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Implementing World Summit on the Information Society outcomes, 2016-2017

Abstract

This report discusses 2016-2017 trends related to the implementation of the World Summit on the Information Society (WSIS) at the regional and international levels. It has been prepared with a view to complement the report of the Secretary-General on "Progress made in the implementation of and follow-up to the outcomes of the World Summit on the Information Society at the regional and international levels" (A/72/64-E/2017/12).

The first section outlines current levels of information and communication technology (ICT) access and use and considers ongoing digital divides. Subsequent sections address, in turn, linkages between information and communication technologies (ICTs) and sustainable development goals (SDGs) and constraints inhibiting developmental outcomes; emerging trends in ICTs and services including e-government and e-commerce; and challenges facing WSIS implementation in areas including governance, employment and capacity-building and data gathering.

Key words: WSIS follow-up, information and communication technologies (ICTs), SDGs

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Under the overall direction of Shamika N. Sirimanne, Director of the Division on Technology and Logistics of UNCTAD and the supervision of Angel Gonzalez Sanz, Head of the Science, Technology and ICT Branch, this report was prepared by a team comprising Dong Wu (team leader), David Souter (consultant) and Claudia Contreras (UNCTAD).

Introduction

The Secretary-General is requested by the General Assembly to report annually, through the ECOSOC, on progress made in implementing the outcomes of the World Summit on the Information Society (WSIS), which was held in two phases in 2003 and 2005. This report complements the report of the Secretary-General on "Progress made in the implementation of and follow-up to the outcomes of the World Summit on the Information Society at the regional and international levels" (A/72/64-E/2017/12).[1]

The General Assembly completed its ten-year review of the implementation of WSIS outcomes in December 2015.[2] In the outcome document from that review (A/RES/70/125), the Assembly reiterated the commitment of all stakeholders, articulated in the Tunis Agenda for the Information Society, to build 'a people-centred, inclusive and development-oriented Information Society.'[3] It emphasised the importance of integrating the Information Society with the international community's work to implement the 2030 Agenda for Sustainable Development and fulfil its Sustainable Development Goals (SDGs). The WSIS+10 review and the 2030 Agenda provide the framework for continued efforts by the international community to implement WSIS outcomes for the next decade.

The first section of this report outlines current levels of ICT access and use and considers ongoing digital divides. Subsequent sections address, in turn, linkages between ICTs and SDGs and constraints inhibiting developmental outcomes; emerging trends in information and communication technologies and services including e-government and e-commerce; and challenges facing WSIS implementation in areas including governance, employment and capacity-building and data gathering.

[1] http://unctad.org/en/PublicationsLibrary/a72d64_en.pdf
[2] http://workspace.unpan.org/sites/Internet/Documents/UNPAN96078.pdf
[3] http://www.itu.int/net/wsis/docs2/tunis/off/6rev1.html

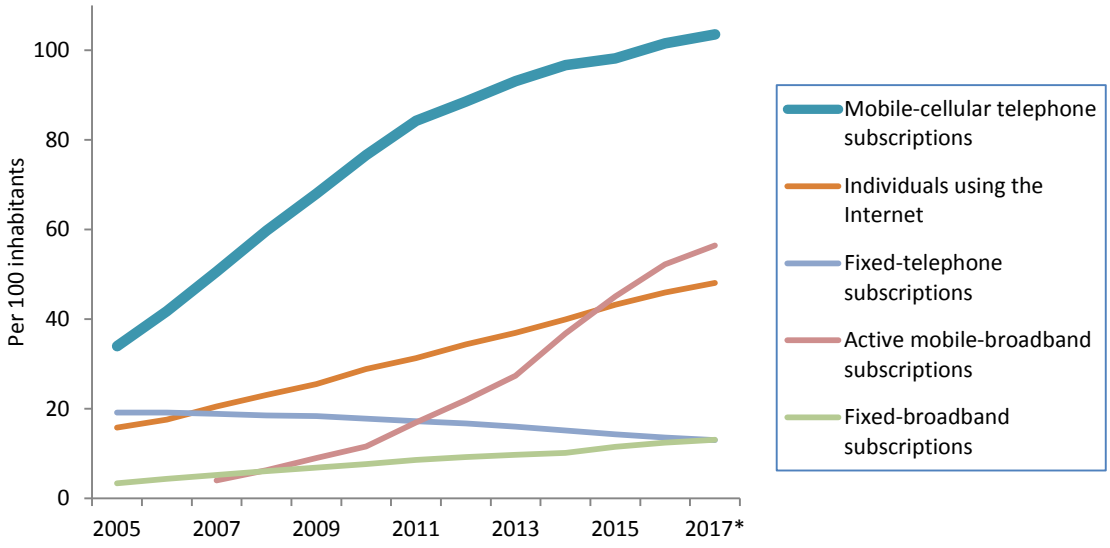
1. The digital divide

Access for all to ICTs, including the Internet, is essential if they are to change lives and promote sustainable development. Considerable progress has been made since WSIS, as shown in Figure 1, but much still needs to be done to reduce inequalities in digital access and achieve the core goal of the sustainable development agenda, that 'no-one should be left behind.'

The number of people with mobile phone subscriptions worldwide is now more than 60% of the world's population.[4] It is estimated that 48% of the world's inhabitants made use of the Internet at least once in a three-month period in 2017, compared with 15.8% in 2005, and that 53.6% of households had Internet access at home by 2017, compared with 18.4% in 2005.[5] The capabilities of the networks, devices and services they use are far greater now than they were then.

