

Digital Inclusion Benchmark: Scoping Report

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Background and summary



The World Benchmarking Alliance (WBA) was established to drive wider and deeper participation from the private sector in the global efforts towards a sustainable future for all. To accomplish this, the WBA has set out to develop and publish a set of transformative, publicly-available benchmarks that will track and compare companies' performance on the UN's 17 Sustainable Development Goals (SDGs).¹ These benchmarks aim to incentivise and accelerate corporate involvement in achieving the SDGs by crediting top industries and companies, spotlighting their best practices and holding laggards to account. The UN's 2030 Agenda for Sustainable Development, which presents the 17 SDGs and their 169 associated targets, was adopted by 193 countries in September 2015 to serve as a comprehensive blueprint for global societal transformation. In addition to governments and civil society, the 2030 Agenda envisions a significant role for business. Consequently, a number of platforms and mechanisms have been established to facilitate private sector's engagement in the SDGs.² At the same time, thousands of companies have pledged their support to the 2030 Agenda by way of concrete projects. However, a systematic approach to track the efforts companies are making to drive the SDGs is missing. The WBA seeks to address this gap.

To ensure that these new corporate SDG benchmarks effectively empower all stakeholders – from consumers and investors, to employers and business leaders – the WBA strives to base their

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methodology on the best-available science and establish a process that is as transparent and consultative as possible, while respecting the brief time left before we reach the 2030 deadline. The benchmarks' methodology and results will also be free to use and continually improved through an ongoing and open multi-stakeholder dialogue. More information about the WBA can be found at www.worldbenchmarkingalliance.org.

Between 2016 and 2017, an extensive series of global, regional and online consultations were launched to hear from key stakeholders and help determine the WBA's industry priorities. Among the outcomes of the consultations was a broad consensus around the cross-cutting role of the information and communication technology (ICT) industry in helping to deliver most, if not all, the SDGs. In the online consultations, respondents were mostly likely to consider both the ICT and energy industries as highly influential for achieving the SDGs worldwide. In the general public survey, the ICT industry was seen as one of the top three most impactful industries for 12 of the 17 SDGs, and the professionals' survey respondents considered ICT one of the top three key industries for nine of the SDGs.

Unfortunately, as it stands, benefits from information and communications technology are not equally enjoyed across countries, regions and people from different walks of life, hampering the

potential of these technologies to advance the SDGs. While individual companies are taking steps to foster greater access to information and communications technologies in a number of ways, there are no systematic or transparent mechanisms to track and compare these efforts across the ICT industry. There is a need for a global, company-level benchmark that measures corporate contributions towards digital inclusion.

This scoping report outlines a conceptual framework for measuring company-level contributions to digital inclusion, reviews current approaches, compares related benchmarking initiatives, identifies the gaps, and proposes potential industries and companies to cover under the WBA Digital Inclusion Benchmark.

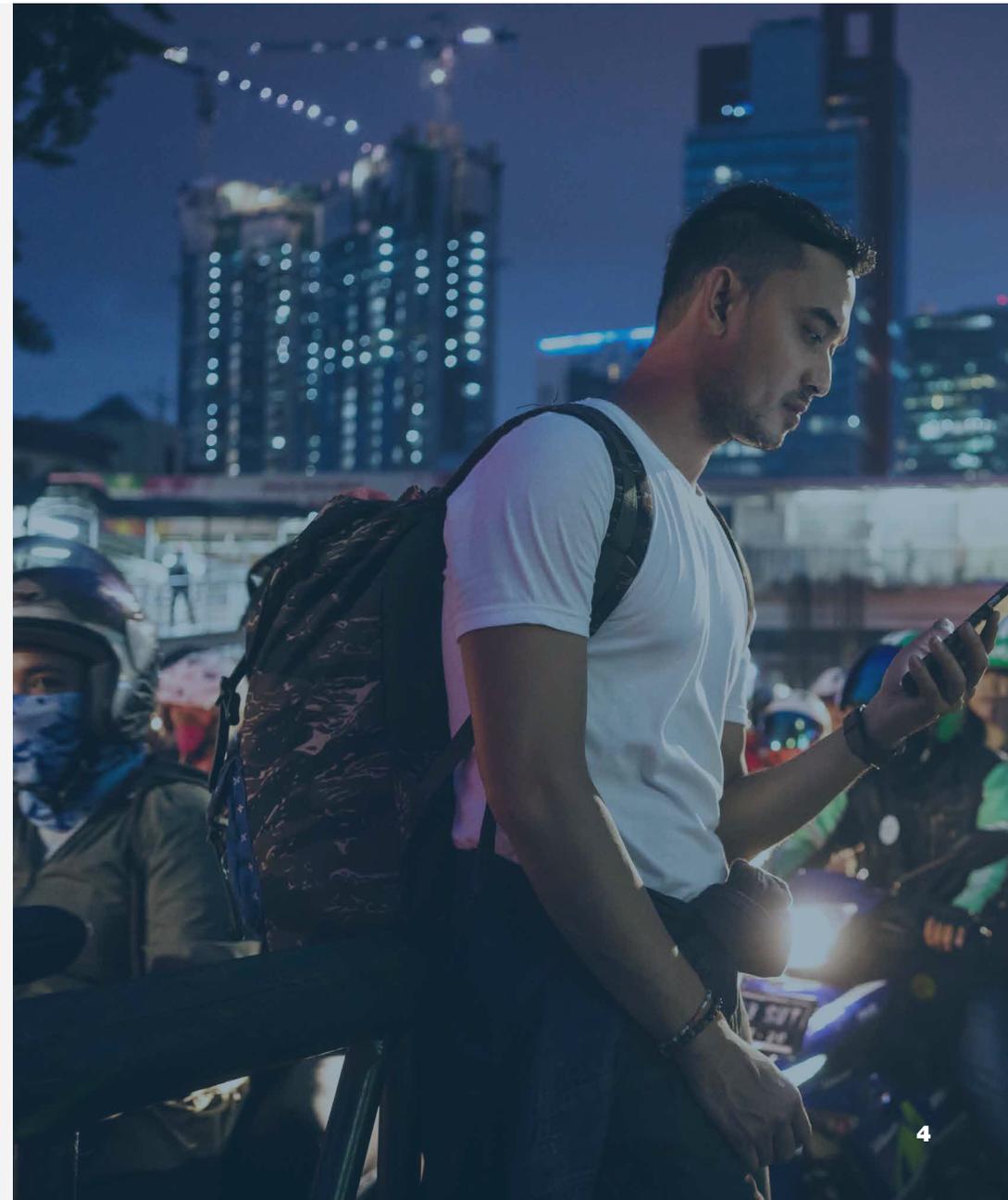
Thus far, two of the Digital Inclusion Benchmark's key features have been defined following a synthesis of the current understanding of digital inclusion in scholarly and grey literature, a review of existing ICT-related benchmarks and private sector projects, and consultations with stakeholders. This benchmark will aim to be:

- **Comprehensive, beyond material access.** Digital inclusion is more than material access to a computer or the Internet. While equitable access is necessary, it does not suffice to guarantee that digital technologies benefit all of humanity. People must also be offered equal opportunities to develop

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relevant skills and productively use digital technologies to improve their lives. Moreover, gaps between developed and developing countries' abilities to innovate ICT products, services, processes and business models will need to be bridged. The conceptual framework and metrics for a benchmark that aims to measure and compare company-level contributions towards digital inclusion will need to consider all dimensions of digital inclusion. The Digital Inclusion Benchmark, therefore, will track corporate contributions based on four dimensions: access, skills, use, and innovation.

