop industry-leading AI/ML solutions. These unique solutions will drive greater value to Airtel's customers and will include geospatial analytics solutions with advanced location intelligence for trend-spotting, predictive capabilities, market assessment, site selection, risk management, and asset tracking; voice analytics solutions for superior conversational applications trained across languages; among others.

Sources: https://economictimes.indiatimes.com/industry/telecom/telecom-news/airtel-develops-ai-based-solution-to-tackle-fraud-messages/articleshow/99996610.cms?from=mdr; www.airtel.in/press-release/03-2022/airtels-self-optimising-network-solution-wins-the-innovative-mobile-service-and-application-award-at-gti-awards-2022; www.airtel.in/press-release/05-2024/airtel-and-google-cloud-enter-into-a-long-term-strategic-collaboration-to-accelerate-cloud-adoption-and-deploy-generative-ai-solutions

Box 9: Digital twins for modelling radiofrequency propagation in real-world environments

US Cellular is using generative AI to develop digital twins of its cell towers. Drones will capture images and put them in a database that is then translated into a large language Markov model specifically optimized for image classification. This digital twin of the operator's cell towers will allow a person with a VR headset to check whether a tower's antennas are off-line due to storms or other factors, enabling faster repairs. Digital twins could eventually be extended to generate 3D models of data centres.

Nvidia has also unveiled a platform to democratise 6G research by employing AI and digital twins. The chip Nvidia 6G Research Cloud platform has several interconnected components that allow vendors, researchers and operators to test AI algorithms on its Aerial Omniverse Digital Twin for 6G platform.

Ansys, Arm, ETH Zurich, Fujitsu, Keysight, Nokia, Northeastern University, Rohde & Schwarz, Samsung, SoftBank Corp. and Viavi are the first members of the ecosystem which could create digital twins of neighbourhoods or entire cities.

Using ray tracing, Omniverse can simulate the radiofrequency part of spectrum to help operators determine where to place their antennas and terminals while also simulating the location of moving mobile devices. It also allows operators and vendors to accurately simulate the propagation of RF in areas where there' are impediments such as glass, concrete or foliage in a digital twin. The digital twin is designed to work across a single base station with a few mobile devices all the way up to hundreds of base stations with thousands of devices.

The platform also includes a software-defined, full RAN stack to allow researchers and members to customise, programme and test 6G network components in real time. Vendors, such as Nokia, can bring their own RAN stack to the platform, but Nvidia's open RAN compliant stack is provided.

Source: GSMA Mobile World Live, 29 April 2024, Feature: AI twins and the digital revolution - Mobile World Live

Case Study – How Vodacom uses AI in its services in African countries

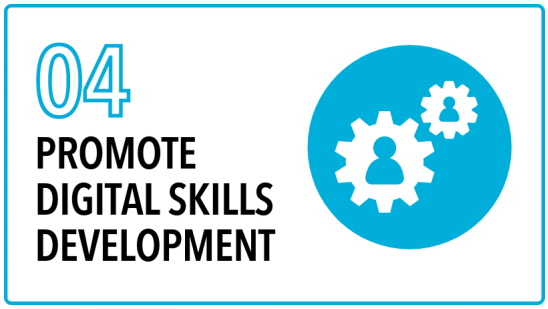
Vodacom Group is a leading pan-African telco that provides an array of services from traditional products to financial services to over 200 million people in Africa. In addition to deploying various cloud-based digital platforms, products and tools across our footprint, Vodacom has successfully deployed AI tools (including machine learning and big data) to provide better services to customers and develop new products and services in line with their needs, including mobile financial services products and loans.

One example of customers benefitting from AI is through an offer deployed in South Africa in 2017 and in the DRC, Lesotho, Mozambique and Tanzania as of 2019, called 'Just 4 You'. It provides affordable, tailor-made bundles, created using machine learning and big data to design bespoke deals for each customer. Today, this package delivers great value to over 40 million customers in Africa, and it has evolved to offer smart discounts on fintech services

and third-party offerings, as well as regional offers on voice and data bundles and some third-party services. In particular, it has become highly popular among people on very low incomes, as a best value deal.

Vodacom has also deployed various health and IoT solutions across Africa, as well as implemented process improvements across numerous areas, including in its call centres. Vodacom implements these innovations ethically and responsibly, taking various factors into account including each country's specific consumer protection laws and human rights laws.