However, these global figures mask continued digital divides in ICT access and use which are critical concerns for WSIS implementation.

Figure 1
Changes in global uptake of ICTs, 2005-2017

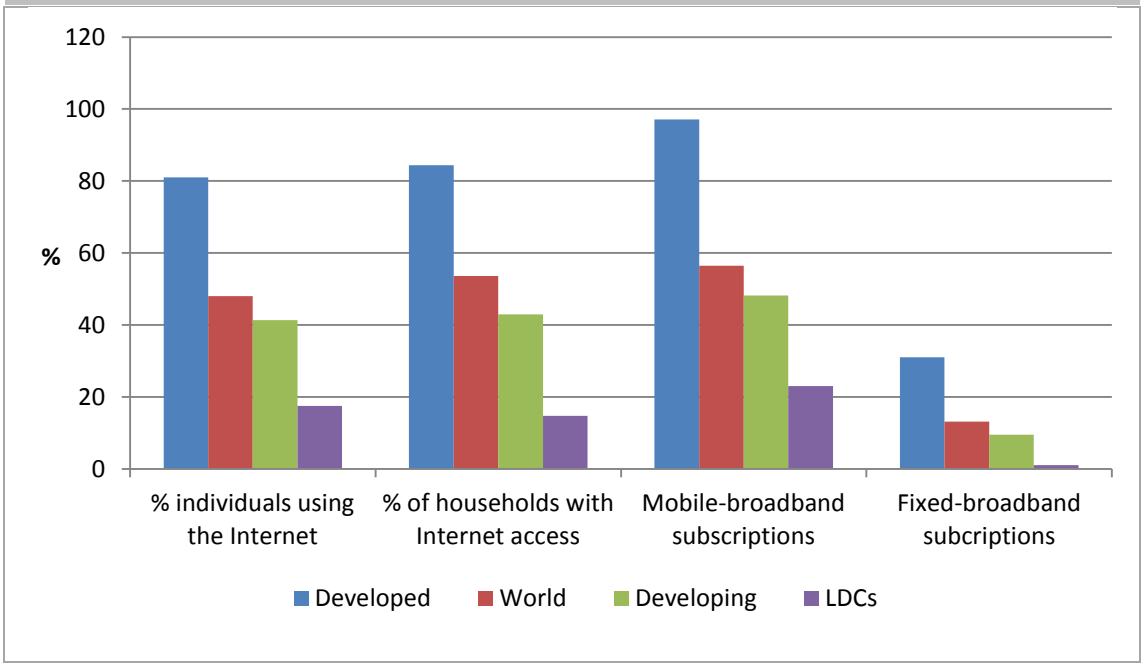


Note: *Estimate
Source: ITU World Telecommunication /ICT Indicators database

[4] https://www.gsmaintelligence.com/research/?file=9e927fd6896724e7b26f33f61db5b9d5&download
[5] Global and regional ICT data (source ITU), http://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx

As illustrated in Figures 2 and 3, there are marked differences in ICT access and use between developed and developing countries, with particularly low levels for least developed countries (LDCs), and within certain geographic regions. Latest estimates suggest that there are 97.1 active mobile broadband subscriptions and 31 fixed broadband subscriptions for every 100 inhabitants in developed countries, compared with 48.2 and 9.5 in developing countries. These figures are particularly low in sub-Saharan Africa (26 and 0.4), where the proportion of households with Internet access at home is estimated to be 18 per cent compared with 48.1 per cent in the Asia-Pacific region and 84.2 per cent in Europe.[6] There is an even greater broadband divide between and within countries in terms of access, speed as well as affordability.[7]

Figure 2
Access to ICTs by development status, 2017 estimates



Note: The developed/developing country classifications are based on the UN M49, see: http://www.itu.int/en/ITU-D/Statistics/Pages/definitions/regions.aspx.html
Source: ITU[8]

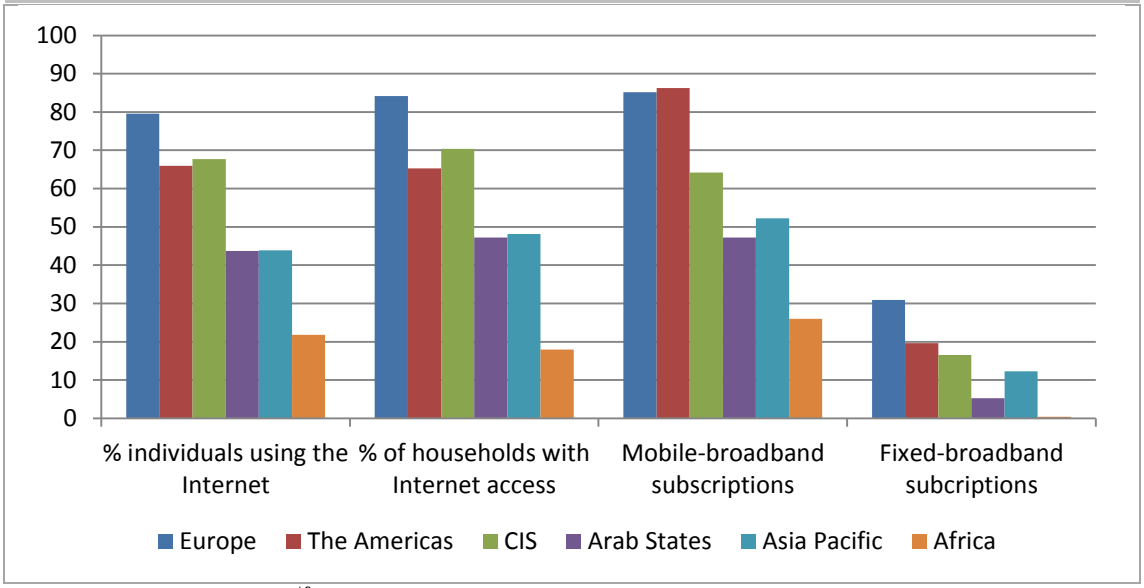
These differences have proved to be persistent as developed countries and emerging market economies are better placed to take advantage of new technological developments than other countries.[9]

