Improve cities resilience and sustainability through e-government assessment

7.1. Introduction

7.1.1 Urbanisation and Sustainability

Cities are important hubs of human activity that are gaining in population and increased importance in the global economy. In 2016, close to 4 billion people — 54 per cent of the world's population — lived in cities. According to the World Bank[1], in the last 50 years the proportion of population living in cities has increased by 50 per cent, and it is estimated that, by 2050, 6 billion people will be living in cities (66 per cent of the world's population). In 2014, high levels of urbanisation, at or above 80 per cent, characterised Latin America and the Caribbean and Northern America. Europe, with 73 per cent of its population living in cities, is expected to be over 80 per cent urban by 2050. Africa and Asia, in contrast, remain mostly rural, with 40 per cent and 48 per cent of their respective populations living in urban areas. Over the coming decades, the level of urbanisation is expected to increase in all regions, with Africa and Asia urbanising faster than the rest[2].

The role of local administration in the achievement of the United Nations Sustainable Development Goals (SDGs) is critical, since those goals recognise the transformative power of urbanisation for development and the significance of city leaders in driving global change from the bottom up. Most of the SDGs have targets that are directly or indirectly related to the daily operation of local and regional governments. Local governments are policy makers and catalysts of change. They are also the level of government best-placed to bind the goals with local communities[3]. Improvement of local e-Government functions encompasses local public institutions, their operations and civil society organisations alignment with UN SDGs 11 and 17 for sustainable cities and communities and goal 16 for peace, justice and strong institutions. In practice, institutions are strengthened by free, fair and equal citizen participation. Furthermore, local governments that possess decentralised authority can better set local priorities to assure the rights and needs of vulnerable groups and provide transparent and accountable institutions.

7.1.2 Public service delivery at a local level

Municipality administration constitutes the lowest level of governance in each country (Lanvin and Lewin, 2006). E-Government at the local level has its own flavour, since cities and municipalities are developing specific functions and components that cannot be found at other levels of government. On the one hand, local government serves the

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Chapter 7

administrative purpose of maintaining the essential infrastructures and providing services, and on the other hand, it offers their citizens the possibility of active participation in decision-making.

Local governments are key players in public life, since what they do has a daily and direct impact on citizens. People interact more often with local administration than with the central one, because the first delivers the vast majority of services that concerns them[4] and determines the sustainable development of their close living environment. In Europe, 50 to 80 per cent of the interaction between citizens and government takes place at the local levels[5].

Municipal public administration organisations assure the sustainability and resilience of the city and they are responsible for a huge number of operations covering a wide range of areas. They provide to citizens with a wide spectrum of services like educational services (e.g. day nurseries, adult training programs), health and social care services (health advice services, health care centres, programmes for vulnerable groups), environmental and urban management services (e.g. disaster management, traffic planning, public transport, pollution, cleaning, waste collection, flood control), security and infrastructure services (water, sewage, power, public lighting, crime contention) and cultural and sport services. At the same time, they significantly interact with enterprises through different types of services such as enterprise registration, local taxation, business occupancy permit, networking events, financing programs, professional authorisations and licenses.

Citizen interaction and engagement in local communities is a main responsibility of local authorities. Facilitation of citizens' participation is vital because it allows individuals to express their needs and to provide feedback about their local governments' policies. Citizen inclusion in decision-making and proximity to public administration are achieved by applying a wide spectrum of processes and tools. Virtual face-to-face meetings, such as online discussion forums, e-Bulletin boards, social media applications, real-time discussions, e-Petitions and e-Meetings, are some of the local e-Government systems that encourage citizens' participation and enable a wide scope of formal and informal government-citizen interaction and engagement[6].

This chapter illustrates the necessity of local e-Government assessment and highlights the specific characteristics of local government. It also offers an overview of existing e-Government assessment models and practices, based on which new assessment method for local e-government is proposed. The results of a pilot local e-Government assessment study, carried out in 40 municipalities worldwide, are presented, and options to advance SDG implementation through e-Government application are discussed. Finally, lessons learned are presented.

7.2. Local Level e-Government

7.2.1 Supporting e-Government implementation at local level

A significant number of cities worldwide have adopted local initiatives in response to the growing recognition of the need to improve their sustainability and resilience. Municipalities, aligning with Sustainable Development Goals, have taken action on policies related to eradicating poverty; providing equal opportunities for all, including vulnerable groups; land development and land-use planning; economic development; smart growth; transport optimisation including in connection with inner-city public transit; pollution prevention, energy, water and resource conservation; eco-projects and alternative energy development policies[7]. The need for enhancing the sustainability and resilience of cities has prompted many politicians, policy-makers and public officials to define new policies and activities.

In order to integrate those policies into local planning and development efforts, public administration processes are continuously reengineered and increasingly underpinned by emerging technologies and innovations. Public administration authorities' portals provide the opportunity to local governments, not only to digitize services but, at the same time, to "localise" their resilience and sustainability. This underlines the need for web-based local government systems to enhance access to services and prompt greater engagement among constituents. It should be ensured that policies are tailored to the socioeconomic characteristics of each city.

7.2.2. e-Government assessment on local level

Therefore, the analysis of public administration portals is essential and a way for e-Government development assessment[8]. Such assessment assists public sector organisations to determine their web strategy, achieve resilient and sustainable policies and operations, and inform policy-makers and agencies about how e-Government has performed[9] from a citizen's point of view[10]. Since local government has the greatest direct contact with citizens, it is critical to collect and exploit regional and local-level data, as the more resources that are allocated at the subnational level, the more value its citizens obtain[11].

As is the case at the national level, successful existing practices and initiatives worldwide could set the benchmark for local e-Government development. Politicians, policy-makers and local public administration officers could use e-Government assessment and successful paradigms in megacities, as a guide to making informed decisions[12]. They could monitor the results of current e-Government investments and determine if the applied e-Government strategy is well-balanced, fruitful and aligned with the designated resilience and sustainability programme. Decision-makers then could set new targets regarding specific areas of e-Government service provision and improve the local government agenda.

Assessment and comparison of various practices are key instruments for depicting the existing e-Government status, ascertaining which objectives have been achieved, confirming the efficiency of applied policies, identifying strengths and weaknesses, suggesting new measures and looking for improved operational patterns in large cities around the world.

7.2.3. Relative assessment efforts

Apart from United Nations e-Government Development Index (EGDI), several other assessment efforts are also commissioned, at national levels, by different stakeholders. The European Commission, in 2017, found that individual countries, private consulting companies, individual researchers, and the Commission itself apply various assessment processes. In each case, policy-makers, government officials, researchers, and others seek to learn lessons from other governments' e-Government policies, to measure their relative progress, discover best practices and global trends and explore underlying e-Government concepts to identify points of leverage[13]. There are some efforts, mainly in the research realm, to evaluate municipal portals (Box 7.1). Some of them consider ICT readiness for the municipality, while others assess the local administration portal.

Box 7.1   Local e-Government Assessment Efforts

The **Digital Governance in Municipalities Worldwide** assesses the practice of digital governance in large municipalities around the world. It evaluates the official municipality portals of 100 cities of the top 100 most wired nations (based on International Telecommunication Union data), in terms of public service provision and residents' participation in governance and ranks the portals. The evaluation categories they apply are: services provision, privacy/security, usability, content, and citizen participation. Regarding provided services, it checks 20 specific ones, assessed in terms of maturity with a reference framework of three stages[14].

The **e-Government Municipal Assessment Project** (MeGAP) for benchmarking of local e-Government is proposed by Kaylor et al.[15]. This bottom-up approach assesses 68 services that are performed by local administrations in the US and is grouped in four distinct categories (information dissemination, interactive functions, eCommerce functions and e-Democracy). Each service is evaluated using a four-level services sophistication assessment framework. Finally, a summary statistic is defined to encapsulate all the results and is the base for a score used to rank cities. MeGAP has been also applied to the 30 municipalities in southern Norway.

The Evaluation of the Portuguese Municipalities' Online Presence is a Portuguese robust and well-established study developed and evolved since 1999. This method introduces a procedure and an assessment evaluation grid. Municipalities' portals are evaluated according to 32 groups of indicators allocated in four criteria: content, accessibility, online services and participation.

The United Nations Department of Economic and Social Affairs considers that the different role cities play in different countries makes comparison difficult (i.e. a public function that is highly centralised in one country may be highly decentralised in another).[16] In addition, the variety of services and operations make it even more complex for information collection and comparison. Collecting internationally comparable data at the local level – even where it exists – is especially difficult, due to differences in political and economic systems.[17] It is thus challenging to design a municipality e-Government assessment process that avoids misleading results.[18]

7.2.4.   Towards Local e-Government Assessment

Consequently, a need to move the focus of assessment of e-Government development to different levels of public administration emerges. It is expected that local level e-Government assessment will improve public services, citizen engagement and authorities' transparency and accountability. Local e-government could also be used as a tool to propel resiliency and sustainability goals and align local government operation with national digital strategy plans. Assessment results could produce useful benchmarks, which can lead to further improvement and application of best practices.

The actions needed to improve local public governance and achieve the UN SDGs need more sub-national, policy-orientated, and capacity-building indices. That requires comprehensive government indicators, which reflect universal aspects of local governance to enable global comparisons across cities. The indicators should, for instance, evaluate specific municipality services, community participation, support to vulnerable groups, access to information, and anti-corruption measures.

7.3   Current Status of Local Online Services: a Pilot Study

This section reports on a pilot study of local e-Government development, which sampled 40 diverse cities across the globe. It starts by describing the instrument used to assess the municipalities' online services, as well as its application to the 40 cities. The study's main findings, including some best practices, are presented in the second part of this section.

7.3.1   Study Methodology

Local Online Service Index

Municipalities worldwide are constantly improving their official websites, as those are the primary interfaces with citizens in the e-Government paradigm.[19] The focus of the proposed assessment instrument is the municipality's official website, where information about administration and online services are provided by the local government authorities. Specifically, a municipal website should include information about available city services, along with information related to the city council, mayor and executive branch, as well as other departments and services. These websites should use the appropriate technologies to effectively provide government services and engage citizens in decision-making. Local government portals are also the main gateways to promote and apply cities' resiliency and sustainability programmes.

There are many parameters for assessing local government websites, as different perceptions of evaluation lead to diverse criteria. Therefore, local e-Government metrics cannot be regarded as one-size fits-all. Existing research indicates that they differ, to some extent, by municipality needs, operation and provided services. To define an appropriate set of metrics, the study expands upon previous empirical research to understand and to measure the degree of web presence in municipality portals.

The proposed instrument, applied in this pilot to assess local e-Government progress around the world, is based on a set of specific indicators that yield some sort of score and, furthermore, allow city e-Government status comparison. The suggested instrument enables the comparison of individual indicators identified on municipalities' portals by clustering them into certain criteria groups using website provided information.[20]. Apart from the indicators, an email response test is conducted which identifies different aspects regarding how municipality portals respond to citizen email requests for information[21].

Simply stated, the Local Online Service Index (LOSI) comprises four criteria groups which cover the whole spectrum of the identified assessment indicators depicted in Table 7.1, derived from the analysis of literature and practice efforts. The first one is the *Technology* criterion, where some basic features of the website are assessed; next is the *Content Provision criterion*, where the existence of essential information is examined; the third criterion is *Services Provision*, where the delivery of fundamental electronic services is assessed; and the final criterion is *Participation and Engagement* which assesses the existence of relevant participation and engagement mechanisms and initiatives.

LOSI is a multi-criteria index, composed of 60 indicators (Table 7.1). The indicators enable progress towards the achievement of each criterion's key objectives to be measured. That, in turn, permits the ongoing evaluation of success in implementing the municipality's website aimed strategy. Each of the 60 indicators is ascribed a "value 1" if it is found in a municipality website, "value 0" if it is absent and nothing if it is not applicable. The LOSI value of a municipality is the sum of the values of all the 60 indicators for that municipality.

Table 7.1   LOSI – Criteria and Indicators

Technology	Content Provision
Browser compatibility	Contact details
Ease of portal finding	Organization structure
Portal loading speed	Names and contacts about heads of departments
Mobile device accessibility	Municipality information
Navigability	Budget related information
Internal search mechanism	Information about procurement announcements
Internal advanced search mechanism	Information about procurement results
Alignment with markup validation standards	Information about provided services
Alignment with display standards	Information about municipality partnership with third parties
Alignment with accessibility standards	Facilitation of free internet access
Customization of display features	Health information
Foreign language support	Environmental information
	Education information
	Social welfare information
	Sport and culture information
	Privacy policy
	Open data policy
	Open data provision
	OGD metadata
	Smart cities initiatives
	Use of emergent technologies
	Online user support
	Guiding information on online services use
	Links for government agencies
	Statistical data and studies provision
	Evidence of portal content update
Service Provision	**Participation and engagement**
Portal authentication	Real time communication
Personal data accessibility	Feedback/complaint submission
Personal data updating	Online deliberation processes
Municipality responsiveness t emails	Social networking features
Delay of email response	Reporting of occurrences in public spaces
Quality of email response	Participatory budgeting
e-Procurement service	Participatory land use plan
Police online declaration	Announcement of upcoming e-participation activities
Address change notification	Feedback about consultation processes
Online residentship	
Online building permit	
Online vacancies	
e-Payment	

Assessment Procedure

The 40 cities in the pilot assessment were selected on the basis of geographical coverage and population size. All geopolitical regional groups of United Nations Member States were covered. More specifically the number of countries per region that are included is based on the percentage of that region's total population in the context of the global population: Africa – 7; Americas – 6; Asia – 13; Europe – 12; Oceania – 2. Wherever possible, all sub regions in the region are covered. Within regions, the cities with the largest population were selected, wherever possible. Where this was not possible, other criteria such as gross domestic product (GDP) and e-Government ranking were considered. Within countries, the city with the largest population was selected. Cities' population were obtained from The United Nations Statistics Division (UNSD) website[22]. In 31 cases, the largest city is also the capital city. Table 7.2 systematises the final list of cities considered. After selection, a search was conducted to identify the relative municipality website link for each.

The link for each municipality's website and the 60 indicators to be evaluated were sent to an assessor, who was a native speaker of the official language of the city. Instructions and guidance regarding the assessment process and about the email messages to be sent to the municipality to assess municipalities' responsiveness to email contacts, were also sent to the assessors. In order to have external validation of the information collected by the assessors, an expert review was conducted. To do so, the assessors were asked to introduce comments to the indicators and, departing from that, a researcher from the team re-checked the information provided.

Table 7.2　　Pilot Cities Profile

City	Country	Region	Sub-region	Population
Luanda	Angola	Africa	Middle Africa	2107648
Buenos Aires	Argentina	Americas	South America	2965403
Sydney	Australia	Oceania	Australia and New Zealand	4451841
Toronto	Canada	Americas	Northern America	2808503
Shanghai	China	Asia	Eastern Asia	14348535
Bogotá	Colombia	Americas	South America	6763325
Abidjan	Cote d'Ivoire	Africa	Western Africa	4395243
Prague	Czech Republic (the)	Europe	Eastern Europe	1259079
Santo Domingo	Dominican Republic (the)	Americas	Caribbean	965040
Cairo	Egypt	Africa	Northern Africa	7771617
Tallinn	Estonia	Europe	Northern Europe	413782
Addis Ababa	Ethiopia	Africa	Eastern Africa	2739551
Helsinki	Finland	Europe	Northern Europe	616690
Paris	France	Europe	Western Europe	2243833
Berlin	Germany	Europe	Western Europe	3469849
Accra	Ghana	Africa	Western Africa	1594419
Athens	Greece	Europe	Southern Europe	664046
Mumbai	India	Asia	Southern Asia	11978450
Jakarta	Indonesia	Asia	South-Eastern Asia	9607787
Rome	Italy	Europe	Southern Europe	2867672
Tokyo	Japan	Asia	Eastern Asia	9272740
Almaty	Kazakhstan	Asia	Central Asia	1507509

City	Country	Region	Sub-region	Population
Nairobi	Kenya	Africa	Eastern Africa	3133518
Kuala Lumpur	Malaysia	Asia	South-Eastern Asia	1588750
México City	Mexico	Americas	Central America	8851080
Amsterdam	Netherlands	Europe	Western Europe	821752
Karachi	Pakistan	Asia	Southern Asia	9339023
Port Moresby	Papua New Guinea	Oceania	Melanesia	254158
Warsaw	Poland	Europe	Eastern Europe	1735391
Seoul	Republic of Korea	Asia	Eastern Asia	9860372
Moscow	Russian Federation (the)	Europe	Eastern Europe	11918057
Riyadh	Saudi Arabia	Asia	Western Asia	5188286
Cape Town	South Africa	Africa	Southern Africa	433688
Madrid	Spain	Europe	Southern Europe	3186241
Colombo (commercial)	Sri Lanka	Asia	Southern Asia	647100
Bangkok	Thailand	Asia	South-Eastern Asia	6355144
Istanbul	Turkey	Asia	Western Asia	14100000
London	UK	Europe	Northern Europe	8135667
Dubai	United Arab Emirates	Asia	Western Asia	2983248
New York City	United States of America	Americas	Northern America	8550405

7.3.2   Study Findings

The aim of this study was twofold: to demonstrate the feasibility of the methodology used to assess local e-Government development and to present a set of findings that illustrate the value of this kind of information for policy- and decision-makers, and managers involved in promoting e-Government locally. Its goal is to contribute to the sustained and sustainable development of cities and societies.

As mentioned, each city was analysed against the 60 LOSI indicators, covering technical and content aspects of the municipality website, as well as electronic services provision and e-Participation initiatives available through the portal.

Table 7.3 presents the final ranking of cities. The table also clusters the cities according to the total number of indicators in which they scored. Four clusters are considered: *very high* cluster, grouping cities that met at least 46 indicators of the 60 analysed (more than 75 per cent of the indicators); *high* cluster, grouping cities that achieved between 31 and 45 indicators (between 50 and 75 per cent); *medium* cluster, grouping cities that satisfied between 16 and 30 indicators (between 25 and 50 per cent) and, finally, *low* cluster, grouping cities that met fewer than 16 indicators (less than 25 per cent). This cluster is not presented in the table since none of the cities scored in fewer than 16 indicators.

Table 7.3   Ranking of cities

Rank	City	Total indicators	Technology indicators	Content provision indicators	Service provision indicators	Participation and engagement indicators	Cluster
1	Moscow	55	10	26	11	9	Very high (more than 75% indicators)
2	Cape Town	53	10	26	11	7	
2	Tallinn	53	11	26	12	5	
4	London	51	10	25	11	6	
4	Paris	51	11	24	8	9	
6	Sydney	50	11	21	12	7	
7	Amsterdam	49	9	25	10	6	
7	Seoul	49	11	25	6	8	
9	Rome	48	11	25	8	5	
9	Warsaw	48	11	25	7	6	
11	Helsinki	47	10	24	7	7	
11	Istanbul	47	6	24	12	6	
11	Shanghai	47	10	24	5	9	
14	Madrid	46	10	22	8	7	
14	New York City	46	10	21	10	6	
16	Dubai	44	10	21	10	4	High (50% to 75% indicators)
17	Prague	43	10	23	4	7	
18	Addis Ababa	42	12	21	4	6	
19	Tokyo	41	12	24	3	3	
19	Toronto	41	9	22	8	3	
21	Buenos Aires	40	8	22	5	6	
22	Berlin	39	11	21	2	6	
23	Jakarta	37	9	17	5	7	
24	Mumbai	36	12	19	5	1	
25	Almaty	35	11	19	3	3	
25	Kuala Lumpur	35	11	19	4	2	
27	Athens	33	8	18	7	1	
27	Cairo	33	10	18	5	1	
27	Nairobi	33	5	15	10	4	
30	Riyadh	31	9	15	3	5	
31	Bogotá	30	7	17	3	4	
32	México City	29	7	20	1	2	Medium (25% to 50% indicators)
33	Colombo (commercial)	28	8	13	5	3	
34	Bangkok	24	5	11	5	4	
34	Port Moresby	24	9	12	0	4	
36	Accra	23	10	12	0	2	
37	Abidjan	19	10	9	0	1	
38	Luanda	17	8	9	0	1	
38	Santo Domingo	17	5	11	0	2	
40	Karachi	16	5	11	0	1	

When considering the whole set of indicators, the study found that municipalities tend to be performing quite reasonably. As shown in Figure 7.1, 75 per cent of the cities were classified in *very high* or *high clusters*, meaning that 30 of the 40 cities scored in more than half of the 60 indicators assessed.

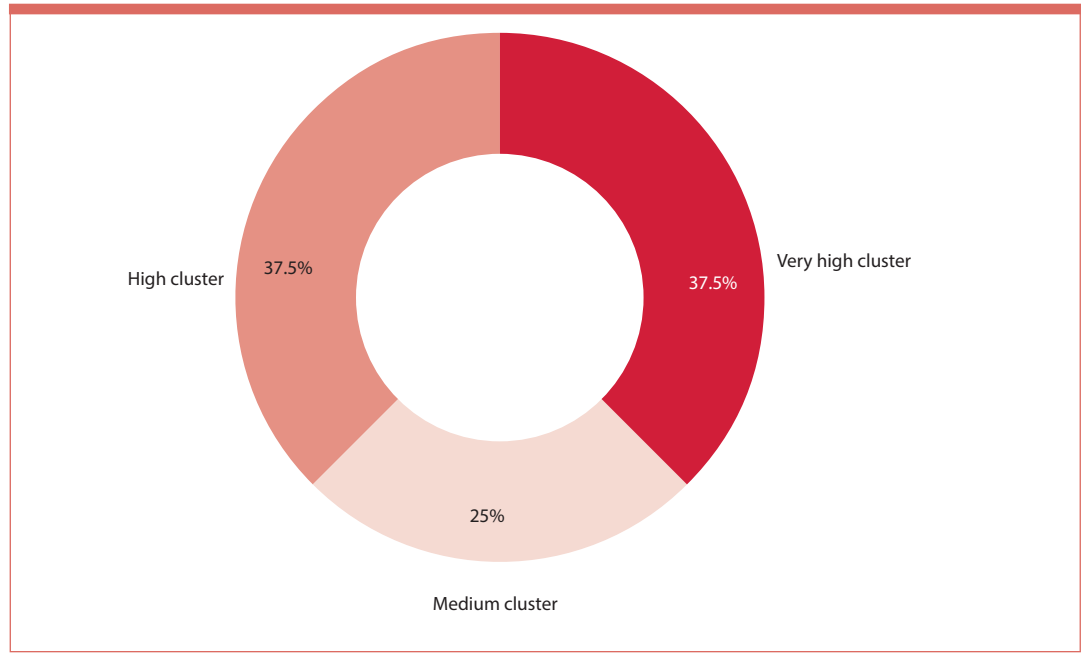Figure 7.1   Percentage of cities in each cluster

Figure 7.2 illustrates the relationship between the level of assessment obtained by a city and the level of e-Government development of the country to which the city belongs. It does so by comparing the classification obtained by the city in this pilot (LOSI) with the 2018 UN OSI (Online Service Index) value and classification (*very high* (countries with OSI >= 0.75), *high* (countries with OSI between 0.5 and 0.75), *medium* (countries with OSI between 0.25 and 0.5) and *low* (countries with OSI <= 0.25)). The 2018 UN OSI values and classifications were presented and discussed in chapter 5 of this report.

As shown, 55 per cent of the cities got a cluster position in LOSI similar to the one that their countries got in UN 2018 OSI (37.5 per cent *very high–very high*; 12.5 per cent high-high; 5 per cent *medium-medium*). There were, however, 42.5 per cent of the cities that got a LOSI classification lower than that of the country in which they resided, as per the UN 2018 OSI (25 per cent *high-very high*; 12.5 per cent *medium-high*; 5 per cent *medium-very high*). Two municipalities received a classification (5 per cent) that differs two levels from that of its country as per OSI (the municipality got a *medium* position in LOSI while its country got a *very high* position in OSI). Only in one case, for Abidjan, did a municipality reach a LOSI level higher than that of its country in OSI (the municipality got a *medium* position in LOSI while its country got a *low* position in OSI).

These figures tend to suggest that there is not a very strong correlation between the level of assessment obtained by a local municipality and the level of e-Government development of the country to which the city belongs. This fact reinforces the need to conduct assessments of e-Government development at the local level, to complement the national level assessment.

The discrepancy that may exist in national and local-level e-Government development may be even greater than the one shown by these figures, considering the fact that the cities included in this

pilot study are the biggest cities, in terms of population, in their countries. Being big cities, it is highly probable that they present higher levels of e-government development than smaller ones, meaning that, when conducting a wider local e-government analysis, the difference found between performance at a national and local level may be more marked.

Figure 7.2   City–Country Online Services Index cross classification in 2018

City/Municipality classification in the LOSI 2018

Country classification in UN OSI ranking 2018	Low	Medium	High		Very high	
Very high		**5%** Bogotá Mexico City	**25%** Almaty Athens Berlin Buenos Aires Dubai Kuala Lumpur Mumbai	Riyadh Tokyo Toronto	**37.5%** Amsterdam Cape Town Helsinki Istanbul London Madrid Moscow New York City	Paris Rome Seoul Shanghai Sidney Tallinn Warsaw
High		**12.5%** Accra Bangkok Colombo (commercial) Karachi Santo Domingo	**12.5%** Addis Ababa Cairo Jakarta Nairobi Prague			
Medium		**5%** Luanda Port Moresby				
Low		**2.5%** Abidjan				

The analysis by region shows that cities in Europe scored higher. As depicted in Figure 7.3, all European cities analysed are included in *very high* and *high* clusters. Most of the African, Americas and Asian cities, respectively, 86 per cent, 83 per cent and 77 per cent, fell into the *medium* and *high* clusters.

Figure 7.3   Performance of cities per region
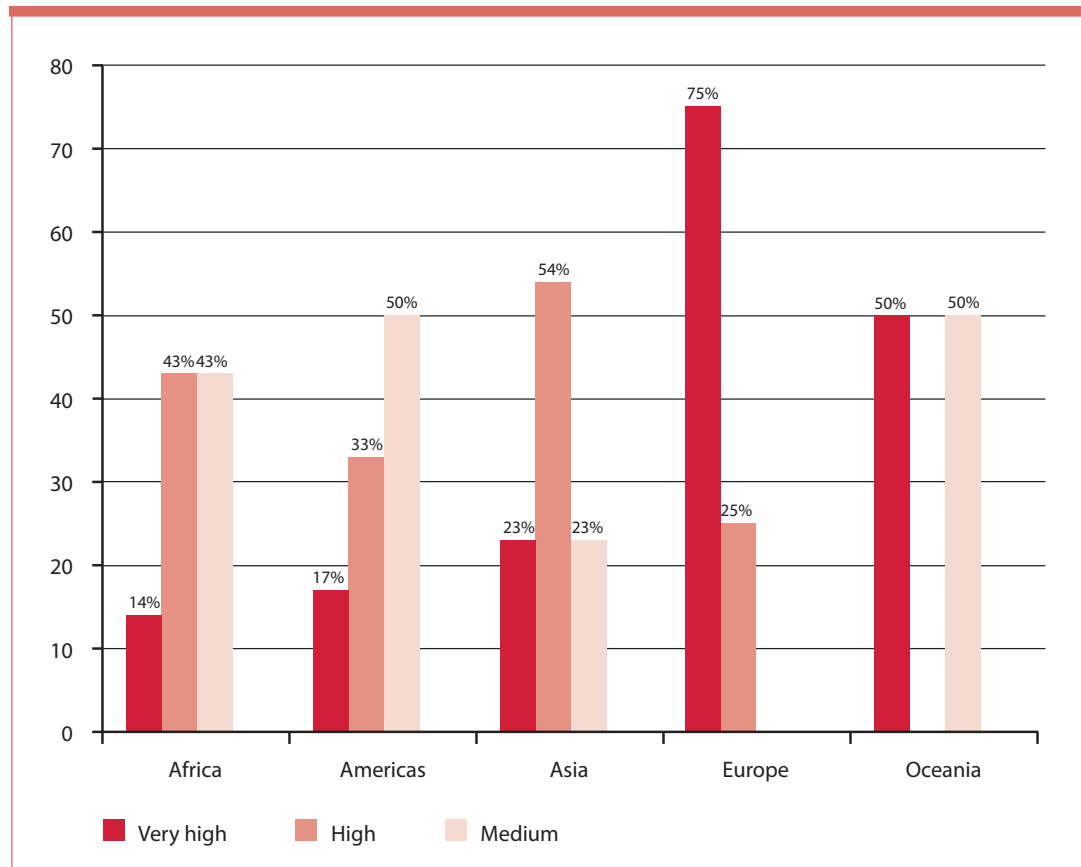
Despite the reasonable global scores achieved by the cities, when looking individually to the different criteria and indicators assessed, it becomes evident that municipalities do not perform uniformly in all of them.

As can be seen (Table 7.4), 85 per cent of the 13 *Technology* indicators (i.e. indicators which cover basic features related to accessibility, navigability, and ease of use of the website, such as browser compatibility, portal finding, portal loading speed, mobile device accessibility, internal search mechanism, customisation of display features, and foreign language support), were positively assessed in more than 50 per cent of the cities, meaning that these issues are regarded and implemented in most of municipalities' websites. Similarly, 96 per cent of the *Content Provision* indicators, such as those related to the availability of essential information, were also found in more than 50 per cent of the cities analysed, with half of them being satisfied by more than 75 per cent of the cities.

Table 7.4   Percentage of indicators per criteria that scored by percentage of cities.

Indicators		Percentage of cities			
Criterion	Total Number	0%-25%	25%-50%	50%-75%	75%-100%
Technology	13	0	15%	39%	46%
Content Provision	26	0	4%	46%	50%
Service Provision	13	15%	54%	31%	0
Participation and Engagement	9	12%	44%	22%	22%

A different situation emerges with the other two criteria. As shown by the numbers, 56 per cent of the *Participation and Engagement* indicators, or those covering the availability of citizen engagement and participation initiatives through the website, were implemented by less than 50 per cent of the municipalities. The *Service Provision* criterion scored the lowest, with 69 per cent of its indicators being implemented only by less than half the municipalities ranked.

These results tend to show that, despite some very good cases, many municipalities continue to focus their attention more on providing websites with adequate content and satisfactory usability, and less on making life easier for citizens insofar as such things as service request and execution and promoting citizen participation.

As shown in Figure 7.4, *Technology* indicators addressed most by municipality websites are related to accessibility, ease of use, and navigability. Most of the websites are compliant with the Web Content Accessibility Guidelines (WCAG1.0), as well as with the technical standard recommendations by World Wide Web Consortium (W3C) referring the mark-up validity and Cascade Style Sheets (CSS) standards.

Figure 7.4   Implementation of Technology indicators in municipalities' websites
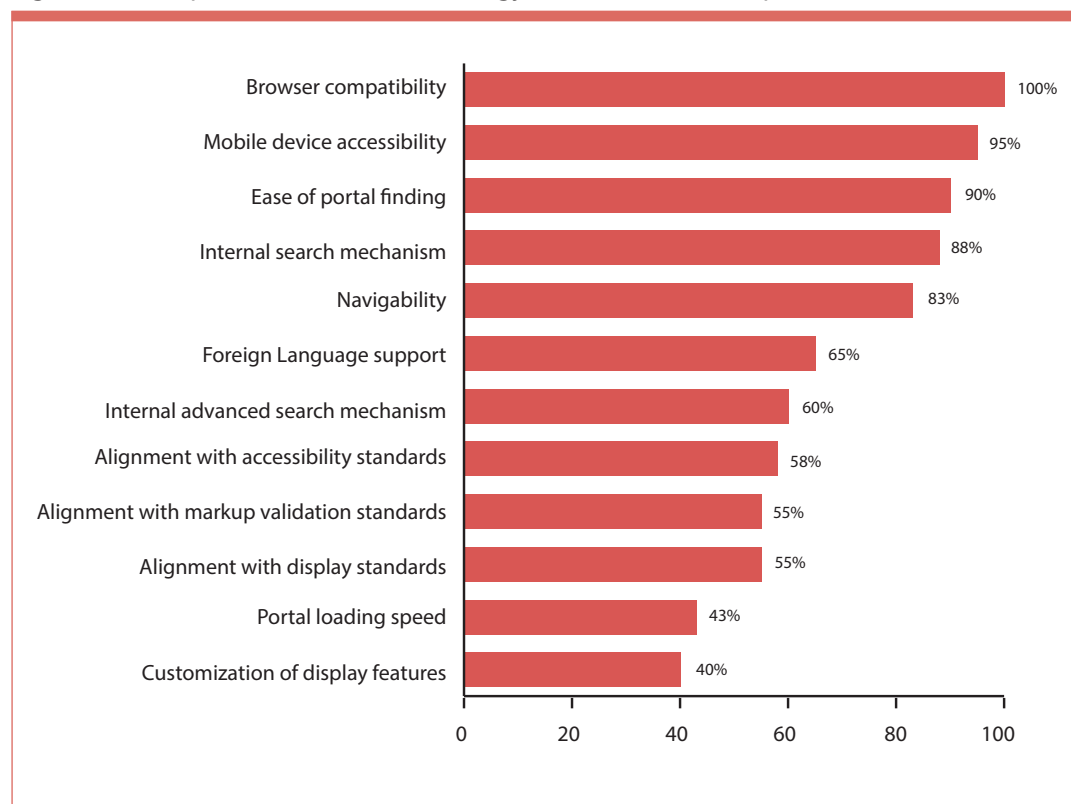
Only 65 per cent of the municipalities provide their website content in more than one language. Considering that the sample used in the pilot includes the biggest city in the countries, and that most are capital cities that attract a huge number of visitors for business and tourism purposes, it would be reasonable to expect that their websites would be fully or partially available in an oft-used language, such as English. There is also an expectation that multilingual website content would be used in multiracial and multi-language cities, to ensure that language, ethnic and indigenous minorities can access public services and information easily.

Most municipalities, or 95 per cent, already provide websites that are accessible through mobile platforms. This is particularly relevant considering the high penetration of mobile devices and the growing trend of "access on moving".

Only 40 per cent of the municipalities studied have websites that make it possible to customise website display options, such as font type, size and colour.

Concerning *Content Provision*, which covers indicators related to the availability of information, namely institutional information, sectorial information, services information and information about policies of privacy and open data, most of the municipalities performed quite well. As previously mentioned, 96 per cent of the *Content Provision* indicators were verified in more than half the cities analysed, with 50 per cent of indicators being satisfied by more than 75 per cent of the cities.

As presented in Figure 7.5, information about the municipalities' organisation, operations and management, such as a municipality chart, the names and titles of heads of departments and their functions, working hours, contracts, municipality budget and budget-related policies, as well as information about services provided is available on the website of more than 75 per cent of the cities.