Advocacy Target 4: Promote Digital skills development



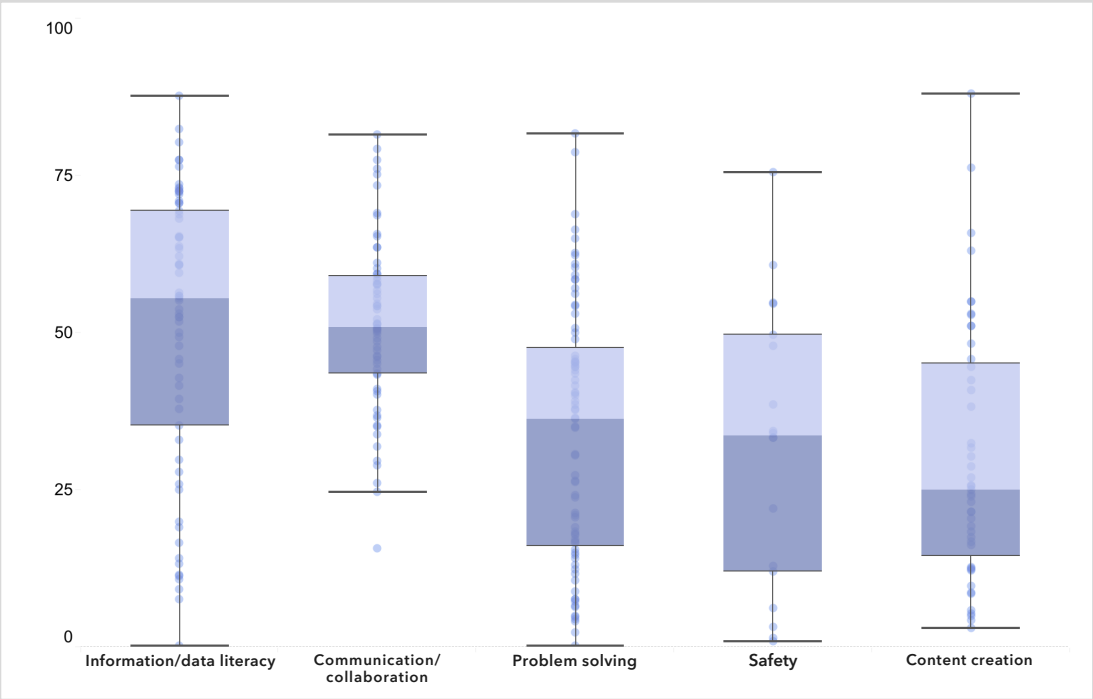
Rationale and Status

Digital literacy is one of the main causes of digital exclusion and often among the top answers when people are surveyed about why they do not use the Internet. This Advocacy Target calls for 60% of youth and adults to have achieved at least a minimum level of proficiency in sustainable digital skills by 2025.

However, relatively few countries provide data for all digital skills. Further, self-reporting of ICT skills is subjective. One framework evaluates ICT skills based on whether an individual has recently performed certain activities that require different types of digital skills: communication/collaboration; problem solving; safety; content creation; and information/data literacy (Figure 8).

Despite the importance of digital skills in leveraging ICTs for economic prosperity, human rights, peace and social well-being, data remain very scant. Only 83 countries provide this data to international surveys, and rarely for all skill areas. Based on this limited dataset, skills linked to *information/data literacy* are the most prevalent, with a median of 56% and an average between 33-69% for most countries. *Communication/collaboration* is the second most prevalent (median of 51%). *Problem solving* (36%), *safety* (34%), and *content creation* (25%) follow with much lower medians.

Figure 8: Proportion of people with digital skills, most recent data, 2019-2022



Source: ITU, https://www.itu.int/itu-d/reports/statistics/2023/10/10/ff23-ict-skills/ Bars indicate the 25th, median and 75th percentile of all country values. Bottom and top lines indicate minimum and maximum values. Light blue shading is therefore the second overall quartile; dark blue shading is the third quartile in the distribution of countries.

However, strong challenges persist in the data availability and interpretation of this indicator, which limit interpretations about global digital literacy. Given that computers can be used for a huge array of tasks, it is very difficult to categorize and assess different tasks to evaluate digital skills. Higher but increasingly vital skills (e.g. web navigation, research, evaluation of sources) are missing from this analysis. There are documented gaps in research, surveys and figures on young children's access to and use of technology in LMICs. This is reflected in the ITU survey, to which only 88 mainly high-income countries provided data.

In January 2022, the Broadband Commission convened a Working Group on Data on Learning chaired by UNESCO to discuss the double-edged nature of data for learning along three thematic areas: (1) infrastructure and architecture of education data ecosystems, (2) data skills and competence frameworks for life and work, and (3) governance, regarding ethics, national sovereignty and cross-border data flows. The Working Group published its report in 2023, which called for critical data literacy and skills to be strengthened at all levels of the education ecosystem to facilitate improved regulation and innovation through effective implementation and monitoring of education data policies and practices (Box 10).

Box 10: The Transformative Potential of Data for Learning

To date, only 54% of countries have established digital skills standards, and many are adopting skills frameworks developed by the private sector that may prioritize technical skills that are valuable in commercial settings (UNESCO, 2023). However, digital data literacy is not limited to technical or software expertise, such as a strong understanding of data analytics tools, cybersecurity practices, and emerging technologies such as artificial intelligence (AI) and virtual reality (VR). It is also essential to be well-versed in the social implications of data use in education, and in particular, the challenges it raises regarding inclusion, equity, ethics, ownership, agency of teachers and learners, and environmental and financial sustainability. Critically assessing the benefits and risks of data use in every learning experience is a key component of data literacy, which must be grounded in an understanding of what data represents, what it does not represent, and, indeed, what it may misrepresent.

Both critical data skills and technical digital competences are lacking around the world, posing significant barriers to the safe and effective use of data in education. Given algorithmic technologies fuelled by large amounts of data, such as applications of AI, are increasingly integrated into education systems, it is necessary that all education stakeholders are able to communicate data insights, assess data quality, grasp the main principles of data governance and ownership, and understand the impact of data use on people and human rights. Investments in capacity-building would reinforce the agency of education and training institutions to direct, design and drive the data revolution towards improving learning opportunities for all.

Source: Pages 11 & 12, "The Transformative Potential of Data for Learning", report of the Broadband Commission Working Group on Data for Learning, at: www.broadbandcommission.org/wp-content/uploads/2023/10/Broadband-Commission-Working-Group-on-Data-for-Learning-Report.pdf

UNICEF and Airtel have developed a 'Reimagine Education' initiative, which aims to boost digital literacy amongst children through connectivity, access to educational platforms and technology[23]. UNICEF and Airtel Networks Zambia Plc are working to help accelerate the roll-out of digital learning by connecting schools to the Internet and ensuring free access to the Learning Passport, a UNICEF-led educational learning platform. The partnership seeks to provide access to digital learning particularly to differently-abled learners as part of an inclusive approach.

Meanwhile, given the proliferation of online information and information sources, UNESCO is expanding definitions of digital literacy to encompass media and information literacy (Box 11).

Box 11: Media and Information Literacy and Digital Competencies

Media and information literacy and digital competencies empower citizens with critical thinking and other necessary competencies to enable informed and ethical engagement that emphasizes the development of inquiry-based skills and the ability to engage meaningfully with all forms of content providers and mediators particularly in digital spaces.

Media and information literacy and digital competencies is considered as a solution to empower users' purposeful and creative use of digital technology and enhance knowledge of rights online, such as privacy rights, and ethical issues concerning access to and use of information. Use of digital tools/ Understand digital identity/ Recognize digital rights /Assess AI issues/ Improve how to communicate digitally/ Manage digital health/ Practice digital security and safety.