- **Inclusive, covering the entire ICT sector.** The ICT sector is an obvious starting point for a company-level benchmark on digital inclusion, since firms in this sector engage in business activities that directly affect all four dimensions of inclusion. The ICT sector is a product of the telecommunications industry converging with the computing and broadcast/media industries. This large and growing sector includes the most highly-valued and profitable companies in the world. The Digital Inclusion Benchmark will track contributions by industries and companies from three layers of the ICT sector: networked elements (e.g. device manufacturers), network providers (e.g. telecommunication companies), and content, platforms and applications (e.g. large search and social media platforms).



Defining digital inclusion



There are diverse points of view regarding what digital inclusion means. When digital inclusion first appeared in public policy discourse during the take-off of the Internet in the late 1990s, the focus was on closing a narrowly defined digital divide — a gap between those who have and do not have material access to a computer or the Internet.³ It was feared that those who did not have access to these technologies would be left behind by a fast-changing information society, unable to reap its benefits, thus widening existing gaps in opportunity, income and wealth. Digital inclusion was viewed largely as a technological problem with an equally streamlined technological solution. A high-profile example of this approach is One Laptop per Child (OLPC), a project that aimed to distribute low-cost educational devices to children in developing countries. The project was supported by a number of ICT firms, including chip manufacturers and content platforms. While the project succeeded tremendously in putting computer literacy on many public agendas, its actual reach was limited.⁴ Other initiatives which took a similar simplified technological approach have floundered when faced with regulatory and political obstacles.⁵

What are ICTs?

Information and communication technologies (ICTs) refer to technologies that store, compute, transmit and communicate information, often in digital form.⁶ These technologies can be software or hardware, or a combination of both. They can include the Internet and the World Wide Web, mobile communication, Internet of Things (IoT), cloud computing, virtual/augmented reality, blockchain, artificial intelligence and robots.

ICTs are classed as general-purpose technologies (GPTs) which, similar to steam engines and electricity, transform all sectors of the economy and fundamentally change the way our societies are organised. These technologies tend to be pervasive, improve over time and spawn other innovations.⁷ History shows that they bring massive economic disruption in the short-run and the promise of prosperity in the long-run.

While ICTs have undeniably opened up more opportunities to improve human well-being, they are not without their disadvantages. The growth of electronic appliance waste, adverse effects on child development, loss of privacy, political polarisation from social media filter bubbles, and job loss from automation are some of the negative consequences that must be mitigated if ICTs are to be effective tools to advance the SDGs.

Digital inclusion, however, is a much more complex and multi-faceted problem. There is not one but many digital divides which can appear between countries (e.g. developed versus developing, large versus small, landlocked versus island states), within different regions of a country (e.g. urban versus rural, coastal versus inland) and between various people, depending on their age, income, gender, education and other social circumstances.

Access

There are different dimensions of how people are excluded from fruitful participation in the information society. The lack of material access, whether to devices, connectivity or content, is one dimension. Availability, affordability and quality are key factors of material access. According to the International Telecommunication Union (ITU), Internet access reached half the global population

in 2018.⁸ However, there are still many locations around the world without broadband coverage or online government services, often in rural and remote areas of both developed and developing countries where the business case for telecommunication infrastructure and services is weak. Least developed countries are particularly behind on SDG target 9.c to provide universal and affordable access to the Internet in these countries by 2020.

Defining digital inclusion

Affordability of digital technologies is often the main barrier to inclusive access and must be prioritised in digital inclusion efforts. Lack of affordable access can either limit low-income groups to lower quality connectivity or block them from access entirely. In developing countries, mobile broadband prices averaged more than 5% of income per capita in 2017, reaching as much as 14% in least developed countries.⁹

Not only are prices higher in developing countries, but the connectivity services are also of lower quality. For instance, average Internet download speeds in developing countries are three to four times slower compared to those in developed countries.¹⁰ These lower quality connections hinder people from effectively using quality-sensitive applications, such as cloud computing or video conferencing, and may even prevent them from going online altogether. The quality of access is an increasingly significant barrier as digital technologies spread and saturate markets.¹¹

Skills

Digital skills are another important dimension of digital inclusion. These skills refer to a person's ability to increase the benefits gained from using digital technologies and avoid the downsides that can ensue from digital engagement.¹² An individual's level of digital skills have been found to greatly vary both within a country, by gender, age, location and other social circumstances, as well as between countries.¹³

There are a range of skills needed to beneficially use ICTs. Given that these technologies are evolving rapidly, acquiring the right set of digital skills is a moving target. These skills are supported by general learning, critical-thinking, problem-solving and creative skills that are also useful in analog domains.

There are a variety of frameworks used to identify, categorise and measure digital skills. Among the most well-known is the European Commission's Digital Competencies (DigComp 2.0) framework, which identifies five pillars: information and digital literacy, communication and collaboration, digital content creation, safety, and problem-solving. Under DigComp 2.0, safety skills for protecting one's personal data and privacy are just as crucial as being able to create content and write software programmes. Van Deursen, Helsper and Eynon propose a framework with four types of skills – operational, information management, content creation, and social skills – which apply to a broad range of ICTs.¹⁴ Although these and other frameworks differ in how skills are categorised, they generally agree that technical, or “button-pushing”, skills are but only one component of an effective digital inclusion analysis.

Use

Use is another key dimension of digital inclusion. Material access and digital skills are necessary foundations for digital inclusion, but they do not guarantee a person's beneficial use of ICTs. Individuals' digital

Defining digital inclusion

inclusion depth can be determined by documented differences in the duration, type and diversity of their ICT-use.

When digital technologies were not as widespread as today, then shorter, more intermittent use was linked to inadequate access and skills, disadvantageous socio-economic circumstances and lower-quality properties of the technologies used.¹⁵ Later, the types and diversity of use gained attention as markers of an individual's degree of digital inclusion.¹⁶ Some use ICTs in very few, specific ways, while others use these technologies to engage in a range of activities, from learning to shopping. Some uses are geared towards media consumption and entertainment, while others focus on information gathering and networking to enhance their productivity.

The absence of relevant, localised content suitable for certain cultural settings, the lack of user-friendly interfaces, and the misgivings surrounding privacy and security can deter those who otherwise have the necessary access and skills from using ICTs. For example, it has been estimated that over half of Internet content continues to be in English, potentially discouraging marginalised users who are more likely to be non-English speakers.¹⁷

Additionally, network effects are an important consideration when analysing the use of digital technologies. An individual's value associated with using the technology increases with each additional

user, leading to a positive feedback loop once a critical mass is reached. Unfortunately, this results in deepening the divide among users and further strengthening those who are already well-positioned to gain from ICT use.

Innovation

Innovation is perhaps the most neglected dimension of digital inclusion, though still an important one. The policy discourse on digital inclusion has remained silent regarding the global gaps in creation and ownership rights to digital technologies.¹⁸ Considering that financial and economic gains from digital innovation are highly concentrated, such an oversight will need to be addressed to ensure these gains are fairly distributed.