Figure 7.5   Implementation of Content Provision indicators in municipalities' websites
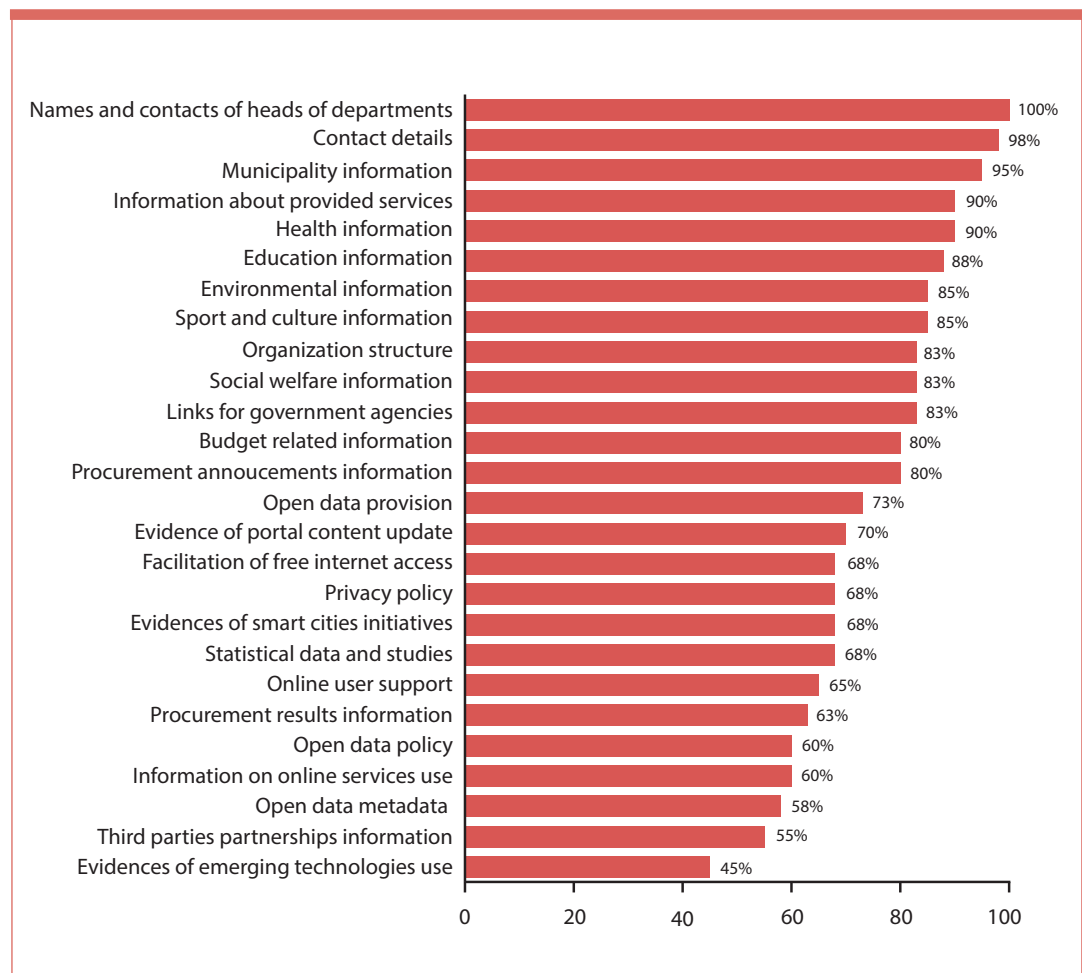
The majority of municipalities' websites also provide a rich and wide range of information covering sectorial areas such as education, health, environment, social welfare, leisure, culture and sports.

Announcements of forthcoming municipality procurement/bidding processes were found in 80 per cent of the websites, although only 63 per cent of them provide the results of the procurement/ bidding processes.

Notably, 68 per cent of the municipalities have a privacy policy or statement available on the website, which denotes respect for citizens' privacy and awareness of transparency and accountability principles.

The websites were also analysed to determine whether the municipality is using, starting to use, or intends to use information and communication technologies (ICTs) in more innovative ways. For that purpose, three aspects were analysed, relating to the existence of any Open Government Data (OGD) initiatives, smart city initiatives, and the adoption and use of emerging technologies, such as Internet of Things (IoT), artificial intelligence (AI), blockchain, virtual reality (VR), or augmented reality (AR).

Open Government Data initiatives were noted in 73 per cent of the cities, which is a sign of municipalities' willingness to become more transparent and economical. However, only 60 per cent of those cities provide an OGD policy, establishing the rules and recommendations for publishing and using open datasets. In most cases, the municipality website provides a link to a specific OGD portal, be it a municipal or national OGD portal. One interesting example of OGD was found in Helsinki (Box 7.2).

Box 7.2   Helsinki: Helsinki Region Infoshare

Helsinki Region Infoshare (HRI) service aims to make regional information quickly and easily accessible to all. Essentially, HRI is a web service for fast and easy access to open data sources between the cities of Helsinki, Espoo, Vantaa and Kauniainen. The data published is mainly statistical, giving a comprehensive and diverse outlook on different urban phenomena, such as living conditions, economics and well-being, employment and transport. A good proportion of the data material offered by the service is GIS based. The main operational activity is to support the producers of information in opening their data and to increase its utilisation by multi-channel communication.

The data can be used in research and development activities, decision-making, visualisation, data journalism and in the development of apps. The data may be used by citizens, businesses, universities, academies, research facilities or municipal administration. The data on offer is ready to be used freely at no cost. There are no limitations on users; anyone interested in open data can participate.

Currently 628 datasets are offered organised in various categories. The data can be downloaded as files and is also available as raw data in different formats (XLS, PC-AXIS, CSV, KML, GML, JSON and XML) via various network services or technical interfaces.

Source: http://www. hri.fi/en/

Smart cities initiatives are emerging around the globe. Prompted by environmental, economic, or social reasons, cities are taking advantage of technology advancements in many domains to become smarter. The pilot study tends to support this evidence, with some smart city initiatives found in 68 per cent of the cities analysed, such as in Amsterdam (Box 7.3).

Comparing with Open Government Data and smart cities initiatives, the results obtained for emerging technologies were somewhat lower. The use, or intention to use, of emerging technologies was found in only 45 per cent of the municipalities. This percentage, however, is a positive sign, since there is still a significant general lack of understanding about the use of emerging technologies. These require new technical competencies, which, at the municipal level, may not be readily available. One interesting case of emerging technologies use was found in Seoul (Box 7.4).

Box 7.3   Amsterdam: Solar Cycle Path

In Amsterdam, they have designed and installed the world's first solar cycle path. Solar path is exactly what it sounds like—solar panels that pull double duty as road surface and electricity generator. The path, which was developed by the Netherlands' TNO Research Institute, runs between the suburbs of Krommenie and Wormerveer. The busy 70-meter stretch serves some 2,000 cyclists per day. Underneath all that glass, the solar panels are hooked up to the electric grid. 70 meters might not sound like much, but it's a proof-of-concept pilot project to test feasibility and practicality, and it makes sense to test the waters on roads that are occupied with lightweight bicycles rather than hefty vehicles. Eventually, it could make the sense to use this solar road electricity for traffic signals and street lights. After a six months' operation, the path attracted more than 150,000 riders, and more importantly, generated more than 3,000 kilowatt-hours of energy. That's enough to power a home for a year.

The solar path was made using prefabricated slabs consisting of concrete blocks topped with a translucent layer of tempered glass. Beneath the protective glass lie crystalline silicon solar cells which are hooked up to the grid. The glass has been given a special coating to make it skid-resistant, and it's strong enough to withstand steel balls dropped onto it. The path has been installed on a slight tilt which is designed to help rain wash off dirt and hence keep it as clean as possible, which will help maximise the amount of sunlight that can reach the solar cells. As it is still in its early days, production costs are unfortunately rather hefty. The pilot cycle path came with a $3.75 million (€3 million) price tag, which was mostly put up by the local authority. However, as the technology develops and production gets scaled-up, the price should drop.

Source: http://www.solaroad.nl/

The favourable scores achieved by municipalities in the *Technology* and *Content Provision* criteria change considerably when looking at the *Participation and Engagement* indicators. As shown in Table 7.4, there were 56 per cent of *Participation* and *Engagement* indicators that were only found in less than half of the municipalities' websites studied.

According to Figure 7.6, one of the *Participation* and engagement indicators that received a more positive assessment relates to a social network presence in municipalities, with 34, or 85 per cent of municipalities polled having a presence in some social network, such as Facebook, Twitter, YouTube, and Flickr.

Box 7.4   Seoul: smart bins for waste management improvement

Seoul had problems of frequent waste collection and waste overflow. With an inadequate number of public waste bins and with four to five daily waste collections proving to be insufficient, they had a serious problem on their hands. Furthermore, because the waste collection planners did not know how full or how quickly the bins became full, Seoul's waste collection staff had to deal with plastic bottles and paper cups that continuously piled up on top of recycling bins.

With the main goal of improving the cityscape by making streets cleaner and reducing waste collection costs, Seoul municipality decided to install 85 solar power trash compactor waste bins which can hold up to 8 times more waste compared to non-compacting bins. Those wheelie bins provide easy and safe trash removal, and they also communicate information they collect in real time through wireless transmission, to monitor the status and fill-level of waste bins and observe the collection efficiency throughout Seoul.

Since installing those waste bins, waste overflow was eliminated, waste collection cost has been reduced by 83%, recycling diversion rate has been increased to 46%, route optimisation for waste collections has been achieved (66% reduction in collection frequency) and there was a significant reduction of litter on the streets. This waste management solution, using emergent technologies, is contributing to making the city cleaner and more pleasant for both residents and tourists.

Source: http://gov.seoul.go.kr/

Figure 7.6   Implementation of Participation indicators in municipalities' websites
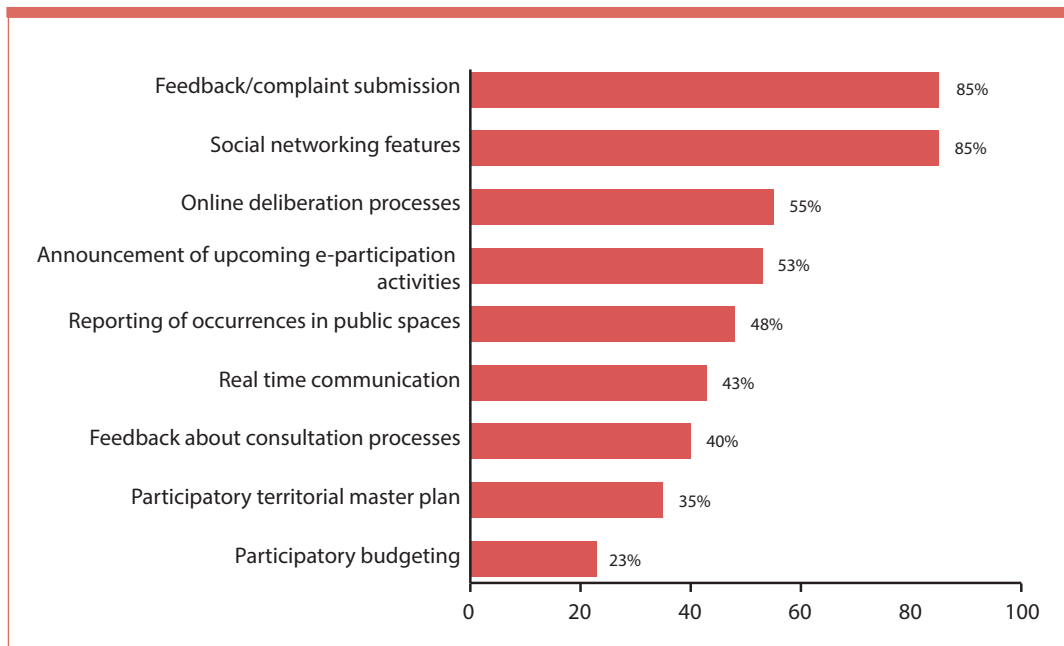
Regarding the possibility for a citizen to send a complaint or opinion to their municipality – present in in 85 per cent of the municipalities - different approaches are used. In some cases, general inquiry options are available, whereas other websites provide specific areas for that feedback. One kind of information or feedback provided by citizens to their municipalities is related with the reporting of occurrences/ problems found in public spaces, such as holes in the street, broken public lamps, damages in sports facilities or playgrounds. This possibility was found, however, in only 19, or 48 per cent, of the websites. One interesting system for reporting occurrences was found in Bogota (Box 7.5).

Box 7.5   Bogota: Geographic Information Services

Bogotá DC has created effective mechanisms to permit timely availability of quality geospatial information to support the range of sectoral, local and regional projects that are deployed in and from the national capital district. The Infrastructure of Spatial Data for the Capital District (or IDECA) is responsible for promoting collaborative strategies to manage geographic information based on official policies and standards, using technological tools that enable information management and facilitate the development of institutional strategies for best practices related to the data lifecycle.

Tu Bogotá is an application that can identify, through an interactive map, variables to make decisions about housing or investment in the capital within a search radius of 0.5 to 2 km. It can also be shared on social networks. The application gives the per-sq-km value of a land, and other useful information, such as the options available in the property's environment related with education options, health providers, parks, and other. The tool allows users to report the real estate offers and civic needs for different sectors of the city (health, education, culture, trade, tourism, social security, risk, mobility, environment, public space). In addition, users can upload a related image, a description of the need and a contact email. This way, users can get in touch with the different public entities that provide information for the app and contribute for portraying a certain area of the city, thus allowing interactive and information wise navigation in the app's map.

Source: http://www. bogota.gov.co/

Too few websites offer mechanisms, such as online forums, social media, online polls, online voting tools, chats, blogs and online petition tools, to gather public opinion so as to inform policy deliberations. Only about half of the cities studied, or 55 per cent, provide tools on their website to engage citizens in deliberative and decision processes. Sydney, Australia has spearheaded a noteworthy community consultation initiative (Box 7.6).

Box 7.6   Sydney: Community Consultation

The City offers a range of opportunities for residents, workers, community groups, business, government and industry stakeholders to share ideas, insight and feedback on our projects and policies to help inform Council decisions. They can take part at workshops and community meetings, stakeholder meetings and roundtables, online consultations, community reference groups, advisory panels, drop-in sessions, surveys, school workshops etc. Consultation and engagement outcomes are collated, analysed and considered along with other input and technical, financial or legislative requirements as a key part of Council's decision-making process.

The following principles guide the city's approach to engaging the community in decision-making:

- Integrity: Engagement should be clear in scope and purpose.
- Inclusiveness: Engagement should be accessible and capture a full range of values and perspectives.
- Dialogue: Engagement should promote dialogue and open up genuine discussion.
- Influence: The community should be able to see and understand the impact of their involvement in consultations that the city conducts.

Source: http://www. cityofsydney.nsw. gov.au

Despite such initiatives, only 16 of the municipalities in the study, or 40 per cent, could point to some indication of online public consultation that resulted in a policy decision, regulation, or service. Likewise, only in 21 of such websites or 53 per cent of those polled, were there calendar announcements or postings of upcoming online consultation, such as voting forums, surveys, or polls.

"Participatory budget" and "participatory municipality's land-use plan" are two specific kinds of initiatives used by municipalities to engage with their citizens. Nevertheless, at this level, the figures in our study are still low. The participatory budget initiative was found in only 9 cities studied, or 23 per cent. Similarly, only 14 cities, 35 per cent in the study, provided evidence of specific initiatives to allow citizens' participation in the municipality's land-use planning process. These lower numbers may, however, be due to the seasonality of such initiatives and may not have been available at the time of the pilot project.

It was observed that some cities, 17 of those studied, or 43 per cent, offer "live support" features with municipality employees in real time (such as VIPE, WhatsApp, call centres) through their portal. This kind of interaction creates a closer relationship among stakeholders.

Regarding the fourth set of indicators, online *Service Provision*, only six cities, or 15 per cent, did not score in any of the 13 *Service Provision* indicators, while 26 cities, or 65 per cent, scored in less than half the indicators.

As depicted in Figure 7.7, citizen authentication, a basic auxiliary service for the online provision of most of the remaining services, was available on 27 (68 per cent) of municipality websites.

Figure 7.7   Implementation of Services Provision indicators in municipalities' websites

Besides this basic auxiliary service, nine specific services were also analysed: (i) access to personal data; (ii) personal data updates; (iii) resident application; (iv) application for government vacancies; (v) building permits; (vi) notification of change of address; (vii) declaration to the municipality police; (viii) submission of a tender through an e-procurement platform; and (ix) payment of fees for government services or fines.

The submission of tenders through e-Procurement platforms is the service offered by most municipalities, as it was found in 60 per cent of the websites, although different approaches are followed: in some cities, citizens are redirected to specific e-procurement municipality platforms while, in others, they are redirected to national e-procurement platforms.

The online service for applying for residency is the least available: only 10 cities, or 25 per cent, have it, and in two of these cases, the service is not provided directly by the municipality but by other entities, namely the magistrate, to which the citizen is redirected.

As for making a declaration to the police, only 15, or 38 per cent of the municipalities studies provide this option, and, similar to the situation prevailing for residency applications, there are nine municipalities in which the police declaration service is not provided directly by the city but through a link to the municipality police website where the declaration can be made.

Application for government positions is available on the websites of 22, or 55 per cent of the municipalities, and this option is not presented by a city website but through a link to external specific websites.

Payment for municipality services or fines can be made in 55 per cent of the municipalities' websites and the possibility of online application for building permits in half of the municipalities studied.

The possibility of online access and the opportunity to update personal data is available on 18, or 45 per cent of the websites, and 14, or 35 per cent, respectively.

Three final services related to the usage, delay and quality of responses to email messages sent by citizens to municipalities were also analysed. For doing so, an email message containing a simple request, in particular, asking about the official working hours of the office, was sent to each municipality. During this process, it was found that not all the municipalities provide email addresses on their websites. In some of those cases, it was possible to send a message through an embedded web form. Overall, only 19, less than half of the municipalities, replied to the messages sent. And of those, only 10 replied in less than two working days. Also, from the 19 replies received, only 15 responses were considered "useful" since they applied directly to the request made. The 15 useful messages received had very different formats. Some were short, providing a simple and clear response to the request. Others did not provide an immediate answer in the email body. Instead they annexed a file, usually in the pdf format, containing the municipality's internal regulation where the timetable of services is defined, requiring users to sort through lengthy documents written a very formal and legal way, just to find very simple information. Tallinn, Estonia is an interesting example of email interaction, since it keeps the citizens well informed about the time that it will take to receive a full reply to their request (Box 7.7).

Box 7.7   Tallinn: Tallinn City Office Response

In Estonia, Tallinn the municipality responds to an email request with specific time indications regarding the expected answer. The expected time response depends on request type.

"Thank you for sending an email to lvpost@tallinnlv.ee. If your message is a request for information, we will answer within 5 business days. A request for information is a query for a document or documented information. If your message is sent as a memorandum or a request for explanation, we will answer within 30 days. A memorandum is an inquiry that makes a suggestion concerning administration or a forwarding of information. A request for information is an inquiry that requires analysis of existing information or the collection of further information."

Source: :
https://tallinn.ee/

The analysis reveals that, despite municipalities' strong performance in the provision of webpage content and in meeting most of the technical indicators embedded in the study's methodology, they are still lagging behind expectations in what refers to the areas of participation and engagement with citizens and services provision. At services provision level, there are already, many cities that provide information about services, as well as forms to be downloaded for their requests, but that still require in-person submission. Likewise, it was found that the responsiveness and quality of email usage by municipalities to interact with citizens are far from the desired levels.

7.4.   Using Local e-Government to Advance SDG implementation

Improving the local level of e-Government is inseparable from achieving the UN Sustainable Development Goals. The development of electronic services and the increase in the number of people participating in decision-making will drastically lead to achievement of the development Goals. It will assist in making cities sustainable, improving local communities, making them inclusive safe and resilient.

The 2030 Agenda for Sustainable Development recognises the important role of technological innovation and contains specific references to the need for high quality, timely, reliable and disaggregated data, including on Earth observation and geospatial information. Many of the Agenda's Sustainable Development Goals have targets that are directly or indirectly related to local e-government assessment indicators, what makes improvements in local e-Government assessment operate as a catalyst for the achievement of the SDGs.

Although most municipalities perform relatively well in the Technology criterion, there is room for improvement in portal design, so as to allow user configuration, content display in more than one language and improvement of user guidance in understanding and using online services. In this way, municipalities will satisfy target 1.4, on access to basic services, ensuring that all people have equal rights to access appropriate new technology, and SDG 9, which requires the building of resilient infrastructure, promotes inclusive and sustainable industrialisation and fosters innovation.

Information related to municipality budget and government procurement processes, provided by 75 per cent of the municipalities, satisfies target 1.4 ensuring that all men and women have equal rights to economic resources, as well as access to financial services.

Service provision in partnership with third parties such as civil society and the private sector, provided by half the sample, aligns with SDG 8, on the promotion of sustained, inclusive and sustainable economic growth, and full and productive employment and decent work for all, requests partnership

with the informal sector to improve working conditions and social protections. Also relevant is SDG 17, aimed at strengthening implementation means and revitalising the Global Partnership for Sustainable Development and encouraging partnerships between public bodies, the private sector and civil society in communities.

Improvement of free access to government online services through kiosks, community centres, post offices, libraries, public spaces or free Wi-Fi, provided by less than 75 per cent of the cities sampled, aligns with target 1.4, which seeks to ensure that all people have access to appropriate new technology, as well as target 9.1, on affordable and equitable access for all, development of quality, reliable, sustainable and resilient infrastructure. Similarly, relevant is target 9.C, on access to ICTs and the Internet, generally, as well as increasing universally and affordable access, especially in least developed countries (LDCs).

Provision of information on health issues, in most of the municipalities, contributes to achieving SDG 2, on ending hunger, achieving food security and improving nutrition, and promoting sustainable agriculture by identifying and tackling child malnutrition. Also significant is the municipality's role in connection with SDG 3, on ensuring healthy lives and promoting well-being for people of all ages.

In over 75 per cent of municipalities reviewed, the indicator on the provision of information about environmental issues is interlinked with the most SDGs. For example, the provision of information promotes targets 3.9, on reducing pollution and contamination, 6.3, on reducing pollution and increasing recycling and safe reuse, as well as SDG 7, on access to affordable, reliable, sustainable and modern energy for all; SDG 12, on sustainable consumption and production patterns; SDG 13, on urgent action to combat climate change and mitigate its impacts; SDG 14, on conserving and sustainably using the oceans, seas and marine resources for sustainable development; and SDG 15, on protecting, restoring and promoting the sustainable use of terrestrial ecosystems, the sustainable management of forests, combatting desertification, and halting and reversing land degradation and biodiversity loss.

Provision of information about educational issues, also present in over 75 per cent of the municipalities, advances SDG 4, on ensuring inclusive and equitable quality education and promoting lifelong learning opportunities for all. Similarly, 75 per cent of those studied on provision of information on social welfare issues, goes hand-in-hand with target 1.4, ensuring that all men and women, particularly the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership, control over land and other forms of property, inheritance, natural resources, appropriate new technology, and financial services including microfinance.

Support for participation and related issues, such as reporting of occurrences in public areas, participatory budgeting and the revision process of the territorial organisation of the municipality displays some gaps, as that is present in less than half the municipalities polled. Enhancing those indicators could improve SDG 16, on the promoting of peaceful and inclusive societies for sustainable development, provision of access to justice for all and the building of effective, accountable and inclusive institutions at all level, as well as participatory and representative decision-making.

Smart city initiatives and use of emergent technologies by the municipality, evident in about half those reviewed, aligns with SDGs 7 and 8. Personalised responses to citizen contact, available in less than half the municipalities, promotes SDG 16, especially targets 16.6, on effective, accountable and transparent institutions, 16.7, on responsive, inclusive, participatory and representative decision-making, and 16.10, on access to information, all of which are aimed at public access to information and protection of fundamental freedoms through national legislation and international agreements.

Enhancement of online service provision and online payments, available in half the municipalities, stands to improve targets 10.2, on empowering and promoting social, economic and political inclusion, and 10.3, on eliminating discriminatory laws, policies and practices, including by ensuring equal opportunity and reducing inequalities of outcome, through elimination of discriminatory laws, policies and practices and promotion of appropriate legislation, policies and actions.

Another area which needs improvement is e-participation, present in less than half the cities examined. Enhancing e-participation and including e-consultation in policymaking initiatives could contribute to target 10.2, on empowering and promoting the social, economic and political inclusion of all people. At the same time, target 10.3 can be advanced, on ensuring equal opportunity and reducing inequalities of outcome. Target 16.7 is also furthered by ensuring responsive, inclusive, participatory and representative decision making at all levels.

7.5. Conclusion

Local Online Service Index (LOSI) assessment has been applied in 40 municipalities worldwide. The results prove the overall suitability of the assessment approach. The present study reveals the main characteristics for a local e-Government assessment, which could be useful for municipality managers, public officials, researchers and politicians. An efficient comparative assessment of municipality electronic administration should cover the breadth and variety of services and tasks performed by local authorities. It should rely on an updated e-Government model including new trends in service delivery, such as user interactivity, citizens' participation, and proactivity. An assessment also should consider the service provision, not only through the web channel, but also through all the new digital channels currently in use, such as social media, kiosks, and mobile apps. It should also be based on the existence of a corpus of services that are common to municipalities worldwide, thereby setting a baseline for comparative assessment of municipalities, which examines similar services rather than similar organisations.

Based on the pilot study results and analysis, some lessons can be extracted:

- Local governments recognise the importance of e-Government in order to achieve sustainability and resilience;

- Generally, cities in countries with very-high and high e-Government Development Index (EGDI) values perform better than the others;

- 42.5 per cent of the cities got a LOSI classification less than the one assigned to their countries, as per the UN 2018 OSI;

- Despite municipalities' sound performance in webpage content provision to citizens and meeting most of the technical indicators considered in the methodology adopted, they are lagging behind in terms of what could be expected and what could be achieved, with the universal participation and engagement of all citizens and particularly in services provision;

- There are already many cities that provide information about services, as well as downloadable forms for their requests, but that still requires in-person submission and process triggering;

- The responsiveness and quality of email usage by municipalities, when interacting with citizens, are far from anticipated levels;

- E-Government systems can become a useful tool for local administration in line with achievement of the SDGs;

- There are already several best practice e-Government cases that can be used as benchmarks for local governments worldwide.

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21   In order to examine responsiveness to citizen requests, an email is sent to the municipality. Email responses are recorded based on the time it took for the agency to respond, as well as based on the quality of response provided (i.e., if the reply effectively responds to citizen request).

22   Note: for details please refer to: http://data.un.org/Data.aspx?d=POP&f=tableCode%3A240

Chapter 8. Fast-evolving technologies in e-government: Government Platforms, Artificial Intelligence and People

Photo credit: pixabay.com

8.1. Introduction

As public institutions focus on the implementation of Agenda 2030 with the core principles of leaving no one behind and eradicating poverty, frontier technologies are creating both opportunities and risks for future governance.

The fourth industrial revolution and convergence of innovative technologies, such as big data, Internet of Things (IoT), cloud and super-computing, geo-spatial data and broadband, artificial intelligence (AI), and deep machine learning, are promoting a dramatic shift towards more data and machine-driven societies, while development challenges and social inequality continue to increase. So-called disruptive technologies, including predictive analytics, are creating unforeseen opportunities in many government sectors, including health, security, water management, environment, among others. The rapidity with which these new technologies are evolving, combined with the knowledge that governments already possess, present a historic opportunity for sustainable development.

However, the pace and evolution of technological innovation can surpass the speed with which governments can absorb changes and reap their rewards. In the past decade, there have been ground-breaking technological advances, such as the economy app, blockchain, and facial recognition via simple smart phones, to name a few. Apart from the need for governments to catch up is the need to ensure that the new data tools are not concentrated in the hands of a few but are equitably distributed. A sufficient balance which serves the needs of many for the greater good is required. Thus, the process of integrating the new data tools could benefit from constant review and an incremental approach.

The accelerated speed of innovation and the integration of technology into all devices and all sectors are equally disrupting the public sector. Models governing the design and consumption of public services are evolving. Beyond digital transformation, governments themselves are increasingly called upon to evolve as well. Indeed, the degree to which technology is disrupting society on the one hand and supporting it on the other is unknown. The use of these fast-evolving technologies in

In this chapter

e-government also raises the question whether and to what extent they are being used by members of society to generate the greatest impact. The interface between government and society reinforces the widely held belief that the use of new technologies by governments can support the realization of society's broader goals.

This chapter examines several fast-evolving technologies, the e-government application of which, can be instrumental in promoting good governance principles and achieving the sustainable development goals. It also ponders present and future challenges and hypothesizes that the success of e-governance lay in leveraging and balancing the extraordinary new platforms with society's needs.

8.2.   Harnessing fast evolving technologies

There is a case to be made that fast-evolving technologies have already transformed the traditional ways in which governments operate and deliver services. In the context of e-government, this chapter focuses on digital technologies, excluding but not discounting innovations in the fields of energy, biology, health and other domains. Some of the major digital technology trends fuelling innovation and growth in both the private and public sectors are mainly related to digital, analytics, cloud, core modernization, and the changing role of information and communications technologies overall. Social and mobile technologies, open data initiatives, and Internet of Things (IoT) also play an important role in transforming government efforts. Constituent engagement also drives transformation, both in service delivery and operational efficiency.

Several rapidly advancing technologies have great potential, both for the ICTs industry as well as for governments around the world, include:

- Data, intelligent apps and analytics

- Artificial Intelligence and Robotic Process Automation

- Intelligent "things", cyber-physical integration and edge computing

- Virtual and augmented reality

- High Performance- and Quantum Computing

- Blockchain and Distributed Ledger Technologies

A combination of the fruition of long-term research and development are among the forces driving these technologies. Artificial Intelligence, for example, has been around since the 1950s, but its use today by businesses and individuals has increased exponentially. That is due in part to the growing processing power of hardware, increasing data availability, and the needs and expectations of society. Often, the technologies themselves are not new. Rather it is the convergence of developments in hardware, software and data availability that offer new potentials.

8.2.1.   Data, intelligent apps and analytics

The public sector has the challenge of processing vast amounts of unstructured data, responding to inquiries, and making knowledge accessible. Through automated capabilities, so-called dark analytics, or the analysis of data that is not in common use, can allocate, store, secure, and retrieve vital data on demand, from such sources as documents, e-mails, tickets, videos, and tweets. Algorithms,

following a form recognition protocol, can read machine print and hand print, and use contextual logic databases for automated validation. This can reveal trends, population movements, user preferences, demographics, transportation details, and more. User trends can then be analyzed to improve customer service. Decision-making in such areas as migration can be made more transparent and targeted, and have profound impacts.

Intelligent apps and platforms are already being used to make correspondence and customer service of public institutions quicker and more effective, as well as less costly. They also support the process of digital payments and help manage information flows and reporting. Moreover, applying analytics frees human resources and reduces costs by speeding up data capture, recognition, and retrieval. This increased capacity allows greater focus on improving the "customer journey".

Data analytics can be the link between public and private institutions. Open public data can be used to fuel private sector innovations, but likewise, private sector data can support new and better public services. Technological developments and information sharing between governments and private stakeholders can benefit such vital areas as national security, health care, social and financial services, transportation, and public safety. Together with artificial intelligence and automated processes, data science are key drivers in technology-induced transformation.

8.2.2. Artificial Intelligence and Robotic Process Automation

Artificial Intelligence constitutes a range of specific technologies through which "intelligent machines are gaining the ability to learn, improve and make calculated decisions in ways that enable them to perform tasks previously thought to rely solely on human experience, creativity, and ingenuity".[1] Artificial Intelligence is the ability of a computer or a computer-enabled robotic system to process information and produce outcomes in a manner similar to the thought process of human beings in learning, decision-making and problem-solving. Artificial Intelligence has been rapidly advancing and will provide benefits through enhancing citizen engagement, automating workloads, and increasing workplace productivity. It will thus significantly impact businesses, societies and the daily lives of their members.

The confluence of significant technological developments in hardware, software and data has fuelled the development of Artificial Intelligence, positioning it to have a major impact on society for the coming decades. The speed of improvements in processing power has continued apace. Graphics processing units, which are specialized hardware that can run specialized algorithms, play a key role in Artificial Intelligence. New software has been developed that can leverage this processing power by leading to faster and better learning. Data – the crucial ingredient for Artificial Intelligence – is also increasingly available, fuelling the learning process of computers. This can significantly benefit the public sector, for example, in automating decision-making of routine tasks, forecasting climate change, answering questions from citizens and managing transport flows. Another change is access to large cloud computing platforms such as AWS, Google, and Microsoft, among others, and the advent of quantum computing, which is a vastly different approach.

8.2.3. Intelligent "things", Cyber-Physical Integration and Edge Computing

Intelligent things are an evolution of the Internet of Things (IoT) whereby physical objects with sensors are connected to a network, and can function almost autonomously by using artificial intelligence. By linking software and IT/cyber) with electric and mechanical or physical parts, data can be monitored and analysed over a communication network. Often, sensors simply gather data that is processed centrally in the cloud. That information is subsequently sent to the location where it is needed. With Edge Computing, data is processed at the point of collection or at the "edge"

instead of inon a central server. This reduces latency and the amount of data that must be moved. With an increasing number of IoT devices, a mix of on-site and cloud processing will be needed. The idea itself is not new. To take a simple example to visualise this, windshield wipers on cars get their information from sensors in the vehicle. The car does not need to send rainfall data to a cloud to get back the information on which action is needed. The data is directly analysed and action is immediately taken. This concept is now being applied to more complex situations and implemented in a network of private and government infrastructures. Using this form of computing, autonomous driving, smart homes, and smart grids are made possible.

In public institutions, hybrid combinations of Cloud and Edge Computing can serve as platforms where sensors are combined to support customer relationship management, enterprise resource planning and supply chain systems.[2] For example, equipping roads and snowploughs with sensors, combined with data from weather and driving apps and tweets, improves snow removal, cuts costs by 10 per cent and frees up human and government resources.[3]

8.2.4. Virtual and Augmented Reality

Virtual Reality (VR) enables users to immerse themselves in a digital world. Augmented Reality (AR) shows the world in real time enriched with digital images, and digital and physical objects interact. With augmented and virtual reality and intelligent things, information is added to the space around the user. This helps the user in processing critical information, visualizing scenarios, improving the quality and speed of decision-making, and communicating with others. Examples of application of augmented reality in the public sector can include public infrastructure management and spatial planning, public safety services (such as firefighting), transportation management and tourism.

The World Economic Forum in 2017 stressed the potential: "AR serves as the visual portal to data across the public and private sectors"[4]. In health care, tele-health formats can be supported by virtual examinations that can improve customer satisfaction and result in treatment success. In the area of defence, AR can help soldiers to see and hear under all conditions. Commanders can communicate more efficiently and make more educated decisions, based on first-hand information and their assessment of the situation. With virtual reality tours of buildings and surroundings, wheelchair access can be checked and planned, benefitting persons with disabilities and their caregivers. With hands-free AR devices, maintenance workers can see exactly which action to perform next with guidance from technical experts and supervisors. Augmented Reality also can be effective in training and education, such as by highlighting cultural artefacts or ecological phenomena while providing information about their appropriate use.