There is a strong association between LDCs and those that are least connected.[10] The *2030 Agenda for Sustainable Development* calls on stakeholders to 'strive to provide universal and affordable access to the Internet in least developed countries by 2020.'[11] Estimates for household Internet access in LDCs have risen slowly, however, from 2.2% in 2010 to 9.7% in 2015 and 14.7% in 2017, reinforcing the need for

[6] *ibid.*
[7] http://unctad.org/en/PublicationsLibrary/a70d63_en.pdf
[8] http://www.itu.int/en/ITU-D/Statistics/Documents/facts/ICTFactsFigures2017.pdf
[9] https://www.itu.int/en/ITU-D/Statistics/Documents/publications/misr2016/MISR2016-w4.pdf
[10] *i.e.* the lowest ranking quartile of countries in the ITU's ICT Development Index: *ibid.*
[11] http://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E, Goal 9 Target c.

redoubled efforts by governments, the private sector and civil society to extend affordable access for all. Public access facilities will continue to play an important part in achieving universal access.[12]

Figure 3
Access to ICTs by region, 2017 estimates



Note: ITU regions definitions[13] CIS: Commonwealth of Independent States region.
Source: ITU[14]

There are also substantial and continued digital divides within regions. These are particularly marked in the Asia-Pacific region, which includes some of the most connected countries in the world, such as the Republic of Korea (ranked second in the ICT Development Index, which measures ICT access, use and skills) as well as a number of LDCs that ranked in the lowest quartile of that Index.[15] There is an even greater broadband divide between and within countries in terms of access, speed as well as affordability.[16]

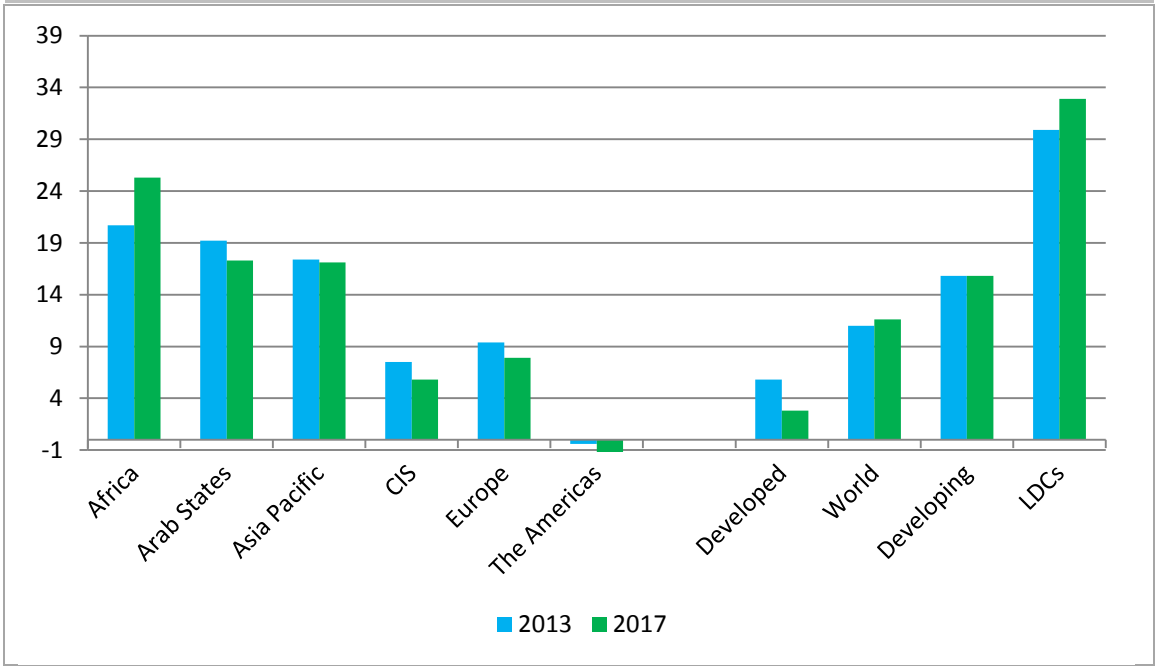
In all regions, countries which are experiencing civil conflict are particularly disadvantaged. Landlocked countries and small island states are also frequently disadvantaged by their geography and demography, as are rural areas of most countries, where rates of return on investment in network infrastructure are harder to achieve than in urban areas, and where average incomes are often lower, reducing intensity of use. Estimated data for 2015 shows that only 29% of the world's rural population is covered by third-generation (3G) mobile networks, compared with 89% of its urban population.[17]

The General Assembly paid particular attention in its WSIS+10 review to the gap in digital access between women and men. Worldwide, it is estimated that women are 11.6 per cent less likely than men to make use of the Internet, and 32.9 per cent less likely to do so in LDCs.[18] As illustrated in Figure 4, the global digital gender gap appears to have grown in developing countries since 2013, reinforcing the need for initiatives by