Media and information literacy is closely linked to the generative evolution of artificial intelligence and can provide an effective means of regulating and integrating ethics to optimize the opportunities and overcome the risks generated by artificial intelligence systems.

Promoting media and information literacy ensures the respect of ethical principles, which are reflected in users' ability to integrate ethical considerations such as privacy, accountability and respect for freedom of expression into their everyday use of AI technology, as well as in developers' ability to ensure security in the design of the AI systems, curtailing social manipulation and surveillance.

Public policy-makers also have a key role to play in developing national MIL-related ethics policies connected to digital transformation. During its last Global Forum on the Ethics of AI, UNESCO launched the "User Empowerment through Media and Information Literacy Responses to the Evolution of Generative AI". A Policy Brief emphasizes user empowerment through Media Information Literacy as a response to generative AI that needs to be fully deployed.

Source: UNESCO.

Impact of AI on Digital Skills – opportunities and risks

Given that digital literacy and data literacy are relatively limited, it might seem premature to talk about AI literacy. Given the explosion in online content, as well as now AI-generated content, higher skills of evaluating online information for bias and authenticity of sources will only become even more important. During the COVID-19 pandemic, online communities shared doubts about the efficacy of COVID-19 vaccinations. The WHO, national health agencies and some social media platforms sought to reassure an anxious public about the authenticity and accuracy of health information.

As it may become increasingly difficult to distinguish 'true' information from AI-generated information (including deepfakes), users will have to be more vigilant about the veracity and authenticity of online information. For example, a recent UNESCO paper from 2023 highlighted the increase in technology-facilitated gender-based violence in an era of generative AI[24], with implications for the need of greater digital skills and media and information literacy. Another problem is the volume of information – if it is increasingly easy to generate information, information overload becomes more of a risk.

Certain digital platforms and social media sites are being investigated by the European Commission for their potentially addictive nature[25]. Internet users need to be aware of the problem of addiction, especially among knowledge workers whose jobs expose them to addictive platforms (e.g. comms specialists required to monitor and respond to breaking news on X, formerly Twitter). There is a need to assess AI readiness across industries and communities to identify gaps limiting adoption. Public trust and acceptance could be driven by responsible AI principles focusing on principles such as transparency, bias mitigation and human oversight.

Case Study – Empowering Teachers with Disabilities through ICT in Burkina Faso and Rwanda

In Burkina Faso and Rwanda, UNESCO, local partners and NGOs are seeking to empower teachers with disabilities, address critical gaps in accessible learning materials and create more inclusive education systems through digital skills training. The projects start by developing tailored self-study and training resources in multiple languages. Resources are designed to empower teachers with disabilities to utilize technology effectively for accessible learning, enhancing digital literacy and creating inclusive learning content. The projects engage key stakeholders in partnerships, including government bodies, educational institutions, and disability advocacy groups, to ensure sustainability and scalability.

Burkina Faso and Rwanda face challenges in providing adequate support and resources for teachers with disabilities. Limited access to accessible learning materials, insufficient provision of assistive technology, and a lack of targeted training programs contribute to the marginalization of educators with disabilities. The projects aim to address these challenges through needs assessments, and implementing targeted interventions to enhance teachers' digital skills and support their development. Through the provision of open educational resources and targeted

training programs, the projects aim to break down barriers to digital inclusion and ensure equitable access to education for all learners.

These projects empower teachers with disabilities to play a more active role in creating inclusive learning environments. Through strategic partnerships and innovative methodologies, these projects aim to empower educators to integrate technology into their teaching practices, creating more inclusive learning environments for students with disabilities.

Sources: UNESCO: https://www.unesco.org/en/articles/empowering-teachers-technology-inclusive-learning-pilot-initiative-burkina-faso; https://www.unesco.org/en/articles/breaking-barriers-empowering-teachers-disabilities-through-ict-cft-and-oers.

Box 12: Singapore's Digital for Life movement

The Digital for Life (DfL) movement introduced by Singapore's Infocomm Media Development Authority (IMDA) activates the community to build a digitally inclusive society. The Digital for Life Festival held in 2023 featured over 130 DfL partners and attracted more than 46,000 members of the public at launch; providing an opportunity for learning, exploration, and participation in building a digitally inclusive Singapore. The movement has led to the development and launch of the Digital Skills for Life (DSL) framework, aimed at equipping Singaporeans of all ages with essential skills for carrying out daily tasks online.

The DSL framework places learners at the centre of its design, offering various learning pathways such as supervised learning from IMDA and other stakeholders, peer or family learning, and self-directed learning. For example, the SG Digital Office's Digital Ambassadors provide personalised 1-to-1 training and support to ensure positive digital experiences. Additionally, learning materials are made available on the Digital for Life portal, enabling open public access to these resources.

Furthermore, the DSL framework serves as a guide for industry and community partners, encouraging them to develop learner-focused resources. This collaborative approach expands the reach of the initiative beyond the efforts of the SG Digital Office Digital Ambassadors. By leveraging the expertise and resources of government agencies, enterprises, and community partners, the initiative aims to equip individuals with digital skills and ensure a safe digital environment. One such collaboration involved Vivita Singapore, a Social Enterprise, and SG Bono, a voluntary group comprising engineers, IT experts, and enthusiasts, who conducted Gen AI courses for seniors with the assistance of youth volunteers.

Source: Singapore's Infocomm Media Development Authority (IMDA).

Advocacy Target 5: Increase use of digital financial services[26]

Rationale and Status

This target aims to have "40% of the world's population using digital financial services by 2025". Digital financial services present a tremendous opportunity to swiftly increase the number of people using the Internet and extend access to the social and economic benefits of digital resources. In 2018, 2 billion adults did not have access to a bank account, and yet 1.6 billion adults had access to a mobile phone, creating the potential for e-finance access, and with this, access to economic empowerment.

The World Bank's Findex survey is the largest international survey of digital finance. According to its latest data (Findex survey 2022), 64% of people aged 15 years and older made and/or received digital payments in 2021. This figure exceeds the global target of 40% on a global basis, but many low-income, lower-middle income countries have not yet reached this target.