Virtual and Augmented Reality technologies are being used increasingly by governments to streamline processes and improve constituent experience. Some of the early adopters were the military, law enforcement and national security agencies. These technologies deliver context, immersion and have the potential to retool training environments, redefine the role of field service workers, improve communication, and reshape public sector business processes. Technological improvements, such as the digital twin concept, which is a cloud-based virtual representation of a physical asset, also are being adopted. Such innovations have the potential to redefine markets, industries and societies.

8.2.5. High Performance- and Quantum Computing

By 2020, 25 billion connected devices will generate more than two zettabyte annual data traffic.[5] By then, High Performance Computers or "supercomputers" executing 1 trillion operations per second will be needed to cope with the massive amount of data. By aggregating computing power, large amounts of data can be processed, thereby solving complex problems in engineering, manufacturing,

science and business. High Performance Computing can cut through complexity, understand patterns and detect anomalies. By processing highly complex data with accuracy, such tools are especially useful in forecasting and real-time-prediction. The potential benefits for the public sector can be vast in such areas as combating disease, forecasting and managing traffic flows, monitoring climate conditions, and allocating tax revenues. High Performance Computers can accelerate science and innovation to solve questions that were previously too complex to tackle. Given the high investment in their use, cooperation between public and private actors is beneficial.

Quantum computing, as opposed to regular computing, leverages the laws of nature to process information in a different way. It can compute for different resultsresults simultaneously, thus increasing computing power exponentially. This allows for discovery of relationships between data that otherwise would not have been possible, leading to improvements in health care, climate change monitoring and managing logistical challenges.

Both high performance computing and quantum computing can help process the vast amount of available data faster, paving the way for new insights into ways to overcome obstacles to achieving sustainable development. Combined with new algorithms in the field of Artificial Intelligence, the potential for its use in tackling the challenges of the 2030 Agenda is significant but have yet to be fully exploited by the public sector.

8.2.6. Distributed Ledger Technologies

Distributed Ledger Technologies are ways of storing information in a distributed manner across numerous actors. Instead of information being stored in one central database, it is stored in several locations among multiple actors. Blockchain is a well-known example of a form of Distributed Ledger Technology where value exchange transactions are sequentially grouped into blocks. Each block is chained to the previous one and immutably recorded across a peer-to-peer network using cryptographic trust and assurance mechanisms. Identified as a game-changing technology, Blockchain has the potential to solve such problems as those related to control over information and access, as well as security and privacy of data with a high degree of sensitivity. Given its decentralised nature, blockchain holds the potential to become the ledger for creating decentralized data management systems that ensure users full control over their data. Blockchain is already being used for, among other things, land registries, speeding up registration processes andreducing possibilities for fraud and corruption.[6] These benefits can augment the building of resilient societies in the context of achieving SDGs, by keeping track of data across various activities and actors, authenticating and guaranteeing the execution of tasks, and enabling the emergence of more transparent and accountable governments. Blockchain solutions can even facilitate cash transfers in refugee camps, identify Stateless refugees or register Global Conservation areas.[7]

Distributed Ledger Technologies benefit the public sector in certifying identities, establishing trust, exchanging assets between parties across borders, and sealing digital contracts. Payment and authentication processes can be made more convenient for citizens and can include parties that are currently outside the traditional financial system.[8] Governments in emerging markets are supporting Blockchain, hoping to create an advantage for the population and economy in ways that facilitate development and growth.[9]

The key game-changing innovation of Distributed Ledger Technology is decentralized trust and traceability of information. It allows for more efficient handling of information, and greater security, because the ledgers cannot be tampered with. The holonic architecture of Distributed Ledger Technologies also means scalability issues can be solved logically and transparently.

The advantages of Blockchain over traditional centralized databases are that it can offer resilience in cases where central databases are difficult to secure. It also distributes management of the ledger, increasing trust in it by not centralizing its management in the hands of more actors. This does however require a large peer-to-peer network to resist manipulation of the blockchain. Having only a small number of nodes can increase the likelihood of the blockchain being compromised. To increase the size of the peer-to-peer network also means that there should also be an incentive to do so. In commercial applications such as cryptocurrencies, those incentives are financial. For public services, alternative incentives should be devised. Advances in computing also present a possible risk to the cryptography, technology that Blockchain currently relies on. It is thus crucial to consider security in any application. Additionally, while decentralizing data offers many advantages, it also creates an increasingly complex network that must communicate and validate information constantly, resulting in an exponential increase in energy consumption.

Blockchain has potential public sector application for record management, identity management, voting, taxes and remittances, and even Blockchain-enabled regulatory reporting. A proof of concept was developed, for example, in Ireland.[10] Blockchain can equally be used to better manage development aid by enhancing security and transparency, as well as making international payments more accessible and easier to monitor. In that regard, multiple pilot projects have been launched, such as by the World Food Programme in Jordan,[11] and in connection with banking services for refugees in Indonesia.[12]

UNECE's United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT), which has played a fundamentally important role in the development, promotion and implementation of trade facilitation, is following the Blockchain developments closely and working to help governments understand and use their potential. (See Box. 8.1)

Box 8.1.   United Nations Economic Commission for Europe (UNECE) : whitepapers on Blockchain

UNECE's United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT) is developing two white papers to address the following questions: What is the impact on existing UN/CEFACT electronic business standards and what gaps could be usefully addressed by new UN/CEFACT specifications? What opportunities do these technologies present for improving e-business, trade facilitation and the international supply chain? The second whitepaper on the opportunities for trade facilitation and e-commerce will be available for comment this autumn. How could blockchain technology be used to facilitate trade? What do government decision-makers who deal with information technology need to be aware of? And how could UNECE contribute to the development of this technology as a trade facilitation tool? The international supply chain can be characterised as a set of three flows - of goods, funds and data. Goods flow from exporter to importer in return for funds that flow in the reverse direction. The flow of goods and funds is supported by a bidirectional flow of data such as invoices, shipping notices, bills of lading, certificates of origin and import/export declarations lodged with regulatory authorities. At the same time, an essential requirement for each of these flows is trust. Where there is no trust at all, there will be no flow of goods, funds and related data. Establishing the minimum level of trustworthiness for carrying out trade can be done in a number of ways. Reducing the delays and costs created by the use of trust services has been one of the focuses of trade facilitation which seeks to increase the transparency and efficiency of international trade processes. At the same time, business, legal and other constraints have limited the ability of trade facilitation measures to reduce the costs and delays created by trust services. Today, "blockchain", or Digital Ledger Technology (DLT), has the potential to provide the trustworthiness that traders need, at a much lower cost and using fewer trust guarantors."

Source: UNECE

8.3.   Deep Dive into a cluster of new technology revolving around data

Data is becoming critical to many government organizations and will fuel the development of new e-government services.[13] Digital data is defined as "a reinterpretable representation of information in a formalised manner, suitable for communication, interpretation or processing", which is authored by people or generated by machines/sensors, often as a by-product.[14] See table 8.1 for further definitions.

Data is useless if it is not processed and analysed, delivering insights, which are leveraged for better decision-making and the development new products and services.[15,16]

Table 8.1.   Definitions

- Algorithms are a set of step-based instructions to solve mathematical problems that are used to query and analyse data. The Algorithm Economy is an emerging concept describing the increasing amount of data analytics performed by economic operators, aimed at tailoring their services and products.

- APIs or Application Programming Interfaces are interfaces for technology products that allow software components to communicate. The Internet of Things has substantially unleashed the volume of machine-to-machine communication.

- Big Data has been coined to describe the exponential growth and availability of data, both structured and unstructured and is defined by 3 V's: Volume, Velocity and Variety.[17]

- Data science is the study of the generalised extraction of knowledge from data by employing machine learning, predictive and prescriptive methodologies, thereby creating direct value on an experimental and ad-hoc basis.

- IoT is the use of interconnected sensors and controls that help gather and analyse data about the environment, the objects that exist within it and the people that act within it, to improve understanding and automate previously manual processes.

- Open Data is information that is open in terms of access, redistribution, reuse, absence of technological restriction, attribution, integrity, no discrimination.[18]

- Open Government Data is data produced or commissioned by public bodies or government-controlled entities, which is then made accessible, and can be used feely, reused and redistributed by anyone.[19]

8.3.1.   Integrating government services – public service as a platform

Taking advantage of the data economy and the data that governments already possess can allow for a much greater integration of services. Such digital transformation is based on a data infrastructure which can either be centralized or decentralized, and rely on two fundamental components. The first concerns the re-use of data already collected from the citizens; the second revolves around the use of Application Programming Interfaces (API) as a core component of the public-sector data infrastructure.

One-time provision of data: Governments making better use of data

With digital technology, public administrations can easily retrieve data and limit the number of user requests the data may address. Citizens in turn have the right to modify and/or delete the data and be informed as to how and where the data is being used, in line with data protection regulation.

In the Europe Union, a number of initiatives have been launched around the "Once Only Principle", which aims to streamline the use of authentic data sources and foster machine-to- machine communication across the different IT systems of various public bodies. That approach is expected to generate a total net savings of approximately 5 billion euros per year[20] across the Union. Additional benefits[21] include: (i) ensuring better control of data as the data is only provided once, which reduces errors and discrepancies; (ii) helping public administrations work faster, more transparently and more efficiently, thereby saving costs; (iii) reducing fraud through the use of consistent and authoritative information; and (iv) making evidence-based decisions through the use of complete and consistent information.

Use of Application Programming Interfaces, and their ability to securely connect applications across government and support the development of new services

Moving towards API-based information systems can improve the efficiency of business operations by providing stronger integration between the organizational value chain and partners such as suppliers and national public administrations. APIs are the connecting links between applications, systems, databases and devices.[22] Accessing data already collected by public administrations allows the use of an internal API to improve public services. Based on their access rights, public administrations can retrieve the data they need, such as an address, a profession, or a social security number.[23]

Several countries, such as Estonia and Finland, along with New South Wales in Australia are using APIs to strengthen government platforms and turn governments into fully integrated one-stop-shops.[24] In Singapore, the Land Authority saved $11.5 million in application costs for 70 government agencies through geospatial data-sharing through the GeoSpace's APIs and Web services. Machine-to-machine access among data-enabled agencies make it possible to adjust applications 30 per cent faster and cut storage costs by 60 per cent. It also eliminates data duplication.[25] There are several instances of non-government API use as well.   The De Waag Society in the Netherlands, for example, uses API for smart cities and the preservation of cultural heritage data. Setting up public or so-called open APIs can also stimulate businesses and civil society to develop new services that address areas that may not fall under the direct competence of the government. Box 8.1 further explores Government as an API.

Box 8.2.   Government as an API

Estonia created X-Road,[26] an application network for exchanging data among agency systems so that all government services are effectively available in one spot. In addition to offering querying mechanisms across multiple databases and supporting the secure exchange of documents, X-Road seamlessly integrates different government portals and applications.

The private sector can also connect with X-Road to make queries and benefit from access to a secure data exchange layer.[27]

X-Road has made it possible to bring 99 per cent of public services online. On average, 500 million queries per year are made annually using X-Road. Indeed, its use has been estimated to save as many as 800 years of working time. The solution has been equally successful in its roll-out to Finland, Azerbaijan, Namibia, as well as the Faroe Islands. Furthermore, cross-border digital data exchanges have been set up between Estonia and Finland, making X-Road the first cross-border data exchange platform.

Source: https://e-estonia.com/solutions/interoperability-services/x-road/

8.3.2. Insights for decision-making and intelligence at the point of action

Data analysis can bring unprecedented insight. Governments are able to take advantage of the data revolution by making use of insights gained through data analytics as well as formulating their response at the point and time of action.[28] As shown in the *2018 United Nations E-Government Survey* as well as in other international benchmarks and indicators, governments have been increasing their efforts to publish open data.[29] This reinforces the drive to align with good governance principles, and underlines the economic and societal benefits governments can expect from open data. Going beyond data publishing, governments are starting to understand the benefits of re-using their own data more efficiently and effectively. As highlighted in the report on Open Data Maturity in Europe 2017, 19 European countries are now using open data in their decision-making. Successes range from better urban planning, thanks to the systematic use of geospatial data in Denmark, to efficiency in public procurement spending in Slovenia. These examples are not limited only to Europe. The use of open data assisted in the formulation of solutions to eliminate or reduce air pollution in Mexico City, for which it received an award at the Data for Climate Action Challenge (D4CA)[30] Australia has been exploring ways to improve data sharing for more efficient research[31] and has renewed its commitment to open data by signing the Open Data Charter in April 2017.[32]

8.3.3. Insights and Data-Driven decision-making in the public sector

Although evidence-based policy-making is not a novel concept, the growth in the volume of data sources as well as in analytics tools, present an opportunity to deliver better informed policy-making. It also has the potential to accelerate data collection, thereby reducing the time spent on policy cycles and iterations. Analyses performed on the data collected can equally be refined.

Algorithms are another useful tool, as they drive digital innovation and redefine the approach to technologies, leadership and execution.[33] Algorithms can determine information flows and influence public-interest decisions, which, until recently, were handled exclusively by human beings. Data analytics also witnessed a shift from sample focus groups to exhaustive analysis or 'real' demand which is increasingly recognised as limiting the bias of statistics and forecast inaccuracy. Taking advantage of Big Data in the public sector also implies expanding the data pool of public-sector information and statistics to include new data sources stemming from the digital economy. These sources include mobile data, Internet of Things, and social media, among others. Finally, data held by private entities such as in the health and financial sectors, as well as eCommerce platforms could also aid policy-making.

Data-driven decision making can be applied in different areas of the public sector. For example, in Latvia, insolvency data is used to plan policies or support operations in both the public and private sector[34]. In the health sector in France, as part of the implementation of the national deployment of telemedicine strategy, the French Ministry of Health has been implementing a data-driven approach to manage acute stroke.[35] It combines data on the distribution of population using census data and the distribution of geographical location of health facilities in the area. Box 8.2. on the Global Pulse Initiative, 2009, underlines how data has been used bu the UN in the context of the SDGs.

To provide a practical illustration for the above, typical applications of data-driven insight for the public sector can advance the following goals, among others:

• SDG 3 on ensuring lives and promoting well-being by developing health-care systems which detect epidemics in their early stages, compile diagnostics, analyse prescription drug use and improve access to medications at the right time and in the right place. This has been witnessed successfully during the ebola outbreak. Further research is currently conducted on monitoring the spread of mosquitoe borne disease.

- SDG 8 on decent work and economic growth by adopting a more prospective vision of the employment market based on the use of professional social networks and job boards. The idea is to enhance Machine Learning engine tools so as to match job offers with job applications.

- SDG 14 on the conservation and sustainable use of oceans by such projects as Life Below Water & Resource management. One example is the Global Fishing Watch[36] prototype, developed by Oceana, Google and Skytruth, which combines data gleaned from scanning behavioural patterns of vessels, in order to identify which are potential fishing vessels and which are not.

- SDG 16 on peace, justice and strong institutions by offering enhanced analyses in support of security, combatting crime, and fraud prevention. Data mining techniques, for instance, can drive the analysis of large amounts of text and evidence to support the structuring of evidence in court cases.

The challenges in implementing data-driven and insights-based policy-making are further developed in section 8.5.

Box 8.3.   Global Pulse Initiative, 2009[37]

Global Pulse is a flagship initiative of the United Nations Secretary-General on big data. Its vision is a future in which big data is harnessed safely and responsibly as a public good. Its mission is to accelerate discovery, development and scaled adoption of big data innovation for sustainable development and humanitarian action. The initiative was established based on a recognition that digital data offers the opportunity to gain a better understanding of changes in human well-being, and to get real-time feedback on how well policy responses are working. To this end, Global Pulse is working to promote awareness of the opportunities Big Data presents for sustainable development and humanitarian action, forge public-private data sharing partnerships, generate high-impact analytical tools and approaches through its network of Pulse Labs, and drive broad adoption of useful innovations across the UN System.

Source:http://unglobalpulse.org/

8.3.4. Insights at the time and point of action: streamlining the use of real-time data

Sensors monitoring traffic, air pollution, energy consumption, among other things, combined with increasing mobile data, are making real-time data available. The benefit of real-time data is its ability to prompt action at very specific locations, as described in Chapter 3. Real-time data, for instance, was used to find housing solutions for victims of natural disasters, such as in the aftermath of the earthquake in Emilia Romagna, Italy.[38] Rapid mobile phone-based surveys were deployed by the Red Cross to complement traditional communication methods, which shaped the response during the critical first days of the Ebola outbreaks in Sierra Leone, Benin, Guinea and Cote d'Ivoire.[39]

The United Nations Food and Agriculture Organisation (FAO) has developed a Water Productivity Open-access portal, known as WaPOR, which uses real-time satellite data to monitor water productivity. That real-time data allows farmers to optimise the use of water in their irrigation systems, rendering a more reliable crop yield.[40] Also notable is the use of real-time data in Slovenia to protect vineyards from pests. Singapore has announced its intention to make port management more efficient with the use of drones capable of capturing real-time data, data analytics as well as mobile applications.[41] These are just a few of the examples of real-time satellite data use.

Box 8.4. Streamlining the use of Earth Observation

The use of Earth Observation data and Geographic Information Systems (GIS) has already been underlined in the *2016 United Nations E-Government Survey* as a promising technology for improving service delivery. With an increase in the availability of satellite data worldwide, thanks to NASA's Earth Observing system[42] and the European multi-stakeholder Copernicus programme,[43] data, and the insights gleaned from it, can be delivered more rapidly. Indeed, the different applications of satellite data, be it GPS or Earth Observation data, have a specific shelf value. Satellite revisit times have proven critical in providing supporting data in the context of wildfires in the United States,[44] Australia and Italy,[45] Initiatives are growing across the globe addressing multiple environmental issues. The Satellite-based Wetland Observation Service (SWOS), for example, makes use of Earth Observation data, which enables large-scale dynamic monitoring of the evolution of the wetlands in Europe, Africa and Asia[46]. Farming by satellite is another advantage of Earth Observation data, which can assist in monitoring crops such as rice.[47] In June 2018, to drive innovation leveraging Earth Observation data, the EU has launched the Data Infrastructure Access Services (DIAS) providing access to data, cloud services as well as data tools and professional support services.[48]

Source: http://swos-service.eu/
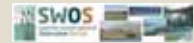
Data use is expected to grow exponentially in the next decade and offer the ability to systematically analyze and act in real time to solve more challenging business problems, enhance competitive advantage and lead to more informed decisions in today's tightly connected world.

8.4. Deep dive into a cluster of new technology revolving around AI and Robotics

The term "Artificial Intelligence", or AI, has been around for nearly 60 years, but it is only recently that AI appears to be on the brink of revolutionizing industries as diverse as health care, law, journalism, aerospace, and manufacturing, with the potential to profoundly affect how people live, work, and play.

AI can be mono- or multi-layered, performing simple automated tasks to highly advanced automation. While robotic process automation enables machines to do repetitive and rules-based work, AI enables robots to do judgment-based processing, such as thinking and learning (machine intelligence) and even making decisions (synthetic, computer-based AI).[49] Robots can appear in the shape of cyber-physical systems, imitating humans. These systems perform tangible work linked to the physical world, such as supporting the elderly, treating patients, and even harvesting fields and manufacturing cars.[50] Robots can also appear formless like virtual assistance on websites, apps, and platforms. By automating responses to matters that arise most frequently, employees can focus on more complex inquiries. The benefits lay in greater capacity, efficiency, service quality, and accuracy. A recent policy inat the European Union level is further illustrated inwithin Box 8.4. Europe rolls out an integrated approach to Artificial Intelligence.

Box 8.5.   Europe rolls out an integrated approach to Artificial Intelligence

Source: http://ec.europa.eu

In April 2018, the European Union chose to pool its resources to foster innovation through the use of artificial intelligence. The Declaration[51] signed by European countries aims to ensure a sustainable vision for AI to thrive, by collectively addressing ethical and societal challenges linked to its growing and pervasive use. This states "where needed [to] review and modernise national policies to ensure that the opportunities arising from AI are seized and the emerging challenges are addressed." The European approach is based on three pillars.[52]   The first foresees an increase in financial support, to reach 20 billion Euros by 2020, thereby promoting the uptake of AI in both the public and the private sector. The second pillar is based on ensuring framework conditions for socio-economic success. Actions here aim at accompanying the transition of the labour market by modernizing education and training. The third pillar addresses the development of an adequate ethical and legal framework. The first series of draft guidelines is expected by the end of 2018 and will build upon the Union's Charter of Fundamental Rights[53].

AI has the potential to bring many societal benefits. It can impact all sectors and industries, with the ability to improve mobility, mortality rates, education, hygiene, food provision and supply, and decrease emissions, crime, and human error. Robotic automation is slowly assuming repetitive tasks previously done by low-paid workers, although low-paid tasks are less likely to be replaced by expensive robots, at least, not in the short term.[54]

Still, AI is expected to displace many low-skilled workers. Robots already perform many jobs on the assembly line, and that trend is expected to increase. According to a World Economic Forum study in 2016, around 5.1 million jobs across 15 countries are expected to be lost to Artificial Intelligence over the next five years alone. A study by the United Nations Department of Economic and Social Affairs found that up to 80 per cent of all existing jobs could be at risk of being automated in the long run.[55]

Although many tasks can be automated, there are still numerous challenges to be addressed, including ethical considerations, social acceptance and economic aspects. Some decisions cannot be left entirely to machines. Human beings can consider unique circumstances when making decisions, which artificial intelligence may never be able to do. Data privacy and security concerns must also be carefully considered. In designing AI solutions, preventing external attacks, anomalies and cyber-attacks must be addressed. Ethical issues, ranging from preventing discrimination and biases to aligning AI systems with respective applications should also be considered. AI development requires the involvement of experts from multi-disciplinary fields such as computer science, social and behavioral sciences, ethics, biomedical science, psychology, economics, law and policy research. This has been the case, as illustrated in Box 8.5 during the AI for Good Global Summit.

Box 8.6.   AI for Good Global Summit[56]

The AI for Good series is the leading United Nations platform for dialogue on beneficial AI. The Summit is organized by ITU in partnership with the XPRIZE Foundation, the Association for Computing Machinery (ACM) and 32 sister United Nations Agencies. The AI for Good series aims to ensure that AI accelerates progress towards the achievement of the United Nations sustainable development goals. The AI for Good Global Summit in June 2017 was the first event to launch inclusive global dialogue on the actions necessary to ensure that AI benefits humanity. The action-oriented 2018 Summit identified AI applications capable of improving the quality and sustainability of life on the planet. The Summit also formulated strategies to ensure trusted, safe and inclusive development of AI technologies and equitable access to their benefits.

Source:https://www.itu.int/en/ITU-T/AI/2018/Pages/default.aspx

8.5.   Harnessing technology for societal resilience

The Internet and the development of ICTs have enabled governments to reduce administrative burdens as well as reorganise their services, from design to delivery. Nonetheless, harnessing fast-evolving technologies poses a number of challenges for governments. Whereas technology is a tool, people are key in driving the development of innovative services and products. The pervasive nature of technology calls for more symmetry across the different operators and users. Ethical questions also must be addressed.

8.5.1.   People and Technology driving new uses and new services

Complex emerging crises herald deep changes in how people live together on the planet. The more people are implicated in the management of these changes the better they can be catalysed to change negative behaviours. However, carrots and not sticks are required in order to productively engage populations. Europeans with their "Open Innovation 2.0[57]" and the Japanese "Ba" approach, (see Box 8.6), highlight the need for change in innovation policy in the coming decades if technology is to play a constructive role in development. That requires deep collaboration between the Information Technology community and society at large. On its own, purely technological advances devoid of context can and often do drive unsustainable material consumption and exploitation. Hence, the broader societal challenge is to create the conditions for sustainable and resilient socio-economic shifts. Increased flexibility in decision making systems will be needed to allow for different perspectives to emerge, in order to challenge the linear extrapolation of the past when seeking new solutions. This in turn requires out-of-the-box thinking and large-scale experimentation to assess impact in real world settings.

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Box 8.7.   Process innovation insight

Source: https://ec.europa.eu/digital-single-market/en

The European approach to a modern innovation policy is based on the Open Innovation 2.0 paradigm characterised by citizen participation and prototyping approaches to socio-technical challenges in real world settings.

Similarly, the Japan Innovation Network (JIN)[58] is driven by Professor Ikujiro Nonaka's ideas on "Ba" – a place for deep interaction and wisdom sharing among stakeholders to create common value. JIN acts as an innovation accelerator, fostering both creativity and productivity.

They are recognised as two descriptions of one key component in modern innovation ecosystem thinking: deep collaboration.

Source: https://ji-network.org/en/

E-government at its core can enable better interaction within the entire society, leading to socially sustainable and acceptable solutions to complex societal issues. Key to balancing the inevitable techno-societal transformation is the creation of a safety net. "There is a need for better balance between short-term economic gain on the one side and ground-breaking research by the universities of science and technology that tackle grand societal challenges on the other."[59] In achieving societal resilience, access to high-speed Internet is key – everyone should be included in the digital economy. This point has been underscored in numerous digital for development initiatives launched by the United Nations and the European Union.

With the rise of new technologies comes the fear of unemployment, which creates anxiety and perceived insecurity.[60] Artificial Intelligence, in particular, may thwart human interaction for certain processes, as new demands and functions arise. History has indeed shown that machines can replace humans, but many experts agree that they can also create new functions for human beings, albeit, equipped with a different skill set. [61] AI will not be an exception. [62]

Artificial Intelligence and related issues - from big data to artificial vision - have been in fashion for several years. At the same time, AI algorithm and technology experiments span multiple sectors of the economy and society, from finance to medicine. Nowadays, AI techniques and the immeasurable storage and processing capacity of modern data centres make it possible to analyze signals and images collected by modern biomedical instruments. For example, in case studies on the early diagnosis of neurodegenerative diseases using non-invasive MRI to focus on the visual or automatic analysis of particular anatomical districts, such as, for example, the hippocampus in the case of Alzheimer's disease, AI can identify changes in the brains of people likely to get Alzheimer's disease almost a decade before doctors can diagnose the disease from symptoms alone. (See box 8.7.)

Box 8.8.   AI and deep machine learning for early diagnosis of brain diseases

A team of researchers at the Physics Department of the Bari University in Italy and the local branch of the National Institute of Nuclear Physics has developed a novel brain connectivity model to reveal early signs of Parkinson's disease in T1-weighted Magnetic Resonance Imaging scans. The same group reported the possibility to detect Alzheimer's disease with analogous techniques just a year ago.

Parkinson's disease is the most common neurological disorder, after Alzheimer's disease, and is characterized by a long so-called prodromal or early phase lasting up to 20 years. The Italian research team lead by Prof. Bellotti has developed a novel approach using complex networks based on the publicly available Parkinson's Progressive Markers Initiative (PPMI) database, a mixed cohort including 169 healthy controls and 374 Parkinson patients. In particular, their analyses allowed the detection of the disease in subjects reported within the prodromal phase: accordingly, when tremor symptoms are yet to appear. The algorithm reported a classification accuracy of 93 per cent,% and these results were cross-validated hundreds of times to grant the statistical robustness of the results.

The physicists of the Bari Medical Physics Group[63] have developed cross-disciplinary research approaches and big data techniques with clinical purposes. The team was awarded by Harvard Medical School for the development of an accurate machine learning tool for schizophrenia diagnosis. These big data analyses, usually computational intensive, are performed thanks to the ReCaS computer facility.

Source: https://www.recas-bari.it/index.php/it/) .

Space science and technology are always at the forefront of human development as they help to break barriers. Through research and innovation, spin-offs stemming from our efforts in space impact virtually all fields of human activities. Utilizing the frontier technologies in outer space has also offered us new insights, knowledge and understanding of the functioning of our planet and its four interconnected spheres: lithosphere, hydrosphere, biosphere, and atmosphere. Space technologies have an impact on almost all aspects of development and the United Nations promote the utilization of space science and technology for sustainable economic and social development. Space is an invaluable tool that can help the UN in achieving the goals and targets of the 2030 Agenda for Sustainable Development and its 17 SDGs. Nearly 40% of the SDG indicators underpinning the goals are reliant on the use space science and technology. The SDGs provide an additional framework for the work of United Nations (See Box. 8.8) as it employs new, more holistic and tangible approaches to its traditional capacity-building role.

Box 8.9. The United Nations Office for Outer Space Affairs (UNOOSA)

UNOOSA

The United Nations Office for Outer Space Affairs (UNOOSA) is the United Nations office responsible for the promotion of international cooperation, and for leading and facilitating the promotion of peaceful uses of outer space. UNOOSA is as the main UN entity dealing with space matters and coordinates UN activities in the utilization of space-related technology for improvement of human conditions globally.

UNOOSA, as a global facilitator, plays a leading role in promoting the peaceful use of outer space and the utilization of space-related technology for sustainable economic and social development. The Office's vision is to bring the benefits of space to all humankind by strengthening the capacity of United Nations Member States to use space science technology, applications, data and services by helping to integrate space capabilities into national development programmes. UNOOSA is part of the UN secretariat with its headquarters in Vienna and two offices in Bonn and Beijing.

UNOOSA serves as the secretariat for the General Assembly's only committee dealing exclusively with international cooperation in the peaceful uses of outer space: the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS). It is also responsible for implementing the Secretary-General's responsibilities under international space law and maintaining the United Nations Register of Objects Launched into Outer Space.

Through its Programme on Space Applications, UNOOSA conducts workshops, training courses, technical advisory missions and other projects worldwide as part of its capacity-building efforts as it strives to promote and facilitate the use of space for the benefit of all United Nations Member States, with a special focus on developing nations. UNOOSA has conducted over 300 capacity-building projects in countries all over the world for over 18,000 participants.

Furthermore, to address global challenges including climate change, disaster risk reduction and building more resilient societies, the United Nations Platform for Space-based Information for Disaster Management and Emergency Response (UN-SPIDER) was established in 2006 and is implemented by UNOOSA to support United Nations Member States in accessing and using satellite data for all phases of disaster management – disaster recovery, risk reduction and emergency response.

Source: http://www.unoosa.org/oosa/en/aboutus/index.html.

Additionally, UNOOSA serves as the secretariat of the International Committee on Global Navigation Satellite Systems (ICG) and as a permanent secretariat to the Space Mission Planning Advisory Group (SMPAG), which concentrates on asteroid impact mitigation.

8.5.2   Symmetry and ethics as the way forward

It is quite important for governments to understand the challenges and opportunities of the new technologies and to be aware of new public policy professions that specialize in machine learning andbut also data science ethics.

The main challenges raised by future and emerging technologies should be clarified. The first concerns data ownership, particularly who owns the data and the algorithms used to access and manage it. A second challenge concerns net neutrality64, which requires a non-discriminatory infrastructure and transparency in network management practices. The third is ethics. The question, for example, of whether one would prefer to undergo surgery by a robot or by a human surgeon raises a number of ethical concerns. Considering the broad scope of the above topics, the *2018 World Economic and Social Survey* is equally addressing a number of these challenges.

The 2030 Agenda has introduced the concept of a data-driven governance, highlighting the challenge to "increase significantly the availability of high-quality, timely, reliable and disaggregated data by

2020". To do so, governments require systemic policies for data production, collection, management and analysis. Society will have to adapt in order to take advantage of ICTs. Today, the hierarchical structures of governments are being challenged as these new technologies equip individuals and informal networks and communities with the necessary tools to better participate in public decision-making processes, and have a societal impact at a much faster pace than ever before. This implies discussing and redefining values, which, in turn, begs the question of the nature of a coherent set of policy actions to address the challenges. Open Innovation invites policymakers to think outside the policy toolbox. Creating linkages between communities could be valuable in that regard. What would Watson[65] do? If the citizens owned their own data, what would they do? The notion of "prosumer" – producer and consumer – is rising, as can be seen by the increase in blockchain-based applications: everyone can create- and benefit from ICT use.

However, the Internet has been developing in an asymmetrical manner, with data in the hands of a limited, albeit growing, number of players as examined by the *2018 World Economic and Social Survey.* Another challenge is the nature of ICT use where users leave a digital footprint. This serves to give away their data, which is then served back to them in the form of commercial offerings which also heightens fears of ever more intrusive monitoring. The rise of AI, as examined in the previous section, also carries uncertainty in terms of work placement, skills and overall employment. Symmetry can be achieved by providing a mechanism which will reduce the gap between the data providers and the data users. The notion of a "citizen salary" is gaining some traction as a way to create a more symmetric model. The idea is to pay citizens as 'data generators' for the data they produce, which has economic value when it is in turn re-used. By being paid for data generation, citizens are rewarded for their efforts and encouraged to continue producing valuable data. The questions arises as to whether the public sector should equally purchase data from its citizens.

8.6.   Conclusion

Transforming the world and realizing the sustainable development goals by 2030 will require a paradigm shift in the way societies govern themselves. It will require rethinking the role of government and the way it interacts with civil society and the private sector in managing the public affairs of a country and responding to the needs of its people. ICTs and e-government have the potential to ensure that no one is left behind in sustainable development. The 2030 Agenda specifically recognized the vital role of these two components as a catalyst for realizing its vision, and stated that "the spread of information and communications technology and global interconnectedness have great potential to accelerate human progress, bridge the digital divide, develop knowledge societies such as scientific and technological innovation among different sectors".

This chapter has considered issues facing governments in light of the widespread deployment and use of fast-evolving technologies, such as Artificial Intelligence, in e-government. The scope of the endeavour is vast and carries human rights, technical, and socio-economic challenges. These questions are not only critical to the e-government mission but represent some of the most difficult questions facing society today. Finding answers will not be easy, nor are there turn-key solutions. However, Member States can leverage their influence to lay a foundation that will bring answers within reach.

From resource allocation, predictive public utilities maintenance, to managing public hotlines, health-care chatbots and real-time verification of digital identity, governments around the world are deploying AI for both back-end and front-end public services. But AI can also actually result in more social exclusion such as through its impacts on jobs and job skills.

This will be the fastest transition on record for humankind. As seen, societies need to prepare for the impact of new technologies on the job market. In reviewing the implementation of the SDGs, the 2017 High Level Political Forum Ministerial Declaration acknowledged "the transformative and disruptive potential of new technologies, particularly advances in automation, on our labour markets, and on the jobs of the future", and recognized the need "to prepare our societies and economies for these effects". As initiated in the 1990s with the beginning of the digital revolution and reiterated in the 2017 High Level Committee on Programmes paper on future of work, technology will affect many aspects of society with unprecedented speed, scale and breadth. Policy responses must take an equally comprehensive and proactive approach to harness the challenges of technology into opportunities. This calls for a system-wide effort, building on existing initiatives, that reflects the 2030 Agenda for rights-based, normative and integrated solutions tailored to the needs of individual Member States as each strives to achieve inclusive and sustainable growth. Efforts to implement AI in government should be approached in a way that augments human capital and does not reduce jobs. With these principles in mind, the United Nations System should lead governments in handling the use of AI under the principles of 2030 Agenda.[66]

The Agenda pays particular attention to effective means of implementation, including the need for special efforts to stimulate digital transformation and to foster and share technology and policy innovation, such as through effective and meaningful deployment of AI.