[12] For an assessment, see http://www.itu.int/en/ITU-D/Statistics/Documents/publications/misr2015/MISR2015-w5.pdf, Chapter 1
[13] See http://www.itu.int/en/ITU-D/Statistics/Pages/definitions/regions.aspx
[14] http://www.itu.int/en/ITU-D/Statistics/Documents/facts/ICTFactsFigures2017.pdf
[15] https://www.itu.int/en/ITU-D/Statistics/Documents/publications/misr2017/MISR2017_Volume1.pdf, Chapter 2
[16] http://unctad.org/en/PublicationsLibrary/a70d63_en.pdf
[17] http://www.itu.int/en/ITU-D/Statistics/Documents/publications/misr2015/MISR2015-w5.pdf
[18] http://www.itu.int/en/ITU-D/Statistics/Pages/facts/default.aspx

businesses and other stakeholders to help women overcome the structural inequalities (particularly lower incomes and fewer years in education) and, in some contexts, social norms that inhibit access to technologies that could enhance their economic opportunities and empower their lives.

Figure 4
The digital gender gap, 2013 and 2017



Note: The gender gap represents the difference between the Internet user penetration rates for males and females relative to the Internet user penetration rate for males, expressed as a percentage. ITU regions definitions[19] CIS: Commonwealth of Independent States region. Data estimates for 2017.
Source: *ITU, Facts and Figure 2017, p. 3.*[20]

2. ICTs and sustainable development

The *2030 Agenda for Sustainable Development* recognised that 'the spread of information and communications technology and global interconnectedness has great potential to accelerate human progress, to bridge the digital divide and to develop knowledge societies.'[21]

This potential is cross-cutting and accelerating. ICTs and the Internet are having transformative impacts on the ways in which economic activities are undertaken, on social interaction, and on the relationships between government, business and citizens. They contribute to poverty reduction by enabling new forms of economic opportunity, improving access to markets, finance and information, and expanding the business and social networks of small and medium-sized enterprises. These impacts are poised to grow as ICTs become more pervasive while new technologies and services continue to emerge.

[19] See http://www.itu.int/en/ITU-D/Statistics/Pages/definitions/regions.aspx
[20] https://www.itu.int/en/ITU-D/Statistics/Documents/facts/ICTFactsFigures2017.pdf
[21] http://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E, para. 15.

Alongside their general impact on economies and societies, ICTs have the potential to support delivery of many of the specific targets included in the *2030 Agenda*. Particular attention has been paid in this context to their contributions to health and education, agriculture and new enterprise development, gender equality and environmental sustainability. Action Line facilitators have compiled a matrix linking SDGs with Action Lines to guide this work into the future.[22,23]

It is clear, however, that many constraints inhibit full achievement of the potential contribution that ICTs can make towards development. These include the inequalities in access described in section 1; difficult geographical environments and demographic contexts, such as those in landlocked countries and small island states; lack of complementary infrastructure such as electrical power networks, particularly in rural areas; limited scope for competition to drive improvements in supply that meet customer demand; and weaknesses in the legal and regulatory environment for investment and innovation.

The positive effects of digital technologies on growth and improved services delivery have been documented in a number of studies, including the 2016 World Development Report.[24] They have recognised that digital technologies have boosted growth, expanded opportunities and improved service delivery since WSIS, and reaffirmed that they offer great scope for fulfilling developmental goals in future. However, the 2016 World Development report argued that the aggregate impact of ICTs on development to date has fallen short of expectations, and been unevenly distributed raising questions concerning its impact on equality and inequality. It also notes that the greatest barriers to developmental are not technological but related to the enabling environment. As well as addressing the digital divide, it is necessary to address the enabling environment of 'analogue complements' to digitalisation by strengthening regulations that ensure competition among businesses; developing workforce skills to meet the demands of the new economy; and ensuring that governance institutions are accountable to those affected by them. The relationship between ICTs and the wider public policy context is fundamental to achievement of the SDGs.

UN Regional Commissions have also drawn attention to the need for policy coherence between technology and wider public policy. The Economic and Social Commission for Asia and the Pacific (ESCAP), for example, has confirmed that private investment in infrastructure in its region is hampered by poor regulation, and is encouraging member States to improve the environment for public-private partnerships and mainstream ICTs into strategic development plans. The Economic and Social Commission for Western Asia has noted significant progress in the formulation and modernization of national ICT strategies, infrastructure and enabling environments, but also has expressed concern about the lack of integration between sustainable development and ICTs, and between technology and administration. The Regional Commission for Latin America and the Caribbean (ECLAC) addresses regional challenges such as these through coordinated Digital Agendas (eLACs) which share experience and promote collaboration in areas such as broadband development.

Infrastructure investment is critical to tackling the inequalities in access described in Section 1 and leveraging benefits from the emerging technologies described in Section 3, but it is only part of the challenge that developing countries face in building people-centred, inclusive and development-oriented Information Societies, in which 'no-one is left behind'. Cost, capabilities and content are also crucial.

[22] The efforts which UN agencies and other stakeholders undertake towards development through the WSIS Action Lines are described in the report of the Secretary-General on "Progress made in the implementation of and follow-up to the outcomes of the World Summit on the Information Society at the regional and international levels" (A/72/64-E/2017/12).