In 2023, there were over 1.75 billion registered mobile money accounts worldwide[27], a 12% increase from the previous year and over tenfold increase from 134 million in 2012. Demand for mobile financial services is likely to remain high among financially excluded and often marginalized populations. Among registered account holders, about 1 billion people are still not active on a monthly basis, a big opportunity for the industry to deepen financial inclusion and economic participation. Catalysts such as mobile money in East Africa, agent networks in Brazil, and digitally enabled national ID systems in India have showcased the potential for digital inclusion. Meanwhile, newer approaches to financial inclusion have opened up[28].

Impact of AI on Digital Finance – opportunities and risks

Financial institutions are exploring AI technologies, mostly for operational purposes at present. Investment and trades have been automated for decades, with banks keen to implement automation for high volume repeat trades. Today, banks are updating and reviewing their operations, identifying future potential clients, detecting fraudulent transactions and money laundering by software identifying patterns among the vast load of daily transactions, as well as introducing chatbots to improve customer services. AI is also used by digital financial service providers (such as M-Pesa) to protect customers and reduce fraud through pattern identification, adaptation as fraud evolves and its learning flexibility.

For example, Mastercard has developed an AI-powered screening tool in use by nine UK lenders to help detect fraud[29]. Tax authorities are using AI to link customer accounts, detect and monitor tax evasion. Accenture has estimated that AI could replace or supplement nearly three-quarters of bank employees' working hours across the industry.

The risks of AI relating to financial services are more speculative. There is evidence that criminals are trying to use AI to write code, develop and launch cyber-attacks. Criminals can use videos to pass online "know your customer" checks to open bank accounts or apply for credit cards. Deepfake videos have been used as clickbait to drive traffic to malicious websites to harvest card payment details[30]. More sophisticated methods have also been used – for example, one banker in Hong Kong was tricked into transferring US$25 million using a fake Zoom call with avatar colleagues[31].

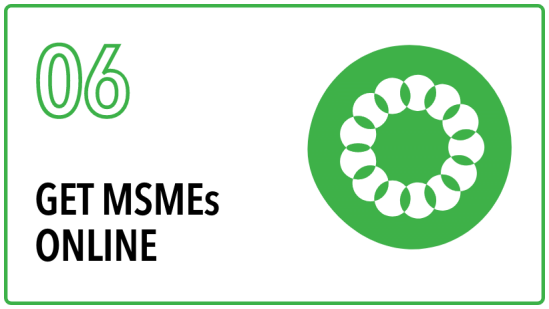
Case Study – Colombia's Solidarity Payment Programme

During the COVID-19 pandemic, Colombia rolled out the Ingreso Solidario (Solidarity Payment) programme. This innovative public-private collaboration transferred emergency relief payments to 2.5 million households affected by the pandemic, 60% of them headed by women (Prieto, 26 October 2020). Among the financial beneficiaries were 1 million previously unbanked households, reached using an app and helplines to explain and build trust in digital payments. Preliminary data show that people receiving transfers through traditional accounts were more likely to cash out than are those who receive transfers via mobile wallets (81% versus 71%). Further, 22% of recipients via mobile wallets used the account to make deposits, which highlights the potential for digital transfers to deepen financial inclusion and increase the uptake of e-commerce (Davico-Thaler and Tellez-Merchan, 8 November 2021).

Building on this experience, UNICEF, the High Commission for Refugees and the World Food Programme are working with the Colombian government to better understand the needs of the 2.2 million Venezuelan migrants in the country, more than half of whom are women, and the barriers to their digital financial inclusion (Government of Colombia, 2021; Better Than Cash Alliance, 2021).

Source: Government of Colombia and the OECD, available at: www.oecd-ilibrary.org/sites/d76cff41-en/index.html?itemId=/content/component/d76cff41-en

Advocacy Target 6: Get MSMEs online[32]



Rationale and Status

According to the United Nations, Micro-, Small- and Medium-sized Enterprises (MSMEs), both formal and informal, make up over 90% of companies worldwide, accounting for 70% of total

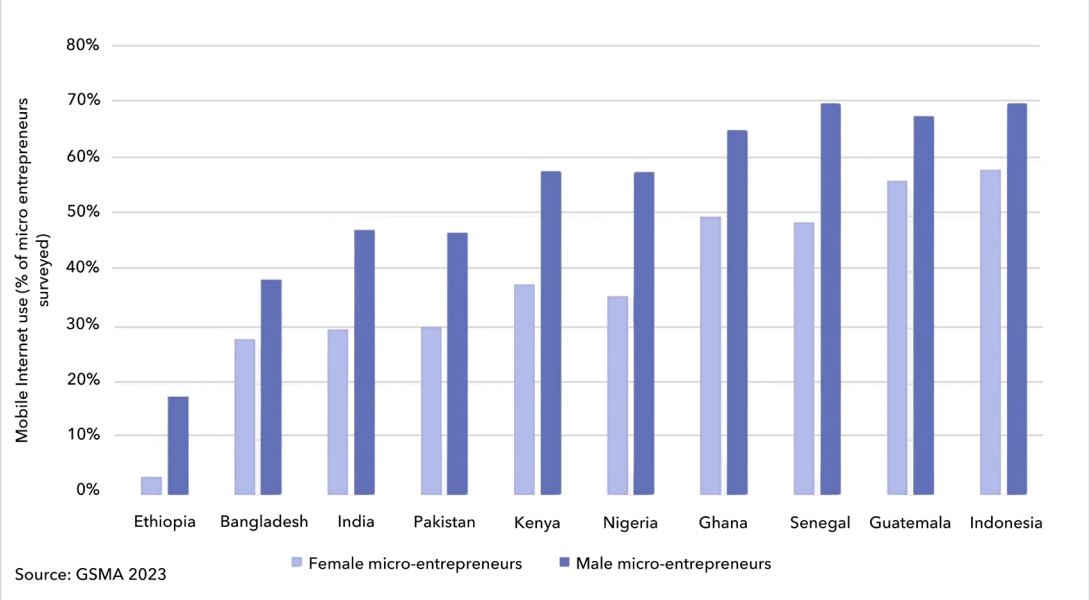
employment and up to 50% of global Gross Domestic Product (GDP). Broadband connectivity can enable MSMEs to reach new markets, increase their competitiveness and enable them to participate in global market. Broadband connectivity is increasingly vital for accessing digital financial services and e-government services.