Without targeted measures, the digital divide will widen with profound implications for inequality, and the principle of leaving no one behind will be challenged by the fourth industrial revolution, unless the needs of both developing and least developed countries and all segments of the population are considered. Scientific knowledge, technologies and know how spawned by the digital age will require careful management to eliminate the risks of new and wider digital divides. To have a significant social impact in using new technologies, governments should partner with the private sector in research and development, including addressing the broadband connectivity gap.

Digital transformation will not only depend on technologies, but also require a comprehensive approach that offers people accessible, fast, reliable and personalized services. The public sector in many countries is ill-prepared for this transformation. Traditional forms of regulation may not apply, and thus, a paradigm shift in strategic thinking, legislation and regulation is needed. Governments can respond by developing the necessary policy, services and regulation. This response will serve as a mission statement and endorse the role of education around core objectives. Services can be delivered to address specific needs and adapted for a defined audience, administration, business or citizen. Law-making can take the form of legally binding acts, regulation, directives, norms and standards that define the parameters of what can and cannot be done. Some governments have already started to prepare ethical and legal frameworks on AI development. It is important to embed new technologies in specific social contexts and ensure that they are properly regulated to have a positive impact on society.

However, many of these legal instruments are slow in being "brought to the market". It is therefore principles such as effectiveness, inclusiveness, accountability, trustworthy and openness that should direct the technologies and not the other way around. Similarly, functionalities should determine the technology to be used. Governments around the world will need to rethink their governance models to meet the core principles of the 2030 Agenda and to respond to demands of the people for more responsive and inclusive services. While e-government was about bringing services online, the future will be about the power of digital government in leveraging societal innovation and resilience and transforming governance to achieve the Sustainable Development Goals.

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64   Note: Over the years, policy debates and regulations on net neutrality have crystallised a few key principles, please see Internet Governance Forum (IGF) for ongoing debate on this issue.

65   Note: Watson is a deep-machine learning AI computer system capable of answering questions posed in natural language, developed in IBM's DeepQA project by a research team led by principal investigator David Ferrucci. Watson was named after IBM's first CEO, industrialist Thomas J. Watson. For details, see: https://www.ibm.com/watson/

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ANNEXES
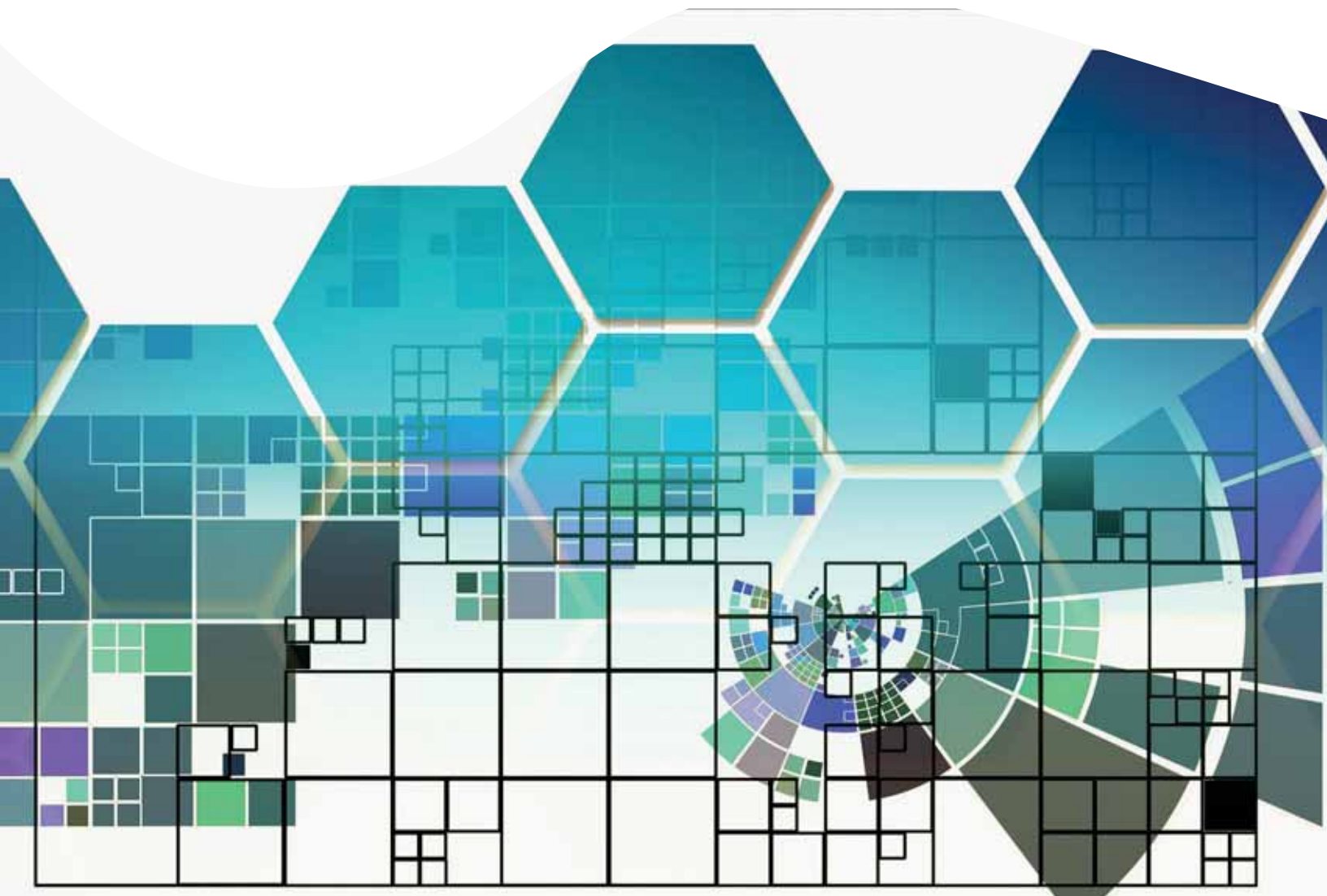
Annexes

Survey Methodology

A.1. E-Government Development Index: An Overview

Mathematically, the E-Government Development Index (EGDI) is the weighted average of normalized scores on the three most important dimensions of egovernment, namely: (i) the scope and quality of online services quantified as the Online Service Index (OSI); (ii) the status of the development of telecommunication infrastructure or the Telecommunication Infrastructure Index (TII); and (iii) the inherent human capital or the Human Capital Index (HCI). Each of these indices is a composite measure that can be extracted and analyzed independently.

$$EGDI = \frac{1}{3}(OSI_{normalized} + TII_{normalized} + HCI_{normalized})$$

Prior to the normalization of the three component indicators, the Z-score standardization procedure is implemented for each component indicator to ensure that the overall EGDI is equally decided by the three component indexes, that is, each component index presents comparable variance subsequent to the Z-score standardization. In the absence of the Z-score standardization treatment, the EGDI would mainly depend on the component index with the greatest dispersion. After the Z-score standardization, the arithmetic average sum becomes a good statistical indicator, where "equal weights" truly means "equal importance."

For standard Z-score calculation of each component indicator:

$$Xnew = \frac{x - \mu}{\sigma}$$

Where:

x is a raw score to be standardized;

μ is the mean of the population;

σ is the standard deviation of the population.

The composite value of each component index is then normalized to fall between the range of 0 to 1 and the overall EGDI is derived by taking the arithmetic average of the three component indexes.

The EGDI is used as a benchmark to provide a numerical ranking of e-government development of all United Nations Member States. While the methodological framework for EGDI has remained consistent across

Photo credit: pixabay.com

In this chapter:

the editions of the *United Nations E-Government Survey,* each edition of the Survey has been adjusted to reflect emerging trends of e-government strategies, evolving knowledge of best practices in e-government, changes in technology and other factors. In addition, data collection practices have been periodically refined.

Figure A.1.   The three components of the E-Government Development Index (EGDI)
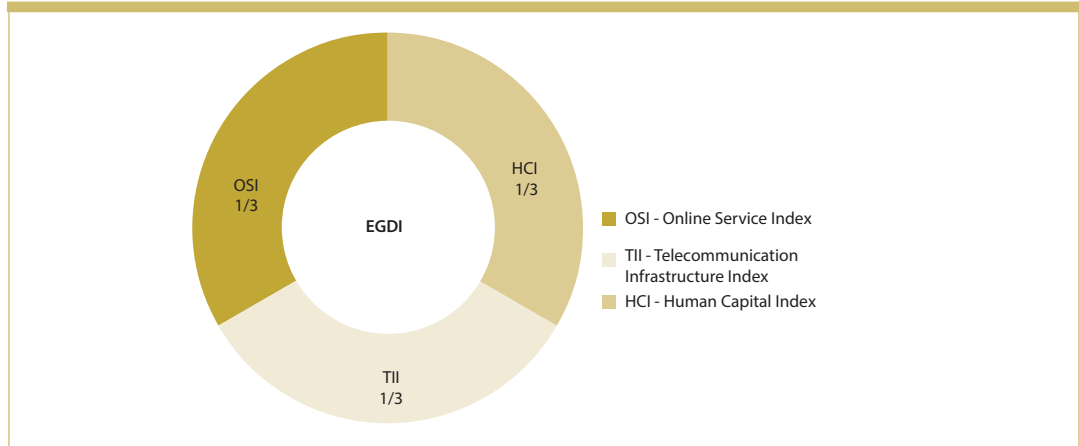
The imputation of missing data is an important step in the construction of a good quality composite indicator. The problem has been studied since 2001; in the EGDI methodology, the cold deck imputation or use of older values for the missing data has always been the first choice of action. Nevertheless, there are cases where no data is available at all. In these cases, a combination of the unconditional mean imputation and the hot deck imputation was used. This combination is based on the "donor imputation" methodology, which replaces missing values in a record with the corresponding values from a complete and valid record.

A.2. Telecommunication Infrastructure Index (TII)

The Telecommunication Infrastructure Index is an arithmetic average composite of five indicators: (i) estimated Internet users per 100 inhabitants; (ii) number of main fixed telephone lines per 100 inhabitants; (iii) number of mobile subscribers per 100 inhabitants; (iv) number of wireless broadband subscriptions per 100 inhabitants; and (v) number of fixed broadband subscriptions per 100 inhabitants. The International Telecommunication Union is the primary source of data in each case. (See Figure A.2)

The definitions of the five components of TII[1] are:

(i)   Internet users per 100 inhabitants refer to individuals who used the Internet from any location in the last three months[2].

(ii)   Main fixed telephone lines per 100 inhabitants refer to telephone lines connecting a customer's terminal equipment, such as telephone set, facsimile machine to the public switched telephone network (PSTN), which has a dedicated port on a telephone exchange. This term is synonymous with the terms main station or Direct Exchange Line (DEL), which are commonly used in telecommunication documents. It may not be the same as an access line or a subscription.

(iii) Mobile subscribers per 100 inhabitants are the number of subscriptions to mobile service in the last three months. A mobile/cellular telephone refers to a portable telephone subscribed to a public mobile telephone service using cellular technology, which provides access to the PSTN. This includes analogue and digital cellular systems and technologies such as IMT-2000 (3G) and IMT-Advanced. Users of both post-paid subscriptions and prepaid accounts are included.

(iv) Active mobile-broadband subscriptions refer to the sum of data and voice mobile-broadband subscriptions and data-only mobile-broadband subscriptions to the public Internet. It covers subscriptions being used to access the Internet at broadband speeds, not subscriptions with potential access, even though the latter may have broadband-enabled handsets. Subscriptions must include a recurring subscription fee to access the Internet or pass a usage requirement – users must have accessed the Internet in the previous three months. It includes subscriptions to mobile-broadband networks that provide download speeds of at least 256 kbit/s (e.g. WCDMA, HSPA, CDMA2000 1x EV-DO, WiMAX IEEE 802.16e and LTE), and excludes subscriptions that only have access to GPRS, EDGE and CDMA 1xRTT.[3]

(v) Fixed broadband subscriptions per 100 inhabitants refers to fixed subscriptions to high-speed access to the public Internet or a TCP/IP connection, at downstream speeds equal to, or greater than, 256 kbit/s. This includes cable modem, DSL, fiber-to-home/building, other fixed/ wired-broadband subscriptions, satellite broadband and terrestrial fixed wireless broadband. This total is measured irrespective of the method of payment. It excludes subscriptions that have access to data communications, including the Internet via mobile-cellular networks. It should include fixed WiMAX and any other fixed wireless technologies. It includes both residential subscriptions and subscriptions for organizations.

Figure A.2.   Telecommunication Infrastructure Index (TII) and its components
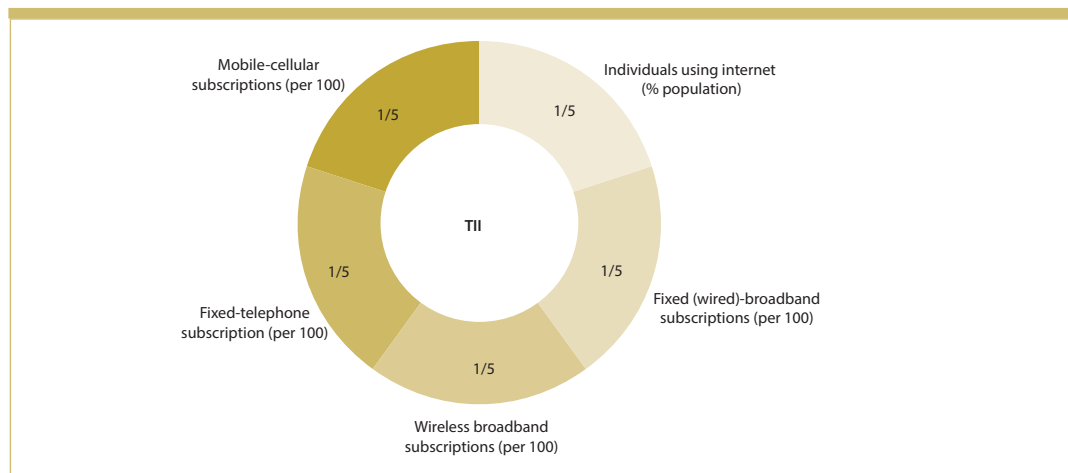
Conceptually, the TII has remained largely unchanged since 2002. Three components, i.e. internet users, mobile-cellular phone subscriptions and fixed-telephone subscriptions have been used in the past Surveys since 2002. However, given the availability of suitable data, several replacements were introduced over the years, such as the replacement of online population with fixed-broadband subscription and the removal of number of television sets in 2008; the replacement of personal computer users with fixed Internet subscriptions in 2012; the replacement of fixed Internet subscriptions with wireless broadband subscriptions in 2014 (See Table A.1). In 2018, wireless broadband subscriptions indicator was replaced by active mobile-broadband subscriptions.

The improvement of data quality and coverage has led to the reduction of data gaps that appeared in prior Surveys. However, in cases where gaps still occur, data is retrieved first from the Word Bank data base, and when all previous measures prove unsuccessful, the most recent ITU data is used.

Each of these indicators was standardized through the Z-score procedure to derive the Zscore for each component indicator. The telecommunication infrastructure composite value for country "x" is the simple arithmetic mean of the five standardized indicators derived as follows:

Telecommunication infrastructure composite value=

Average (Internet user Z-score

+ Fixed telephone subscription Z-score

+ Mobile/Cellular telephone subscription Z-score

+ Active mobile broadband subscription Z-score

+ Fixed broadband Z-score)

Table A.1.   Telecommunication infrastructure index (TII) and changes of its components (2003-2018)

TII (2001)	TII (2003)	TII (2004)	TII (2005)	TII (2008)	TII (2010)	TII (2012)	TII (2014)	TII (2016)	TII (2018)
Internet users	Internet users	Internet users	Internet users	Internet users	Internet users	Internet users	Internet users	Internet users	Internet users
Online population	Online population	Online population	Online population	Fixed-broadband subscriptions	Fixed-broadband subscriptions	Fixed-broadband subscriptions	Fixed-broadband subscriptions	Fixed-broadband subscriptions	Fixed-broadband subscriptions
Personal computer (PC) users	Personal computer (PC) users	Personal computer (PC) users	Personal computer (PC) users	Personal computer (PC) users	Personal computer (PC) users	Fixed Internet subscriptions	Wireless broadband subscriptions	Wireless broadband subscriptions	Active mobile-broadband subscriptions
Fixed-telephone subscriptions	Fixed-telephone subscriptions	Fixed-telephone subscriptions	Fixed-telephone subscriptions	Fixed-telephone subscriptions	Fixed-telephone subscriptions	Fixed-telephone subscriptions	Fixed-telephone subscriptions	Fixed-telephone subscriptions	Fixed-telephone subscriptions
Mobile-cellular subscriptions	Mobile-cellular subscriptions	Mobile-cellular subscriptions	Mobile-cellular subscriptions	Mobile-cellular subscriptions	Mobile-cellular subscriptions	Mobile-cellular subscriptions	Mobile-cellular subscriptions	Mobile-cellular subscriptions	Mobile-cellular subscriptions
Television sets	Television sets	Television sets	Television sets	-	-	-	-	-	-

Finally, the TII composite value is normalized by taking its value for a given country, subtracting the lowest composite value in the Survey and dividing by the range of composite values for all countries. For example, if country "x" has the composite value of 1.3813, and the lowest composite value for all countries is -1.1358 and the highest is 2.3640, then the normalized value of TII for country "x" would be:

$$\text{TII (Country "x")} = \frac{[1.3813 - (-1.1358)]}{[2.3640 - (-1.1358)]} = 0.7192$$

A.3. Human Capital Index (HCI)

The Human Capital Index (TII) consists of four components, namely: (i) adult literacy rate; (ii) the combined primary, secondary and tertiary gross enrolment ratio; (iii) expected years of schooling; and (iv) average years of schooling. (See Figure A.3)

Figure A.3.   Telecommunication Infrastructure Index (TII) and its components
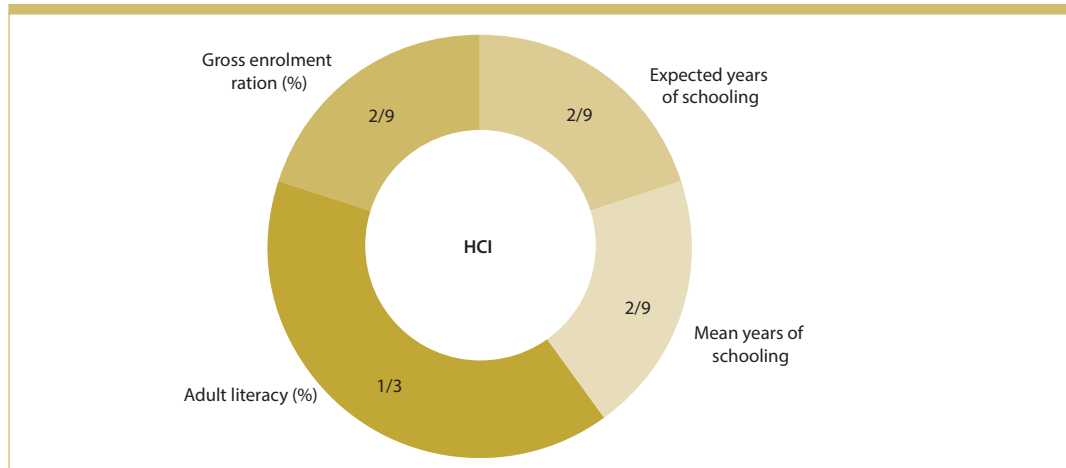
The four indicators of HCI are defined as follows:

1. Adult literacy is measured as the percentage of people aged 15 years and above who can, with understanding, both read and write a short simple statement on their everyday life.

2. Gross enrolment ratio is measured as the combined primary, secondary and tertiary gross enrolment ratio, of the total number of students enrolled at the primary, secondary and tertiary level, regardless of age, as a percentage of the population of school age for that level.

3. Expected years of schooling is the total number of years of schooling that a child of a certain age can expect to receive in the future, assuming that the probability of his or her being in school at any specific age is equal to the current enrolment ratio age.

4. Mean years of schooling (MYS) provides the average number of years of education completed by a country's adult population (25 years and older), excluding the years spent repeating grades (add reference 6).

The first two components, i.e. adult literacy rate and the combined primary, secondary and tertiary gross enrolment ratio have been used for the past Surveys since 2002. Recognizing that education is the fundamental pillar in supporting human capital, the 2014 Survey introduced two new components to the human capital index (HCI), namely (i) expected years of schooling; and (ii) mean years of schooling. The preliminary statistical study commissioned by DESA/DPADM validated the use of the new HCI, accentuating that the two new components have strengthened the HCI without introducing any error[4].

Table A.2.   Human Capital Index and changes of its components (2003-2014)

Components of HCI in past surveys 2002, 2003, 2004, 2008, 2010, 2012)	Components of HCI in 2014 survey
Adult literacy	Adult literacy
Gross enrolment ratio	Gross enrolment ratio
-	Expected years of schooling
-	Mean years of schooling

The HCI is a weighted average composite of the four indicators. In the same manner the TII is computed, each of the four component indicators is first standardized through the Z-score procedure to derive the Z-score value for each component indicator. The human capital composite value for country "x" is the weighted arithmetic mean with one-third weight assigned to adult literacy rate and two-ninth weight assigned to the gross enrolment ratio, estimated years of schooling and mean years of schooling.

Human capital composite value =

1/3 x Adult literacy rate Z-score +

2/9 x Gross enrolment ratio Z-score +

2/9 x Estimated years of schooling Z-score +

2/9 x Mean years of schooling Z-score

The human capital composite value is then normalized by taking its composite value for a given country, subtracting the lowest composite value in the Survey and dividing by the range of composite values for all countries. For example, if country "x" has the composite value at 0.8438, and the lowest composite value for all countries is –3.2354 and the highest equal to 1.2752, then the normalized value of the Human Capital Index for country "x" would be:

$$\text{Human Capital Index (Country "x")} = \frac{[0.8438-(-3.2354)]}{[1.2752-(-3.2354)]} = 0.9044$$

A.4. Online Service Index (OSI)

The Online Service Index (OSI) is a composite normalized score derived on the basis on an Online Service Questionnaire. The 2018 Online Service Questionnaire (OSQ) consists of a list of 140 questions. Each question calls for a binary response. Every positive answer generates "more in-depth question" inside and across the patterns. The outcome is an enhanced quantitative survey with a wider range of point distributions reflecting the differences in the levels of e-government development among Member States.

The total number of points scored by each country is normalized to a range of 0 to 1. The online index value for a given country is equal to the actual total score less the lowest total score divided by the range of total score values for all countries. For example, if country "x" has a score of 114, and the lowest score of any country is 0 and the highest equal to 153, then the online services value for country "x" would be:

$$Online\ Service\ Index\ (Country\ "x") = \frac{(114-0)}{(153-0)} = 0.7451$$

To arrive at a set of Online Service Index values for 2018, a total of 206 online United Nations Volunteer (UNV) researchers from 89 countries covering 66 languages, assessed each country's national website in the native language, including the national portal, e-services portal and e-participation portal, as well as the websites of the related ministries of education, labour, social services, health, finance and environment, as applicable. The UNVs included qualified graduate students and volunteers from universities in the field of public administration.

To ensure consistency of assessments, all the researchers were provided with a rigorous training by e-government and online service delivery experts with years of experience in conducting the assessments, and guided by Data Team Coordinators who provided support throughout the assessment period. Researchers were instructed and trained to assume the mind-set of an average citizen user in assessing sites. Thus, responses were generally based on whether the relevant features could be found and accessed easily, not whether they in fact exist but are hidden somewhere in the site(s). The key point is that the average user needs to find information and features quickly and intuitively for a site to be "usable" with content readily discoverable by the intended beneficiaries.

The data collection and Survey research ran from August 2017 until the end of November 2017. Each country was assessed by at least two researchers who conducted the assessment in the country's national language. After the initial assessment, the evaluations by the two researchers on each country were compared and questions regarding discrepancies were reviewed together and resolved by the researchers. The third phase, from October to November, was the final review by the Data Team Reviewers, who analyzed all the answers and, where needed, carried out further review and verification processes using multiple methods and sources. The scores were then sent for approval to a Senior Reviewer. Through this multilevel approach, all surveyed sites were thoroughly assessed by at least three people, one of whom has years of experience in assessing public sector online services, and reviewed by one of the Data Team Coordinators.

Once the evaluation phase was completed, the statistics team produced the first draft of the OSI ranking. Data was extracted from the platform and the raw OSI scores were created. Rankings were compared with previous OSI scores, and discrepancies were thoroughly reviewed.

A.5. List of Features Assessed

Multiple linkages to the Sustainable Development Goals (SDG) have been included in both the OSQ and the Member State Questionnaire (MSQ).The MSQ is further discussed in more detail in Section A.8 of this Chapter. As done in analytical chapters of past editions of the Survey, selected or proxy themes related to egovernment and sustainable development have been also analyzed, for example, open government data, e-participation, mobile-government and whole-of-government approach. A complete review of the OSQ has been undertaken to include questions related to key services across the SDG domains, including health, education, social protection, gender equality, and decent work and employment, as well as through the SDG principles highlighted in Goal 16, including effectiveness, inclusion, openness, trustworthiness, and accountability.

Below is a list of areas assessed in the 2018 edition of the *United Nations EGovernment Survey*. It should be noted that this list is dynamic and is updated for each edition of the Survey. The language for the areas start with:

- "information about" something such as laws, policies, legislation or expenditures

- "existence of" a feature such as social networking tools

- "ability to" do something on the website i.e. run a transaction

Information about women's right to access to sexual/reproductive healthcare, information and education (policy/legislation)
Information about using open data sets
Information about upcoming procurements
Information about upcoming e-participation activities
Information about technical and vocational skills training for youth
Information about social protection policy or budget
Information about services in partnership with third parties
Information about schools with accessible facilities
Information about road traffic accidents statistics
Information about road safety
Information about results of any government procurement/bidding process
Information about reproductive health-care services
Information about reduction, recycling and reuse of waste
Information about public sector work force distribution by gender
Information about programs/initiatives benefiting the poor or vulnerable groups
Information about privacy statement
Information about primary government expenditures
Information about pollution and precautionary measures
Information about personal data protection
Information about payments for government services through different channels
Information about organizational structure of the government
Information about national budget or budget policy
Information about local/regional government agencies
Information about laws and regulations against discrimination
Information about labour laws and regulation
Information about housing support for older persons
Information about health-emergency preparedness
Information about health policy or budget
Information about government-wide Chief Information Officer (CIO) or equivalent online
Information about government scholarship programmes or education funding
Information about gender equality (policy/legislation)
Information about equal access to education for persons with disabilities
Information about equal access to education for children in vulnerable situations
Information about environment-related policy or budget
Information about employment/labour policy or budget
Information about electricity or power outage

Information about education policy or budget

Information about early childhood development, care and pre-primary education

Information about diseases affecting older persons

Information about citizenship application

Information about citizen's rights to access government information

Information about affordable public housing

Information about accessible public transportation

Existence of up-to-date information on the portal

Existence of tools to obtain inputs for policy deliberation

Existence of support for authentication or digital ID

Existence of support for all official languages

Existence of social networking features

Existence of security features on the portal

Existence of search engine effectiveness

Existence of a site map

Existence of search and advanced search features

Existence of open government data on education, employment, environment, health and social protection

Existence of open data competitions

Existence of online tools helping children with disabilities to participate at all levels of education

Existence of online skills training for youths and/or adults

Existence of online service for female-headed households, immigrants, migrant workers, refugees and/or internally displaced persons, older persons, persons with disabilities, the poor (below poverty line), women, youth

Existence of online participation in public issues related to education, employment, environment, health and social protection

Existence of mobile services in education, employment, environment, health, social protection

Existence of live support functionality

Existence of linkage/reference to technical, vocational and tertiary education

Existence of linkage between national portal and sectoral/ministerial services of education, employment/labour and health

Existence of help, FAQs, contact us features

Existence of help links and references for youth employment

Existence of free access to government services through kiosks, community centres, post offices, libraries, public spaces of free Wi-Fi

Existence of features to configure font size, type, colour and background colour

Existence of features relates accessibility

Existence of digital security or cybersecurity act/legislation online

Existence of cross-browser compatibility of website including in mobile/smartphones

Existence of an outcome of an e-consultation resulted in new policy decisions

Existence of an open government data policy online

Existence of an e-procurement platform

Existence of an e-participation policy/mission statement

Existence of a national portal, an open data portal
Existence of a national e-government/digital government strategy online
Existence of a mobile app to provide e-government services
Existence of a data dictionary or metadata repository in the portal
Existence of tutorials and/or guidance for using the portal
Ability to submit online income and other taxes
Ability to request new open data sets
Ability to report online any form of discrimination
Ability to report online about trafficking, sexual abuse or other form of exploitation
Ability to report and track unethical behaviour of public servants/institutions
Ability to report a violation of labour law
Ability to register online for vehicle
Ability to register online for a new business
Ability to receive updates or alerts on issues related to education, employment, health, social protection, weather conditions or agricultural technology
Ability to receive updates or alerts on environment-related issues
Ability to pay for water, energy bills online
Ability to pay for any government related fees
Ability to monitor and evaluate existing government procurement contracts
Ability to make address change online
Ability to make a police declaration online
Ability to file complaint for public services
Ability to enrol online for primary or secondary education
Ability to apply online for social protection
Ability to apply online for government scholarships/fellowships
Ability to apply for personal ID cards online
Ability to apply for marriage certificates online
Ability to apply for land title registration online
Ability to apply for government jobs online
Ability to apply for environment-related permits online
Ability to apply for driver's license online
Ability to apply for death certificates online
Ability to apply for business licenses or patents online
Ability to apply for building permits online
Ability to apply for birth certificates online
Ability to apply for any visa to enter or transit through this country
Ability to access/modify own data

A.6. Challenges in reviewing the online presence of a country

Selecting the appropriate site/URL at the national level

One of the essential decisions for researchers when undertaking the country assessment is identifying the specific site(s) to review as the national government site for each country. Regardless of the sophistication of e-government in a specific country, the priority for users is to identify which of the many potentially available government sites would be deemed as the "official" national government site—the gateway or starting point for national users. A simple, clear statement at the chosen website is sufficient to start an important step towards providing government information and services to the public in an integrated, usable and easy-to-find manner. Many national sites state that it is the "official" Government site, or "Gateway to Government," or other similar statement.

As done for each edition of the Survey, the United Nations Member States were requested, through the Member State Questionnaire (MSQ), to provide information on the website addresses (URL) of their national portal(s) and the different government ministries. This information was then utilized during the assessment process.

Not all countries provide the appropriate URLs. Thus, some discretion is exerted in deciding whether to use only the websites provided by the Member State. What is noteworthy in this Survey is that the researchers not only reviewed the national portals but also undertook exhaustive research on e-participation and open government data, where applicable.

One dilemma researchers encountered is that several countries provided more than one legitimate national access point. While some have simply not yet consolidated their government entry points into a single site or portal that could be clearly distinguished, others have taken this approach on purpose, that is, offering different access points to different audiences. Considering that the use of integrated portals or multi-portals is emerging as a trend in e-government strategies worldwide, researchers would select the integrated website as a national portal or another portal if it was deemed to be the official homepage of the government. However, more than one site could be scored if the sites were clearly part of a tightly integrated "network" of national sites. It should be noted that during the assessment of the national portals, having more than one national entry is neither a disadvantage nor a benefit.

Some countries offer certain public services at the sub-national or local level rather than the federal level. No country is penalized for offering a service at the sub-national level as opposed to the federal level. In fact, when the issue arises, researchers tend to be inclusive in assessing the matter if the information and/or service can be found at the national portal.

A more difficult problem arises when not only a specific service is located at the local level but when the entire ministerial functions are altogether missing at the national level. If researchers are unable to locate a ministry as per the above described method, then the next step is to find out whether the country in question actually has such a ministry at the national level or whether the functions might be locally administered.

Integrated Portal and Multi-Portal Approaches

Some countries have adopted a different approach to their online e-government portal, by utilizing multiple websites for different topics. Instead of centralizing all the e-information, e-services, e-participation, open data and other online features into one portal, they are made available in separate websites for a more audience-targeted approach. Researchers made sure to examine all possible websites when making the assessment, through links or search engines, to ensure coverage of all government websites where relative information can be found.

Even if the norm recommended is a one-stop-shop type of service delivery or an integrated portal approach, countries that opted for a decentralized approach were not penalized in their score, and the assessment was conducted as if an integrated approach was utilized.

For example, Finland has a website www.valtioneuvosto.fi, providing information on the Finnish Government, while the website www.suomi.fi provides e-service, public service information portal and open government data. Information on e-participation is centralized on the websites www.kansalaisaloite.fi and www.otakantaa.fi. This approach of having several websites for different purposes, such as information, services, participation and open government data, is typical for European countries.

Accessing in national official languages

The research team was fully equipped to handle the six official languages of the United Nations, namely Arabic, Chinese, English, French, Russian and Spanish. However, as in previous assessment cycles, the team went beyond this mandate and reviewed each website in the official language of the country, or where that was not possible, in one of the languages available on the site. Translators aided as necessary so that possible errors based on language are reduced to a minimum.

Towards a more citizen-centric approach

In line with the global trend towards a more citizen-centric approach and the demand for greater efficiency and cost-effectiveness of the public sector, the MSQ has been designed to reflect this paradigm of e-government. User uptake has been included as a special subject in the Survey, encouraging governments to take account not only of the supply side of e-services but also of what is demanded/needed by the target users. Accordingly, the research team was instructed to enforce this approach consistently throughout the entire assessment. Where features could not be found easily, quickly and intuitively, then a site scores poorly.

Data Quality Assurance (QA)

To ensure data quality, UNDESA has put assessment procedures under close monitoring including by developing a web-based application platform for data collection and storage, preparing the methodological and training guidelines for researchers, and instituting a training programme for both group training or individual hands-on support for researchers in resolving thorny issues.

Among other tasks, team members were asked to justify the selection of URLs and to indicate whether the URLs had been reviewed in past Surveys. Regular discussions were held to discuss concerns and ensure consistency of evaluation methods.