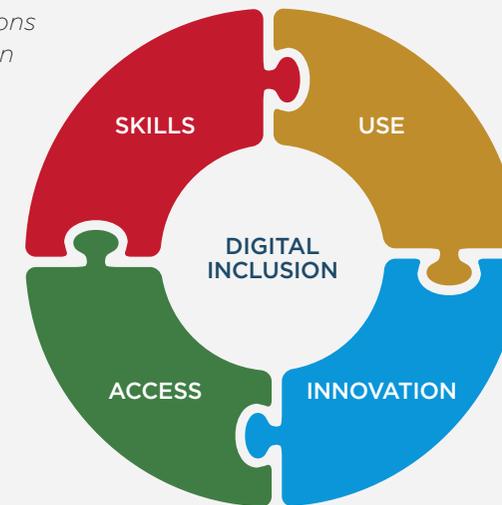
Digital technologies are evolving at an unprecedented rate, bolstered by combinatorial innovations in both software and hardware, accounting for the bulk of patent applications worldwide.¹⁹ Innovation divides at national and sub-national levels are apparent from various metrics, such as number of patent filings, geographical distribution of innovation clusters (e.g. Silicon Valley, Shenzhen, Seoul), and number and valuation of ICT start-ups. As a case in point, more than 200 of the 300 plus ICT start-ups, each valued at USD 1 billion or more, have come out of only two countries: China and the United States.²⁰ This mirrors the uneven distribution of venture capital worldwide, with the largest funds also operating in these two countries.

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Also concerning are the severe imbalances in the distribution of artificial intelligence expertise and its fuel (i.e. big data production), with large and well-connected countries dominating the lead.²¹ Again, the United States and China produce more than double and triple the number of AI research publications, respectively, compared to the rest of the countries in the top ten.²² This divide in AI innovation capacity will have repercussions down the road concerning the distribution of global economic and political power.²³

From a business standpoint, innovation refers to an improvement in the organisation, process, and products and services that create more wealth for the company. These innovations can involve cost-reduction, value-creation or the development of entirely new business models that do both. In the ICT and other sectors, the wealth generating aspect of innovation is closely intertwined with the protection of intellectual property.^{24,25} The ICT sector has already seen very fierce, global legal battles where hundreds of millions, if not billions, in US dollars were at stake.²⁶ IP winners stand to gain from lucrative licensing agreements that could ultimately affect how much products and services cost their end users, bearing negative consequences on consumers and small businesses, especially in the developing world. The nature and purpose of innovation matters when considering to what extent business is creating improvements that profit not only their shareholders, but also society as a whole.

Figure 1. Dimensions of Digital Inclusion



Ultimately, digital inclusion is more than just access to devices and connectivity. To be impactful, a working definition of digital inclusion must cover all four dimensions: access, skills, use and innovation (see *Figure 1. Dimensions of Digital Inclusion*). Equitable access is necessary but not sufficient to guarantee that digital technologies will broadly benefit humanity. People must be offered fair opportunities to develop relevant skills and productively use technologies in ways that can improve their lives. Finally, gaps in the abilities to innovate ICT products, services, processes and business models will need to be bridged. The conceptual framework and metrics for a benchmark that aims to effectively measure and compare company-level contributions towards digital inclusion

Digital inclusion and the SDGs



Digital inclusion can be viewed as both a means to a desired end and a desirable end in itself. As a mechanism, digital inclusion helps to ensure that individuals have an equal opportunity in employing digital technology for personal and social betterment. As for the end goal, it is only right that everyone enjoys this technology and participates fully in the information society.

Digital technologies are recognised for their cross-cutting contribution to the SDGs. The 2015 UN summit outcome document “Transforming our world: the 2030 Agenda for Sustainable Development” recognises that the spread of ICTs has the potential to accelerate human progress.²⁷ The 2030 Agenda, therefore, focuses on information and communications technology as an enabling tool to advance the SDGs. While there is not an SDG specifically focused on digital inclusion, there are SDG targets that explicitly reference information and communication technology (see Table 1).

Table 1. ICT-related targets in the 2030 Sustainable Development Agenda

Goal	Target
SDG 4: Quality Education	Target 4.b: By 2020, substantially expand globally the number of scholarships available to developing countries [...] for enrolment in higher education, including vocational training and information and communications technology, technical, engineering, and scientific programmes, in developed countries and other developing countries.
SDG 5: Gender Equality	Target 5.b: Enhance the use of enabling technology, in particular information and communications technology, to promote the empowerment of women.
SDG 9: Industry, Innovation and Infrastructure	Target 9.c: Significantly increase access to information and communications technology and strive to provide universal and affordable access to the Internet in least developed countries by 2020.
SDG 17: Partnership for the Goals	Target 17.8: Fully operationalise the technology bank and science, technology and innovation capacity-building mechanism for least-developed countries by 2017 and enhance the use of enabling technology, in particular information and communications technology.

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Other targets in the 2030 Agenda imply a role for digital technologies. For example, Target 1.4 under SDG 1 (No Poverty) states, “By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services [...], appropriate new technology and financial services, including microfinance.” Target 8.2 under SDG 8 (Decent Work and Economic Growth) aims to achieve “higher levels of economic productivity through diversification, technological upgrading and innovation.”

Additionally, the globally agreed statistical framework to monitor SDG landmarks have seven ICT-related indicators. These include the proportion of schools with access to computers and the proportion of schools with access to the Internet (SDG 4: Quality Education), the proportion of individuals with ICT skills (SDG 4: Quality Education), the proportion of individuals who own a mobile phone by sex (SDG 5: Gender Equality), the percentage of the population covered by a mobile network (SDG 9: Industry, Innovation and Infrastructure), fixed broadband subscriptions by speed and the proportion of individuals using the Internet (SDG 17: Partnerships for the Goals).²⁸

Digital technologies intersect with all 17 SDGs in varying degrees. A variety of applications, such as IoT for better environmental monitoring, e-health and telemedicine for rural areas, smart

sustainable cities, smart grids for more energy efficiency and e-government for better transparency, all have potential to accelerate the delivery of the SDGs (*see Table 2*). The UN General Assembly, in its 2015 review of the outcomes of the World Summit on the Information Society, highlighted the cross-cutting contribution of information and communications technology to the SDGs and poverty eradication and noted that access to ICTs has become “a development indicator and aspiration in and of itself.”²⁹ Digital inclusion, therefore, is acknowledged as both a means and marker of sustainable development.