The UN Broadband Commission's Advocacy Target 6 focuses on improving the sectoral connectivity of MSMEs by 50% over the time period 2018 to 2025, which is relatively ambitious. For example, a sector in which MSMEs are 60% unconnected in 2018, will have only 30% unconnected by 2025. However, data availability for MSMEs globally is very sparse.

According to TeleGeography's analysis of firm connectivity, enterprises can keep their IT needs simple by relying on one service provider for all their connectivity or they can work with different carriers to get the lowest prices available in each region. With regards to enterprise connectivity for large firms, according to TeleGeography's most recent WAN Manager Survey, just over a quarter—27%—of companies sourced their Multiprotocol label switching (MPLS) needs from a single global provider[33].

Connectivity data disaggregated by enterprise size is generally available for high-income nations, although not always for micro-enterprises. For most low- and middle-income countries, aggregated data on enterprises with Internet access is rarely available. The nature of the connectivity also matters – whether it is fixed or mobile. A one-person micro enterprise might find having a smartphone with wireless access sufficient to carry out operations, particularly for social-media based online selling. However, where data of mobile Internet use by micro-entrepreneurs are available, a gender gap is apparent (Figure 9).

Figure 9: Mobile Internet Use of Micro-Entrepreneurs, by gender, 2023

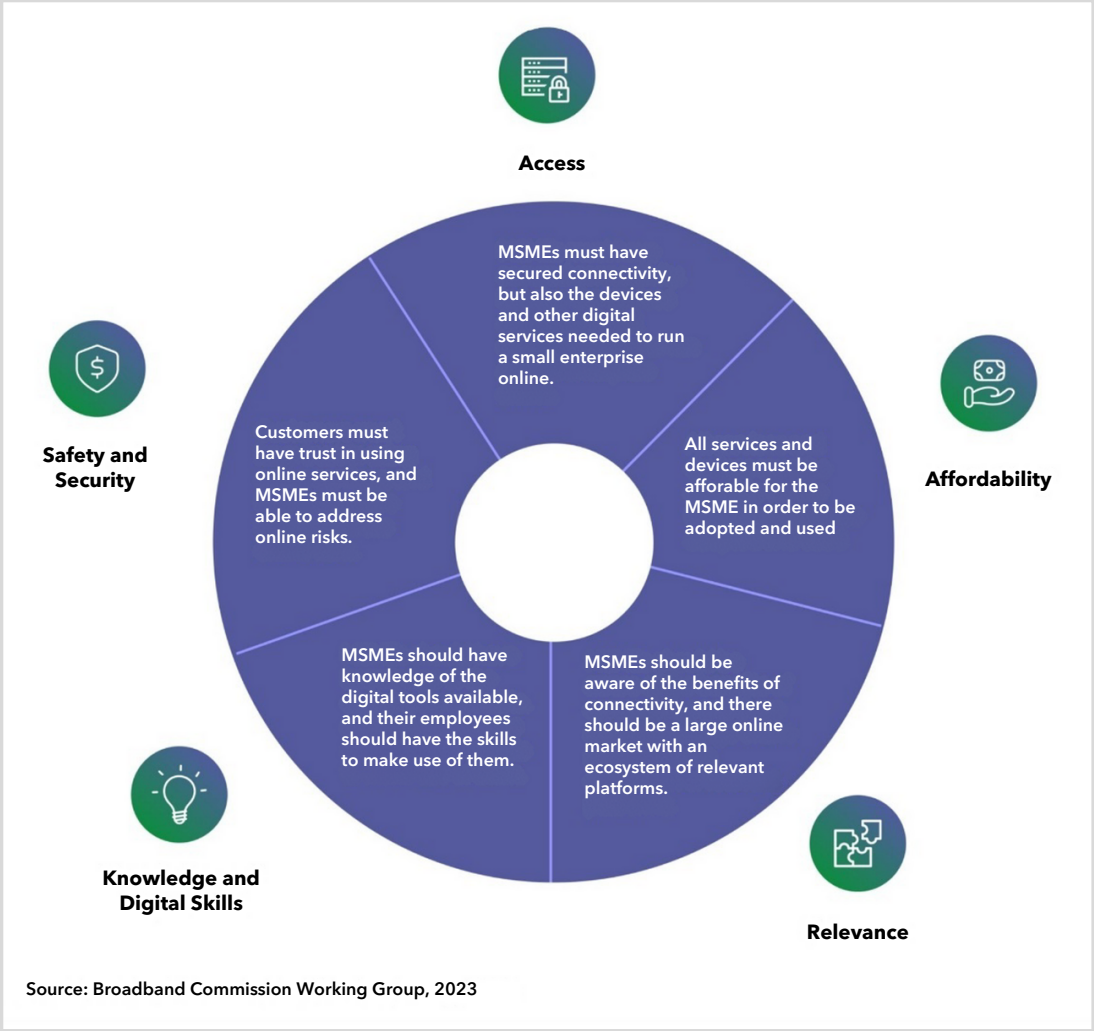


MSMEs also face numerous challenges in broadband adoption, including the availability of technologies and suitable apps and services; the ability of SMEs to gauge, plan, finance, implement and optimize transformation through digital skills.

To address these challenges, as well as data availability, the Broadband Commission Working Group on Connectivity for MSMEs, co-chaired by the GSMA and the International Trade Centre

(ITC), released the Making Digital Connectivity Work for MSMEs report. One of the biggest challenges for improving MSME policy is the lack of standardized definitions for MSMEs. The Working Group report outlines barriers and opportunities to MSME connectivity with a five-part framework (Figure 10):

Figure 10: Barriers & Challenges to connected MSMEs, 2023



Source: Broadband Commission Working Group, 2023

Europe has good SME data availability, due to Eurostat's regular surveys. In 2021, a vast majority (94%) of all EU enterprises[34] used a fixed broadband Internet connection, while 78% had a website, 59% used social media and 22% made e-commerce sales. By 2023, 99% used a fixed broadband connection, including 93% of small enterprises and 97% of medium-sized enterprises with broadband access[35]. In 2023, 45% of all EU enterprises used cloud computing services and 61% used social media. In 2022, 23% made e-commerce sales, including just over a fifth (20.8%) of small enterprises, and nearly a third of medium-sized enterprises (30.2%) made e-sales[36]. Meanwhile, Internet access speeds increased rapidly in Europe – the share of EU enterprises using fixed Internet connections of over 1 Gb/s was 12.8% in 2023[37].