UNDESA applied the assessment scores to generate an ordering of online service presence of all United Nations Member States and compared them with the historical results in previous Surveys

so as to detect possible shortcomings in the process. The new scores are then compared to scores from the previous Surveys by removing the new questions and only considering the ones that remain unchanged. The team was assisted in the research by United Nations interns and volunteers with language skills not otherwise covered by the core group.

Below is a list of the criteria adopted for data QA:

Three levels of assessment/supervision (volunteers, First Report Officer, Second Report Officer)
First check of consistency of data with data patterns by group ranking (VH, H, M, L OSI)
Tuning of OSI questions to stabilize the dataset and to be consistent with EGDI data model
Second check of consistency of data with data patterns by group ranking (VH, H, M, L OSI)
First calculation of OSI
Two levels of assessment/supervision of the outliners - Compensation with MSQ (if doable)
Second calculation of OSI
Data analysis of target countries (outliners or cases with significant drop/improvement …)
Random check of OSI subset of questions / URL - Compensation with MSQ (if doable)
Third calculation of OSI
Second check of consistency of data with data patterns by group ranking (VH, H, M, L OSI)
Check for consistency with other international benchmark reports and 3rd party Sources (MSQ)
Recalculation of OSI (Final)
Data analysis of target countries (those jumping from on group to another)
Final calculation of EGDI

A.7. E-Participation Index (EPI)

The E-Participation Index (EPI) is derived as a supplementary index to the *United Nations EGovernment Survey.* It extends the dimension of the Survey by focusing on the government use of online services in providing information to its citizens or "einformation sharing", interacting with stakeholders or "e-consultation" and engaging in decision-making processes or "e-decision-making" (See Box A.1)

Box A.1. E-Participation Framework

- E-information: Enabling participation by providing citizens with public information and access to information without or upon demand

- E-consultation: Engaging citizens in contributions to and deliberation on public policies and services

- E-decision-making: Empowering citizens through co-design of policy options and co-production of service components and delivery modalities.

A country's EPI reflects the e-participation mechanisms that are deployed by the government as compared to all other countries. The purpose of this measure is not to prescribe any specific practice, but rather to offer insight into how different countries are using online tools in promoting interaction between the government and its citizens, as well as among the citizens, for the benefit of all. As the EPI is a qualitative assessment based on the availability and relevance of participatory services available on government websites, the comparative ranking of countries is for illustrative purposes and only serves as an indicator of the broad trends in promoting citizen engagement. As with the

EGDI, the EPI is not intended as an absolute measurement of e-participation, but rather, as an attempt to capture the e-participation performance of counties relative to one another at a point in time.

In the *2018 Survey,* the e-participation questions were carefully reviewed and expanded to reflect current trends and modalities on how governments engage their citizens in public policy-making, implementation and evaluation. New questions were added to address data publishing and sharing by government agencies. Other updates included: (i) the availability of information on the citizens' rights to access government information; (ii) feedback from citizens concerning the improvement of online public services; and (iii) public opinion tools on policy deliberation through social media, online polls and online discussion forums. While EPI provides a useful qualitative analytical tool when comparing the data and ranking of countries for one specific year, caution must be taken in comparing e-participation rankings with past editions of the Survey.

Mathematically, the EPI is normalized by taking the total score value for a given country, subtracting the lowest total score for any country in the Survey and dividing by the range of total score values for all countries. For example, if country "x" has an e-participation score of 29, and the lowest value of any country is 0 and the highest equal to 38, then the normalized index value for country "x" would be:

$$\text{E} - \text{Participation Index (Country ``x'')} = \frac{(29 - 0)}{(38 - 0)} = 0.7632$$

The e-participation ranking of countries is determined by the value of EPI through the "standard competition ranking". In standard competition ranking, countries with the same EPI receive the same ranking number and a gap is left in the ranking numbers. This ranking strategy is adopted in view that if two or more countries tie for a position in the ranking, the positions of all those ranked below them are unaffected. For example, if country A ranks ahead of B and C, both of which share the same EPI value and scores ahead of D, then A is ranked first (1st), B and C are ranked second (2nd) and D is ranked fourth (4th). In 2012, the "modified competition ranking" was used and for comparison reasons, all ranks were adjusted in 2014 and 2016 using the standard competition ranking.

A.8. Member State Questionnaire (MSQ)

As done for each edition of the Survey, Member States were requested, through the Member State Questionnaire (MSQ) to provide information on the website addresses (URL) of their respective national portal(s) as well as those of the different government ministries. Information on efforts in support of egovernment development, open government data, e-participation and the designated authority in charge of e-government policies was also requested. One hundred (100) Member States comprising 51.8 per cent of United Nations membership returned the completed questionnaires. The appropriate submitted sites were then utilized during the assessment process. Some information provided in the MSQ were also used in the case studies included in the Survey.

The Questionnaire

**Member States Questionnaire (MSQ) for the
2018 United Nations EGovernment Survey**

Please provide the most recent information on your country, as this information will be used in preparation of the United Nations E-Government Survey 2018. Please feel free to skip question for which you feel you do not have the relevant information.

Strategy/Implementation Plan/Policy (where available, please specify URLs or attach relevant documents)
- Is there a national development strategy or equivalent incorporating the Sustainable Development Goals (SDGs)?
- Is there a national e-Government Strategy or Digital Government Strategy or equivalent?
- If yes:
    - Is there an implementation plan for the Strategy?
    - Is the e-Government Strategy aligned with the national development strategy and with the Sustainable Development Goals (SDGs)?
- Is there an ICT for development strategy?
- Is there a national policy on e-participation and/or inclusion in Digital Government?
- Is there a Cybersecurity strategy?
- Does the e-Government or other strategy provide other specific measures to ensure e-Government is used by the most vulnerable segments of the population?

Legal Framework (where available, please specify URLs or attach relevant documents)
- Has specific legislation been adopted in relation to the SDGs?
- Is there any e-Government related legislation?
- Is there a law on access to information such as Freedom of Information Act?
- Is there a personal data protection law such as Data Protection Act?
- Are there government-wide guidelines or ethical frameworks related to collection, retention or management of public data?
- Is there a digital security law such as Cybersecurity Act?
- Is there any legislation on open government and/or open government data?
- Is there legislation governing the reuse of government software and systems?
- Is there legislation in place to promote (or enforce) interoperability?

Portals (National level) (where available, please specify URLs or attach relevant documents)
- Is there an official e-Government portal? Please name all portals if there is more than one national portal.
- Is there an official open data portal?
- Please provide the URLs for the ministries of education, health, social protection, labor (employment, taxation, and decent work), environmental protection, energy, finance or any institutions performing the equivalent functions of these ministries. Please also provide relevant URLs including one-stop portals for these sectors.

Usage of online services and user satisfaction (where available, please specify URLs or attach relevant documents)
- Do you conduct surveys to measure satisfaction of e-Government services?
- If yes, do you publish the results online and share them with the public institutions concerned? Please provide details and any outcome if possible.

- Do you collect usage statistics of e-Government services? If yes, is there disaggregation by age, gender, vulnerable groups, and other dimensions?
- Do you publish such usage statistics? Please provide details and any outcome if possible.
- Do you have information on the share of public services or other operations conducted online compared to in person operations? If yes, please provide details.
- Does your government have a preferred modality for people to access services or interact with public administration?

Mobile Government (where available, please specify URLs or attach relevant documents)
- What are the public services available through mobile devices such as smartphones and tablets?
- Are there dedicated mobile apps (through platforms like Android, iOS, etc.) to deliver online services? Please provide details.
- Do you provide any mobile service through short message service (SMS) or equivalent? Please provide details.
- Do you track usage and user satisfaction of mobile services? If yes, please provide details.

E-government at the local level (where available, please specify URLs or attach relevant documents)
- What is the percentage of local governments and/or municipalities with a web presence?
- What is the percentage of local governments and/or municipalities with an e-Government/ Digital Government Strategy or equivalent?
- Do you know the approximate share of online public services delivered at local level? Please indicate the key sectors concerned.

Indicators (within government organizations) (where available, please specify URLs or attach relevant documents)
- What is the proportion of persons employed in central government organizations routinely using computers?
- What is the proportion of persons employed in central government organizations routinely using the Internet?
- What is the proportion of central government organizations with Internet access, by type of access? (Such as broadband, dial-up, cable)
- What is the proportion of central government organizations with a local area network?
- What is the proportion of central government organizations with a web presence?
- What is the proportion of central government organizations with a social media presence?
- What is the proportion of central government organizations releasing data in open formats (either at the national open data portal or in their own open data portal)?
- What percentage of your GDP is allocated for e-government at the national level?
- What percentage of your GDP is allocated for R&D (Research and Development) purposes?

Institutional Framework (National level) (where available, please specify URLs or attach relevant documents)
- Please provide the name of the government authority (department or ministry) in charge of e-Government/Digital Government. What is its positioning within the government?
- Does your country have a Chief Information Officer (CIO), or a similar senior official with a leadership role, to manage national cross-agency e-Government programs/projects?
- Is your government offering or planning to offer support to other countries in the area of e-Government?

Please provide details and contact point if possible.

Others (where available, please specify URLs or attach relevant documents)
- Is ICT training provided to civil servants to promote digital literacy and improve service delivery?
- Do you systematically collect large amount of digital data (social media data, IoT sensors, etc.) for public policy design or implementation? If so, do you utilize big data analytics technology in policy-making cycle?
- Do you utilize artificial intelligence, Internet of Things (IoT), blockchain, robotics, or other new and emerging technologies in delivering and managing online services? Please provide details.
- Do you have a digital ID system? Please provide details Does it target a specific segment of the population?
- In which area does your government plan to expand e-Government?

Please select whichever applies:
☐ I did not have the full information to respond to this questionnaire
☐ This questionnaire did not apply to my country but I did my best to respond to most questions.
☐ I mostly provided my own opinion/assessment rather than official information.
☐ Other:

Please provide additional information and/or data or docs that in your view are relevant for this questionnaire:

Contact details:
- Name:
- Job title:
- Email:
- Department/Organization:
- Country:
- Date Submitted:

Responding Member States

Afghanistan	Japan	Republic of Korea
Albania	Jordan	Republic of Moldova
Argentina	Kazakhstan	Romania
Armenia	Latvia	Russian Federation
Australia	Lebanon	Rwanda
Austria	Liechtenstein	Samoa
Azerbaijan	Lithuania	Saudi Arabia
Bahamas	Luxembourg	Serbia
Bahrain	Malawi	Seychelles
Bangladesh	Malaysia	Singapore
Barbados	Malta	Slovakia
Belarus	Marshall Islands	Slovenia
Belgium	Mauritius	Somalia
Brazil	Mexico	South Africa
Bulgaria	Mongolia	Spain
Burundi	Montenegro	Sweden
Cambodia	Morocco	Thailand
Chile	Mozambique	Timor-Leste
Colombia	Myanmar	Togo
Czech Republic	Namibia	Tonga
Denmark	Nauru	Tunisia
Dominican Republic	Netherlands	Turkey
Ecuador	New Zealand	Uganda
Eswatini	Niger	Ukraine
Ethiopia	Norway	United Arab Emirates
Finland	Oman	United Kingdom
Gambia	Panama	Uruguay
Georgia	Papua New Guinea	Uzbekistan
Ghana	Paraguay	Vanuatu
Guatemala	Peru	Viet Nam
Guinea	Philippines	Yemen
Iran	Poland	Zambia
Israel	Portugal	
Italy	Qatar	

A.9. Local Online Service Index

For the first time, assessment of sub-national or local delivery of e-government services has been carried out through a pilot exercise using a subset of cities/municipalities from each region. An ad-hoc local assessment questionnaire has been used to derive a Local Online Service Index (LOSI).

LOSI is a multi-criteria index that captures e-government development at the local level, by assessing information and services provided by municipalities to citizens through their official websites. LOSI is composed of 60 indicators organized into four criteria: (i) technology, (ii) content provision, (iii) services provision, and (iv) participation and engagement. The technology criterion focuses on the content and services assembled and made available in a municipality/city website. It addresses issues related to ease of navigation, website quality, visual appeal, functionality and reliability.

The focus of the content provision criterion is on the relevance of information provided to the citizens. It assesses the quality, availability, relevance, and concise presentation of specific information provided on a municipality's website. This criterion also assesses issues such as access to contact information about the organizational structure of the municipal government; access to public documents; access to sectorial information such as those on health, education, social security, economy. The presence of website privacy policies is also analyzed, since it has the potential to improve public perception, trust in government, and to enable greater citizen engagement with government.

In the services provision criterion, the focus is on the delivery of fundamental electronic services. This criterion includes aspects of electronic service delivery such as online application and delivery of certificates and licenses, employment search/offer, electronic payments, and the ability of users to apply or register for municipal events or services online, forms and reports submission and registration for services, participation in tenders and e-Procurement. Issues related to electronic authentication are likewise addressed in this criterion. This criterion also covers issues related to different aspects regarding how municipalities respond to citizen email requests for information.

The participation and engagement criterion assesses the existence of relevant online participation and engagement mechanisms and initiatives such as forums, complaint forms, and on-line surveys. Other features considered in this criterion includes the availability of social media features and the possibility to send comments/suggestions/complains to the concerned local government and more advanced participatory initiatives such as participatory budget, citizen engagement in online deliberations regarding public policies and services, and citizen empowerment through co-designing of policy options and coproduction of service components and delivery modalities.

Each of the 60 indicators is ascribed a "value 1" if it is found in a city/municipality website, "value 0" if it is absent and nothing if it is not applicable. The LOSI value of a municipality is the sum of the values of all the 60 indicators for that municipality.

The 60 indicators utilized are listed below:

Technology
Browser compatibility
Ease of portal finding
Portal loading speed
Mobile device accessibility
Navigability
Internal search mechanism
Internal advanced search mechanism
Alignment with markup validation standards
Alignment with display standards
Alignment with accessibility standards
Customization of display features
Foreign language support
Content Provision
Contact details
Organization structure
Names and contacts about heads of departments
Municipality information
Budget related information

Information about procurement announcements
Information about procurement results
Information about provided services
Information about municipality partnership with third parties
Facilitation of free internet access
Health information
Environmental information
Education information
Social welfare information
Sport and culture information
Privacy policy
Open data policy
Open data provision
OGD metadata
Smart cities initiatives
Use of emergent technologies
Online user support
Guiding information on online services use
Links for government agencies
Statistical data and studies provision
Evidence of portal content update
Service Provision
Portal authentication
Personal data accessibility
Personal data updating
Municipality responsiveness to emails
Delay of email response
Quality of email response
e-Procurement service
Police online declaration
Address change notification
Online application for residency
Online building permit
Online vacancies
e-Payment
Participation and engagement
Real time communication
Feedback/complaint submission
Online deliberation processes
Social networking features
Reporting of occurrences in public spaces
Participatory budgeting
Participatory land use plan
Announcement of upcoming e-participation activities
Feedback about consultation processes

The assessment of the 60 indicators for each city/municipality is done by a native speaker of the official language of that city/municipality. Instructions and guidance regarding the assessment process, and about email messages to be sent to the municipality to assess municipalities' responsiveness to email contacts, are provided to the assessors. To ensure validity and comparability of the data collected by the assessors, an expert review of all the data is conducted.

The cities/municipalities assessed are selected based on geographical coverage and population size. All geopolitical regional groups of United Nations Member States are represented. The number of countries included per region is determined based on the percentage of that region's total population in the context of the global population. Where possible, all subregions in a region are covered. Within regions, the countries with the largest population are selected, wherever possible. Where this is not possible, other criteria such as gross domestic product (GDP) and e-government ranking are considered. Within countries, the city with the largest population is selected. City population information are obtained from the United Nations Statistics Division (UNSD) website: (http://data.un.org/Data.aspx?d=POP&f=tableCode%3A240).

A.10. Country Classifications and Nomenclature in the Survey

Regional groupings are taken from the classification of the United Nations Statistics Division. For details, see http://unstats.un.org/unsd/methods/m49/m49regin.htm.

Economies are divided according to 2016 GNI per capita, calculated using the World Bank Atlas method. The groups are: low income, US$1,005 or less; lower middle income, US$1,006 - $3,955; upper middle income, US$3,956 - $12,235; and high income, US$12,236 or more[5]. Where data and statistics are reported by income groups, the Survey classifies countries according to the World Bank income classification of high, middle and low-income groups.

For details, see http://data.worldbank.org/about/country-classifications.

The lists of least developing countries, landlocked developing countries and small island developing countries were obtained from the United Nations Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States (UN-OHRLLS).

For details, see http://www.unohrlls.org/en/ldc/25/

A.11. United Nations e-government knowledge base

The Division for Public Institutions and Digital Government (formerly Division for Public Administration and Development Management) of the United Nations Department of Economic and Social Affairs maintains the United Nations egovernment knowledge base (egovkb) to provide governments and all stakeholders with easy access to data and information on e-government development.

The egovkb is an interactive online tool to view, sort and download information and datasets in open data formats from the 2018 UN E-Government Survey and as well as previous editions (2003, 2004, 2005, 2008, 2010, 2012. 2014 and 2016). The egovkb also includes advanced research features such as customizable regional and country comparisons, rankings and country profiles.

For more information and details, see the United Nations e-Government Knowledge Base at https://publicadministration.un.org/egovkb/

A.12. Evolving definitions and understanding of egovernment and its related development

Sources	Definition
2001 Benchmarking E-government: A Global Perspective (UNDESA, 2001)	E-government is 'a tool for information and service provision to citizens'
2003 World Public Sector Report: E-Government at the Crossroads (UNDESA, 2003)	E-government enhances the capacity of public administration using ICTs to increase the supply of public value (i.e., to deliver the things that people want)
United Nations Global E-Government Readiness Report 2004: Towards Access for Opportunity (UNDESA, 2004)	E-government is defined as the use of all ICTs by government to provide information and services to the public. This is a broader concept than in cases where it refers only to G-2-G networking.
United Nations Global E-Government Readiness Report 2005: From E-Government to E-Inclusion (UNDESA, 2005)	The definition of e-government needs to be enhanced from simply 'government-to-government networking' or 'use of ICTs by governments to provide information and services to the public' to one which encompasses the role of the government in promoting equality and social inclusion.
United Nations E-Government Survey 2008: From E-Government to Connected Governance (UNDESA, 2008)	E-government is the continuous innovation in the delivery of services, public participation and governance through the transformation of external and internal relationships using information technology, especially the Internet.
UN E-Government Survey 2014: E-Government for the Future We Want (UNDESA, 2014)	E-government can be referred to as the use and application of information technologies in public administration to streamline and integrate workflows and processes, to effectively manage data and information, enhance public service delivery, as well as expand communication channels for engagement and empowerment of people.
Organisation for Economic Co-operation and Development (OECD)	E-government is defined as 'the use of information and communications technologies (ICTs), and particularly the Internet, to achieve better government'.
World Bank (WB, 2015)	E-government refers to government agencies' use of information technologies (such as Wide Area Networks, the Internet, and mobile computing) that can transform relations with citizens, businesses, and other arms of government. These technologies can serve a variety of different ends: better delivery of government services to citizens, improved interactions with business and industry, citizen empowerment through access to information, or more efficient government management. The resulting benefits can be less corruption, increased transparency, greater convenience, revenue growth and/or cost reductions.

Table 1.   Country Profiles

Rank	Country	Region	Sub-Region	EGDI 2018	OSI	TII	HCI	Level of Income	LDC	LLDC	SIDS
177	Afghanistan	Asia	Southern Asia	0.2585	0.3056	0.1138	0.3562	Low income	x	x	
74	Albania	Europe	Southern Europe	0.6519	0.7361	0.4318	0.7877	Upper middle income			
130	Algeria	Africa	Northern Africa	0.4227	0.2153	0.3889	0.6640	Upper middle income			
62	Andorra	Europe	Southern Europe	0.6857	0.6042	0.7220	0.7309	High income			
155	Angola	Africa	Middle Africa	0.3376	0.4097	0.0972	0.5060	Lower middle income	x		
90	Antigua and Barbuda	Americas	Caribbean	0.5906	0.4583	0.5617	0.7518	High income			x
43	Argentina	Americas	South America	0.7335	0.7500	0.5927	0.8579	Upper middle income			
87	Armenia	Asia	Western Asia	0.5944	0.5625	0.4660	0.7547	Lower middle income		x	
2	Australia	Oceania	Australia and New Zealand	0.9053	0.9722	0.7436	1.0000	High income			
20	Austria	Europe	Western Europe	0.8301	0.8681	0.7716	0.8505	High income			
70	Azerbaijan	Asia	Western Asia	0.6574	0.7292	0.5062	0.7369	Upper middle income		x	
72	Bahamas	Americas	Caribbean	0.6552	0.7014	0.5393	0.7249	High income			x
26	Bahrain	Asia	Western Asia	0.8116	0.7986	0.8466	0.7897	High income			
115	Bangladesh	Asia	Southern Asia	0.4862	0.7847	0.1976	0.4763	Lower middle income	x		
46	Barbados	Americas	Caribbean	0.7229	0.6667	0.6719	0.8301	High income			x
38	Belarus	Europe	Eastern Europe	0.7641	0.7361	0.6881	0.8681	Upper middle income			
27	Belgium	Europe	Western Europe	0.8080	0.7569	0.6930	0.9740	High income			
132	Belize	Americas	Central America	0.4115	0.3333	0.2247	0.6765	Upper middle income			x
159	Benin	Africa	Western Africa	0.3264	0.4722	0.1418	0.3653	Low income	x		
126	Bhutan	Asia	Southern Asia	0.4274	0.5000	0.3080	0.4743	Lower middle income	x	x	
103	Bolivia(Plurinational State of)	Americas	South America	0.5307	0.5625	0.3148	0.7148	Lower middle income		x	
105	Bosnia and Herzegovina	Europe	Southern Europe	0.5303	0.4306	0.4385	0.7217	Upper middle income			
127	Botswana	Africa	Southern Africa	0.4253	0.2083	0.3982	0.6694	Upper middle income		x	
44	Brazil	Americas	South America	0.7327	0.9236	0.5220	0.7525	Upper middle income			
59	Brunei Darussalam	Asia	South-Eastern Asia	0.6923	0.7222	0.6066	0.7480	High income			
47	Bulgaria	Europe	Eastern Europe	0.7177	0.7639	0.5785	0.8106	Upper middle income			
165	Burkina Faso	Africa	Western Africa	0.3016	0.5347	0.1603	0.2097	Low income	x	x	
166	Burundi	Africa	Eastern Africa	0.2985	0.3056	0.0786	0.5113	Low income	x	x	
145	Cambodia	Asia	South-Eastern Asia	0.3753	0.2500	0.3132	0.5626	Lower middle income	x		
136	Cameroon	Africa	Middle Africa	0.3997	0.4583	0.1790	0.5618	Lower middle income			
23	Canada	Americas	Northern America	0.8258	0.9306	0.6724	0.8744	High income			
112	Cabo Verde	Africa	Western Africa	0.4980	0.4861	0.3926	0.6152	Lower middle income			x

Table 1.   Country Profiles (continued)

Rank	Country	Region	Sub-Region	EGDI 2018	OSI	TII	HCI	Level of Income	LDC	LLDC	SIDS
188	Central African Republic	Africa	Middle Africa	0.1584	0.2083	0.0322	0.2347	Low income	x	x	
190	Chad	Africa	Middle Africa	0.1257	0.1458	0.0669	0.1644	Low income	x	x	
42	Chile	Americas	South America	0.7350	0.8333	0.5377	0.8339	High income			
65	China	Asia	Eastern Asia	0.6811	0.8611	0.4735	0.7088	Upper middle income			
61	Colombia	Americas	South America	0.6871	0.8819	0.4412	0.7382	Upper middle income			
182	Comoros	Africa	Eastern Africa	0.2336	0.0972	0.0871	0.5166	Low income	x		x
164	Congo	Africa	Middle Africa	0.3024	0.1667	0.1889	0.5515	Lower middle income			
56	Costa Rica	Americas	Central America	0.7004	0.6736	0.6343	0.7933	Upper middle income			
172	Côte d'Ivoire	Africa	Western Africa	0.2776	0.2222	0.2748	0.3357	Lower middle income			
55	Croatia	Europe	Southern Europe	0.7018	0.6806	0.6051	0.8196	Upper middle income			
134	Cuba	Americas	Caribbean	0.4101	0.2986	0.1455	0.7862	Upper middle income			x
36	Cyprus	Asia	Western Asia	0.7736	0.7847	0.7279	0.8083	High income			
54	Czech Republic	Europe	Eastern Europe	0.7084	0.6528	0.5971	0.8752	High income			
185	Democratic People's Republic of Korea	Asia	Eastern Asia	0.2159	0.0000	0.0327	0.6150	Low income			
176	Democratic Republic of the Congo	Africa	Middle Africa	0.2612	0.2083	0.0645	0.5108	Low income	x		
1	Denmark	Europe	Northern Europe	0.9150	1.0000	0.7978	0.9472	High income			
179	Djibouti	Africa	Eastern Africa	0.2401	0.2917	0.0961	0.3325	Lower middle income	x		
93	Dominica	Americas	Caribbean	0.5794	0.6111	0.4775	0.6497	Upper middle income			x
95	Dominican Republic	Americas	Caribbean	0.5726	0.6597	0.3655	0.6927	Upper middle income			x
84	Ecuador	Americas	South America	0.6129	0.7292	0.3699	0.7395	Upper middle income			
114	Egypt	Africa	Northern Africa	0.4880	0.5347	0.3222	0.6072	Lower middle income			
100	El Salvador	Americas	Central America	0.5469	0.6250	0.3810	0.6348	Lower middle income			
184	Equatioral Guinea	Africa	Middle Africa	0.2298	0.0486	0.1010	0.5397	Upper middle income			
189	Eritrea	Africa	Eastern Africa	0.1337	0.0833	0.0000	0.3179	Low income	x		
16	Estonia	Europe	Northern Europe	0.8486	0.9028	0.7613	0.8818	High income			
141	Eswatini	Africa	Southern Africa	0.3820	0.3750	0.1772	0.5939	Lower middle income		x	
151	Ethiopia	Africa	Eastern Africa	0.3463	0.6319	0.0976	0.3094	Low income	x	x	
102	Fiji	Oceania	Melanesia	0.5348	0.4583	0.3562	0.7899	Upper middle income			x
6	Finland	Europe	Northern Europe	0.8815	0.9653	0.7284	0.9509	High income			
9	France	Europe	Western Europe	0.8790	0.9792	0.7979	0.8598	High income			
125	Gabon	Africa	Middle Africa	0.4313	0.2292	0.4250	0.6398	Upper middle income			

Table 1.   Country Profiles (continued)

Rank	Country	Region	Sub-Region	EGDI 2018	OSI	TII	HCI	Level of Income	LDC	LLDC	SIDS
168	Gambia	Africa	Western Africa	0.2958	0.2708	0.2627	0.3539	Low income	x		
60	Georgia	Asia	Western Asia	0.6893	0.6944	0.5403	0.8333	Lower middle income			
12	Germany	Europe	Western Europe	0.8765	0.9306	0.7952	0.9036	High income			
101	Ghana	Africa	Western Africa	0.5390	0.6944	0.3558	0.5669	Lower middle income			
35	Greece	Europe	Southern Europe	0.7833	0.8194	0.6439	0.8867	High income			
89	Grenada	Americas	Caribbean	0.5930	0.4931	0.4658	0.8202	Upper middle income			x
113	Guatemala	Americas	Central America	0.4974	0.6458	0.2941	0.5524	Lower middle income			
181	Guinea	Africa	Western Africa	0.2348	0.3125	0.1513	0.2406	Low income	x		
187	Guinea-Bissau	Africa	Western Africa	0.1887	0.0764	0.1028	0.3869	Low income	x		x
124	Guyana	Americas	South America	0.4316	0.4306	0.2541	0.6102	Upper middle income			x
163	Haiti	Americas	Caribbean	0.3047	0.4444	0.1078	0.3620	Low income	x		x
123	Honduras	Americas	Central America	0.4474	0.5139	0.2268	0.6015	Lower middle income			
45	Hungary	Europe	Eastern Europe	0.7265	0.7361	0.6071	0.8364	High income			
19	Iceland	Europe	Northern Europe	0.8316	0.7292	0.8292	0.9365	High income			
96	India	Asia	Southern Asia	0.5669	0.9514	0.2009	0.5484	Lower middle income			
107	Indonesia	Asia	South-Eastern Asia	0.5258	0.5694	0.3222	0.6857	Lower middle income			
86	Iran (Islamic Republic of)	Asia	Southern Asia	0.6083	0.6319	0.4566	0.7364	Upper middle income			
155	Iraq	Asia	Western Asia	0.3376	0.3194	0.1840	0.5094	Upper middle income			
22	Ireland	Europe	Northern Europe	0.8287	0.8264	0.6970	0.9626	High income			
31	Israel	Asia	Western Asia	0.7998	0.8264	0.7095	0.8635	High income			
24	Italy	Europe	Southern Europe	0.8209	0.9514	0.6771	0.8341	High income			
118	Jamaica	Americas	Caribbean	0.4697	0.3194	0.3941	0.6957	Upper middle income			x
10	Japan	Asia	Eastern Asia	0.8783	0.9514	0.8406	0.8428	High income			
98	Jordan	Asia	Western Asia	0.5575	0.4931	0.4406	0.7387	Lower middle income			
39	Kazakhstan	Asia	Central Asia	0.7597	0.8681	0.5723	0.8388	Upper middle income		x	
122	Kenya	Africa	Eastern Africa	0.4541	0.6250	0.1901	0.5472	Lower middle income			
153	Kiribati	Oceania	Micronesia	0.3450	0.2986	0.0773	0.6591	Lower middle income	x		x
41	Kuwait	Asia	Western Asia	0.7388	0.7917	0.7394	0.6852	High income			
91	Kyrgizistan	Asia	Central Asia	0.5835	0.6458	0.3418	0.7628	Lower middle income		x	
162	"Lao People's Democratic Republic"	Asia	South-Eastern Asia	0.3056	0.1667	0.2246	0.5254	Lower middle income	x	x	
57	Latvia	Europe	Northern Europe	0.6996	0.6667	0.6188	0.8132	High income			

Table 1.   Country Profiles (continued)

Rank	Country	Region	Sub-Region	EGDI 2018	OSI	TII	HCI	Level of Income	LDC	LLDC	SIDS
99	Lebanon	Asia	Western Asia	0.5530	0.4722	0.5219	0.6649	Upper middle income			
167	Lesotho	Africa	Southern Africa	0.2968	0.1111	0.2468	0.5324	Lower middle income	x	x	
173	Liberia	Africa	Western Africa	0.2737	0.3403	0.1036	0.3772	Low income	x		
140	Libya	Africa	Northern Africa	0.3833	0.0972	0.3353	0.7173	Upper middle income			
25	Liechtenstein	Europe	Western Europe	0.8204	0.7986	0.8389	0.8237	High income			
40	Lithuania	Europe	Northern Europe	0.7534	0.7986	0.6293	0.8323	High income			
18	Luxembourg	Europe	Western Europe	0.8334	0.9236	0.7964	0.7803	High income			
170	Madagascar	Africa	Eastern Africa	0.2792	0.3056	0.0499	0.4822	Low income	x		
175	Malawi	Africa	Eastern Africa	0.2708	0.2569	0.0834	0.4720	Low income	x	x	
48	Malaysia	Asia	South-Eastern Asia	0.7174	0.8889	0.5647	0.6987	Upper middle income			
97	Maldives	Asia	Southern Asia	0.5615	0.4931	0.5159	0.6754	Upper middle income			x
178	Mali	Africa	Western Africa	0.2424	0.2639	0.2074	0.2558	Low income	x	x	
30	Malta	Europe	Southern Europe	0.8011	0.8403	0.7657	0.7973	High income			
149	Marshall Islands	Oceania	Micronesia	0.3543	0.2292	0.1037	0.7301	Upper middle income			x
183	Mauritania	Africa	Western Africa	0.2314	0.1597	0.1878	0.3467	Lower middle income	x		
66	Mauritius	Africa	Eastern Africa	0.6678	0.7292	0.5435	0.7308	Upper middle income			x
64	Mexico	Americas	Central America	0.6818	0.9236	0.4173	0.7044	Upper middle income			
161	Micronesia	Oceania	Micronesia	0.3155	0.1458	0.1118	0.6889	Lower middle income			x
28	Monaco	Europe	Western Europe	0.8050	0.6250	1.0000	0.7901	High income			
92	Mongolia	Asia	Eastern Asia	0.5824	0.5972	0.3602	0.7899	Lower middle income		x	
58	Montenegro	Europe	Southern Europe	0.6966	0.6667	0.6059	0.8172	Upper middle income			
110	Morocco	Africa	Northern Africa	0.5214	0.6667	0.3697	0.5278	Lower middle income			
160	Mozambique	Africa	Eastern Africa	0.3195	0.4236	0.1398	0.3951	Low income	x		
157	Myanmar	Asia	South-Eastern Asia	0.3328	0.2292	0.2565	0.5127	Lower middle income	x		
121	Namibia	Africa	Southern Africa	0.4554	0.4514	0.3299	0.5850	Upper middle income			
158	Nauru	Oceania	Micronesia	0.3324	0.1319	0.3033	0.5619	Upper middle income			x
117	Nepal	Asia	Southern Asia	0.4748	0.6875	0.2413	0.4957	Low income	x	x	
13	Netherlands	Europe	Western Europe	0.8757	0.9306	0.7758	0.9206	High income			
8	New Zealand	Oceania	Australia and New Zealand	0.8806	0.9514	0.7455	0.9450	High income			
129	Nicaragua	Americas	Central America	0.4233	0.4028	0.2825	0.5847	Lower middle income			
192	Niger	Africa	Western Africa	0.1095	0.1597	0.0795	0.0894	Low income	x	x	
143	Nigeria	Africa	Western Africa	0.3807	0.5278	0.1883	0.4261	Lower middle income			

Table 1. Country Profiles (continued)