[23] https://www.itu.int/net4/wsis/forum/2016/Content/documents/outcomes/WSISForum2016%E2%80%94WSISActionLinesAndSDGsMatrix.pdf

[24] 2016 *World Development Report* on *Digital Dividends.* http://documents.worldbank.org/curated/en/896971468194972881/pdf/102725-PUB-Replacement-PUBLIC.pdf

Unaffordability is one of the principal barriers to access and use of ICTs for many people, reducing the developmental gains that can be achieved by them and their societies. While prices for access have generally been falling, and broadband speeds increasing, users in lower-income countries typically still experience lower speeds at higher prices than those in higher-income countries. Mobile broadband services are generally cheaper than fixed broadband, but are only available in 38 per cent of LDCs and, where present, are usually still poorly available in rural areas. There is, however, considerable variation in the price of services between different developing countries, indicating the importance of the enabling environment for investment and competition in network and service provision in determining price levels.[25]

Capabilities and content also vary. The need for capacity-building to enhance the digital capabilities of individuals, businesses and organisations is discussed in Section 4. Further efforts are needed to diversify online content, which is still dominated by a small number of languages, making information less accessible to those without international language skills. Some progress is being made towards greater diversity. Estimates published by Internet World Statistics suggest that 47 per cent of the world's Internet users are English or Chinese speakers, compared with 51 per cent in 2011. Just under three quarters of articles on Wikipedia are now written in languages other than the six official UN languages (though entries in English and other international languages are often longer).[26] However, there is still little content available in many minority languages, which are used by people who are less likely to have second language skills. More also needs to be done to make more locally relevant content available, by both governments and other sources.[27]

The quality of governance and the enabling environment for innovation and investment, including international investment, are also critical. Experience has shown that competitive markets are more likely to facilitate infrastructure deployment, reduce prices, and foster the availability of higher bandwidth which enables a wider range of services, including e-government and e-commerce, to be delivered more quickly to more users. Business use of ICTs requires an enabling legal and regulatory framework for electronic transactions and data protection that foster trust. Policies and regulations need to be implemented coherently across government departments, and constantly updated to take account of rapid technological development. These are complex issues for resource-limited governments which would benefit from wider experience-sharing and capacity-building support from development partners.

3. Emerging trends

ICTs and the Internet have been driven by continual improvements in the capacities of networks and devices and resulting technological innovation, which have in turn enabled new kinds of online services and new ways of delivering services to users. Continued improvements in network and device capacities, and continued innovation, will further transform ICTs, their potential for implementing WSIS outcomes and for disrupting established business models, in the next decade.

3.1 Trends in technology

The first decade since WSIS saw major innovations in technology transform the ICT experience for many users, including the advent of broadband networks and mobile Internet, social media and cloud computing. These innovations continue to evolve and change patterns of social and economic behaviour.

[25] For an analysis, see https://www.itu.int/en/ITU-D/Statistics/Documents/publications/misr2016/MISR2016-w4.pdf, Chapter 4.
[26] https://www.itu.int/en/ITU-D/Statistics/Documents/publications/misr2016/MISR2016-w4.pdf, p. 186.
[27] For a more detailed recent analysis see http://www.itu.int/en/ITU-D/Statistics/Documents/publications/wsisreview2014/WSIS2014_review.pdf, Target 9.

The increasing availability of cloud services, which manage users' data and applications data centres rather located around the world, rather than on users' own devices, has led to many new services for users and enabled businesses to benefit from low-cost access to new technology. It has also changed the relationship between online businesses and their customers, and raised new questions concerning data privacy, security and jurisdiction.

Platform businesses such as Amazon, Uber and Airbnb have disrupted traditional business models in retail, travel and other markets, challenging established business sectors. Social media are displacing traditional media as the most important sources of news and opinion for many users leading to debate about their impact on social norms, on the quality of information, and the diversity of political and social discourse. The global nature of leading businesses in these new online markets, and their degree of market dominance, has raised new questions concerning the competitiveness of Internet services and the viability of national and international jurisdiction over them.

Innovation in information technology is continuing relentlessly. The number of connected devices in the Internet of Things is expected to reach some 30 billion by the end of the decade, more than three for every person in the world.[28] A great deal of investment is being made in the development of autonomous vehicles and 3D printing, robotics, machine learning and artificial intelligence. Algorithmic decision-making, in which computers displace human decision-makers, is becoming more widespread. The long-term impact of these and related innovations will be profound, but is very difficult for governments and other stakeholders to anticipate. Governments and businesses are paying increased attention to foresight analysis and scenario planning in order to identify likely economic impacts and legal and regulatory requirements.[29]

One area of development at the interface between technology and public policy which received attention during 2016 was the potential of 'smart cities'. Rapid urbanisation poses new challenges for many areas of public policy including housing, transport, education, public health, environmental welfare and the provision of infrastructure such as power and water. The potential of ICTs and other new technologies to improve efficiency and foster innovation in addressing these is beginning to be demonstrated in a number of cities around the world. There is growing awareness of the need to learn lessons from experience and explore the extent to which 'smart' solutions can be introduced into the challenging and resource-constrained environments of rapidly expanding cities in developing countries. It is hoped that greater economic and technical efficiency can be achieved, reducing unnecessary expenditure and cutting pollution, including emissions that contribute to climate change.

ICTs are not the only technology sector that is experiencing rapid change. Innovations which will radically affect economies and societies are also taking place in sectors such as energy, biotechnology and nanotechnology. To a large extent progress in these sectors is influenced by the speed on growing power of information technologies. Convergence between ICTs and other technological innovations will be key to harnessing the power of STI for development.

3.2 Trends in services

It is not possible in this report to give a comprehensive overview of what is taking place in each of these development sectors. The following paragraphs summarise trends in two critical cross-cutting areas, e-government and e-business.