Digital inclusion and the SDGs

Table 2. Digital technologies applied to the UN SDGs

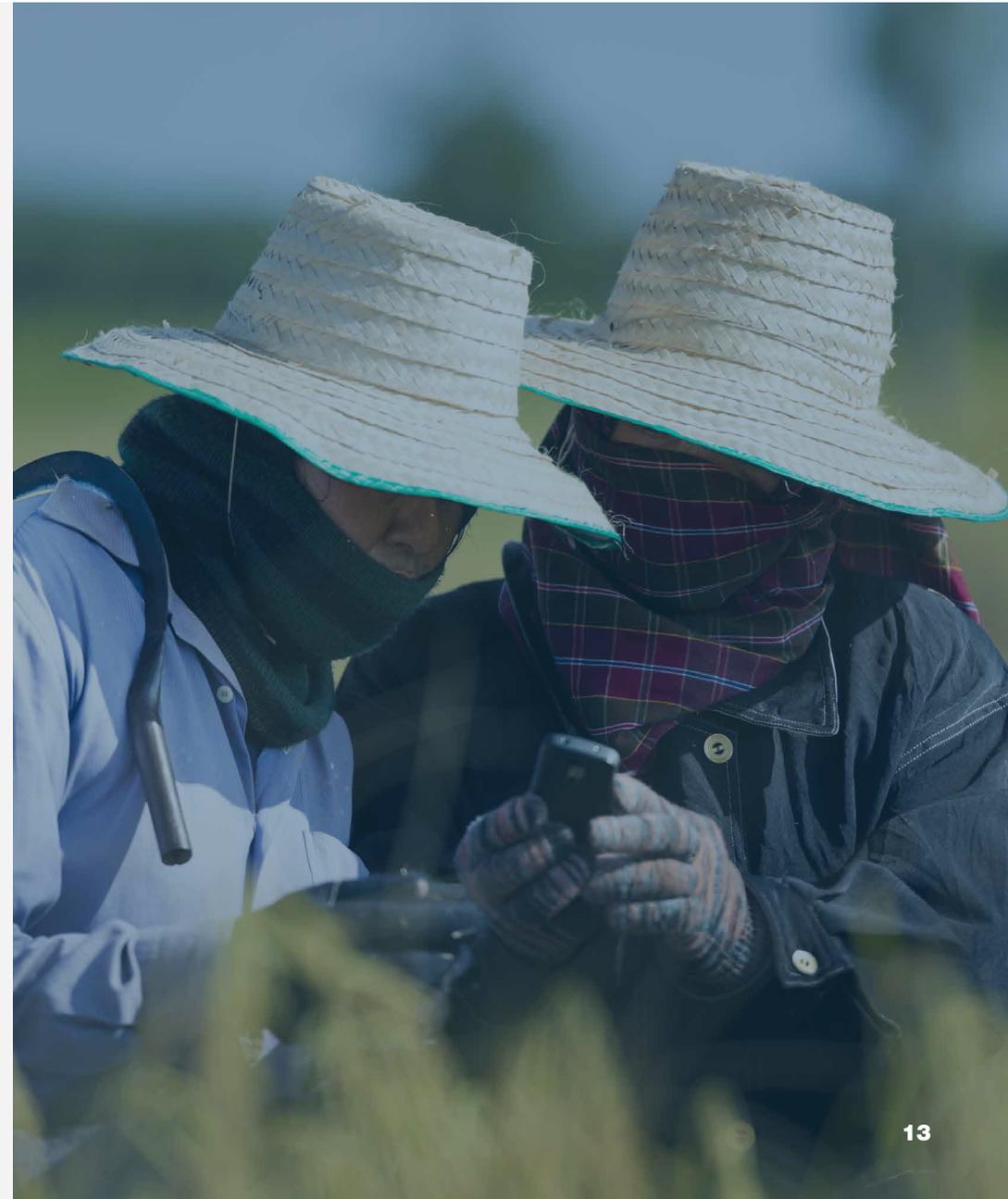
SDG	Examples of Applications
SDG 1: No Poverty	Mobile money and mobile payment solutions that enable the unbanked to access financial services at a lower cost and obtain the means to escape poverty.
SDG 2: Zero Hunger	ICT applications that improve agricultural productivity and empower smallholder and marginalised farmers with access to information about the market, as well as updated weather forecasts.
SDG 3: Good Health and Well-being	E-health solutions that allow low-income and rural populations to access healthcare remotely and at lower costs.
SDG 4: Education	E-learning and online courses that level the playing field with access to relevant and high-quality educational content.
SDG 5: Gender Equality	Ownership and use of mobile devices that enable women to improve their livelihoods and expand their choices.
SDG 6: Clean Water and Sanitation	Mobile solutions, smart grids and meters that result in more efficient water use and demand of water management.
SDG 7: Affordable and Clean Energy	Mobile solutions, smart grids and meters that result in more efficient energy use and demand of energy management.
SDG 8: Decent Work and Economic Growth	Cloud services that enable small enterprises' access to ICT resources that require large capital outlays. Moreover, digital skills improve employment prospects. Also, see application under SDG 1.

SDG 9: Industry, Innovation and Infrastructure	Universal availability of connectivity, especially mobile-based services, that allows people to access a broad range of information and services.
SDG 10: Reduced Inequalities	ICT applications that allow those with disabilities to have greater independence and participate fully in the economy.
SDG 11: Sustainable Cities and Communities	Smart city applications that use GPS and big data to improve the efficiency of public transport.
SDG 12: Responsible Consumption and Production	Machine-to-machine services that track and reduce waste and energy use in production and consumption.
SDG 13: Climate Action	Satellite imaging that monitors loss of forest cover.
SDG 14: Life Below Water	Maritime vessel tracking that reveals illegal, unregulated and unreported fishing activities.
SDG 15: Life on Land	IoT applications that monitor biodiversity.
SDG 16: Peace and Justice	Sentiment analysis of social media that reveals public opinion on effective governance, and e-government that enhances access to public services.
SDG 17: Partnership for the Goals	ICT applications that enhance the ability to communicate and coordinate action on the SDGs at a global level.

Source: ITU and UN Global Pulse

Digital inclusion and the SDGs

Huge gaps around digital technologies continue to exist in terms of access, skills, use and innovation between developed and developing countries. There are still approximately 3.7 billion people who are not yet online and almost 2 billion who do not own a mobile phone.³⁰ Among those who are online, there are substantial disparities in international bandwidth usage: Internet users in developed countries have 13 times larger bandwidth at their disposal compared to users in least developed countries.³¹ A skills gap is also evident among those who already access and use ICTs, compared to those who do not. In developing countries, 46% of the general population were reported to have basic skills, such as transferring digital files and sending e-mail attachments, compared to almost 69% in developed countries.³² These gaps show that many people are disempowered and unable to benefit from the array of potential ICT applications that could advance the SDGs.



Reviewing benchmarks relevant to digital inclusion



Most of the existing benchmarks relevant to digital inclusion focus on cross-country comparison and public sector accountability. Few benchmarks exist that disaggregate intranational performance, and even fewer look at the private sector's contribution comprehensively. A company-level benchmark that tracks corporate contributions to all four dimensions of digital inclusion would address a gap in the policy debate, acknowledge the current role of the private sector, and help harmonise digital inclusion and SDG-reporting initiatives across the ICT industry.

A range of existing benchmarks were reviewed to gather insights and highlight best practices, as well as identify relevant concepts and methods. Each of the nine benchmarks reviewed either tracks an issue area related to one or several dimensions of digital inclusion

or is a broader benchmark with an ICT-component. See Appendix A for a summary of the benchmarks included in the review.

This review revealed three major gaps in the current ICT benchmarking landscape, which translate into potential scope for the Digital Inclusion Benchmark:

- **A strong focus on private sector accountability and intra-national comparison is missing.** Of the nine benchmarks reviewed, only the Ranking Digital Rights Corporate Accountability Index clearly tracked company-level indicators. Most of the benchmarks compare countries, and in doing so they focus on national governments' efforts within their policy and legal frameworks and public investment plans. While it is indeed important to hold governments accountable for national outcomes, given that they can shape the market environment and invest in large, high-risk infrastructure projects, business also needs to take responsibility for societal outcomes. After all, a substantial amount of highly-specialised assets, whether intellectual property, network infrastructure, big data or engineering talent, is owned or controlled by the private sector. What companies do in their day-to-day operations, corporate social responsibility programmes and public policy advocacy activities matter a great deal to digital inclusion and the SDGs.