Rank	Country	Region	Sub-Region	EGDI 2018	OSI	TII	HCI	Level of Income	LDC	LLDC	SIDS
14	Norway	Europe	Northern Europe	0.8557	0.9514	0.7131	0.9025	High income			
63	Oman	Asia	Western Asia	0.6846	0.8125	0.5399	0.7013	High income			
148	Pakistan	Asia	Southern Asia	0.3566	0.5486	0.1529	0.3682	Lower middle income			
111	Palau	Oceania	Micronesia	0.5024	0.3264	0.3346	0.8462	High income			x
85	Panama	Americas	Central America	0.6092	0.6597	0.4543	0.7137	Upper middle income			
171	Papua New Guinea	Oceania	Melanesia	0.2787	0.2708	0.0875	0.4778	Lower middle income			x
108	Paraguay	Americas	South America	0.5255	0.5556	0.3507	0.6701	Upper middle income		x	
77	Peru	Americas	South America	0.6461	0.8194	0.3913	0.7276	Upper middle income			
75	Philippines	Asia	South-Eastern Asia	0.6512	0.8819	0.3547	0.7171	Lower middle income			
33	Poland	Europe	Eastern Europe	0.7926	0.9306	0.5805	0.8668	High income			
29	Portugal	Europe	Southern Europe	0.8031	0.9306	0.6617	0.8170	High income			
51	Qatar	Asia	Western Asia	0.7132	0.7917	0.6797	0.6683	High income			
3	Republic of Korea	Asia	Eastern Asia	0.9010	0.9792	0.8496	0.8743	High income			
69	Republic of Moldova	Europe	Eastern Europe	0.6590	0.7708	0.4787	0.7274	Lower middle income		x	
67	Romania	Europe	Eastern Europe	0.6671	0.6597	0.5471	0.7944	Upper middle income			
32	Russian Federation	Europe	Eastern Europe	0.7969	0.9167	0.6219	0.8522	Upper middle income			
120	Rwanda	Africa	Eastern Africa	0.4590	0.7222	0.1733	0.4815	Low income	x	x	
71	Saint Kitts and Nevis	Americas	Caribbean	0.6554	0.5347	0.6825	0.7491	High income			x
119	Saint Lucia	Americas	Caribbean	0.4660	0.2847	0.4110	0.7022	Upper middle income			x
104	"Saint Vincent and the Grenadines"	Americas	Caribbean	0.5306	0.4514	0.4583	0.6820	Upper middle income			x
128	Samoa	Oceania	Polynesia	0.4236	0.3403	0.2064	0.7241	Upper middle income			x
76	San Marino	Europe	Southern Europe	0.6471	0.4236	0.7075	0.8102	High income			
154	Sao Tome and Principe	Africa	Middle Africa	0.3424	0.1389	0.3053	0.5830	Lower middle income	x		x
52	Saudi Arabia	Asia	Western Asia	0.7119	0.7917	0.5339	0.8101	High income			
150	Senegal	Africa	Western Africa	0.3486	0.4792	0.2240	0.3427	Low income	x		
49	Serbia	Europe	Southern Europe	0.7155	0.7361	0.6208	0.7896	Upper middle income			
83	Seychelles	Africa	Eastern Africa	0.6163	0.6181	0.5008	0.7299	High income			x
174	Sierra Leone	Africa	Western Africa	0.2717	0.3472	0.1597	0.3081	Low income	x		
7	Singapore	Asia	South-Eastern Asia	0.8812	0.9861	0.8019	0.8557	High income			x
49	Slovakia	Europe	Eastern Europe	0.7155	0.7361	0.5964	0.8141	High income			
37	Slovenia	Europe	Southern Europe	0.7714	0.7986	0.6232	0.8923	High income			

Table 1. Country Profiles (continued)

Rank	Country	Region	Sub-Region	EGDI 2018	OSI	TII	HCI	Level of Income	LDC	LLDC	SIDS
169	Solomon Islands	Oceania	Melanesia	0.2816	0.2431	0.1285	0.4732	Lower middle income	x		x
193	Somalia	Africa	Eastern Africa	0.0566	0.1111	0.0586	0.0000	Low income	x		
68	South Africa	Africa	Southern Africa	0.6618	0.8333	0.4231	0.7291	Upper middle income			
191	South Sudan	Africa	Eastern Africa	0.1214	0.1111	0.0262	0.2269	Low income	x	x	
17	Spain	Europe	Southern Europe	0.8415	0.9375	0.6986	0.8885	High income			
94	Sri Lanka	Asia	Southern Asia	0.5751	0.6667	0.3136	0.7451	Lower middle income			
180	Sudan	Africa	Northern Africa	0.2394	0.1528	0.1780	0.3873	Lower middle income	x		
116	Suriname	Americas	South America	0.4773	0.2917	0.4595	0.6808	Upper middle income			x
5	Sweden	Europe	Northern Europe	0.8882	0.9444	0.7835	0.9366	High income			
15	Switzerland	Europe	Western Europe	0.8520	0.8472	0.8428	0.8660	High income			
152	Syrian Arab Republic	Asia	Western Asia	0.3459	0.2986	0.2532	0.4860	Lower middle income			
131	Tajikistan	Asia	Central Asia	0.4220	0.3403	0.2254	0.7002	Lower middle income		x	
73	Thailand	Asia	South-Eastern Asia	0.6543	0.6389	0.5338	0.7903	Upper middle income			
79	The former Yugoslav Republic of Macedonia	Europe	Southern Europe	0.6312	0.7153	0.4859	0.6924	Upper middle income		x	
142	Timor-Leste	Asia	South-Eastern Asia	0.3816	0.3125	0.2937	0.5387	Lower middle income	x		x
138	Togo	Africa	Western Africa	0.3989	0.5556	0.1353	0.5058	Low income	x		
109	Tonga	Oceania	Polynesia	0.5237	0.4722	0.2951	0.8039	Upper middle income			x
78	Trinidad and Tobago	Americas	Caribbean	0.6440	0.6389	0.5735	0.7195	High income			x
80	Tunisia	Africa	Northern Africa	0.6254	0.8056	0.4066	0.6640	Lower middle income			
53	Turkey	Asia	Western Asia	0.7112	0.8889	0.4298	0.8148	Upper middle income			
147	Turkmenistan	Asia	Central Asia	0.3652	0.1319	0.3011	0.6626	Upper middle income		x	
144	Tuvalu	Oceania	Polynesia	0.3779	0.2222	0.2693	0.6422	Upper middle income	x		x
135	Uganda	Africa	Eastern Africa	0.4055	0.5694	0.1566	0.4906	Low income	x	x	
82	Ukraine	Europe	Eastern Europe	0.6165	0.5694	0.4364	0.8436	Lower middle income			
21	United Arab Emirates	Asia	Western Asia	0.8295	0.9444	0.8564	0.6877	High income			
4	United Kingdom of Great Britain and Northern Ireland	Europe	Northern Europe	0.8999	0.9792	0.8004	0.9200	High income			
139	United Republic of Tanzania	Africa	Eastern Africa	0.3929	0.5625	0.1403	0.4759	Low income	x		
11	United States of America	Americas	Northern America	0.8769	0.9861	0.7564	0.8883	High income			
34	Uruguay	Americas	South America	0.7858	0.8889	0.6967	0.7719	High income			

Table 1.   Country Profiles (continued)

Rank	Country	Region	Sub-Region	EGDI 2018	OSI	TII	HCI	Level of Income	LDC	LLDC	SIDS
81	Uzbekistan	Asia	Central Asia	0.6207	0.7917	0.3307	0.7396	Lower middle income		x	
137	Vanuatu	Oceania	Melanesia	0.3990	0.4375	0.1920	0.5675	Lower middle income	x		x
106	Venuzuela (Bolivian Republic of)	Americas	South America	0.5287	0.4097	0.4148	0.7615	Upper middle income			
88	Viet Nam	Asia	South-Eastern Asia	0.5931	0.7361	0.3890	0.6543	Lower middle income			
186	Yemen	Asia	Western Asia	0.2154	0.0972	0.1454	0.4037	Lower middle income	x		
133	Zambia	Africa	Eastern Africa	0.4111	0.4792	0.1853	0.5689	Lower middle income	x	x	
146	Zimbabwe	Africa	Eastern Africa	0.3692	0.3264	0.2144	0.5668	Low income		x	

Table 2.   E-Government Development Index (EGDI)

Rank	Country	EGDI Level	EGDI	Online Service Component	Telecomm. Infrustrcture Component	Human Capital Component
177	Afghanistan	Middle EGDI	0.2585	0.3056	0.1138	0.3562
74	Albania	High EGDI	0.6519	0.7361	0.4318	0.7877
130	Algeria	Middle EGDI	0.4227	0.2153	0.3889	0.6640
62	Andorra	High EGDI	0.6857	0.6042	0.7220	0.7309
155	Angola	Middle EGDI	0.3376	0.4097	0.0972	0.5060
90	Antigua and Barbuda	High EGDI	0.5906	0.4583	0.5617	0.7518
43	Argentina	High EGDI	0.7335	0.7500	0.5927	0.8579
87	Armenia	High EGDI	0.5944	0.5625	0.4660	0.7547
2	Australia	Very High EGDI	0.9053	0.9722	0.7436	1.0000
20	Austria	Very High EGDI	0.8301	0.8681	0.7716	0.8505
70	Azerbaijan	High EGDI	0.6574	0.7292	0.5062	0.7369
72	Bahamas	High EGDI	0.6552	0.7014	0.5393	0.7249
26	Bahrain	Very High EGDI	0.8116	0.7986	0.8466	0.7897
115	Bangladesh	Middle EGDI	0.4862	0.7847	0.1976	0.4763
46	Barbados	High EGDI	0.7229	0.6667	0.6719	0.8301
38	Belarus	Very High EGDI	0.7641	0.7361	0.6881	0.8681
27	Belgium	Very High EGDI	0.8080	0.7569	0.6930	0.9740
132	Belize	Middle EGDI	0.4115	0.3333	0.2247	0.6765
159	Benin	Middle EGDI	0.3264	0.4722	0.1418	0.3653
126	Bhutan	Middle EGDI	0.4274	0.5000	0.3080	0.4743
103	Bolivia(Plurinational State of)	High EGDI	0.5307	0.5625	0.3148	0.7148
105	Bosnia and Herzegovina	High EGDI	0.5303	0.4306	0.4385	0.7217
127	Botswana	Middle EGDI	0.4253	0.2083	0.3982	0.6694
44	Brazil	High EGDI	0.7327	0.9236	0.5220	0.7525
59	Brunei Darussalam	High EGDI	0.6923	0.7222	0.6066	0.7480
47	Bulgaria	High EGDI	0.7177	0.7639	0.5785	0.8106
165	Burkina Faso	Middle EGDI	0.3016	0.5347	0.1603	0.2097
166	Burundi	Middle EGDI	0.2985	0.3056	0.0786	0.5113
145	Cambodia	Middle EGDI	0.3753	0.2500	0.3132	0.5626
136	Cameroon	Middle EGDI	0.3997	0.4583	0.1790	0.5618
23	Canada	Very High EGDI	0.8258	0.9306	0.6724	0.8744
112	Cabo Verde	Middle EGDI	0.4980	0.4861	0.3926	0.6152
188	Central African Republic	Low EGDI	0.1584	0.2083	0.0322	0.2347
190	Chad	Low EGDI	0.1257	0.1458	0.0669	0.1644
42	Chile	High EGDI	0.7350	0.8333	0.5377	0.8339
65	China	High EGDI	0.6811	0.8611	0.4735	0.7088
61	Colombia	High EGDI	0.6871	0.8819	0.4412	0.7382
182	Comoros	Low EGDI	0.2336	0.0972	0.0871	0.5166
164	Congo	Middle EGDI	0.3024	0.1667	0.1889	0.5515
56	Costa Rica	High EGDI	0.7004	0.6736	0.6343	0.7933
172	Côte d'Ivoire	Middle EGDI	0.2776	0.2222	0.2748	0.3357
55	Croatia	High EGDI	0.7018	0.6806	0.6051	0.8196

Table 2.   E-Government Development Index (EGDI) (continued)

Rank	Country	EGDI Level	EGDI	Online Service Component	Telecomm. Infrustrcture Component	Human Capital Component
134	Cuba	Middle EGDI	0.4101	0.2986	0.1455	0.7862
36	Cyprus	Very High EGDI	0.7736	0.7847	0.7279	0.8083
54	Czech Republic	High EGDI	0.7084	0.6528	0.5971	0.8752
185	Democratic People's Republic of Korea	Low EGDI	0.2159	0.0000	0.0327	0.6150
176	Democratic Republic of the Congo	Middle EGDI	0.2612	0.2083	0.0645	0.5108
1	Denmark	Very High EGDI	0.9150	1.0000	0.7978	0.9472
179	Djibouti	Low EGDI	0.2401	0.2917	0.0961	0.3325
93	Dominica	High EGDI	0.5794	0.6111	0.4775	0.6497
95	Dominican Republic	High EGDI	0.5726	0.6597	0.3655	0.6927
84	Ecuador	High EGDI	0.6129	0.7292	0.3699	0.7395
114	Egypt	Middle EGDI	0.4880	0.5347	0.3222	0.6072
100	El Salvador	High EGDI	0.5469	0.6250	0.3810	0.6348
184	Equatioral Guinea	Low EGDI	0.2298	0.0486	0.1010	0.5397
189	Eritrea	Low EGDI	0.1337	0.0833	0.0000	0.3179
16	Estonia	Very High EGDI	0.8486	0.9028	0.7613	0.8818
141	Eswatini	Middle EGDI	0.3820	0.3750	0.1772	0.5939
151	Ethiopia	Middle EGDI	0.3463	0.6319	0.0976	0.3094
102	Fiji	High EGDI	0.5348	0.4583	0.3562	0.7899
6	Finland	Very High EGDI	0.8815	0.9653	0.7284	0.9509
9	France	Very High EGDI	0.8790	0.9792	0.7979	0.8598
125	Gabon	Middle EGDI	0.4313	0.2292	0.4250	0.6398
168	Gambia	Middle EGDI	0.2958	0.2708	0.2627	0.3539
60	Georgia	High EGDI	0.6893	0.6944	0.5403	0.8333
12	Germany	Very High EGDI	0.8765	0.9306	0.7952	0.9036
101	Ghana	High EGDI	0.5390	0.6944	0.3558	0.5669
35	Greece	Very High EGDI	0.7833	0.8194	0.6439	0.8867
89	Grenada	High EGDI	0.5930	0.4931	0.4658	0.8202
113	Guatemala	Middle EGDI	0.4974	0.6458	0.2941	0.5524
181	Guinea	Low EGDI	0.2348	0.3125	0.1513	0.2406
187	Guinea-Bissau	Low EGDI	0.1887	0.0764	0.1028	0.3869
124	Guyana	Middle EGDI	0.4316	0.4306	0.2541	0.6102
163	Haiti	Middle EGDI	0.3047	0.4444	0.1078	0.3620
123	Honduras	Middle EGDI	0.4474	0.5139	0.2268	0.6015
45	Hungary	High EGDI	0.7265	0.7361	0.6071	0.8364
19	Iceland	Very High EGDI	0.8316	0.7292	0.8292	0.9365
96	India	High EGDI	0.5669	0.9514	0.2009	0.5484
107	Indonesia	High EGDI	0.5258	0.5694	0.3222	0.6857
86	Iran (Islamic Republic of)	High EGDI	0.6083	0.6319	0.4566	0.7364
155	Iraq	Middle EGDI	0.3376	0.3194	0.1840	0.5094
22	Ireland	Very High EGDI	0.8287	0.8264	0.6970	0.9626
31	Israel	Very High EGDI	0.7998	0.8264	0.7095	0.8635

Table 2.   E-Government Development Index (EGDI) (continued)

Rank	Country	EGDI Level	EGDI	Online Service Component	Telecomm. Infrustrcture Component	Human Capital Component
24	Italy	Very High EGDI	0.8209	0.9514	0.6771	0.8341
118	Jamaica	Middle EGDI	0.4697	0.3194	0.3941	0.6957
10	Japan	Very High EGDI	0.8783	0.9514	0.8406	0.8428
98	Jordan	High EGDI	0.5575	0.4931	0.4406	0.7387
39	Kazakhistan	Very High EGDI	0.7597	0.8681	0.5723	0.8388
122	Kenya	Middle EGDI	0.4541	0.6250	0.1901	0.5472
153	Kiribati	Middle EGDI	0.3450	0.2986	0.0773	0.6591
41	Kuwait	High EGDI	0.7388	0.7917	0.7394	0.6852
91	Kyrgizistan	High EGDI	0.5835	0.6458	0.3418	0.7628
162	Lao People's Democratic Republic	Middle EGDI	0.3056	0.1667	0.2246	0.5254
57	Latvia	High EGDI	0.6996	0.6667	0.6188	0.8132
99	Lebanon	High EGDI	0.5530	0.4722	0.5219	0.6649
167	Lesotho	Middle EGDI	0.2968	0.1111	0.2468	0.5324
173	Liberia	Middle EGDI	0.2737	0.3403	0.1036	0.3772
140	Libya	Middle EGDI	0.3833	0.0972	0.3353	0.7173
25	Liechtenstein	Very High EGDI	0.8204	0.7986	0.8389	0.8237
40	Lithuania	Very High EGDI	0.7534	0.7986	0.6293	0.8323
18	Luxembourg	Very High EGDI	0.8334	0.9236	0.7964	0.7803
170	Madagascar	Middle EGDI	0.2792	0.3056	0.0499	0.4822
175	Malawi	Middle EGDI	0.2708	0.2569	0.0834	0.4720
48	Malaysia	High EGDI	0.7174	0.8889	0.5647	0.6987
97	Maldives	High EGDI	0.5615	0.4931	0.5159	0.6754
178	Mali	Low EGDI	0.2424	0.2639	0.2074	0.2558
30	Malta	Very High EGDI	0.8011	0.8403	0.7657	0.7973
149	Marshall Islands	Middle EGDI	0.3543	0.2292	0.1037	0.7301
183	Mauritania	Low EGDI	0.2314	0.1597	0.1878	0.3467
66	Mauritius	High EGDI	0.6678	0.7292	0.5435	0.7308
64	Mexico	High EGDI	0.6818	0.9236	0.4173	0.7044
161	Micronesia	Middle EGDI	0.3155	0.1458	0.1118	0.6889
28	Monaco	Very High EGDI	0.8050	0.6250	1.0000	0.7901
92	Mongolia	High EGDI	0.5824	0.5972	0.3602	0.7899
58	Montenegro	High EGDI	0.6966	0.6667	0.6059	0.8172
110	Morocco	High EGDI	0.5214	0.6667	0.3697	0.5278
160	Mozambique	Middle EGDI	0.3195	0.4236	0.1398	0.3951
157	Myanmar	Middle EGDI	0.3328	0.2292	0.2565	0.5127
121	Namibia	Middle EGDI	0.4554	0.4514	0.3299	0.5850
158	Nauru	Middle EGDI	0.3324	0.1319	0.3033	0.5619
117	Nepal	Middle EGDI	0.4748	0.6875	0.2413	0.4957
13	Netherlands	Very High EGDI	0.8757	0.9306	0.7758	0.9206
8	New Zealand	Very High EGDI	0.8806	0.9514	0.7455	0.9450
129	Nicaragua	Middle EGDI	0.4233	0.4028	0.2825	0.5847
192	Niger	Low EGDI	0.1095	0.1597	0.0795	0.0894

Table 2.   E-Government Development Index (EGDI) (continued)

Rank	Country	EGDI Level	EGDI	Online Service Component	Telecomm. Infrustrcture Component	Human Capital Component
143	Nigeria	Middle EGDI	0.3807	0.5278	0.1883	0.4261
14	Norway	Very High EGDI	0.8557	0.9514	0.7131	0.9025
63	Oman	High EGDI	0.6846	0.8125	0.5399	0.7013
148	Pakistan	Middle EGDI	0.3566	0.5486	0.1529	0.3682
111	Palau	High EGDI	0.5024	0.3264	0.3346	0.8462
85	Panama	High EGDI	0.6092	0.6597	0.4543	0.7137
171	Papua New Guinea	Middle EGDI	0.2787	0.2708	0.0875	0.4778
108	Paraguay	High EGDI	0.5255	0.5556	0.3507	0.6701
77	Peru	High EGDI	0.6461	0.8194	0.3913	0.7276
75	Philippines	High EGDI	0.6512	0.8819	0.3547	0.7171
33	Poland	Very High EGDI	0.7926	0.9306	0.5805	0.8668
29	Portugal	Very High EGDI	0.8031	0.9306	0.6617	0.8170
51	Qatar	High EGDI	0.7132	0.7917	0.6797	0.6683
3	Republic of Korea	Very High EGDI	0.9010	0.9792	0.8496	0.8743
69	Republic of Moldova	High EGDI	0.6590	0.7708	0.4787	0.7274
67	Romania	High EGDI	0.6671	0.6597	0.5471	0.7944
32	Russian Federation	Very High EGDI	0.7969	0.9167	0.6219	0.8522
120	Rwanda	Middle EGDI	0.4590	0.7222	0.1733	0.4815
71	Saint Kittis and Nevis	High EGDI	0.6554	0.5347	0.6825	0.7491
119	Saint Lucia	Middle EGDI	0.4660	0.2847	0.4110	0.7022
104	Saint Vincent and the Grenadines	High EGDI	0.5306	0.4514	0.4583	0.6820
128	Samoa	Middle EGDI	0.4236	0.3403	0.2064	0.7241
76	San Marino	High EGDI	0.6471	0.4236	0.7075	0.8102
154	Sao Tome and Principe	Middle EGDI	0.3424	0.1389	0.3053	0.5830
52	Saudi Arabia	High EGDI	0.7119	0.7917	0.5339	0.8101
150	Senegal	Middle EGDI	0.3486	0.4792	0.2240	0.3427
49	Serbia	High EGDI	0.7155	0.7361	0.6208	0.7896
83	Seychelles	High EGDI	0.6163	0.6181	0.5008	0.7299
174	Sierra Leone	Middle EGDI	0.2717	0.3472	0.1597	0.3081
7	Singapore	Very High EGDI	0.8812	0.9861	0.8019	0.8557
49	Slovakia	High EGDI	0.7155	0.7361	0.5964	0.8141
37	Slovenia	Very High EGDI	0.7714	0.7986	0.6232	0.8923
169	Solomon Islands	Middle EGDI	0.2816	0.2431	0.1285	0.4732
193	Somalia	Low EGDI	0.0566	0.1111	0.0586	0.0000
68	South Africa	High EGDI	0.6618	0.8333	0.4231	0.7291
191	South Sudan	Low EGDI	0.1214	0.1111	0.0262	0.2269
17	Spain	Very High EGDI	0.8415	0.9375	0.6986	0.8885
94	Sri Lanka	High EGDI	0.5751	0.6667	0.3136	0.7451
180	Sudan	Low EGDI	0.2394	0.1528	0.1780	0.3873
116	Suriname	Middle EGDI	0.4773	0.2917	0.4595	0.6808
5	Sweden	Very High EGDI	0.8882	0.9444	0.7835	0.9366
15	Switzerland	Very High EGDI	0.8520	0.8472	0.8428	0.8660

Table 2.   E-Government Development Index (EGDI) (continued)

Rank	Country	EGDI Level	EGDI	Online Service Component	Telecomm. Infrustrcture Component	Human Capital Component
152	Syrian Arab Republic	Middle EGDI	0.3459	0.2986	0.2532	0.4860
131	Tajikistan	Middle EGDI	0.4220	0.3403	0.2254	0.7002
73	Thailand	High EGDI	0.6543	0.6389	0.5338	0.7903
79	The former Yugoslav Republic of Macedonia	High EGDI	0.6312	0.7153	0.4859	0.6924
142	Timor-Leste	Middle EGDI	0.3816	0.3125	0.2937	0.5387
138	Togo	Middle EGDI	0.3989	0.5556	0.1353	0.5058
109	Tonga	High EGDI	0.5237	0.4722	0.2951	0.8039
78	Trinidad and Tobago	High EGDI	0.6440	0.6389	0.5735	0.7195
80	Tunisia	High EGDI	0.6254	0.8056	0.4066	0.6640
53	Turkey	High EGDI	0.7112	0.8889	0.4298	0.8148
147	Turkmenistan	Middle EGDI	0.3652	0.1319	0.3011	0.6626
144	Tuvalu	Middle EGDI	0.3779	0.2222	0.2693	0.6422
135	Uganda	Middle EGDI	0.4055	0.5694	0.1566	0.4906
82	Ukraine	High EGDI	0.6165	0.5694	0.4364	0.8436
21	United Arab Emirates	Very High EGDI	0.8295	0.9444	0.8564	0.6877
4	United Kingoom of Great Britain and Northern Ireland	Very High EGDI	0.8999	0.9792	0.8004	0.9200
139	United Republic of Tanzania	Middle EGDI	0.3929	0.5625	0.1403	0.4759
11	United States of America	Very High EGDI	0.8769	0.9861	0.7564	0.8883
34	Uruguay	Very High EGDI	0.7858	0.8889	0.6967	0.7719
81	Uzbekistan	High EGDI	0.6207	0.7917	0.3307	0.7396
137	Vanuatu	Middle EGDI	0.3990	0.4375	0.1920	0.5675
106	Venuzuela (Bolivian Republic of)	High EGDI	0.5287	0.4097	0.4148	0.7615
88	Viet Nam	High EGDI	0.5931	0.7361	0.3890	0.6543
186	Yemen	Low EGDI	0.2154	0.0972	0.1454	0.4037
133	Zambia	Middle EGDI	0.4111	0.4792	0.1853	0.5689
146	Zimbabwe	Middle EGDI	0.3692	0.3264	0.2144	0.5668

Table 3.   Regional and Economic Groupings for E-Government Development Index (EGDI)

Region	EGDI	Online Service Component	Telecomm. Infrustructure Component	Human Capital Component
Africa	0.3423	0.3633	0.2034	0.4602
Americas	0.5898	0.6095	0.4441	0.7157
Asia	0.5779	0.6216	0.4385	0.6735
Europe	0.7727	0.7946	0.6765	0.8471
Oceania	0.4611	0.3929	0.2825	0.7078
World	**0.5491**	**0.5691**	**0.4155**	**0.4155**

	EGDI	Online Service Component	Telecomm. Infrustructure Component	Human Capital Component
Small Island Developing States	0.4744	0.4090	0.3460	0.6684
Land Locked Developing Countries	0.4100	0.4481	0.2502	0.5318
Least Developed Countries	0.2961	0.3251	0.1521	0.4113

Levels of Income	EGDI	Online Service Component	Telecomm. Infrustructure Component	Human Capital Component
High income	0.7838	0.8120	0.7018	0.8375
Upper middle income	0.5655	0.5479	0.4256	0.7231
Lower middle income	0.4411	0.4688	0.2703	0.5843
Low income	0.2735	0.3329	0.1191	0.3684

Table 4.   E-Government Development Index (EGDI) by region - AFRICA

Rank	Country	Sub-Region	EGDI	Online Service Component	Telecomm. Infrustructure Component	Human Capital Component
130	Algeria	Northern Africa	0.4227	0.2153	0.3889	0.6640
155	Angola	Middle Africa	0.3376	0.4097	0.0972	0.5060
159	Benin	Western Africa	0.3264	0.4722	0.1418	0.3653
127	Botswana	Southern Africa	0.4253	0.2083	0.3982	0.6694
165	Burkina Faso	Western Africa	0.3016	0.5347	0.1603	0.2097
166	Burundi	Eastern Africa	0.2985	0.3056	0.0786	0.5113
136	Cameroon	Middle Africa	0.3997	0.4583	0.1790	0.5618
112	Cabo Verde	Western Africa	0.4980	0.4861	0.3926	0.6152
188	Central African Republic	Middle Africa	0.1584	0.2083	0.0322	0.2347
190	Chad	Middle Africa	0.1257	0.1458	0.0669	0.1644
182	Comoros	Eastern Africa	0.2336	0.0972	0.0871	0.5166
164	Congo	Middle Africa	0.3024	0.1667	0.1889	0.5515
172	Côte d'Ivoire	Western Africa	0.2776	0.2222	0.2748	0.3357
176	Democratic Republic of the Congo	Middle Africa	0.2612	0.2083	0.0645	0.5108
179	Djibouti	Eastern Africa	0.2401	0.2917	0.0961	0.3325
114	Egypt	Northern Africa	0.4880	0.5347	0.3222	0.6072
184	Equatioral Guinea	Middle Africa	0.2298	0.0486	0.1010	0.5397
189	Eritrea	Eastern Africa	0.1337	0.0833	0.0000	0.3179
141	Eswatini	Southern Africa	0.3820	0.3750	0.1772	0.5939
151	Ethiopia	Eastern Africa	0.3463	0.6319	0.0976	0.3094
125	Gabon	Middle Africa	0.4313	0.2292	0.4250	0.6398
168	Gambia	Western Africa	0.2958	0.2708	0.2627	0.3539
101	Ghana	Western Africa	0.5390	0.6944	0.3558	0.5669
181	Guinea	Western Africa	0.2348	0.3125	0.1513	0.2406
187	Guinea-Bissau	Western Africa	0.1887	0.0764	0.1028	0.3869
122	Kenya	Eastern Africa	0.4541	0.6250	0.1901	0.5472
167	Lesotho	Southern Africa	0.2968	0.1111	0.2468	0.5324
173	Liberia	Western Africa	0.2737	0.3403	0.1036	0.3772
140	Libya	Northern Africa	0.3833	0.0972	0.3353	0.7173
170	Madagascar	Eastern Africa	0.2792	0.3056	0.0499	0.4822
175	Malawi	Eastern Africa	0.2708	0.2569	0.0834	0.4720
178	Mali	Western Africa	0.2424	0.2639	0.2074	0.2558
183	Mauritania	Western Africa	0.2314	0.1597	0.1878	0.3467
66	Mauritius	Eastern Africa	0.6678	0.7292	0.5435	0.7308
110	Morocco	Northern Africa	0.5214	0.6667	0.3697	0.5278
160	Mozambique	Eastern Africa	0.3195	0.4236	0.1398	0.3951
121	Namibia	Southern Africa	0.4554	0.4514	0.3299	0.5850
192	Niger	Western Africa	0.1095	0.1597	0.0795	0.0894
143	Nigeria	Western Africa	0.3807	0.5278	0.1883	0.4261
120	Rwanda	Eastern Africa	0.4590	0.7222	0.1733	0.4815
154	Sao Tome and Principe	Middle Africa	0.3424	0.1389	0.3053	0.5830

Table 4. E-Government Development Index (EGDI) by region - AFRICA (continued)

Rank	Country	Sub-Region	EGDI	Online Service Component	Telecomm. Infrustructure Component	Human Capital Component
150	Senegal	Western Africa	0.3486	0.4792	0.2240	0.3427
83	Seychelles	Eastern Africa	0.6163	0.6181	0.5008	0.7299
174	Sierra Leone	Western Africa	0.2717	0.3472	0.1597	0.3081
193	Somalia	Eastern Africa	0.0566	0.1111	0.0586	0.0000
68	South Africa	Southern Africa	0.6618	0.8333	0.4231	0.7291
191	South Sudan	Eastern Africa	0.1214	0.1111	0.0262	0.2269
180	Sudan	Northern Africa	0.2394	0.1528	0.1780	0.3873
138	Togo	Western Africa	0.3989	0.5556	0.1353	0.5058
80	Tunisia	Northern Africa	0.6254	0.8056	0.4066	0.6640
135	Uganda	Eastern Africa	0.4055	0.5694	0.1566	0.4906
139	United Republic of Tanzania	Eastern Africa	0.3929	0.5625	0.1403	0.4759
133	Zambia	Eastern Africa	0.4111	0.4792	0.1853	0.5689
146	Zimbabwe	Eastern Africa	0.3692	0.3264	0.2144	0.5668

Table 5.　E-Government Development Index (EGDI) by region - AMERICAS

Rank	Country	Sub-Region	EGDI	Online Service Component	Telecomm. Infrustructure Component	Human Capital Component
90	Antigua and Barbuda	Caribbean	0.5906	0.4583	0.5617	0.7518
43	Argentina	South America	0.7335	0.7500	0.5927	0.8579
72	Bahamas	Caribbean	0.6552	0.7014	0.5393	0.7249
46	Barbados	Caribbean	0.7229	0.6667	0.6719	0.8301
132	Belize	Central America	0.4115	0.3333	0.2247	0.6765
103	Bolivia(Plurinational State of)	South America	0.5307	0.5625	0.3148	0.7148
44	Brazil	South America	0.7327	0.9236	0.5220	0.7525
23	Canada	Northern America	0.8258	0.9306	0.6724	0.8744
42	Chile	South America	0.7350	0.8333	0.5377	0.8339
61	Colombia	South America	0.6871	0.8819	0.4412	0.7382
56	Costa Rica	Central America	0.7004	0.6736	0.6343	0.7933
134	Cuba	Caribbean	0.4101	0.2986	0.1455	0.7862
93	Dominica	Caribbean	0.5794	0.6111	0.4775	0.6497
95	Dominican Republic	Caribbean	0.5726	0.6597	0.3655	0.6927
84	Ecuador	South America	0.6129	0.7292	0.3699	0.7395
100	El Salvador	Central America	0.5469	0.6250	0.3810	0.6348
89	Grenada	Caribbean	0.5930	0.4931	0.4658	0.8202
113	Guatemala	Central America	0.4974	0.6458	0.2941	0.5524
124	Guyana	South America	0.4316	0.4306	0.2541	0.6102
163	Haiti	Caribbean	0.3047	0.4444	0.1078	0.3620
123	Honduras	Central America	0.4474	0.5139	0.2268	0.6015
118	Jamaica	Caribbean	0.4697	0.3194	0.3941	0.6957
64	Mexico	Central America	0.6818	0.9236	0.4173	0.7044
129	Nicaragua	Central America	0.4233	0.4028	0.2825	0.5847
85	Panama	Central America	0.6092	0.6597	0.4543	0.7137
108	Paraguay	South America	0.5255	0.5556	0.3507	0.6701
77	Peru	South America	0.6461	0.8194	0.3913	0.7276
71	Saint Kittis and Nevis	Caribbean	0.6554	0.5347	0.6825	0.7491
119	Saint Lucia	Caribbean	0.4660	0.2847	0.4110	0.7022
104	Saint Vincent and the Grenadines	Caribbean	0.5306	0.4514	0.4583	0.6820
116	Suriname	South America	0.4773	0.2917	0.4595	0.6808
78	Trinidad and Tobago	Caribbean	0.6440	0.6389	0.5735	0.7195
11	United States of America	Northern America	0.8769	0.9861	0.7564	0.8883
34	Uruguay	South America	0.7858	0.8889	0.6967	0.7719
106	Venuzuela (Bolivian Republic of)	South America	0.5287	0.4097	0.4148	0.7615