[28] http://spectrum.ieee.org/tech-talk/telecom/internet/popular-internet-of-things-forecast-of-50-billion-devices-by-2020-is-outdated

[29] http://unctad.org/meetings/en/SessionalDocuments/CSTD_2015_Issuespaper_Theme2_ForesightDigitalDev_en.pdf

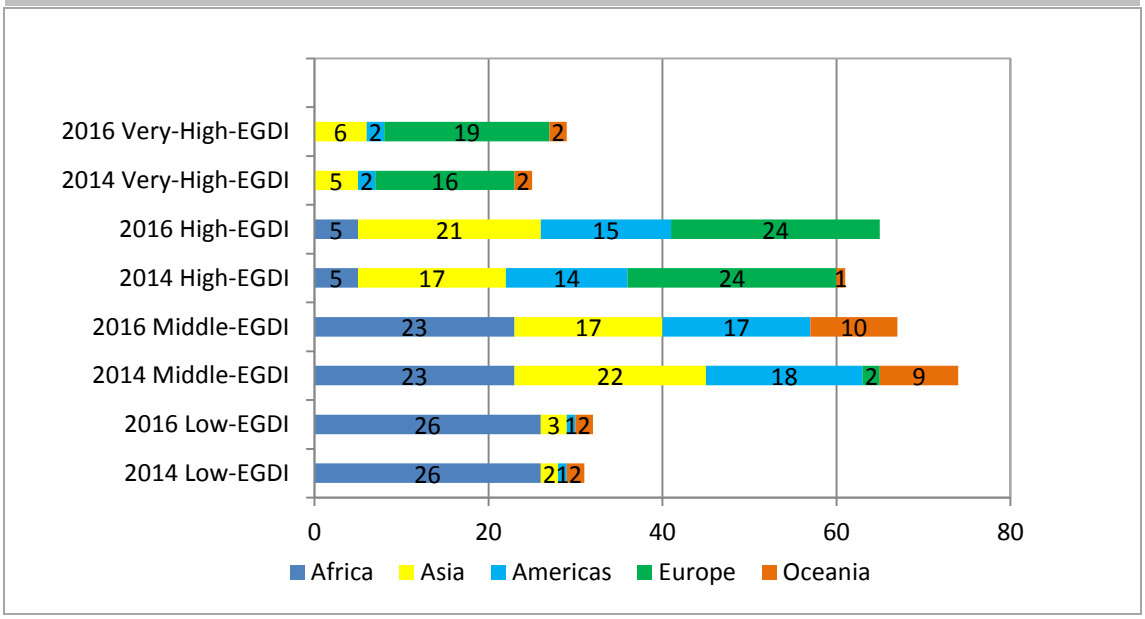
3.2.1 E-government

More advantage is being taken every year of the potential for new technology to improve the efficiency of government, the provision of information to citizens and the delivery of public services. This supports progress towards many of the SDGs, which depend on good governance and evidence-based decision-making.

Since 2014, all 193 member-states of the United Nations have had some form of online presence. E-government has become widespread in many developed countries, where citizens are now able to access extensive government information, participate in decision-making processes and undertake transactions (such as tax returns) online. Open data initiatives are becoming more common, and 128 countries now provide government data in machine-readable form, while more than 100 governments procure services online. There is a trend towards more integrated online public services, including one-stop platforms that allow access to a range of public services, improving both administrative efficiency and user experience. Experience of online consultation and other forms of e-participation is spreading. More and more access to e-government is being made through mobile devices and on social media.[30]

However, as Figure 5 shows, there is a persistent digital divide in the prevalence and extent of e-government, particularly between more developed countries and LDCs. Countries in Europe achieve much higher ratings in the United Nations' E-Government Development Index than do those in Africa and most in other continents.

Figure 5
E-Government Development Index, 2014 and 2016



Source: UN Department for Economic and Social Affairs, UN E-Government Survey 2016, p. 112.

[30] http://workspace.unpan.org/sites/Internet/Documents/UNPAN96407.pdf

This digital divide is partly due to differences in connectivity, but different outcomes also result from different approaches to e-government in different countries. More integrated e-government is more likely to be found in developed than developing countries. Efforts to promote holistic policies and service delivery will need to be accompanied by efforts to ensure that organisational cultures, coordination mechanisms, financial and accountability systems support collaboration amongst public institutions. As in other areas, there is a need for further sharing of experience.

3.2.2 E-commerce

There has been continued strong growth in e-commerce as governments and businesses have become increasingly aware of the relationship between high-quality connectivity and competitiveness. The global value of e-commerce is estimated to have grown from US$16.4 trillion to US$25.3 trillion, between 2013 and 2015, with the majority of this growth taking place in emerging economies.[31] Most e-commerce comprises business-to-business transactions, though substantial growth is also taking place in business-to-consumer transactions, particularly in developed countries.

As with other online services, some countries are better equipped than others to benefit. E-commerce readiness depends on a number of factors including the reach, reliability and speed of broadband networks but also that of credit card and other financial services. It also depends on the extent of which there is a positive legal and regulatory environment for business innovation, including enabling legislation for online transactions, data protection and cybersecurity. As illustrated in Table 1, business-to-consumer e-readiness is least developed in Africa, where there is a need for investment in both connectivity and in the underlying transactions and logistics infrastructures, including the legal and regulatory environment to facilitate cross-border trade in goods and services. Maximisation of the benefits of e-commerce will require particular attention to capacity-building and to measures to build trust among e-commerce users.