Reviewing benchmarks relevant to digital inclusion



- **There is too much emphasis on access, especially Internet connectivity.** Eight of the nine benchmarks focus on material access, particularly with respect to connectivity and content. This is reflected in the weightings given to the access sub-index, the proportion of components and indicators, the conceptual framework, and even the benchmarks' rationale and titles. Furthermore, inclusion has been measured predominantly in terms of the Internet and associated technologies. This emphasis on Internet connectivity and access is partly a hold-over from the first appearance of digital inclusion in public policy discourse in the late 1990s. The Internet is certainly an important advance in communication technology that widely impacts human well-being, thus access to such connectivity is the bedrock on which digital inclusion stands. However, there are other digital technologies, such as IoT and artificial intelligence, that are now the crux of experimenting and applying a range of sustainable development solutions. A broader and more comprehensive benchmarking framework will have the advantage of being flexible enough to encompass changing technologies and evolving divides among users.
- **Innovation is missing from the equation.** Innovation measures are largely absent from the benchmarks that specifically track digital inclusion. The GeSI's Digital Access Index includes metrics for digital solutions (e.g. e-health, e-learning) which

is a good starting point to capture the innovative application of ICTs toward sustainable development. On the other hand, the Global Innovation Index regards ICT access and use as an innovation input, though it does not set out to explicitly track the digital innovation divide. Given that the digital innovation of today becomes the digital divide of tomorrow, there is an opportunity to highlight this missing dimension and integrate it into the digital inclusion conversation.

The review also revealed some methodological best practices among existing digital benchmarks. A good digital benchmark should:

- **Build on a clear and coherent conceptual framework using the best-available science.** A benchmark's credibility is enhanced when it is guided by a coherent conceptual framework that draws upon a synthesis of current scholarly and scientific understandings of the relevant issues. It is also important to clearly define the constructs being measured in order to identify valid indicators, thus ensuring the benchmark is measuring what it set out to. Much has already been written and analysed regarding digital inclusion, serving as an excellent trove of insights upon which a new framework can be based.
- **Stay simple enough, but not simplistic.** Benchmarking corporate contributions to digital inclusion requires a balance

Reviewing benchmarks relevant to digital inclusion



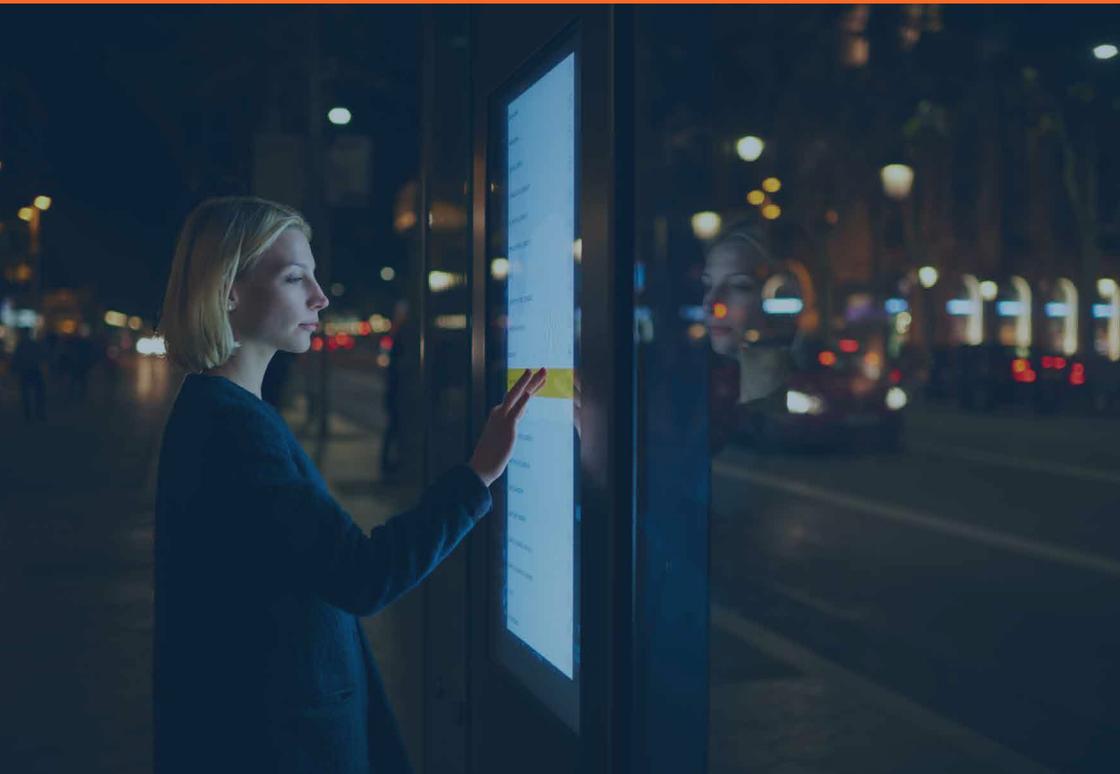
between capturing complexity and maintaining tractability. Digital inclusion has multiple dimensions, each of which intersects with different corporate activities – from investment, production and pricing, to lobbying and public policy advocacy strategies. A company-level benchmark will have to contend with this complexity, while remaining streamlined enough to be apprehensible.

- **Crowdsource and open-source data.** The widely-cited benchmarks are transparent in their methodology, indicators and data sources. This allows stakeholders, notably relevant companies, to evaluate corporate performance using the benchmark, which can lead to increased awareness and engagement. Transparency also facilitates crowdsourcing feedback from multiple stakeholders, which can strengthen the benchmark's methodology through a process of consultation and iteration. As a result, open-sourced and crowdsourced benchmarks tend to be more robust. Transparency also facilitates sharing, consequently multiplying the benchmark's user base. Admittedly, there are challenges to open-sourcing indicators when these are proprietary. Secondary data sources with permissive rights or those already in the public domain should be selected, if possible, when primary data collection is impractical. Reconciling divergent feedback is another challenge that arises from crowdsourcing. Guiding principles and mechanisms will need

to be in place to process and prioritise inputs.

- **Emphasise scores and make them as comparable over time as possible.** A benchmark becomes more useful as a tool for tracking progress if it discloses scores, both for the benchmark as a whole and for its components, rather than publishing only rankings. While corporate rankings grab headlines and call attention to the issues, scores provide companies with more actionable information, especially when they can be broken down into different components and compared over time. Ensuring time series comparability for digital inclusion is challenging in the face of a dynamic digital economy, and the new benchmark's methodology would need to be periodically updated to reflect this movement. It is important to be aware of this trade-off from the outset.

Scoping industries and companies: a layered view of the ICT sector



An obvious starting point for a company-level benchmark on digital inclusion is the ICT sector. Firms in this sector engage in business activities that directly affect all four dimensions of inclusion: access, skills, use, and innovation. This is a large and growing sector which includes the most highly valued and profitable companies in the world. In 2018, device manufacturers like Apple and Samsung and telecommunication providers like Verizon, AT&T and China Mobile were listed alongside large banks

and energy companies in the 20 most profitable in the world.³³ By the same token, big tech brands currently dominate in market capitalisation, receiving seven of the top 10 spots: Apple, Amazon, Alphabet (Google), Microsoft, Facebook, Alibaba, and Tencent.

The ICT sector is a product of the convergence of the telecommunications industry with the computing and broadcast/media industries. Delineating and classifying the industries that fall within the ICT sector is challenging, given that many of the industry classification systems were set-up in a pre-digital world.³⁴ The challenge is compounded by rapid technological change and evolving business models. Current approaches to classifying the ICT sector vary according to their purpose, whether for trade statistics, national income accounting or investment portfolio management.

To harmonise national income accounts and track the growth of the digital economy, member countries of the Organisation for Economic Co-operation and Development (OECD) agreed in 1998 to define the ICT sector as a combination of “manufacturing and services industries that capture, transmit and display data and information electronically.”³⁵ The OECD considers an industry to be part of the ICT sector if its product is “intended to fulfil and enable the function of information processing and communications including transmission and display.” The OECD’s definition is based on the UN International Standard Industrial Classification

Scoping industries and companies: a layered view of the ICT sector



of All Economic Activities (ISIC) Revisions 3 and 4, which group industries by the activities they carry out. Individual industries can be identified based on their ISIC classification codes (e.g. 6110 for Internet backbone services, 2610 for printed circuits). The OECD's approach to defining the ICT sector distinguishes ICT products from content and media products, but it does not split the products according to whether they are goods or services. Table 3 lists the products under the OECD ICT sector definition.