By comparison, an IFC/World Bank survey of 3,325 microenterprises in seven African countries found low levels of smartphone and computer use. Use of the Internet for business purposes was 7% on average[38], ranging from 24% in South Africa to 1% in Rwanda. Computer ownership is also low with over 90% of businesses surveyed in Ghana, Kenya, Mozambique, Nigeria,

Rwanda, Tanzania and Uganda reporting not having one. Most cited not having a need for Internet access or computers in their business. A UNDP survey focusing on MSMEs in Kenya revealed that they were adversely affected by the pandemic, with one out of every 10 enterprises surveyed indicating a shutdown of their businesses due to the pandemic.

Impact of AI on Broadband Access by MSMEs – opportunities and risks

The big tech firms pioneering and propagating AI technologies and tools have huge financial and information resources at their disposal, giving them first-mover advantages that become increasingly difficult for new entrants to overturn. (The European Union's Digital Markets Act aims to ensure contestable and fair markets in the digital sector[39] and the European Commission is considering some of the competitive issues in relation to digital platforms and services).

While AI could offer many benefits to MSMEs by improving and automating and enhancing some services, MSMEs may be less able to take advantage of AI services, as they are generally more cash-constrained and have fewer resources to take advantage of both the new tools and the huge wealth of information and data that AI can offer.

Conversely, AI could be sold as a service on a retail basis, with an extensive market of available AI applications for a range of purposes. Rather than every company investing in the development of bespoke AI applications, MSMEs may be able to benefit from the learnings of the first movers through the application/deployment of AI, rather than in the pure creation of bespoke AI.

Case Study – Digital Skills for MSMEs in Nigeria and India

Nigeria, Africa's most populous economy, has 40 million MSMEs, responsible for roughly 8 in 10 jobs, and many are agribusinesses. The International Trade Centre (ITC)'s Inclusive Digital Entrepreneurship in Agri-business Sector (IDEAS) project, funded by the Government of Japan, aims to equip MSMEs in Imo State, Nigeria, with the knowledge, skills and tools needed for digital trade. Particular attention is given to inclusion of women and youth and the use of emerging technologies like AI to bridge the digital divide and accelerate achievement of the SDGs.

Many agri-businesses have insufficient skills and resources to create engaging content with professional photography and copywriting. Generative AI provides accessible and free tools for creating text, images, and video. To complement its e-commerce learning, ITC partnered with Microsoft to expand MSME capabilities in adoption of generative AI. Data Science Nigeria, a Microsoft non-profit implementing partner, supported MSMEs through hands-on workshops on use of generative AI tools for creation of company logo, social media posts, product descriptions, and more.

The successful adoption of AI tools by early-stage entrepreneurs in Nigeria, and their high engagement levels show the significant potential for non-tech savvy communities to leverage AI in trade. ITC and Microsoft are exploring ways to scale MSME skilling across regions and jointly advocate for inclusive digital trade practices and policies.

In India, two-thirds of around 100 million MSMEs or small businesses have Internet connectivity, but only 6 % can sell via digital platforms. Sellers, particularly in rural areas, may lack either the digital access or the knowledge to confidently use digital platforms for trade. Even firms interested in selling online may be deterred by the prohibitive costs of digitalizing inventory, warehousing and logistics. They may also struggle to access the capital required to modernize and expand. The credit gap for MSMEs in India has been estimated at about US$300 billion, driving about 60% of business owners to opt for informal credit at prohibitive costs[40].

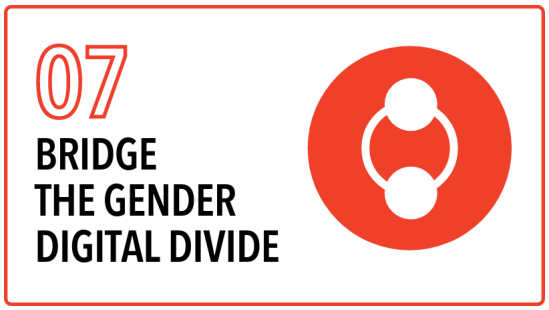
India's MSMEs account for 90% of all enterprise in the country and nearly half of GDP. However, their growth remains perpetually limited by a dependence on cash due to which the transactions too are inevitably limited. With this in mind, Airtel has partnered with the National Small Industries Corporation (NSIC) to accelerate the digital transformation of MSMEs – something that is key to the Government's vision of 'Atma Nirbhar Bharat' for enabling MSMEs to scale up faster by adopting digital ways of doing business.[41] Airtel has introduced several solutions for MSMEs, including:

- Airtel Mobile: Corporate Mobile Plans with bundled G-Suite;
- Airtel Cloud: Private, Public and edge cloud solutions; and
- Airtel Secure: Integrated security solutions for businesses.

Airtel Payments Bank has also launched 'Suraksha Salary Account' – an innovative salary account for the MSMEs for making cashless payments and providing a financial security blanket to their employees, aimed at driving digital financial inclusion in the country.[42]

Sources: ITC and Airtel.