Table 1
Indicator values for UNCTAD E-commerce Readiness Index, by region, 2017

Region	Share of individuals using Internet (2016)	Secure Internet servers per 1 million people (normalized, 2016)	UPU postal reliability score (2016)	Share of individuals with an account (15+, 2014 or latest)	UNCTAD B2C e-commerce Index value
Africa	23	31	31	29	28
East, South and Southeast Asia	46	51	63	58	54
Latin America and the Caribbean	51	57	34	46	47
Western Asia	67	59	50	56	58
Transition economies	64	59	66	49	59
Developed	83	88	86	92	87
World	52	56	54	55	54

Source: UNCTAD, B2C E-Commerce Index 2017, p. 12[32]

[31] Source: UNCTAD
[32] http://unctad.org/en/PublicationsLibrary/tn_unctad_ict4d09_en.pdf

"eTrade for All"[33] is a multi-stakeholder initiative launched at UNCTAD's Ministerial Conference in 2016 to improve the ability of developing countries to use and benefit from e-commerce. It is a demand-driven mechanism in which leading development partners cooperate with the private sector to pool capabilities and resources. Key to the initiative is an online platform, which makes it easier for developing countries to navigate the supply of technical and financial assistance from partnering institutions. Developing countries will also benefit from the exchange of knowledge and information, and the sharing of best practices on e-commerce.

The trend towards greater e-commerce, which has been long anticipated, is facilitated by the growth in cloud computing, which has enabled small and medium-sized enterprises, as well as larger firms, to take advantage of ICTs' potential to develop and reach new markets with their products and services.[34] A growing number of countries are designing national policies and strategies in order to harness the potential of e-commerce for development. There is, however, a pressing need to improve the quality and depth of data concerning cross-border and digital trade in order to support the development of effective strategies.

4. Challenges for the international community

The most critical challenge for all stakeholders remains the digital divide, which was discussed in Section 1. This section identifies challenges in four further areas that have been the subject of considerable discussion during 2016 and will be significant for both implementation of WSIS outcomes and the SDGs during the next decade.

4.1 Governance

The Information Society has altered many of the underlying assumptions of traditional governance, shifting the balance between national and international jurisdictions and fostering new approaches to multistakeholder cooperation and dialogue. The pace of change has made it difficult for governments to legislate and regulate emerging technologies and markets in ways that maximise the value that can be derived from innovations while maintaining established rights and principles. Cooperation between governments, the private sector, the technical community and civil society organisations has proved valuable, particularly in complex areas that require both technical and public policy expertise.

Development of the Information Society also includes a political and social discussion. The Internet and social media have made it easier for people to exercise rights to association and expression, while the growing datafication of society has altered the parameters surrounding privacy, enabling more intrusive scrutiny of individuals' lives and patterns of behaviour by both online businesses and governments. Attention has also begun to focus on the relationship between ICTs and economic, social and cultural rights.

The General Assembly's WSIS+10 review reaffirmed that 'the same rights that people have offline must also be protected online.'[35] However, modalities for the enjoyment and enforcement of rights can be significantly different online and offline, raising complex and evolving challenges for both cyber- and national security. These will remain important subjects of debate over the coming years.

Two global fora established in the aftermath of WSIS have become important annual spaces for sharing experience and developing new approaches to WSIS implementation. The WSIS Forum, held annually in

[33] http://unctad.org/en/Pages/DTL/STI_and_ICTs/eTrade-for-All.aspx
[34] http://unctad.org/en/PublicationsLibrary/ier2013_en.pdf
[35] http://workspace.unpan.org/sites/Internet/Documents/UNPAN96078.pdf, paras 9, 42.

Geneva, has become a significant platform for governments and other stakeholders to explore developmental aspects of the Information Society. The Internet Governance Forum (IGF), held annually in different locations, fulfils a similar role where the Internet is concerned and is now complemented by 72 national and regional IGFs and a range of intersessional initiatives.

One of the most significant developments for Internet governance during 2016 involved the transfer of functions of the Internet Assigned Numbers Authority (IANA), which manages Internet protocol assignments, number resources and root-zone management, from the United States government to new stewardship arrangements overseen by the global, multistakeholder Internet community.

Governments and other stakeholders renewed their efforts, during the year, to develop enhanced cooperation, as required by WSIS, with a view to enable governments, on an equal footing, to carry out their roles and responsibilities in international public policy issues pertaining to the Internet.

International concern has continued to grow around issues of cybersecurity, including the integrity of communications networks and other infrastructure; the risk to government and business databases from hacking, distributed denial of service attacks and other threats; the threat from terrorism and money laundering; and the protection of individual users from fraud, identity theft and other types of criminality. The advent of the Internet of Things, which will greatly expand the range and number of online devices, has caused particular concern because of the risk that low-cost devices will be insufficiently protected against cyber-attacks. Trust in the security of the Internet is critically important to its role as an enabler for economic growth and social welfare, suggesting that discussions about cybersecurity will become even more important than they are today.

4.2 Employment and capacity-building

The impact of digitalisation on employment received much attention during 2016, particularly the casualisation of some forms of work; polarisation between high-paid highly-skilled and low-paid low-skilled jobs; and the potential long-term impact of automation and artificial intelligence on total employment levels. Technological change has always involved profound changes on the supply and demand of labour.

It is generally agreed that workers in all sectors need to be reskilled for the digital age if they are not to lose out in increasingly automated work environments. ICT capabilities need to be entrenched in school curricula but regular retraining of adult workers will also be required. Professional skills in this area are poorly distributed, and early investments will be needed to develop a new generation of ICT teachers and trainers.