Table 3. The OECD ICT sector overview

ICT Products	Content and Media Products
1 Computers and peripheral equipment	1 Printed and other text-based content on physical media, and related services
2 Communication equipment	2 Motion picture, video, television and radio content, and related services
3 Consumer electronic equipment	3 Music content and related services
4 Miscellaneous ICT components and goods	4 Games software
5 Manufacturing services for ICT equipment	5 Online content and related services
6 Business and productivity software and licensing services	6 Other content and related services
7 Information technology consultancy and services	
8 Telecommunication services	
9 Leasing or rental services for ICT equipment	
10 Other ICT services	

Source: OECD 2011

The Global Industry Classification Standard (GICS), developed by S&P Dow Jones and MSCI, presents another way to delineate industries – classifying them by their main revenue sources – and is widely used by the investment community.³⁶ Unlike the OECD, the GICS does not set out to define an ICT sector per se. The 2018 version of the GICS has 11 sectors, two of which correspond to the OECD ICT sector definition: information technology and communication services. The GICS consumer discretionary sector also includes ICT-related industries, such as internet and direct marketing retail and consumer electronics. Table 4 lists the ICT-related industries under the GICS sectors.

Table 4. ICT-related industries under the GICS sectors

Information Technology	Communication Services	Consumer Discretionary
1 IT services	1 Diversified telecommunication services	1 Internet and direct marketing
2 Software	2 Wireless telecommunication services	2 Consumer electronics
3 Communications equipment	3 Media	
4 Technology hardware, storage and peripherals	4 Entertainment	
5 Electronic equipment, instruments and components	5 Interactive media and services	
6 Semiconductors and semiconductor equipment		

Source: MSCI

Scoping industries and companies: a layered view of the ICT sector

The giant e-commerce platform Amazon falls under the consumer discretionary sector according to GICS classification, while the company falls outside the scope of the OECD ICT sector definition. The characterisation of Amazon as an Internet retail company is problematic and emblematic of the difficulties in categorising ICT companies.³⁷ While retail comprises the bulk of Amazon’s business operations and revenue, it is also a highly data-driven company, operating at the forefront of AI and automation. Amazon is almost tied with Microsoft as the largest cloud provider by revenue, and, in 2017, nearly all of the company’s operating income came from Amazon Web Services.³⁸ Amazon produces media and content, as well as dominates the market in specific ICT products (e.g. Kindle for e-readers, Alexa for voice-activated assistants).

Since online platforms like Amazon and platform-enabled services are not satisfactorily captured by either the GICS or the OECD/ UN ISIC classifications, the International Monetary Fund (IMF) suggests defining the digital sector as “producers at the core of digitalization: online platforms, platform-enabled services, and suppliers of ICT goods and services.”³⁹ This means that platform-enabled services, such as peer-to-peer rentals (e.g. AirBnB), peer-to-peer labour (e.g. Uber, Grab, DiDi), peer-to-peer lending and gig economy platforms (e.g. Upwork, Freelancer), are covered under the IMF’s digital sector. Thus far, the IMF definition is the most current and comprehensive to delineate the ICT sector.

Applying the layering analogy, borrowed from network engineering, helps organise the ICT sector by understanding how different industries interact and co-evolve with each other, as well as determine key players with significant impact on digital inclusion. The ICT sector can be visualised as consisting of three layers: 1) networked elements providers, 2) network operators, and 3) content, platforms and applications.⁴⁰ Table 5 lists examples of industries and products, as well as examples of companies, under each of the three layers.

Table 5. A layered view of the ICT sector

Layer	Examples of Industries and Products	Examples of Companies
Layer 1: Networked elements	Semiconductors, communications equipment, operating systems, computers, colocation and data centres	Intel, Qualcomm, Cisco, Ericsson, Samsung, Dell, Lenovo, Huawei, Cisco, Apple, Microsoft, Alphabet, Equinix, Digital Realty Trust
Layer 2: Network providers	Telecoms, cable, satellite, broadcast networks, Internet service providers, Tier 1 backbones, content delivery networks	Verizon, AT&T, Vodafone, Orange, Bharti Airtel, China Telecom, Telenor, Telia, Tata, Akamai, Limelight, ChinaCache, Cloudflare
Layer 3: Content, platforms and applications	Platforms, platform-enabled services, media and content, social media, search engines	Alphabet, Baidu, Facebook, Tencent, Amazon, Alibaba, Uber, Ebay/Paypal, AirBnB

Source: Modified from Fransman (2010)

Scoping industries and companies: a layered view of the ICT sector



Layer 1, which forms the base of the ICT sector, consists of networked elements providers who produce the hardware, software and services that higher layers in the sector combine to produce services.⁴¹ This includes most of the industries under the information technology sector of the GICS classification, such as chip manufacturers like Intel and Qualcomm and device and communications equipment manufacturers like Samsung, Ericsson, Dell, Lenovo, Huawei, Cisco and Apple. Operating system providers are also key constituents of Layer 1. Microsoft with Windows remains in the GICS information technology sector, but Alphabet with Android – the most popular operating system in terms of worldwide device shipment – now falls under the GICS communication services sector. Specialised colocation and data centre providers, such as Equinix and Digital Realty Trust, can also be included under Layer 1.

Diversified network providers, including telecoms, cable, satellite and broadcasting networks, form the core of Layer 2. These include vertically integrated telecommunication companies that supply mobile and fixed connectivity (e.g. Verizon, AT&T, Vodafone, Orange, Bharti Airtel, China Telecom), cable and broadband providers (e.g. Comcast, Charter Communications, Liberty Global), and satellite companies (e.g. Intelsat, SES, Iridium, Eutelsat). This layer also includes wholesale providers of global Internet connectivity, such as Tier 1 backbones like CenturyLink, Tata and PCCW Global,⁴²

as well as overlay or content delivery networks like Akamai, LimeLight, Cloudflare and ChinaCache.

Finally, on top of Layers 1 and 2 sits the third layer: content, platforms and applications. This layer consists of companies that provide what network operators label as over-the-top (OTT) services. Facebook, Alphabet, Baidu and Tencent are examples of the largest names that provide a number of ‘free’ applications, such as social media, messaging, search, video streaming and maps, and earn revenues from targeted advertising. This includes global e-commerce and payment platforms such as Amazon, Alibaba (and its subsidiary Alipay), Ebay/Paypal and a growing range of platform-enabled services like ride-sharing app Uber or peer-to-peer rental apps like AirBnB. This is a growing and dynamic layer where companies are leveraging massive amounts of personal and other data to develop products and services.

These three layers should not be viewed as fixed but as fluid boundaries that shift with the changes in technology and business models. There are companies that straddle multiple layers. For example, Alphabet is a major player in all three layers as an operating system provider (Android), content delivery network (Google Cloud CDN) and search engine provider (Google Search).