Advocacy Target 7: Bridge the gender digital divide[43]



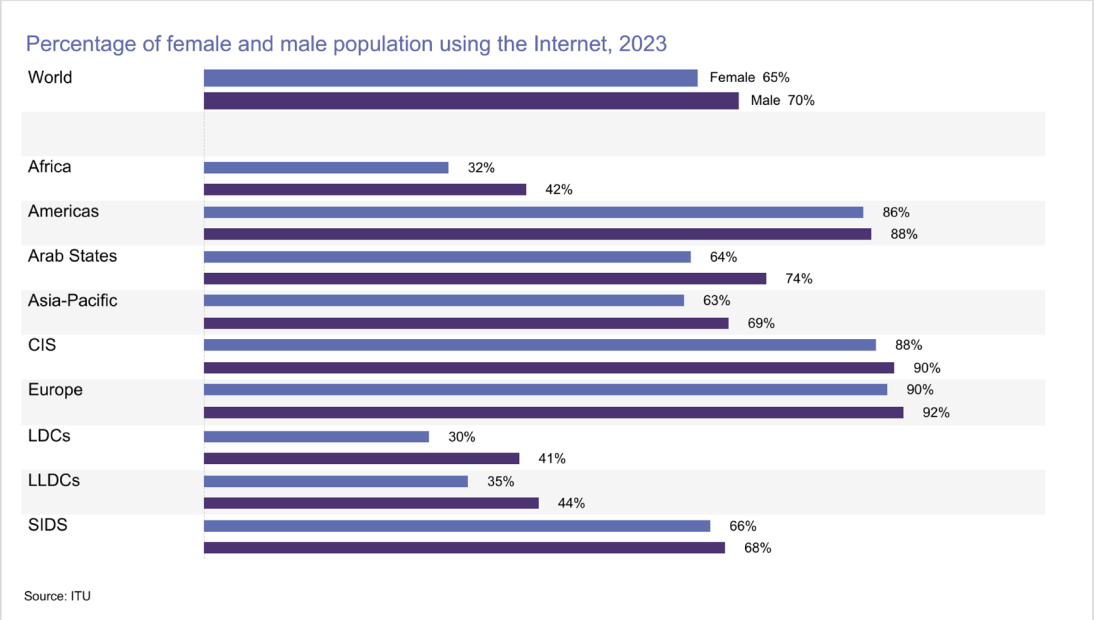
Rationale and Status

This target states that, by 2025, gender equality should be achieved across all the other targets. The Broadband Commission highlighted the importance of gender equality among Internet users in 2013, when it introduced this advocacy target, so the benefits of broadband Internet can reach everyone, regardless of gender.

According to the latest ITU estimates, in 2023, 70% of all men used the Internet, compared to 65% of all women (Figure 11). These proportions have increased marginally from 2022, when 69% of all men were using the Internet, compared to 63% of all women. Globally, 244 million more men than women used the Internet regularly in 2023. Gender parity increased from 0.90 in 2019 to 0.92 in 2023, indicating that the gender digital divide persists, but it is narrowing overall.

Generally, the regions and income groups with the highest Internet use also have the highest gender parity scores, including high-income countries, SIDS, the Americas, CIS countries and Europe. In contrast, LDCs continue to exhibit low levels of Internet use and to generate low gender parity scores despite having made noticeable progress in recent years in both usage and gender parity. Landlocked developing countries have shown only limited progress towards gender parity since 2019.

Figure 11: Percentage of female and male population using the Internet, 2023



Source: ITU, https://www.itu.int/itu-d/reports/statistics/2023/10/10/ff23-the-gender-digital-divide/

However, notable gender gaps in mobile Internet access persist in LMICs. The GSMA's Mobile Gender Gap Report 2023[44] found more women in LMICs are using mobile Internet than ever before, but adoption has slowed for the second year in a row and a significant gender gap remains. Today, women are 19% less likely than men to use mobile Internet. Of 900 million women who are still not using it, almost two-thirds live in South Asia and Sub-Saharan Africa, where mobile gender gaps are widest. 440 million women in 12 countries across Asia, Africa and Latin America do not have a mobile phone[45]. Gender gaps in smartphone ownership and overall mobile ownership remained unchanged in 2023 at 17% and 7%, respectively.

The GSMA concludes that "with the rate of digital inclusion slowing across LMICs, more effort and focus are needed to address the digital divide" and ensure that women are not left behind. The GSMA further observes that "gender inequalities [may be] exacerbated, as economies suffer in the current economic crisis and mobile becomes less affordable"[46]. The report offers detailed recommendations for operators, Internet companies, policy-makers and regulators and the development community, concluding that concerted action is needed by all stakeholders to close the mobile gender gap.

Impact of AI on the Gender Digital Divide – opportunities and risks

AI stands to transform concepts of gender identity, gender relations and gender equality further. UNESCO points out that there are significant challenges in ensuring that AI does not exacerbate existing societal biases, inequalities and divides which lead to discrimination against or exclusion of certain populations – notably, minorities along identities of gender, race, ethnicity and religion.

These challenges are highlighted in a recent UNESCO publication entitled "Your Opinion Doesn't Matter, Anyway: Exposing Technology-Facilitated Gender-Based Violence in an Era of Generative AI". Published in November 2023, the report examines how generative AI can intensify gender-based and racial discrimination. It warns that generative AI can be exploited by those with harmful intentions, offering automated and advanced means to target and harm marginalized groups, further entrenching existing biases and inequalities. Further UNESCO-supported research on "Challenging systematic prejudices: an investigation into bias against women and girls in large language models" has found the significant degree to which LLMs recreate gender biases.

Such bias can be reflected or amplified in AI by simple statistical error or through conscious and unconscious assumptions about race, gender, or other ideological concepts and social stereotypes. For example:

- AI language models draw their material from already published information, meaning that they can replicate and amplify existing gender biases.
- Women are extremely under-represented in the companies and teams developing AI tools: women make up only 12% of AI researchers (Kiden et al, 2019), and are 13 times less likely to file ICT patents[47]. This has downstream biases for how the technologies may function.
- There is some evidence that the automation of some types of job stand to disadvantage women more than men, with women 1.5 times more likely to have to move into a new occupation than men in the United States (e.g. McKinsey 2023[48]).
- The use of AI in recruitment algorithms may, for example, preselect a disproportionate number of men's CVs for more senior positions, while selecting or reserving women's CVs for secretarial or administrative work, as a replication of existing biases in some societies (e.g. Amazon's experience with recruitment algorithms in 2015).
- One early chatbot online (Microsoft's Tay) quickly became misogynistic and racist, and was withdrawn after one day. In 2019, UNESCO released a report on the predominance of 'female' voice-based assistants (such as Alexa and Siri) and their impact on gender stereotypes (e.g. encouraging others to view and treat women as assistants). There is a gendered bias to the automation of certain tasks, including housework by robots, which may lead to the devaluation of work traditionally performed by women in some cultures.
- Online visual imagery may result in the spread of harmful stereotypes and even the extension of Gender-Based Violence (GBV) online. AI has also been used to identify transgender people or homosexual individuals, even based on photos or social media posts.
- In terms of women's safety, in some countries Airtags have been used by abusive partners to track women; women have been murdered on the basis of their running routes posted online on a popular online running application.