Initiatives to address skill shortages, such as innovation hubs, new forms of educational delivery such as Massive Open Online Courses (MOOCs), and measures to encourage women and girls into science and technology careers, are being undertaken in more countries but have not yet reached critical mass. Wider sharing of experience between government, business and civil society stakeholders in different countries should help to focus resources on successful interventions. Policymakers also need technical and other expertise if they are to design effective strategies that leverage ICTs' potential, while business leaders need to understand ICTs' potential to increase efficiency and productivity if their businesses are to remain competitive.

4.3 Global multistakeholder cooperation

The WSIS outcome documents emphasised the importance of cooperation in leveraging the opportunities presented by the Information Society – including cooperation amongst governments and cooperation amongst all stakeholders. Multistakeholder partnership has become a hallmark of WSIS implementation, and

is also central to the vision set out in the *2030 Agenda for Sustainable Development*. Financial and technical cooperation form two important aspects of this.

Financial investment in ICTs has increased substantially during the past decade, complemented by innovative financing mechanisms. Private investment remains the main source of ICT sector finance, while public-private partnerships have added to the range of investment initiatives for infrastructure and services in developing countries. South-South investment has been increasingly important in recent years while significant infrastructure investments have continued to be made by international financial institutions including the World Bank. However, there is still scope for universal service funds and related mechanisms that can direct investment into geographic areas and disadvantaged communities that would otherwise find it difficult to access the Internet and other ICTs. Efforts to 'connect the next billion' need to include broadband networks and services if they are to ensure that no-one is left behind. They also need to prepare the ground for the next generation of technology which will emerge during the next decade. There will continue to be scope for both international development actors and public private partnerships in these areas.

The *Addis Ababa Action Agenda* on *Financing for Development* established a Technology Facilitation Mechanism to foster technological cooperation between countries and innovation within developing countries.[36] The General Assembly has encouraged for a prominent profile for ICTs in this mechanism, which is still in its early stages of development.[37] In addition to cooperation between governments and international agencies through this Mechanism, there is greater scope for collaboration between global ICT businesses and the wide range of innovative companies concerned with software, networking and online services which are emerging around the world, including developing countries such as China, India, Brazil, South Africa and Kenya. As with other aspects of the Information Society, greater value will be derived from these opportunities if governments take steps to address skill shortages and establish positive enabling frameworks for innovation and investment.

4.4 Building a better evidence base

Effective implementation of WSIS outcomes and efforts to support the achievement of the SDGs through ICTs depend on a comprehensive and reliable evidence base concerning the emerging Information Society and its impact on sustainable development.

Valuable data, gathered from national sources and, in some cases, independent surveys are gathered and published by UN agencies including DESA, ITU, UNCTAD, UNESCO and WHO. The Partnership on Measuring ICTs for Development brings together these and other agencies to improve and systematise relevant data gathering for development policy. Working with the Partnership, the UN Statistical Commission has adopted indicators for measuring progress towards the SDGs, many of which rely on or will be enhanced by ICTs.

The present evidence base is, however, limited, especially where LDCs are concerned. Rapid changes in technology and markets make it difficult to measure progress in ICTs, as available data rapidly become outdated. It is especially difficult to obtain accurate information from the demand side of the Information Society, including user behaviour, and on the impact which ICTs are having on particular social and economic goals and groups. Particular attention is needed to sex-disaggregated data on access and use, data on e-commerce, and data on the impact of ICTs on progress towards achievement of the SDGs. National statistical systems in low-income countries do not have sufficient resources to gather or analyse complex data sets of the kind required, and need considerable investment in order to improve capacity.

'Big data' analysis is expected to play a particularly important part in monitoring implementation of the SDGs and other developmental goals over the next fifteen years. The improved understanding of development

[36] https://sustainabledevelopment.un.org/TFM
[37] http://workspace.unpan.org/sites/Internet/Documents/UNPAN96078.pdf

challenges and progress which it enables should help to improve the efficiency of government programmes and target interventions where they will have most impact. It will, however, require new partnerships between governments, development partners and private sector businesses to gather and analyse data, with appropriate data protection and privacy safeguards.

Conclusion

ICTs have played a large and growing role in achieving developmental goals since WSIS and have tremendous potential to support delivery of the SDGs, promote economic prosperity and enhance social welfare, but they also pose new challenges for development, human rights and governance. There has been considerable progress in broadening access and enabling developmental applications over the past decade, but powerful digital divides remain between and within regions and countries, which inhibit maximisation of developmental outcomes. Other challenges are posed by the evolving Information Society in areas such as skills, content, and business use. International cooperation will be essential if ICTs are to make the most effective contribution to achieving SDGs.

These challenges are exacerbated by the very rapid pace of change which is taking place in ICT technology and markets, including the development of cloud computing, big data and the Internet of Things. Further advances in automation, machine learning and artificial intelligence will have further transformative impacts on global trade, patterns of economic production, employment, social norms and cultural engagement. How these global developments will play out in different local contexts will be shaped, to considerable extent by policy choices.

Governance institutions need to keep up with this pace of change. If they are to contribute towards shaping the people-centred, inclusive and development-oriented information society required by the *Tunis Agenda*, these institutions will need to develop decision-making processes that can interact dynamically with the development of technology and services. The ability of ICTs to contribute fully to the SDGs, and the achievement of those SDGs themselves, will depend on their ability to do so.