Using the layered view of the ICT sector, we can define the criteria

Scoping industries and companies: a layered view of the ICT sector



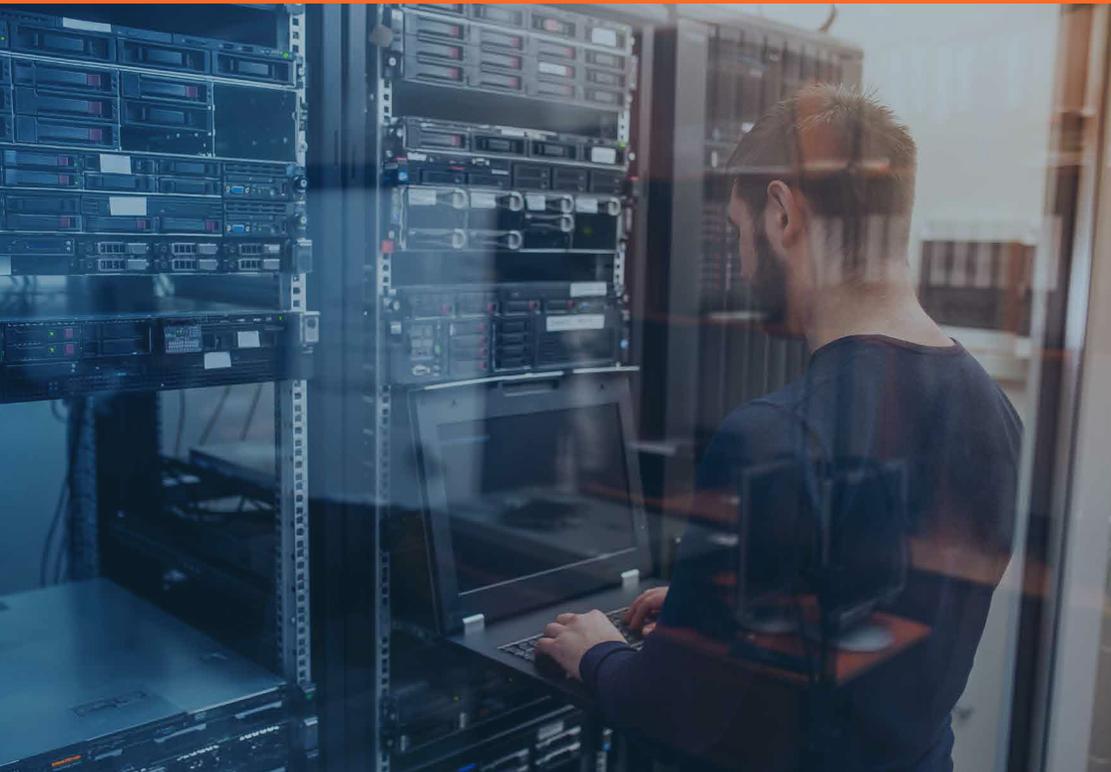
for selecting which industries and companies to benchmark on multiple fronts in order to capture their potential impact on digital inclusion. For example, companies in each layer can be considered key players on several criteria: revenue, market capitalisation, market share, geographic reach, and size of user and subscriber base.

In selecting Layer 2 companies to benchmark, it would also be important to include telecommunications companies who dominate national retail connectivity markets with large populations, but who are not subsidiaries or affiliates of a multinational telecom firm or may not have multinational retail operations. This covers both private and government-owned national carriers in countries such as India, Brazil, Indonesia, Bangladesh, Pakistan, Mexico, Russia, Nigeria, Ethiopia and the Philippines. Some examples of these types of Layer 2 companies include Reliance (India), Telkom (Indonesia) and Ethio Telecom (Ethiopia).

Finally, priority must be accorded to selecting companies who are significant market players across multiple layers of the ICT sector. Increasingly, large ICT firms are blurring boundaries between different layers as they innovate in technology and business models, as well as explore new verticals. Platform giants are owning and controlling more and more infrastructure in the bottom layers in order to efficiently deliver their content at scale. For instance, Google (now Alphabet) has been buying up dark fibre since 2005

to build a massive global private network. On the other hand, traditional telecommunications companies are diversifying into growth areas such as machine-to-machine (M2M) connectivity and even OTT services. It is important to reflect this dynamism in the Digital Inclusion Benchmark's scope.

Mapping corporate contributions to digital inclusion



ICT companies at all layers are involved in digital inclusion efforts in various ways. Many of these companies see digital inclusion, especially the material access dimension, as a market opportunity.⁴³ They also commonly frame their standard business practices as part of their contribution toward digital inclusion.

For instance, chip manufacturers may view their practice of product binning — repurposing a batch of integrated circuits with non-fatal

defects at cheaper prices for lower-end market segments — as a way to make computer devices more affordable. Likewise, telecommunication companies may venture into new verticals, such as e-health or M2M solutions for agriculture, and consider this part of their contribution to spreading the benefits of digital technologies. Software and platform giants have embarked on many connectivity projects globally and actively lobbied governments for policies conducive to broadband infrastructure investment. For these companies, digital inclusion projects are an essential part of growing their market reach.⁴⁴

Likewise, the corporate social responsibility (CSR) activities of ICT companies are likely to be closely aligned to digital inclusion issues, making maximum use of the company's own products and services. For example, Huawei in partnership with Safaricom implemented an e-health project in Kenya which used Huawei Matebooks, Safaricom's network and software developed by a local social enterprise to enable remote consultations and training for health workers.⁴⁵ Another example is when Microsoft was able to pilot test its TV white space technology by using it to quickly restore connectivity for the Philippine government's relief operations following Typhoon Haiyan in 2013.⁴⁶ However, these projects are not necessarily sustained overtime, guided by explicit criteria or assessed transparently on their impact, nor do they sufficiently address North-South digital divides.⁴⁷

Table 6. Mapping corporate contributions to digital inclusion by layer and dimension

	Layer 1: Networked elements	Layer 2: Network providers	Layer 3: Content, platforms and applications
Material Access	<ul style="list-style-type: none"> - Making affordable devices and equipment 	<ul style="list-style-type: none"> - Investing in rural broadband infrastructure - Peering openly at local exchanges - Providing affordable and high-quality connectivity packages - Offering discounted services for social good applications - Permitting number portability - Developing affordable M2M technologies for smallholder and marginalised farmers - Enabling spectrum-sharing - Promoting infrastructure-sharing, especially for social good uses in poor and marginalised communities 	<ul style="list-style-type: none"> - Caching and peering at local exchanges - Investing in rural broadband infrastructure - Supplying open-sourced, affordable, or permissive licensing of operating systems - Offering discounted services for social good applications
Skills	<ul style="list-style-type: none"> - Partnering with technical education centres in developing countries or marginalised communities in developed countries 	<ul style="list-style-type: none"> - Supporting digital skills programs for disadvantaged groups - Transparently evaluating and publishing information on the impact of a company's own digital skills initiatives 	<ul style="list-style-type: none"> - Providing open online education content - Supporting digital skills programmes for disadvantaged groups - Transparently evaluating and publishing information on the impact of a company's own digital skills initiatives
Use	<ul style="list-style-type: none"> - Ensuring security of network devices - Designing the technology and user-interface in ways that empower female, elderly, and/or illiterate users - Ensuring accessibility for those with disabilities 	<ul style="list-style-type: none"> - Promoting fair network traffic shaping practices - Committing to data privacy and security - Preventing data breaches 	<ul style="list-style-type: none"> - Providing content in multiple languages - Implementing data privacy and security - Ensuring accessibility for those with disabilities - Designing the technology and user-interface in ways that empower female, elderly, and/or illiterate users - Using fair, accountable, and transparent algorithms - Preventing data breaches
Innovation	<ul style="list-style-type: none"> - Promoting R&D in developing countries - Allowing technology transfer - Offering fair licensing agreements - Furthering R&D that addresses the needs of lower-income market segments - Developing technologies using open-standards - Developing technologies that directly address SDG requirements 	<ul style="list-style-type: none"> - Funding ICT start-ups in developing country markets, disadvantaged groups, and disadvantaged regions - Sharing secure, anonymised, and aggregated data for public good programs 	<ul style="list-style-type: none"> - Funding ICT start-ups in developing country markets, disadvantaged groups, and disadvantaged regions - Sharing secure, anonymised, and aggregated data for public good programs - Developing technologies that directly address SDG requirements - Supporting AI and machine learning research and teaching in developing countries and disadvantaged regions