Table 6.   E-Government Development Index EGDI by region - ASIA

Rank	Country	Sub-Region	EGDI	Online Service Component	Telecomm. Infrustructure Component	Human Capital Component
177	Afghanistan	Southern Asia	0.2585	0.3056	0.1138	0.3562
87	Armenia	Western Asia	0.5944	0.5625	0.4660	0.7547
70	Azerbaijan	Western Asia	0.6574	0.7292	0.5062	0.7369
26	Bahrain	Western Asia	0.8116	0.7986	0.8466	0.7897
115	Bangladesh	Southern Asia	0.4862	0.7847	0.1976	0.4763
126	Bhutan	Southern Asia	0.4274	0.5000	0.3080	0.4743
59	Brunei Darussalam	South-Eastern Asia	0.6923	0.7222	0.6066	0.7480
145	Cambodia	South-Eastern Asia	0.3753	0.2500	0.3132	0.5626
65	China	Eastern Asia	0.6811	0.8611	0.4735	0.7088
36	Cyprus	Western Asia	0.7736	0.7847	0.7279	0.8083
185	Democratic People's Republic of Korea	Eastern Asia	0.2159	0.0000	0.0327	0.6150
60	Georgia	Western Asia	0.6893	0.6944	0.5403	0.8333
96	India	Southern Asia	0.5669	0.9514	0.2009	0.5484
107	Indonesia	South-Eastern Asia	0.5258	0.5694	0.3222	0.6857
86	Iran (Islamic Republic of)	Southern Asia	0.6083	0.6319	0.4566	0.7364
155	Iraq	Western Asia	0.3376	0.3194	0.1840	0.5094
31	Israel	Western Asia	0.7998	0.8264	0.7095	0.8635
10	Japan	Eastern Asia	0.8783	0.9514	0.8406	0.8428
98	Jordan	Western Asia	0.5575	0.4931	0.4406	0.7387
39	Kazakhistan	Central Asia	0.7597	0.8681	0.5723	0.8388
41	Kuwait	Western Asia	0.7388	0.7917	0.7394	0.6852
91	Kyrgizistan	Central Asia	0.5835	0.6458	0.3418	0.7628
162	Lao People's Democratic Republic	South-Eastern Asia	0.3056	0.1667	0.2246	0.5254
99	Lebanon	Western Asia	0.5530	0.4722	0.5219	0.6649
48	Malaysia	South-Eastern Asia	0.7174	0.8889	0.5647	0.6987
97	Maldives	Southern Asia	0.5615	0.4931	0.5159	0.6754
92	Mongolia	Eastern Asia	0.5824	0.5972	0.3602	0.7899
157	Myanmar	South-Eastern Asia	0.3328	0.2292	0.2565	0.5127
117	Nepal	Southern Asia	0.4748	0.6875	0.2413	0.4957
63	Oman	Western Asia	0.6846	0.8125	0.5399	0.7013
148	Pakistan	Southern Asia	0.3566	0.5486	0.1529	0.3682
75	Philippines	South-Eastern Asia	0.6512	0.8819	0.3547	0.7171
51	Qatar	Western Asia	0.7132	0.7917	0.6797	0.6683
3	Republic of Korea	Eastern Asia	0.9010	0.9792	0.8496	0.8743
52	Saudi Arabia	Western Asia	0.7119	0.7917	0.5339	0.8101
7	Singapore	South-Eastern Asia	0.8812	0.9861	0.8019	0.8557
94	Sri Lanka	Southern Asia	0.5751	0.6667	0.3136	0.7451
152	Syrian Arab Republic	Western Asia	0.3459	0.2986	0.2532	0.4860
131	Tajikistan	Central Asia	0.4220	0.3403	0.2254	0.7002
73	Thailand	South-Eastern Asia	0.6543	0.6389	0.5338	0.7903

Table 6.   E-Government Development Index EGDI by region - ASIA (continued)

Rank	Country	Sub-Region	EGDI	Online Service Component	Telecomm. Infrustructure Component	Human Capital Component
142	Timor-Leste	South-Eastern Asia	0.3816	0.3125	0.2937	0.5387
53	Turkey	Western Asia	0.7112	0.8889	0.4298	0.8148
147	Turkmenistan	Central Asia	0.3652	0.1319	0.3011	0.6626
21	United Arab Emirates	Western Asia	0.8295	0.9444	0.8564	0.6877
81	Uzbekistan	Central Asia	0.6207	0.7917	0.3307	0.7396
88	Viet Nam	South-Eastern Asia	0.5931	0.7361	0.3890	0.6543
186	Yemen	Western Asia	0.2154	0.0972	0.1454	0.4037

Table 7.   E-Government Development Index EGDI by region - EUROPE

Rank	Country	Sub-Region	EGDI	Online Service Component	Telecomm. Infrustructure Component	Human Capital Component
74	Albania	Southern Europe	0.6519	0.7361	0.4318	0.7877
62	Andorra	Southern Europe	0.6857	0.6042	0.722	0.7309
20	Austria	Western Europe	0.8301	0.8681	0.7716	0.8505
38	Belarus	Eastern Europe	0.7641	0.7361	0.6881	0.8681
27	Belgium	Western Europe	0.808	0.7569	0.693	0.974
105	Bosnia and Herzegovina	Southern Europe	0.5303	0.4306	0.4385	0.7217
47	Bulgaria	Eastern Europe	0.7177	0.7639	0.5785	0.8106
55	Croatia	Southern Europe	0.7018	0.6806	0.6051	0.8196
54	Czech Republic	Eastern Europe	0.7084	0.6528	0.5971	0.8752
1	Denmark	Northern Europe	0.915	1	0.7978	0.9472
16	Estonia	Northern Europe	0.8486	0.9028	0.7613	0.8818
6	Finland	Northern Europe	0.8815	0.9653	0.7284	0.9509
9	France	Western Europe	0.879	0.9792	0.7979	0.8598
12	Germany	Western Europe	0.8765	0.9306	0.7952	0.9036
35	Greece	Southern Europe	0.7833	0.8194	0.6439	0.8867
45	Hungary	Eastern Europe	0.7265	0.7361	0.6071	0.8364
19	Iceland	Northern Europe	0.8316	0.7292	0.8292	0.9365
22	Ireland	Northern Europe	0.8287	0.8264	0.697	0.9626
24	Italy	Southern Europe	0.8209	0.9514	0.6771	0.8341
57	Latvia	Northern Europe	0.6996	0.6667	0.6188	0.8132
25	Liechtenstein	Western Europe	0.8204	0.7986	0.8389	0.8237
40	Lithuania	Northern Europe	0.7534	0.7986	0.6293	0.8323
18	Luxembourg	Western Europe	0.8334	0.9236	0.7964	0.7803
30	Malta	Southern Europe	0.8011	0.8403	0.7657	0.7973
28	Monaco	Western Europe	0.805	0.625	1	0.7901
58	Montenegro	Southern Europe	0.6966	0.6667	0.6059	0.8172
13	Netherlands	Western Europe	0.8757	0.9306	0.7758	0.9206
14	Norway	Northern Europe	0.8557	0.9514	0.7131	0.9025
33	Poland	Eastern Europe	0.7926	0.9306	0.5805	0.8668
29	Portugal	Southern Europe	0.8031	0.9306	0.6617	0.817
69	Republic of Moldova	Eastern Europe	0.659	0.7708	0.4787	0.7274
67	Romania	Eastern Europe	0.6671	0.6597	0.5471	0.7944
32	Russian Federation	Eastern Europe	0.7969	0.9167	0.6219	0.8522
76	San Marino	Southern Europe	0.6471	0.4236	0.7075	0.8102
49	Serbia	Southern Europe	0.7155	0.7361	0.6208	0.7896
49	Slovakia	Eastern Europe	0.7155	0.7361	0.5964	0.8141
37	Slovenia	Southern Europe	0.7714	0.7986	0.6232	0.8923
17	Spain	Southern Europe	0.8415	0.9375	0.6986	0.8885
5	Sweden	Northern Europe	0.8882	0.9444	0.7835	0.9366
15	Switzerland	Western Europe	0.852	0.8472	0.8428	0.866
79	The former Yugoslav Republic of Macedonia	Southern Europe	0.6312	0.7153	0.4859	0.6924

Table 7.   E-Government Development Index EGDI by region - EUROPE (continued)

Rank	Country	Sub-Region	EGDI	Online Service Component	Telecomm. Infrustructure Component	Human Capital Component
82	Ukraine	Eastern Europe	0.6165	0.5694	0.4364	0.8436
4	United Kingoom of Great Britain and Northern Ireland	Northern Europe	0.8999	0.9792	0.8004	0.92

Table 8. E-Government Development Index EGDI by region - OCEANIA

Rank	Country	Sub-Region	EGDI	Online Service Component	Telecomm. Infrustructure Component	Human Capital Component
2	Australia	Australia and New Zealand	0.9053	0.9722	0.7436	1
102	Fiji	Melanesia	0.5348	0.4583	0.3562	0.7899
153	Kiribati	Micronesia	0.345	0.2986	0.0773	0.6591
149	Marshall Islands	Micronesia	0.3543	0.2292	0.1037	0.7301
161	Micronesia	Micronesia	0.3155	0.1458	0.1118	0.6889
158	Nauru	Micronesia	0.3324	0.1319	0.3033	0.5619
8	New Zealand	Australia and New Zealand	0.8806	0.9514	0.7455	0.945
111	Palau	Micronesia	0.5024	0.3264	0.3346	0.8462
171	Papua New Guinea	Melanesia	0.2787	0.2708	0.0875	0.4778
128	Samoa	Polynesia	0.4236	0.3403	0.2064	0.7241
169	Solomon Islands	Melanesia	0.2816	0.2431	0.1285	0.4732
109	Tonga	Polynesia	0.5237	0.4722	0.2951	0.8039
144	Tuvalu	Polynesia	0.3779	0.2222	0.2693	0.6422
137	Vanuatu	Melanesia	0.399	0.4375	0.192	0.5675

Table 9. E-Government Development Index EGDI of Least Developed Countries(LDCs)

Rank	Country	Sub-Region	EGDI	Online Service Component	Telecomm. Infrastructure Component	Human Capital Component
177	Afghanistan	Southern Asia	0.2585	0.3056	0.1138	0.3562
155	Angola	Middle Africa	0.3376	0.4097	0.0972	0.506
115	Bangladesh	Southern Asia	0.4862	0.7847	0.1976	0.4763
159	Benin	Western Africa	0.3264	0.4722	0.1418	0.3653
126	Bhutan	Southern Asia	0.4274	0.5	0.308	0.4743
165	Burkina Faso	Western Africa	0.3016	0.5347	0.1603	0.2097
166	Burundi	Eastern Africa	0.2985	0.3056	0.0786	0.5113
145	Cambodia	South-Eastern Asia	0.3753	0.25	0.3132	0.5626
188	Central African Republic	Middle Africa	0.1584	0.2083	0.0322	0.2347
190	Chad	Middle Africa	0.1257	0.1458	0.0669	0.1644
182	Comoros	Eastern Africa	0.2336	0.0972	0.0871	0.5166
176	Democratic Republic of the Congo	Middle Africa	0.2612	0.2083	0.0645	0.5108
179	Djibouti	Eastern Africa	0.2401	0.2917	0.0961	0.3325
189	Eritrea	Eastern Africa	0.1337	0.0833	0	0.3179
151	Ethiopia	Eastern Africa	0.3463	0.6319	0.0976	0.3094
168	Gambia	Western Africa	0.2958	0.2708	0.2627	0.3539
181	Guinea	Western Africa	0.2348	0.3125	0.1513	0.2406
187	Guinea-Bissau	Western Africa	0.1887	0.0764	0.1028	0.3869
163	Haiti	Caribbean	0.3047	0.4444	0.1078	0.362
153	Kiribati	Micronesia	0.345	0.2986	0.0773	0.6591
162	Lao People's Democratic Republic	South-Eastern Asia	0.3056	0.1667	0.2246	0.5254
167	Lesotho	Southern Africa	0.2968	0.1111	0.2468	0.5324
173	Liberia	Western Africa	0.2737	0.3403	0.1036	0.3772
170	Madagascar	Eastern Africa	0.2792	0.3056	0.0499	0.4822
175	Malawi	Eastern Africa	0.2708	0.2569	0.0834	0.472
178	Mali	Western Africa	0.2424	0.2639	0.2074	0.2558
183	Mauritania	Western Africa	0.2314	0.1597	0.1878	0.3467
160	Mozambique	Eastern Africa	0.3195	0.4236	0.1398	0.3951
157	Myanmar	South-Eastern Asia	0.3328	0.2292	0.2565	0.5127
117	Nepal	Southern Asia	0.4748	0.6875	0.2413	0.4957
192	Niger	Western Africa	0.1095	0.1597	0.0795	0.0894
120	Rwanda	Eastern Africa	0.459	0.7222	0.1733	0.4815
154	Sao Tome and Principe	Middle Africa	0.3424	0.1389	0.3053	0.583
150	Senegal	Western Africa	0.3486	0.4792	0.224	0.3427
174	Sierra Leone	Western Africa	0.2717	0.3472	0.1597	0.3081
169	Solomon Islands	Melanesia	0.2816	0.2431	0.1285	0.4732
193	Somalia	Eastern Africa	0.0566	0.1111	0.0586	0
191	South Sudan	Eastern Africa	0.1214	0.1111	0.0262	0.2269
180	Sudan	Northern Africa	0.2394	0.1528	0.178	0.3873
142	Timor-Leste	South-Eastern Asia	0.3816	0.3125	0.2937	0.5387

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Table 9. E-Government Development Index EGDI of Least Developed Countries(LDCs)

Rank	Country	Sub-Region	EGDI	Online Service Component	Telecomm. Infrustructure Component	Human Capital Component
138	Togo	Western Africa	0.3989	0.5556	0.1353	0.5058
144	Tuvalu	Polynesia	0.3779	0.2222	0.2693	0.6422
135	Uganda	Eastern Africa	0.4055	0.5694	0.1566	0.4906
139	United Republic of Tanzania	Eastern Africa	0.3929	0.5625	0.1403	0.4759
137	Vanuatu	Melanesia	0.399	0.4375	0.192	0.5675
186	Yemen	Western Asia	0.2154	0.0972	0.1454	0.4037
133	Zambia	Eastern Africa	0.4111	0.4792	0.1853	0.5689

Table 10. E-Government Development Index EGDI of Small Island Developing States (SIDS)

Rank	Country	Sub-Region	EGDI	Online Service Component	Telecomm. Infrustructure Component	Human Capital Component
90	Antigua and Barbuda	Caribbean	0.5906	0.4583	0.5617	0.7518
72	Bahamas	Caribbean	0.6552	0.7014	0.5393	0.7249
46	Barbados	Caribbean	0.7229	0.6667	0.6719	0.8301
132	Belize	Central America	0.4115	0.3333	0.2247	0.6765
112	Cabo Verde	Western Africa	0.498	0.4861	0.3926	0.6152
182	Comoros	Eastern Africa	0.2336	0.0972	0.0871	0.5166
134	Cuba	Caribbean	0.4101	0.2986	0.1455	0.7862
93	Dominica	Caribbean	0.5794	0.6111	0.4775	0.6497
95	Dominican Republic	Caribbean	0.5726	0.6597	0.3655	0.6927
102	Fiji	Melanesia	0.5348	0.4583	0.3562	0.7899
89	Grenada	Caribbean	0.593	0.4931	0.4658	0.8202
187	Guinea-Bissau	Western Africa	0.1887	0.0764	0.1028	0.3869
124	Guyana	South America	0.4316	0.4306	0.2541	0.6102
163	Haiti	Caribbean	0.3047	0.4444	0.1078	0.362
118	Jamaica	Caribbean	0.4697	0.3194	0.3941	0.6957
153	Kiribati	Micronesia	0.345	0.2986	0.0773	0.6591
97	Maldives	Southern Asia	0.5615	0.4931	0.5159	0.6754
149	Marshall Islands	Micronesia	0.3543	0.2292	0.1037	0.7301
66	Mauritius	Eastern Africa	0.6678	0.7292	0.5435	0.7308
161	Micronesia	Micronesia	0.3155	0.1458	0.1118	0.6889
158	Nauru	Micronesia	0.3324	0.1319	0.3033	0.5619
111	Palau	Micronesia	0.5024	0.3264	0.3346	0.8462
171	Papua New Guinea	Melanesia	0.2787	0.2708	0.0875	0.4778
71	Saint Kittis and Nevis	Caribbean	0.6554	0.5347	0.6825	0.7491
119	Saint Lucia	Caribbean	0.466	0.2847	0.411	0.7022
104	Saint Vincent and the Grenadines	Caribbean	0.5306	0.4514	0.4583	0.682
128	Samoa	Polynesia	0.4236	0.3403	0.2064	0.7241
154	Sao Tome and Principe	Middle Africa	0.3424	0.1389	0.3053	0.583
83	Seychelles	Eastern Africa	0.6163	0.6181	0.5008	0.7299
7	Singapore	South-Eastern Asia	0.8812	0.9861	0.8019	0.8557
169	Solomon Islands	Melanesia	0.2816	0.2431	0.1285	0.4732
116	Suriname	South America	0.4773	0.2917	0.4595	0.6808
142	Timor-Leste	South-Eastern Asia	0.3816	0.3125	0.2937	0.5387
109	Tonga	Polynesia	0.5237	0.4722	0.2951	0.8039
78	Trinidad and Tobago	Caribbean	0.644	0.6389	0.5735	0.7195
144	Tuvalu	Polynesia	0.3779	0.2222	0.2693	0.6422
137	Vanuatu	Melanesia	0.399	0.4375	0.192	0.5675

Table 11.   E-Government Development Index EGDI of Landlocked Developing Counties(LLDCs)

Rank	Country	Sub-Region	EGDI	Online Service Component	Telecomm. Infrustructure Component	Human Capital Component
177	Afghanistan	Southern Asia	0.2585	0.3056	0.1138	0.3562
87	Armenia	Western Asia	0.5944	0.5625	0.466	0.7547
70	Azerbaijan	Western Asia	0.6574	0.7292	0.5062	0.7369
126	Bhutan	Southern Asia	0.4274	0.5	0.308	0.4743
103	Bolivia(Plurinational State of)	South America	0.5307	0.5625	0.3148	0.7148
127	Botswana	Southern Africa	0.4253	0.2083	0.3982	0.6694
165	Burkina Faso	Western Africa	0.3016	0.5347	0.1603	0.2097
166	Burundi	Eastern Africa	0.2985	0.3056	0.0786	0.5113
188	Central African Republic	Middle Africa	0.1584	0.2083	0.0322	0.2347
190	Chad	Middle Africa	0.1257	0.1458	0.0669	0.1644
141	Eswatini	Southern Africa	0.382	0.375	0.1772	0.5939
151	Ethiopia	Eastern Africa	0.3463	0.6319	0.0976	0.3094
39	Kazakhistan	Central Asia	0.7597	0.8681	0.5723	0.8388
91	Kyrgizistan	Central Asia	0.5835	0.6458	0.3418	0.7628
162	Lao People's Democratic Republic	South-Eastern Asia	0.3056	0.1667	0.2246	0.5254
167	Lesotho	Southern Africa	0.2968	0.1111	0.2468	0.5324
175	Malawi	Eastern Africa	0.2708	0.2569	0.0834	0.472
178	Mali	Western Africa	0.2424	0.2639	0.2074	0.2558
92	Mongolia	Eastern Asia	0.5824	0.5972	0.3602	0.7899
117	Nepal	Southern Asia	0.4748	0.6875	0.2413	0.4957
192	Niger	Western Africa	0.1095	0.1597	0.0795	0.0894
108	Paraguay	South America	0.5255	0.5556	0.3507	0.6701
69	Republic of Moldova	Eastern Europe	0.659	0.7708	0.4787	0.7274
120	Rwanda	Eastern Africa	0.459	0.7222	0.1733	0.4815
191	South Sudan	Eastern Africa	0.1214	0.1111	0.0262	0.2269
131	Tajikistan	Central Asia	0.422	0.3403	0.2254	0.7002
79	The former Yugoslav Republic of Macedonia	Southern Europe	0.6312	0.7153	0.4859	0.6924
147	Turkmenistan	Central Asia	0.3652	0.1319	0.3011	0.6626
135	Uganda	Eastern Africa	0.4055	0.5694	0.1566	0.4906
81	Uzbekistan	Central Asia	0.6207	0.7917	0.3307	0.7396
133	Zambia	Eastern Africa	0.4111	0.4792	0.1853	0.5689
146	Zimbabwe	Eastern Africa	0.3692	0.3264	0.2144	0.5668

Table 12. E-Participation Index (EPI) and its utilisation by stages

Rank	Country	EPI	Total %	Stage 1%	Stage 2%	Stage 3%
145	Afghanistan	0.3202	34.24%	63.33%	21.74%	18.18%
59	Albania	0.7584	76.63%	63.33%	91.30%	72.73%
165	Algeria	0.2022	22.83%	30.00%	34.78%	0.00%
103	Andorra	0.5674	58.15%	70.00%	65.22%	36.36%
125	Angola	0.4326	45.11%	66.67%	47.83%	18.18%
121	Antigua and Barbuda	0.4607	47.83%	56.67%	34.78%	54.55%
87	Argentina	0.6236	63.59%	76.67%	73.91%	36.36%
103	Armenia	0.5674	58.15%	60.00%	52.17%	63.64%
5	Australia	0.9831	98.37%	100.00%	95.65%	100.00%
45	Austria	0.8258	83.15%	90.00%	78.26%	81.82%
79	Azerbaijan	0.6798	69.02%	76.67%	73.91%	54.55%
92	Bahamas	0.618	63.04%	60.00%	65.22%	63.64%
53	Bahrain	0.7978	80.43%	76.67%	82.61%	81.82%
51	Bangladesh	0.8034	80.98%	86.67%	82.61%	72.73%
87	Barbados	0.6236	63.59%	80.00%	56.52%	54.55%
33	Belarus	0.882	88.59%	90.00%	78.26%	100.00%
59	Belgium	0.7584	76.63%	86.67%	78.26%	63.64%
148	Belize	0.2921	31.52%	46.67%	43.48%	0.00%
136	Benin	0.3708	39.13%	53.33%	43.48%	18.18%
111	Bhutan	0.5281	54.35%	60.00%	78.26%	18.18%
99	Bolivia(Plurinational State of)	0.5787	59.24%	63.33%	73.91%	36.36%
125	Bosnia and Herzegovina	0.4326	45.11%	53.33%	52.17%	27.27%
168	Botswana	0.1966	22.28%	43.33%	21.74%	0.00%
12	Brazil	0.9719	97.28%	96.67%	95.65%	100.00%
97	Brunei Darussalam	0.6067	61.96%	83.33%	78.26%	18.18%
35	Bulgaria	0.8708	87.50%	83.33%	95.65%	81.82%
87	Burkina Faso	0.6236	63.59%	73.33%	69.57%	45.45%
147	Burundi	0.309	33.15%	50.00%	30.43%	18.18%
171	Cambodia	0.1742	20.11%	36.67%	21.74%	0.00%
143	Cameroon	0.3258	34.78%	63.33%	30.43%	9.09%
27	Canada	0.9101	91.30%	96.67%	86.96%	90.91%
127	Cabo Verde	0.427	44.57%	66.67%	39.13%	27.27%
151	Central African Republic	0.2753	29.89%	36.67%	26.09%	27.27%
177	Chad	0.1461	17.39%	33.33%	17.39%	0.00%
46	Chile	0.8202	82.61%	96.67%	78.26%	72.73%
29	China	0.9045	90.76%	86.67%	86.96%	100.00%
23	Colombia	0.9213	92.39%	96.67%	82.61%	100.00%
190	Comoros	0.0562	8.70%	16.67%	8.70%	0.00%
169	Congo	0.1854	21.20%	23.33%	21.74%	18.18%
57	Costa Rica	0.7697	77.72%	83.33%	69.57%	81.82%
171	Côte d'Ivoire	0.1742	20.11%	23.33%	26.09%	9.09%
57	Croatia	0.7697	77.72%	63.33%	86.96%	81.82%
150	Cuba	0.2809	30.43%	56.67%	17.39%	18.18%
46	Cyprus	0.8202	82.61%	80.00%	78.26%	90.91%

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Table 12.   E-Participation Index (EPI) and its utilisation by stages (continued)

Rank	Country	EPI	Total %	Stage 1%	Stage 2%	Stage 3%
92	Czech Republic	0.618	63.04%	73.33%	60.87%	54.55%
193	Democratic People's Republic of Korea	0	3.26%	10.00%	0.00%	0.00%
183	Democratic Republic of the Congo	0.1236	15.22%	36.67%	8.70%	0.00%
1	Denmark	1	100.00%	100.00%	100.00%	100.00%
153	Djibouti	0.2697	29.35%	50.00%	13.04%	27.27%
106	Dominica	0.5562	57.07%	50.00%	65.22%	54.55%
79	Dominican Republic	0.6798	69.02%	73.33%	69.57%	63.64%
81	Ecuador	0.6742	68.48%	70.00%	78.26%	54.55%
109	Egypt	0.5393	55.43%	53.33%	65.22%	45.45%
82	El Salvador	0.6517	66.30%	80.00%	78.26%	36.36%
191	Equatioral Guinea	0.0506	8.15%	20.00%	4.35%	0.00%
192	Eritrea	0.0337	6.52%	20.00%	0.00%	0.00%
27	Estonia	0.9101	91.30%	96.67%	86.96%	90.91%
142	Eswatini	0.3315	35.33%	60.00%	34.78%	9.09%
101	Ethiopia	0.573	58.70%	80.00%	65.22%	27.27%
139	Fiji	0.3483	36.96%	53.33%	30.43%	27.27%
1	Finland	1	100.00%	100.00%	100.00%	100.00%
13	France	0.9663	96.74%	100.00%	91.30%	100.00%
175	Gabon	0.1685	19.57%	33.33%	8.70%	18.18%
149	Gambia	0.2865	30.98%	40.00%	26.09%	27.27%
87	Georgia	0.6236	63.59%	73.33%	69.57%	45.45%
23	Germany	0.9213	92.39%	96.67%	82.61%	100.00%
85	Ghana	0.6292	64.13%	83.33%	69.57%	36.36%
34	Greece	0.8764	88.04%	83.33%	82.61%	100.00%
116	Grenada	0.4888	50.54%	60.00%	39.13%	54.55%
92	Guatemala	0.618	63.04%	66.67%	73.91%	45.45%
138	Guinea	0.3539	37.50%	40.00%	43.48%	27.27%
186	Guinea-Bissau	0.1124	14.13%	33.33%	8.70%	0.00%
140	Guyana	0.3371	35.87%	36.67%	34.78%	36.36%
117	Haiti	0.4831	50.00%	46.67%	56.52%	45.45%
107	Honduras	0.5449	55.98%	70.00%	52.17%	45.45%
69	Hungary	0.7079	71.74%	76.67%	95.65%	36.36%
75	Iceland	0.6854	69.57%	80.00%	65.22%	63.64%
15	India	0.9551	95.65%	100.00%	95.65%	90.91%
92	Indonesia	0.618	63.04%	66.67%	73.91%	45.45%
111	Iran (Islamic Republic of)	0.5281	54.35%	60.00%	56.52%	45.45%
140	Iraq	0.3371	35.87%	60.00%	21.74%	27.27%
22	Ireland	0.9326	93.48%	90.00%	91.30%	100.00%
43	Israel	0.8315	83.70%	86.67%	82.61%	81.82%
15	Italy	0.9551	95.65%	100.00%	95.65%	90.91%
146	Jamaica	0.3146	33.70%	43.33%	30.43%	27.27%
5	Japan	0.9831	98.37%	100.00%	95.65%	100.00%
117	Jordan	0.4831	50.00%	60.00%	52.17%	36.36%
42	Kazakhistan	0.8371	84.24%	86.67%	91.30%	72.73%

Table 12. E-Participation Index (EPI) and its utilisation by stages (continued)

Rank	Country	EPI	Total %	Stage 1%	Stage 2%	Stage 3%
110	Kenya	0.5337	54.89%	66.67%	73.91%	18.18%
157	Kiribati	0.2528	27.72%	46.67%	26.09%	9.09%
72	Kuwait	0.691	70.11%	93.33%	69.57%	45.45%
75	Kyrgizistan	0.6854	69.57%	60.00%	82.61%	63.64%
171	Lao People's Democratic Republic	0.1742	20.11%	33.33%	17.39%	9.09%
75	Latvia	0.6854	69.57%	76.67%	60.87%	72.73%
122	Lebanon	0.4438	46.20%	63.33%	39.13%	36.36%
189	Lesotho	0.0787	10.87%	23.33%	8.70%	0.00%
127	Liberia	0.427	44.57%	50.00%	60.87%	18.18%
183	Libya	0.1236	15.22%	26.67%	17.39%	0.00%
63	Liechtenstein	0.7472	75.54%	86.67%	82.61%	54.55%
51	Lithuania	0.8034	80.98%	86.67%	82.61%	72.73%
19	Luxembourg	0.9382	94.02%	96.67%	86.96%	100.00%
143	Madagascar	0.3258	34.78%	50.00%	34.78%	18.18%
165	Malawi	0.2022	22.83%	40.00%	26.09%	0.00%
32	Malaysia	0.8876	89.13%	93.33%	91.30%	81.82%
129	Maldives	0.4101	42.93%	56.67%	43.48%	27.27%
159	Mali	0.2416	26.63%	43.33%	26.09%	9.09%
39	Malta	0.8483	85.33%	96.67%	78.26%	81.82%
171	Marshall Islands	0.1742	20.11%	36.67%	21.74%	0.00%
170	Mauritania	0.1798	20.65%	30.00%	21.74%	9.09%
72	Mauritius	0.691	70.11%	93.33%	69.57%	45.45%
17	Mexico	0.9438	94.57%	93.33%	91.30%	100.00%
179	Micronesia	0.1404	16.85%	26.67%	21.74%	0.00%
105	Monaco	0.5618	57.61%	80.00%	47.83%	45.45%
65	Mongolia	0.736	74.46%	73.33%	69.57%	81.82%
64	Montenegro	0.7416	75.00%	76.67%	60.87%	90.91%
56	Morocco	0.7753	78.26%	80.00%	73.91%	81.82%
122	Mozambique	0.4438	46.20%	43.33%	56.52%	36.36%
181	Myanmar	0.1348	16.30%	26.67%	13.04%	9.09%
133	Namibia	0.3933	41.30%	63.33%	47.83%	9.09%
177	Nauru	0.1461	17.39%	20.00%	21.74%	9.09%
55	Nepal	0.7809	78.80%	80.00%	82.61%	72.73%
4	Netherlands	0.9888	98.91%	96.67%	100.00%	100.00%
5	New Zealand	0.9831	98.37%	100.00%	95.65%	100.00%
134	Nicaragua	0.3876	40.76%	46.67%	39.13%	36.36%
163	Niger	0.2135	23.91%	30.00%	30.43%	9.09%
117	Nigeria	0.4831	50.00%	63.33%	56.52%	27.27%
11	Norway	0.9775	97.83%	93.33%	100.00%	100.00%
43	Oman	0.8315	83.70%	83.33%	78.26%	90.91%
115	Pakistan	0.5	51.63%	66.67%	65.22%	18.18%
157	Palau	0.2528	27.72%	46.67%	26.09%	9.09%
66	Panama	0.7191	72.83%	86.67%	60.87%	72.73%
165	Papua New Guinea	0.2022	22.83%	40.00%	26.09%	0.00%

Table 12.   E-Participation Index (EPI) and its utilisation by stages (continued)

Rank	Country	EPI	Total %	Stage 1%	Stage 2%	Stage 3%
101	Paraguay	0.573	58.70%	70.00%	73.91%	27.27%
36	Peru	0.8652	86.96%	83.33%	86.96%	90.91%
19	Philippines	0.9382	94.02%	100.00%	91.30%	90.91%
31	Poland	0.8933	89.67%	100.00%	86.96%	81.82%
30	Portugal	0.8989	90.22%	96.67%	91.30%	81.82%
67	Qatar	0.7135	72.28%	73.33%	78.26%	63.64%
1	Republic of Korea	1	100.00%	100.00%	100.00%	100.00%
37	Republic of Moldova	0.8596	86.41%	76.67%	91.30%	90.91%
69	Romania	0.7079	71.74%	70.00%	65.22%	81.82%
23	Russian Federation	0.9213	92.39%	93.33%	100.00%	81.82%
59	Rwanda	0.7584	76.63%	83.33%	73.91%	72.73%
98	Saint Kittis and Nevis	0.5843	59.78%	60.00%	56.52%	63.64%
161	Saint Lucia	0.2191	24.46%	36.67%	26.09%	9.09%
113	Saint Vincent and theGrenadines	0.5169	53.26%	50.00%	47.83%	63.64%
155	Samoa	0.264	28.80%	46.67%	21.74%	18.18%
156	San Marino	0.2584	28.26%	53.33%	21.74%	9.09%
176	Sao Tome and Principe	0.1573	18.48%	20.00%	17.39%	18.18%
67	Saudi Arabia	0.7135	72.28%	76.67%	82.61%	54.55%
114	Senegal	0.5056	52.17%	63.33%	47.83%	45.45%
48	Serbia	0.8146	82.07%	73.33%	82.61%	90.91%
84	Seychelles	0.6461	65.76%	63.33%	69.57%	63.64%
129	Sierra Leone	0.4101	42.93%	56.67%	43.48%	27.27%
13	Singapore	0.9663	96.74%	100.00%	91.30%	100.00%
50	Slovakia	0.809	81.52%	80.00%	82.61%	81.82%
48	Slovenia	0.8146	82.07%	90.00%	82.61%	72.73%
163	Solomon Islands	0.2135	23.91%	30.00%	30.43%	9.09%
181	Somalia	0.1348	16.30%	13.33%	17.39%	18.18%
39	South Africa	0.8483	85.33%	96.67%	78.26%	81.82%
188	South Sudan	0.0899	11.96%	26.67%	8.70%	0.00%
5	Spain	0.9831	98.37%	100.00%	95.65%	100.00%
85	Sri Lanka	0.6292	64.13%	73.33%	56.52%	63.64%
179	Sudan	0.1404	16.85%	36.67%	13.04%	0.00%
159	Suriname	0.2416	26.63%	56.67%	21.74%	0.00%
19	Sweden	0.9382	94.02%	100.00%	91.30%	90.91%
41	Switzerland	0.8427	84.78%	90.00%	82.61%	81.82%
137	Syrian Arab Republic	0.3652	38.59%	43.33%	43.48%	27.27%
134	Tajikistan	0.3876	40.76%	36.67%	47.83%	36.36%
82	Thailand	0.6517	66.30%	86.67%	65.22%	45.45%
71	The former Yugoslav Republic of Macedonia"	0.7022	71.20%	76.67%	86.96%	45.45%
153	Timor-Leste	0.2697	29.35%	46.67%	30.43%	9.09%
107	Togo	0.5449	55.98%	70.00%	73.91%	18.18%
120	Tonga	0.4663	48.37%	60.00%	47.83%	36.36%
99	Trinidad and Tobago	0.5787	59.24%	76.67%	69.57%	27.27%
53	Tunisia	0.7978	80.43%	86.67%	73.91%	81.82%

Table 12.   E-Participation Index (EPI) and its utilisation by stages (continued)