The CSW67 Expert Group Meeting convened by UN Women with the participation of UNESCO notes that, "to date, current efforts to address the risks of bias in AI remain largely focused on computational factors, such as the statistical representativeness of datasets"[49], for example. The UNESCO Recommendation on the Ethics of AI includes an entire policy area dedicated to gender, which lays out a roadmap of system-wide concrete actions to ensure that AI developments do not leave behind women, the marginalized and the most vulnerable. It underlines the need for governments to put in place positive actions aimed at the full inclusion of girls and women in AI and to set up gender-inclusive training strategies to mitigate the impact of labour market shifts triggered by AI – in terms of numbers, job profiles and skill requirements.

The CSW67 Expert Group calls for national digital policies to include a gender action plan to ensure existing gender stereotyping and discriminatory biases are not translated or amplified in AI systems and that women are not left out of the digital economy powered by AI. Member States should promote economic and regulatory incentives and policies which aim at balanced gender representation in all stages of an AI system lifecycle, in AI research and development. Member States should encourage female entrepreneurship, and representation in AI companies' top management positions.

In September 2023, the UN agency UN Women convened a Summit to debate gender biases in AI and how they may impact our lives going forward[50]. ITU's AI for Good Summit online hosts regular webinars about the gender impact of AI.

Case Study – the role of data in combatting gender-based violence (GBV) in Spain

The UN Office on Drugs & Crime (UNODC) and UN Women recorded the highest yearly number of intentional killings of women and girls in 2022 over the past two decades[51]. They note that women and girls in all regions across the world are affected by this type of gender-based violence (GBV).

According to UN Women, violence against women is silenced, hidden and structural, which is why transparent data is so important to shed light on GBV and make GBV more visible. There continue to be significant limitations in data and information, especially for certain groups of women and girls, including those from marginalized communities. Women in the public eye, including those in politics, women human rights defenders and journalists are often targets of intentional acts of violence – online or offline – with some tragically resulting in fatal outcomes and intentional killings.

In Spain, administrative data is collected by government authorities and other organizations as part of essential support to survivors, or during interactions with an alleged or convicted perpetrator by authorities. It can be collected by different types of service providers, such as the police, prosecutors, courts, social welfare agencies, social services providers, women's shelters, violence hotlines, the health sector, as well as the Spanish Government Delegation against GBV[52].

To prevent GBV, Spanish authorities record comprehensive data on victims. It is commonly alleged that there are an elevated number of false complaints of violence made by women against men, but in Spain, official data from the judiciary shows that this belief is false. Finally, administrative data helps to monitor and improve services for women and girls who are

survivors of violence. By identifying women and girls at greater risk, countries can better inform prevention and protection mechanisms.

According to UN Women, gender-related killings and other forms of violence against women and girls can be prevented through primary prevention initiatives focused on transforming harmful social norms and engaging whole communities and societies to create zero tolerance for violence against women. Early intervention and risk assessment, access to survivor-centred support and protection as well as gender-responsive policing and justice services are key to ending gender-related killings of women and girls.

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Chapter 3

Conclusion

The online world is evolving rapidly. Broadband and computing infrastructure underpins many current developments, including AI and emerging technologies. Conversely, AI stands to impact the Broadband Commission's targets and SDGs, as this report has shown.

AI for Good Global Summit 2024, Switzerland
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Chapter 3: Conclusions

Internet access for all remains an elusive goal for one third of humanity, with the benefits of Internet access unevenly distributed. Efforts are still focused towards making broadband universally available, affordable, and providing fair and equitable access to the benefits and opportunities of digital technologies. Despite substantive progress in some areas, the Broadband Commission's targets have still not been achieved. Target 2 for mobile broadband affordability is close to being achieved, and Target 7 for gender equality in access to broadband has been achieved for some countries, although not globally.

The online world is evolving rapidly. Broadband and computing infrastructure underpins many current developments, including AI and emerging technologies. Conversely, AI stands to impact the Broadband Commission's targets and SDGs, as this report has shown.

AI also adds new dimensions to broadband policy, and policy-makers are racing to catch up. The implications of these developments are far from clear, and the policy landscape is evolving very rapidly to accommodate these new developments. There is a range of regulatory initiatives and a massive policy push underway in countries around the world. A number of countries and regions are starting to issue guidance or regulations on the use of AI. Policy-makers are trying to find the proper balance promoting the benefits of AI, while managing possible risks.

As the digital landscape transforms, there are various efforts by many stakeholders to ensure that these changes occur within a collectively agreed ethical framework. In 2021, UNESCO produced the first-ever global standard on AI ethics, the Recommendation on the Ethics of Artificial Intelligence. In 2022, the GSMA's AI for Impact Initiative published a guide for the mobile policy community on the ethical design, development and deployment of AI systems. ITU hosts the AI for Good platform, supported by 40 UN partners, which aims at employing AI to progress the SDGs.

The ITU/UNESCO Broadband Commission stands ready to support policy-makers as they engage with the development of digital technologies and their impact on the policy landscape.

Annex: Measuring progress towards achieving the 2025 targets

To read more about our advocacy targets: https://broadbandcommission.org/advocacy-targets/

To download the below infographic: https://www.broadbandcommission.org/download/5052

International Telecommunication Union
Place des Nations
CH-1211 Geneva 20
Switzerland

BROADBAND COMMISSION
FOR SUSTAINABLE DEVELOPMENT

broadbandcommission.org

Published in Switzerland,
Geneva, 2024