Mapping corporate contributions to digital inclusion



The Digital Inclusion Benchmark methodology will have to consider how industries under these three layers of the ICT sector can contribute to the four dimensions of digital inclusion. Another consideration will be how differences regarding the legal and regulatory constraints faced by ICT companies influence the degree to which these companies act towards increased digital inclusion. Do any industries or companies make strong contributions to one, several or all dimensions? Is the industry or company approach to digital inclusion systematically integrated within core business activities? Do any industries or companies go above and beyond the minimum required by sector regulators or competition authorities in the legal jurisdictions where they operate? What distinguishes business-as-usual practices from a company's extra effort and commitment toward digital inclusion? These are some questions to consider when mapping corporate contributions to digital inclusion and identifying corresponding indicators.

Conclusion and a way forward



There is already a strong rationale for establishing a company-level benchmark that tracks corporate contributions toward digital inclusion across four dimensions: digital technologies are cross-cutting tools that enable the advancement of all 17 SDGs. To do so, however, it is crucial that benefits from these technologies are broadly enjoyed by people from all walks of life, in both developed and developing countries. Companies need to play a significant role for this happen. This corporate benchmarking exercise aims to highlight industries and companies that are currently leading the way in promoting digital inclusion and trigger a 'race to the top' across the private sector as a result.

Thus far, two of the Digital Inclusion Benchmark's key features have been defined following a synthesis of the current understanding of digital inclusion in the scholarly and grey literature, a review of existing ICT-related benchmarks and private sector projects, and consultations with stakeholders. This benchmark will aim to be:

- **Comprehensive, beyond material access.** The benchmark will track corporate contributions to digital inclusion on four dimensions: access, skills, use, and innovation.
- **Inclusive, covering the entire ICT sector.** The benchmark will track contributions by industries and companies from the three layers of the ICT sector: networked elements (e.g. device manufacturers), network providers (e.g. telecommunication companies), and content, platforms and applications (e.g. large search and social media platforms).

The next steps will involve further consultation and dialogue with stakeholders to:

- Map in greater detail the contributions of industries and companies under the three layers of the ICT sector to each of the four dimensions of digital inclusion.
- Identify priority industries and companies for the first round of benchmarking.
- Define the components of the benchmark, their corresponding weights and indicators, and potential data sources.

Appendix A: Review of ICT-related benchmarks



Benchmark Title	Description
ICT Development Index	Published yearly by the International Telecommunication Union since 2009. Benchmarks more than 160 countries. Uses 11 indicators across three sub-indexes: ICT access, ICT use, and ICT skills. Uses official statistics submitted by governments. Uses proxy instead of direct indicators due to lack of official statistics, especially for ICT use and ICT skills (e.g., subscriptions for use and enrolment ratios for skills). Openly published methodology.
Ranking Digital Rights	Published yearly since 2015. Evaluates more than 20 of the most influential telecommunications companies and Internet platform giants on their disclosed commitments and policies affecting freedom of expression and privacy. Contains 35 indicators in three main categories: governance, freedom of expression, and privacy. Each indicator is categorical and awarded a score (e.g., 100 for full disclosure, 50 for partial disclosure, and 0 for none or no disclosure found). Indicators are evaluated at both parent company and local level depending on company structure. Openly published methodology.

Appendix A: Review of ICT-related benchmarks

<p>Global Competitiveness Index</p>	<p>Published yearly by the World Economic Forum under its Global Competitiveness Report since 2005. However, the GCI has been in existence for four decades and is one of the most cited and influential country-level indexes. It compares more than 130 countries on their national competitiveness—defined as a set of institutions, policies and factors that determine the level of productivity. The GCI assesses over 100 indicators across 12 pillars. One of its pillars measures technological readiness using seven indicators: availability of latest technologies, firm-level technology absorption, FDI and technology transfer, Internet users, fixed-broadband Internet subscriptions per 100, Internet bandwidth per capita, and mobile-broadband subscriptions per 100. Openly published methodology.</p>	<p>Affordability Drivers Index</p>	<p>Published by the Web Foundation's Alliance for Affordable Internet annually since 2014. It is a composite measure of the drivers of Internet affordability in more than 60 countries. The index scores and ranks countries according to two key aspects driving affordability: communications infrastructure and access. The infrastructure sub-index tracks infrastructure deployment, as well as enabling policy and regulation that encourages network expansion. The access sub-index tracks current broadband adoption rates, as well as policy and regulatory frameworks that ensure affordable and equitable access. The 28 indicators are sourced from an expert survey and from statistics published elsewhere (e.g., ITU). Openly published methodology.</p>
<p>Inclusive Internet Index</p>	<p>Commissioned by Facebook and conducted by the Economist Intelligence Unit since 2017. Measures national-level Internet inclusion for over 80 countries across four categories: availability, affordability, relevance, and readiness. Acknowledges that inclusion goes beyond infrastructure access. Countries are also evaluated on cost of access, market competition, availability of relevant and local content, as well as capacity in terms of education and skills. However, certain aspects of the methodology are not clearly explicated, and countries are ranked but not scored.</p>	<p>Global Innovation Index</p>	<p>Published annually by the World Intellectual Property Organization (WIPO) together with INSEAD and Cornell University since 2008. Composite benchmark that aims to track innovation in all its complexity across more than 120 countries. Methodology is published openly. The GII has two sub-indexes, innovation input and innovation output, built on five and two pillars, respectively. Each pillar has sub-pillars, and the index has about 80 indicators. The ICT sub-pillar itself is a composite of four other indexes: ICT access, ICT use, online service by governments, and online participation by citizens.</p>

Appendix A: Review of ICT-related benchmarks

<p>Australian Digital Inclusion Index</p>	<p>Research is supported by Telstra and conducted by Roy Morgan Research and researchers from RMIT and Swinburne University. Tracks Internet inclusion in terms of three sub-indexes: access, affordability, and digital ability across different states and territories in Australia. Each sub-index is broken down into components, and the index has more than 30 indicators. This index uses survey data for the indicators and is consequently able to highlight digital skills in more detail.</p>
<p>Digital Access Index (GeSI)</p>	<p>Published by an industry group, Global e-Sustainability Initiative. The index tracks digital and technology indicators for the whole digital industry. It has 21 indicators across three categories: connectivity (e.g. infrastructure, use, affordability), technologies (e.g. M2M connections), and digital solutions (e.g. e-health, e-learning). No additional details about the methodology and results are available since the index is available only to members. Not clear whether the analysis is at the company, industry or country level.</p>

<p>E-Government Development Index (UN)</p>	<p>Assesses and compares 193 UN member states based on the level of development of e-government services to promote access and inclusion of their people. It recognises that e-government development depends not only on the supply of online services, but also on the country's capacity to participate in the information society. The index is a weighted average of normalised scores for threedimensions of e-government development: scope and quality of online services, development status of telecommunications infrastructure, and inherent human capital. It is regularly revised to reflect changing trends in e-government strategies. Openly published methodology.</p>
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