Rank	Country	EPI	Total %	Stage 1%	Stage 2%	Stage 3%
37	Turkey	0.8596	86.41%	93.33%	91.30%	72.73%
186	Turkmenistan	0.1124	14.13%	23.33%	17.39%	0.00%
161	Tuvalu	0.2191	24.46%	53.33%	4.35%	18.18%
87	Uganda	0.6236	63.59%	70.00%	86.96%	27.27%
75	Ukraine	0.6854	69.57%	63.33%	65.22%	81.82%
17	United Arab Emirates	0.9438	94.57%	96.67%	95.65%	90.91%
5	United Kingoom of Great Britain and Northern Ireland	0.9831	98.37%	100.00%	95.65%	100.00%
92	United Republic of Tanzania	0.618	63.04%	83.33%	73.91%	27.27%
5	United States of America	0.9831	98.37%	100.00%	95.65%	100.00%
26	Uruguay	0.9157	91.85%	93.33%	91.30%	90.91%
59	Uzbekistan	0.7584	76.63%	93.33%	86.96%	45.45%
124	Vanuatu	0.4382	45.65%	60.00%	47.83%	27.27%
131	Venuzuela (Bolivian Republic of)	0.4045	42.39%	46.67%	43.48%	36.36%
72	Viet Nam	0.691	70.11%	83.33%	56.52%	72.73%
185	Yemen	0.118	14.67%	26.67%	8.70%	9.09%
132	Zambia	0.3989	41.85%	56.67%	47.83%	18.18%
151	Zimbabwe	0.2753	29.89%	53.33%	26.09%	9.09%

Table 13. Regional and Economic Groupings for E-Participation Index (EPI)

	EPI	Total	Stage 1	Stage 2	Stage 3
Small Island Developing States	0.3819	0.4020	0.5153	0.3890	0.2948
Landlocked Developing Countries	0.4568	0.4745	0.5740	0.5150	0.3153
Least Developed Countries	0.3270	0.3490	0.4716	0.3617	0.1992
High Income	0.8028	0.8092	0.8655	0.7997	0.7598
Upper Middle Income	0.5443	0.5592	0.6400	0.5565	0.4744
Lower Middle Income	0.4622	0.4798	0.5745	0.5013	0.3494
Low Income	0.3440	0.3654	0.4806	0.3857	0.2141
Africa	0.3566	0.3776	0.5025	0.3929	0.2222
Americas	0.6043	0.6172	0.6876	0.6174	0.5403
Asia	0.6126	0.6252	0.7014	0.6364	0.5280
Europe	0.8103	0.8165	0.8488	0.8140	0.7844
Oceania	0.3632	0.3839	0.5143	0.3696	0.2597
World	0.5654	0.5796	0.6625	0.5850	0.4823

Table 14. Telecommunication Infrastructure Index (TII) and its components

Country	TII	Fixed telephone subscritions per 100 inhabitants	Mobile cellular telephone subscriptions per 100 inhabitants	Percentage of Individuals using the Internet	Fixed (wired) broadband subscriptions per 100 inhabitants	Active mobile-broadband subscriptions per 100 inhabitants
Afghanistan	0.1138	0.33	62.33	10.6	0.03	13.47
Albania	0.4318	8.5	115.15	66.36	9.1	57.63
Algeria	0.3889	8.38	115.85	42.95	7.04	65.7
Andorra	0.7220	50.07	92.04	97.93	42.04	50.47
Angola	0.0972	1.06	45.12	13	0.43	13.97
Antigua and Barbuda	0.5617	22.29	178.28	73	9.17	40.61
Argentina	0.5927	22.67	145.33	70.97	16.49	78.05
Armenia	0.4660	18.18	117.43	67	10.23	52.87
Australia	0.7436	33.91	110.05	88.24	30.56	130.75
Austria	0.7716	40.95	163.79	84.32	28.96	87.07
Azerbaijan	0.5062	17.48	104.77	78.2	18.55	56.21
Bahamas	0.5393	30.95	92.07	80	21.41	51.3
Bahrain	0.8466	19.64	210.14	98	16.29	157.34
Bangladesh	0.1976	0.47	83.45	18.25	4.05	27.07
Barbados	0.6719	49.02	116.57	79.55	32.44	45.3
Belarus	0.6881	47.63	120.67	71.11	32.36	67.53
Belgium	0.6930	38.48	110.5	86.52	37.6	65.86
Belize	0.2247	6.27	61.86	44.58	6	13.39
Benin	0.1418	1.15	81.79	11.99	0.2	8.11
Bhutan	0.3080	2.64	87.54	41.77	2.07	68.41
Bolivia(Plurinational State of)	0.3148	7.97	92.82	39.7	2.64	56.58
Bosnia and Herzegovina	0.4385	21.18	96.79	54.74	18.84	40.51
Botswana	0.3982	6.32	146.16	39.36	2.62	62.63
Brazil	0.5220	20.15	117.54	60.87	12.88	88.47
Brunei Darussalam	0.6066	17.54	123.69	90	8.53	119.5
Bulgaria	0.5785	20.74	125.83	59.83	23.8	87.39
Burkina Faso	0.1603	0.41	82.61	13.96	0.05	19.64
Burundi	0.07860	0.19	50.91	5.17	0.04	8.79
Cambodia	0.3132	1.44	126.35	32.4	0.61	50.76
Cameroon	0.1790	4.48	79.86	25	0.2	10.51
Canada	0.6724	41.76	84.74	89.84	36.89	68.81
Cabo Verde	0.3926	12	111.56	50.32	2.88	66.55
Central African Republic	0.0322	0.04	27.17	4	0.02	3.5
Chad	0.0669	0.1	43.11	5	0.07	9.22
Chile	0.5377	18.84	130.11	66.01	16.22	72.11
China	0.4735	14.72	97.25	53.2	22.99	69.37
Colombia	0.4412	14.63	120.62	58.14	12.15	46.87
Comoros	0.0871	1.64	57.11	7.94	0.36	0
Congo	0.1889	0.33	105.82	8.12	0.01	23.41
Costa Rica	0.6343	17.5	171.51	66.03	13.1	108.05

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Table 14.   Telecommunication Infrastructure Index (TII) and its components (continued)

Country	TII	Fixed telephone subscritions per 100 inhabitants	Mobile cellular telephone subscriptions per 100 inhabitants	Percentage of Individuals using the Internet	Fixed (wired) broadband subscriptions per 100 inhabitants	Active mobile-broadband subscriptions per 100 inhabitants
Côte d'Ivoire	0.2748	1.22	115.85	26.53	0.58	43.72
Croatia	0.6051	34.08	104.77	72.7	24.77	77.22
Cuba	0.1455	11.52	34.75	38.77	0.13	0
Cyprus	0.7279	37.72	133.42	75.9	32.77	96.69
Czech Republic	0.5971	16.57	117.66	76.48	28.93	80.39
Democratic People's Republic of Korea	0.0327	4.65	12.9	0	0	14.21
Democratic Republic of the Congo	0.0645	0	36.69	6.21	0.001	13.18
Denmark	0.7978	27.26	122.29	96.97	42.54	123.57
Djibouti	0.0961	2.65	36.64	13.13	2.87	11.25
Dominica	0.4775	18.12	106.66	67.03	21.06	40.71
Dominican Republic	0.3655	12.63	81.78	61.33	7.21	49.77
Ecuador	0.3699	14.96	84.73	54.06	9.79	46.93
Egypt	0.3222	6.39	102.2	41.25	4.67	47.28
El Salvador	0.3810	14.71	151.89	29	6.23	29.08
Equatioral Guinea	0.1010	0.9	47.13	23.78	0.28	0.25
Eritrea	0	1.33	10.21	1.18	0.01	0
Estonia	0.7613	28.24	144.61	87.24	30.22	121.61
Eswatini	0.1772	3.13	74.08	28.57	0.52	12.59
Ethiopia	0.0976	1.12	50.02	15.37	0.55	5.23
Fiji	0.3562	8.25	116.24	46.51	1.37	54.3
Finland	0.7284	8.31	133.85	87.7	31.11	152.31
France	0.7979	60.27	104.4	85.62	42.74	82.45
Gabon	0.4250	0.96	149.64	48.05	0.76	83.36
Gambia	0.2627	1.86	139.23	18.5	0.18	21.2
Georgia	0.5403	21.24	140.95	58.01	17.57	64.03
Germany	0.7952	53.84	126.31	89.65	39.07	77.03
Ghana	0.3558	0.89	135.8	34.67	0.31	69.64
Greece	0.6439	46.5	112.12	69.09	32.32	51.05
Grenada	0.4658	24.95	110.86	55.86	19.4	32.85
Guatemala	0.2941	14.8	110.14	34.51	3.05	13.93
Guinea	0.1513	0	87.13	9.8	0.01	15.33
Guinea-Bissau	0.1028	0	70.82	3.76	0.04	6.95
Guyana	0.2541	18.31	75.61	35.66	7.4	0.24
Haiti	0.1078	0.05	59.96	12.23	0.01	10.19
Honduras	0.2268	4.86	85.95	30	2.42	23.3
Hungary	0.6071	31.99	120.78	79.26	28.86	45.09
Iceland	0.8292	49.5	120.8	98.24	38.51	106.45
India	0.2009	1.84	85.17	29.55	1.41	16.41
Indonesia	0.3222	4.12	147.66	25.37	2	33.91

Table 14. Telecommunication Infrastructure Index (TII) and its components (continued)

Country	TII	Fixed telephone subscritions per 100 inhabitants	Mobile cellular telephone subscriptions per 100 inhabitants	Percentage of Individuals using the Internet	Fixed (wired) broadband subscriptions per 100 inhabitants	Active mobile-broadband subscriptions per 100 inhabitants
Iran (Islamic Republic of)	0.4566	38.24	100.3	53.23	11.61	33.85
Iraq	0.1840	5.46	81.19	21.23	0.01	16.24
Ireland	0.6970	40.14	103.15	85.01	28.78	100.8
Israel	0.7095	40.78	129.03	79.65	27.56	91.55
Italy	0.6771	34.1	153	61.32	26.19	88.06
Jamaica	0.3941	10.77	113.4	45	9.93	55.16
Japan	0.8406	50.18	130.61	93.18	31.16	131.12
Jordan	0.4406	4.27	103.84	62.3	4.83	103.84
Kazakhistan	0.5723	21.85	141.96	74.59	13.06	74.23
Kenya	0.1901	0.15	80.44	26	0.33	25.89
Kiribati	0.0773	0.57	45.46	13.7	0.06	0.87
Kuwait	0.7394	9.95	133.07	78.37	2.5	254.42
Kyrgizistan	0.3418	6.42	127.84	34.5	4.04	44.86
Lao People's Democratic Republic	0.2246	18.74	58.57	21.87	0.36	36.65
Latvia	0.6188	18.42	134.5	79.84	26.35	76.34
Lebanon	0.5219	30.24	81.42	76.11	21.64	56.8
Lesotho	0.2468	1.87	103.59	27.36	0.1	35.9
Liberia	0.1036	0.17	67.56	7.32	0.17	5.25
Libya	0.3353	21.84	121.72	20.27	2.68	35.42
Liechtenstein	0.8389	43.5	117.61	98.09	42.31	119.48
Lithuania	0.6293	18.25	144.58	74.38	29.49	71.71
Luxembourg	0.7964	48.01	132.7	98.14	35.28	83.72
Madagascar	0.0499	0.6	32.13	4.71	0.11	8.12
Malawi	0.0834	0.06	39.68	9.61	0.05	18.21
Malaysia	0.5647	15.51	140.8	78.79	8.72	91.49
Maldives	0.5159	4.94	189.86	59.09	6.85	61.94
Mali	0.2074	1.12	112.35	11.11	0.12	23.18
Malta	0.7657	54.59	123.94	77.29	39.89	71.93
Marshall Islands	0.1037	4.46	29.25	29.79	1.88	0
Mauritania	0.1878	1.24	84.03	18	0.25	29.34
Mauritius	0.5435	30.86	143.73	52.19	16.84	51.56
Mexico	0.4173	16.04	87.6	59.54	12.58	58.86
Micronesia	0.1118	6.56	22.31	33.35	3.02	0
Monaco	1	120.98	86.49	95.21	48.35	75.05
Mongolia	0.3602	7.44	111.24	22.27	7.47	80.28
Montenegro	0.6059	23.55	165.56	69.88	18.27	59.97
Morocco	0.3697	5.87	117.68	58.27	3.56	44.84
Mozambique	0.1398	0.29	52.12	17.52	0.16	32.77
Myanmar	0.2565	0.97	95.65	25.07	0.17	56.3
Namibia	0.3230	7.58	107.27	31.03	2.59	64.98

Table 14. Telecommunication Infrastructure Index (TII) and its components (continued)

Country	TII	Fixed telephone subscritions per 100 inhabitants	Mobile cellular telephone subscriptions per 100 inhabitants	Percentage of Individuals using the Internet	Fixed (wired) broadband subscriptions per 100 inhabitants	Active mobile-broadband subscriptions per 100 inhabitants
Nauru	0.3033	0	87.25	54	9.48	32.61
Nepal	0.2413	2.96	110.83	19.69	0.77	30.54
Netherlands	0.7758	39.88	122.97	90.41	42.28	88.4
New Zealand	0.7455	37.76	124.44	88.47	32.84	100.84
Nicaragua	0.2825	5.96	125.94	24.57	2.88	23.47
Niger	0.0795	0.78	42.18	4.32	0.13	18.33
Nigeria	0.1883	0.08	82.98	25.67	0.06	23.27
Norway	0.7131	15.34	109.04	97.3	40.35	111.38
Oman	0.5310	9.55	155.18	69.93	6.43	91.46
Pakistan	0.1529	1.61	70.65	15.51	0.85	19.9
Palau	0.334	33.84	111.53	26.97	5.75	0
Panama	0.4543	15.91	127.46	54	9.59	59.18
Papua New Guinea	0.0875	1.9	46.78	9.6	0.21	8.89
Paraguay	0.3507	5.21	111.36	51.35	3.56	49.38
Peru	0.3913	9.68	116.24	45.46	6.67	61.61
Philippines	0.3547	3.71	109.37	55.5	5.47	46.36
Poland	0.5805	21.3	138.66	73.3	19.17	68.59
Portugal	0.6617	46.16	111.57	70.42	32.55	62.45
Qatar	0.6797	18.18	142.13	94.29	9.87	139.92
Republic of Korea	0.8496	55.2	120.68	92.84	40.47	109.69
Republic of Moldova	0.4787	28.85	93.32	71	13.73	47.28
Romania	0.5471	20.78	115.78	59.5	22.49	80.19
Russian Federation	0.6219	22.42	159.15	73.09	19.12	73.7
Rwanda	0.1733	0.11	74.86	20	0.18	28.92
Saint Kittis and Nevis	0.6825	31.8	139.7	76.82	29.92	78.66
Saint Lucia	0.4110	19.97	99.23	46.73	16.73	38.74
aint Vincent and the Grenadines	0.4583	18.74	102.74	55.57	19.94	49.32
Samoa	0.2064	4.96	77.39	29.41	1.11	22.51
San Marino	0.7075	48.19	110.14	49.6	36.14	110.14
Sao Tome and Principe	0.3053	2.87	89.06	28	0.71	87.66
Saudi Arabia	0.5334	11.27	148.51	73.75	10.19	74
Senegal	0.2240	1.86	98.54	25.66	0.64	26.04
Serbia	0.6208	37.53	130.24	67.06	20.78	72.81
Seychelles	0.5008	22.11	161.16	56.51	14.89	22.64
Sierra Leone	0.1597	0.23	84.9	11.77	0	20.38
Singapore	0.8019	35.54	150.48	81	25.99	148.44
Slovakia	0.5964	15.13	128.39	80.48	24.55	78.99
Slovenia	0.6231	35.2	114.82	75.5	28.31	62.3
Solomon Islands	0.1285	1.24	69.5	11	0.27	12.86
Somalia	0.0586	0.34	46.47	1.88	0.64	1.96

Table 14.   Telecommunication Infrastructure Index (TII) and its components (continued)

Country	TII	Fixed telephone subscritions per 100 inhabitants	Mobile cellular telephone subscriptions per 100 inhabitants	Percentage of Individuals using the Internet	Fixed (wired) broadband subscriptions per 100 inhabitants	Active mobile-broadband subscriptions per 100 inhabitants
South Africa	0.4231	8.07	147.13	54	2.05	56.34
South Sudan	0.0262	0	22.08	6.68	0	1.15
Spain	0.6986	42.36	111.16	80.56	30.45	89.55
Sri Lanka	0.3136	11.92	124.03	32.05	4.29	19.19
Sudan	0.1780	0.34	70.26	28	0.07	25.78
Suriname	0.4595	15.94	144.51	45.4	12.75	47.29
Sweden	0.7835	31.56	127.5	89.65	37.41	123.41
Switzerland	0.8428	47.23	133.81	89.13	45.13	100.56
Syrian Arab Republic	0.2532	18.8	72.43	31.87	5.48	12.84
Tajikistan	0.2254	5.36	107.61	20.47	0.07	18.29
Thailand	0.5338	6.83	173.78	47.5	10.48	92.9
The former Yugoslav Republic of Macedonia	0.4859	17.7	98.52	72.16	18.33	57.14
Timor-Leste	0.2937	0.21	117.61	25.25	0.08	60.75
Togo	0.1353	0.44	72.38	11.31	0.59	15.02
Tonga	0.2951	10.27	74.68	39.95	2.8	56.01
Trinidad and Tobago	0.5735	19.94	158.67	73.3	18.72	46.73
Tunisia	0.4066	8.55	125.25	49.6	5.62	62.68
Turkey	0.4298	13.93	94.4	58.35	13.21	65.07
Turkmenistan	0.3011	11.74	151.43	17.99	0.07	13.62
Tuvalu	0.2693	18.02	68.49	46.01	9.01	0
Uganda	0.1566	0.89	55.05	21.88	0.26	33.69
Ukraine	0.4364	20.14	135.2	52.48	12.22	23.01
United Arab Emirates	0.8564	24.66	214.73	90.6	14	164.89
United Kingoom of Great Britain and Northern Ireland	0.8004	50.94	119.98	94.78	38.29	89.23
United Republic of Tanzania	0.1403	0.23	72.06	13	3.33	8.94
United States of America	0.7564	37.72	122.88	76.18	33	127
Uruguay	0.6967	32.33	148.57	66.4	26.76	101.88
Uzbekistan	0.3307	10.85	73.98	46.79	8.73	53.47
Vanuatu	0.1920	1.68	80.84	24	1.66	22.19
Venezuela (Bolivian Republic of)	0.4148	24.27	87.43	60	8.27	50.53
Viet Nam	0.3890	5.92	127.53	46.5	9.61	46.44
Yemen	0.1454	4.23	59.57	24.58	1.56	5.72
Zambia	0.1853	0.61	72.43	25.51	0.19	31.08
Zimbabwe	0.2144	1.89	79.74	23.12	1.06	41.63

Note: Last accessed in December 2017

Source: International Telecommunications Union (ITU)

Table 15. Human Capital Index (HCI) and its components

Country	HCI	Adult Literacy (%)			Gross Enrollment Ratio			Expected Year of Schooling			Mean Year of Schooling		
		Index Value	Year	Source	Index Value	Year	Source	Index Value	Year	Source	Index Value	Year	Source
Afghanistan	0.3562	38.2	2015	UNDP (HDI)	69.52	2014	UNESCO	10.77	2014	UNESCO	3.5	2015	UNDP (HDI)
Albania	0.7877	97.6	2015	UNDP (HDI)	86.39	2015	UNESCO	15.52	2015	UNESCO	9.6	2015	UNDP (HDI)
Algeria	0.6640	80.2	2015	UNDP (HDI)	80.97	2011	UNESCO	14.4	2015	UNDP (HDI)	7.8	2015	UNDP (HDI)
Andorra	0.7309	100.00	2016	UNESCO	69	2014	UNESCO	13.5	2012	UNDP (HDI)	10.3	2015	UNDP (HDI)
Angola	0.5060	71.1	2015	UNDP (HDI)	67.10	2011	UNESCO	11.4	2012	UNDP (HDI)	5	2015	UNDP (HDI)
Antigua and Barbuda	0.7518	99.0	2013	UNDP (HDI)	82.03	2012	UNESCO	13.95	2015	UNDP (HDI)	9.2	2015	UNDP (HDI)
Argentina	0.8579	98.1	2015	UNDP (HDI)	101.05	2014	UNESCO	17.29	2014	UNDP (HDI)	9.8	2015	UNESCO
Armenia	0.7547	99.8	2015	UNDP (HDI)	74.48	2015	UNESCO	13.19	2015	UNDP (HDI)	11.3	2015	UNESCO
Australia	1	99	2014	UNESCO	116.23	2014	UNESCO	20.47	2014	UNESCO	13.2	2015	UNESCO
Austria	0.8505	99	2014	UNESCO	95.64	2015	UNESCO	16.04	2015	UNESCO	11.3	2015	UNESCO
Azerbaijan	0.7369	99.79	2016	UNESCO	71.11	2012	UNESCO	12.7	2014	UNDP (HDI)	11.2	2015	UNESCO
Bahamas	0.7249	95.80	2014	UNESCO	74	2014	UNESCO	12.7	2015	UNDP (HDI)	10.9	2015	UNESCO
Bahrain	0.7897	95.7	2015	UNDP (HDI)	88.54	2015	UNESCO	15.95	2015	UNESCO	9.4	2015	UNESCO
Bangladesh	0.4763	72.76	2016	UNESCO	59.22	2011	UNESCO	10.2	2015	UNDP (HDI)	5.2	2015	UNDP (HDI)
Barbados	0.8301	99.7	2014	UNESCO	95.74	2011	UNESCO	15.29	2015	UNESCO	10.5	2015	UNDP (HDI)
Belarus	0.8681	99.7	2015	UNDP (HDI)	99.93	2015	UNESCO	15.60	2015	UNESCO	12	2015	UNESCO
Belgium	0.9740	99	2014	UNESCO	119.38	2015	UNESCO	19.98	2015	UNESCO	11.4	2015	UNESCO
Belize	0.6765	82.7	2015	UNDP (HDI)	75.97	2015	UNESCO	12.82	2015	UNESCO	10.5	2015	UNESCO
Benin	0.3653	38.4	2015	UNDP (HDI)	73.10	2013	UNESCO	10.7	2015	UNDP (HDI)	3.5	2015	UNDP (HDI)
Bhutan	0.4743	64.9	2015	UNDP (HDI)	68.25	2013	UNESCO	12.52	2013	UNESCO	3.1	2013	UNESCO
Bolivia (Plurinational State of)	0.7148	95.7	2015	UNDP (HDI)	79.25	2007	UNESCO	13.8	2015	UNDP (HDI)	8.2	2015	UNDP (HDI)
Bosnia and Herzegovina	0.7217	98.5	2015	UNDP (HDI)	71	2014	UNESCO	14.2	2015	UNDP (HDI)	9	2015	UNDP (HDI)
Botswana	0.6694	88.5	2015	UNDP (HDI)	73.58	2008	UNESCO	12.6	2015	UNDP (HDI)	9.2	2015	UNDP (HDI)
Brazil	0.7525	92.6	2015	UNDP (HDI)	91.08	2015	UNESCO	15.40	2015	UNDP (HDI)	7.8	2015	UNESCO
Brunei Darussalam	0.7480	96.4	2015	UNDP (HDI)	80.91	2015	UNESCO	14.74	2015	UNESCO	9	2015	UNESCO
Bulgaria	0.8106	98.4	2015	UNDP (HDI)	90.53	2015	UNESCO	14.94	2015	UNESCO	10.8	2015	UNESCO
Burkina Faso	0.2097	36	2015	UNDP (HDI)	46.54	2013	UNESCO	7.70	2013	UNDP (HDI)	1.4	2015	UNESCO
Burundi	0.5113	85.6	2015	UNDP (HDI)	64.23	2014	UNESCO	10.6	2015	UNDP (HDI)	3	2015	UNDP (HDI)
Cambodia	0.5626	77.2	2015	UNDP (HDI)	84.49	2010	UNESCO	10.9	2015	UNDP (HDI)	4.7	2015	UNDP (HDI)
Cameroon	0.5618	75	2015	UNDP (HDI)	71.95	2015	UNESCO	12.19	2015	UNESCO	6.1	2015	UNESCO
Canada	0.8744	99	2014	UNESCO	93.04	2000	UNESCO	16.3	2015	UNDP (HDI)	13.1	2015	UNDP (HDI)

Table 15.   Human Capital Index (HCI) and its components (continued)

Country	HCI	Adult Literacy (%) Index Value	Year	Source	Gross Enrollment Ratio Index Value	Year	Source	Expected Year of Schooling Index Value	Year	Source	Mean Year of Schooling Index Value	Year	Source
Cabo Verde	0.6152	87.6	2015	UNDP (HDI)	75.77	2015	UNESCO	13.19	2015	UNESCO	4.8	2015	UNDP (HDI)
Central African Republic	0.2347	36.8	2015	UNDP (HDI)	42.49	2013	UNESCO	7.10	2012	UNESCO	4.2	2015	UNDP (HDI)
Chad	0.1644	22.31	2016	UNESCO	46.19	2011	UNESCO	7.30	2011	UNESCO	2.3	2015	UNDP (HDI)
Chile	0.8339	97.3	2015	UNDP (HDI)	97.17	2015	UNESCO	16.48	2015	UNESCO	9.9	2015	UNDP (HDI)
China	0.7088	95.12	2010	UNESCO	79.97	2015	UNESCO	14.01	2015	UNESCO	7.6	2015	UNDP (HDI)
Colombia	0.7382	94.7	2015	UNDP (HDI)	89.41	2015	UNESCO	14.42	2015	UNESCO	7.6	2015	UNDP (HDI)
Comoros	0.5166	77.8	2015	UNDP (HDI)	64.45	2014	UNESCO	11.09	2014	UNESCO	4.8	2015	UNDP (HDI)
Congo	0.5515	79.3	2015	UNDP (HDI)	67.02	2012	UNESCO	11.1	2015	UNDP (HDI)	6.3	2015	UNDP (HDI)
Costa Rica	0.7933	97.8	2015	UNDP (HDI)	95.07	2015	UNESCO	15.22	2015	UNESCO	8.7	2015	UNDP (HDI)
Côte d'Ivoire	0.3357	43.1	2015	UNDP (HDI)	55.25	2015	UNESCO	9.20	2015	UNESCO	5	2015	UNDP (HDI)
Croatia	0.8196	99.3	2015	UNDP (HDI)	89.24	2015	UNESCO	15.14	2015	UNESCO	11.2	2015	UNDP (HDI)
Cuba	0.7862	99.7	2015	UNDP (HDI)	80.22	2015	UNESCO	13.81	2015	UNESCO	11.8	2015	UNDP (HDI)
Cyprus	0.8083	99.1	2015	UNDP (HDI)	85.67	2015	UNESCO	14.57	2015	UNESCO	11.7	2015	UNDP (HDI)
Czech Republic	0.8752	99	2014	UNESCO	94.21	2015	UNESCO	16.94	2015	UNESCO	12.3	2015	UNDP (HDI)
Democratic People's Republic of Korea	0.6150	100	2015	UNDP (HDI)	66.94	2015	UNESCO	10.96	2015	UNESCO	5.47	2017	estimation
Democratic Republic of the Congo	0.5108	77.04	2016	UNESCO	59.45	2013	UNESCO	9.8	2015	UNDP (HDI)	6.8	2016	UNESCO
Denmark	0.9472	99.00	2014	UNESCO	105.71	2015	UNESCO	19.30	2015	UNESCO	12.7	2015	UNDP (HDI)
Djibouti	0.3325	70.30	2014	UNESCO	36.81	2011	UNESCO	6.29	2011	UNESCO	4.1	2015	UNDP (HDI)
Dominica	0.6497	88.00	2014	UNESCO	73.00	2014	UNESCO	12.8	2015	UNDP (HDI)	7.9	2015	UNDP (HDI)
Dominican Republic	0.6927	91.8	2015	UNDP (HDI)	79.54	2015	UNESCO	13.75	2015	UNESCO	7.7	2015	UNDP (HDI)
Ecuador	0.7395	94.35	2016	UNESCO	88.87	2013	UNESCO	14.0	2015	UNDP (HDI)	8.3	2015	UNDP (HDI)
Egypt	0.6072	75.2	2015	UNDP (HDI)	78.01	2014	UNESCO	13.10	2014	UNESCO	7.1	2015	UNDP (HDI)
El Salvador	0.6345	88.4	2015	UNDP (HDI)	74.17	2015	UNESCO	12.89	2015	UNESCO	6.5	2015	UNDP (HDI)
Equatorial Guinea	0.5397	95.3	2015	UNDP (HDI)	55.00	2014	UNESCO	9.2	2015	UNDP (HDI)	5.5	2015	UNDP (HDI)
Eritrea	0.3179	73.8	2015	UNDP (HDI)	32.76	2014	UNESCO	5.35	2014	UNESCO	3.9	2015	UNDP (HDI)
Estonia	0.8818	99.8	2015	UNDP (HDI)	97.83	2015	UNESCO	16.35	2015	UNESCO	12.5	2015	UNDP (HDI)
Eswatini	0.5939	87.5	2015	UNDP (HDI)	66.73	2011	UNESCO	11.41	2013	UNESCO	6.8	2015	UNDP (HDI)
Ethiopia	0.3094	49.1	2015	UNDP (HDI)	54.59	2012	UNESCO	8.44	2012	UNESCO	2.6	2015	UNDP (HDI)
Fiji	0.7899	94.40	2014	UNESCO	88.0		UNDP	15.3	2015	UNDP (HDI)	10.5	2015	UNDP (HDI)

Table 15.   Human Capital Index (HCI) and its components (continued)

Country	HCI	Adult Literacy (%) Index Value	Year	Source	Gross Enrollment Ratio Index Value	Year	Source	Expected Year of Schooling Index Value	Year	Source	Mean Year of Schooling Index Value	Year	Source
Finland	0.9509	99.00	2014	UNESCO	115.41	2015	UNESCO	19.34	2015	UNESCO	11.2	2015	UNDP (HDI)
France	0.8598	99.00	2014	UNESCO	96.15	2014	UNESCO	16.27	2014	UNESCO	11.6	2015	UNDP (HDI)
Gabon	0.6398	83.2	2015	UNDP (HDI)	76.15	2001	UNESCO	12.6	2015	UNDP (HDI)	8.1	2015	UNDP (HDI)
Gambia	0.3539	55.5	2015	UNDP (HDI)	55.70	2010	UNESCO	8.9	2015	UNDP (HDI)	3.3	2015	UNDP (HDI)
Georgia	0.8333	99.8	2015	UNDP (HDI)	86.33	2015	UNESCO	15.44	2015	UNESCO	12.2	2015	UNESCO
Germany	0.9036	99.00	2014	UNESCO	97.87	2015	UNESCO	17.29	2015	UNESCO	13.2	2015	UNESCO
Ghana	0.5669	76.6	2015	UNDP (HDI)	68.60	2015	UNESCO	11.92	2015	UNESCO	6.9	2015	UNESCO
Greece	0.8867	97.7	2015	UNDP (HDI)	105.78	2014	UNESCO	17.78	2014	UNESCO	10.5	2015	UNESCO
Grenada	0.8202	96.00	2005	UNDP	99.79	2015	UNESCO	16.72	2015	UNESCO	8.6	2015	UNESCO
Guatemala	0.5524	79.3	2015	UNDP (HDI)	68.61	2013	UNESCO	10.88	2015	UNESCO	6.3	2015	UNESCO
Guinea	0.2406	30.4	2015	UNDP (HDI)	53.11	2014	UNESCO	8.82	2014	UNESCO	2.6	2015	UNESCO
Guinea-Bissau	0.3869	59.9	2015	UNDP (HDI)	62.46	2006	UNESCO	9.2	2015	UNDP (HDI)	2.9	2015	UNDP (HDI)
Guyana	0.6102	88.5	2015	UNDP (HDI)	68.54	2012	UNESCO	10.35	2012	UNESCO	8.4	2015	UNESCO
Haiti	0.3620	60.7	2015	UNDP (HDI)	39.40	2014	UNESCO	9.1	2015	UNDP (HDI)	5.2	2015	UNDP (HDI)
Honduras	0.6015	88.99	2016	UNESCO	70.23	2015	UNESCO	11.52	2015	UNESCO	6.2	2015	UNESCO
Hungary	0.8364	99	2015	UNDP (HDI)	90.17	2015	UNESCO	15.37	2015	UNESCO	12	2015	UNESCO
Iceland	0.9365	99.00	2014	UNESCO	102.56	2013	UNESCO	19.63	2013	UNESCO	12.2	2015	UNESCO
India	0.5484	72.1	2015	UNDP (HDI)	71.21	2015	UNESCO	11.96	2015	UNESCO	6.3	2015	UNESCO
Indonesia	0.6857	95.38	2016	UNESCO	76.26	2015	UNESCO	12.77	2015	UNESCO	7.9	2015	UNESCO
Iran (Islamic Republic of)	0.7364	86.8	2015	UNDP (HDI)	90.34	2015	UNESCO	14.93	2015	UNESCO	8.8	2015	UNESCO
Iraq	0.5094	79.7	2015	UNDP (HDI)	54.48	2000	UNESCO	10.1	2015	UNDP (HDI)	6.6	2015	UNDP (HDI)
Ireland	0.9626	99.2	2015	UNDP (HDI)	111.54	2015	UNESCO	19.65	2015	UNESCO	12.3	2015	UNESCO
Israel	0.8635	97.76	2011	UNESCO	94.07	2015	UNESCO	16.01	2015	UNESCO	12.8	2015	UNESCO
Italy	0.8341	98.85	2011	UNESCO	90.86	2015	UNESCO	16.22	2015	UNESCO	10.9	2015	UNESCO
Jamaica	0.6957	88.7	2015	UNDP (HDI)	79.86	2004	UNESCO	12.8	2015	UNDP (HDI)	9.6	2015	UNDP (HDI)

Table 15.   Human Capital Index (HCI) and its components (continued)

Country	HCI	Adult Literacy (%)			Gross Enrollment Ratio			Expected Year of Schooling			Mean Year of Schooling		
		Index Value	Year	Source	Index Value	Year	Source	Index Value	Year	Source	Index Value	Year	Source
Japan	0.8428	99.00	2014	UNESCO	89.84	2014	UNESCO	15.36	2014	UNESCO	12.5	2015	UNDP (HDI)
Jordan	0.7387	96.7	2015	UNDP (HDI)	80.17	2012	UNESCO	13.1	2015	UNDP (HDI)	10.1	2015	UNDP (HDI)
Kazakhistan	0.8388	99.8	2015	UNDP (HDI)	93.73	2016	UNESCO	15.01	2016	UNESCO	11.7	2015	UNDP (HDI)
Kenya	0.5472	78	2015	UNDP (HDI)	67.22	2009	UNESCO	11.1	2015	UNDP (HDI)	6.3	2015	UNDP (HDI)
Kiribati	0.6591	93.00	2014	UN E-GOV Survey	75.14	2008	UNESCO	11.9	2015	UNDP (HDI)	7.8	2015	UNDP (HDI)
Kuwait	0.6852	96.2	2015	UNDP (HDI)	75.24	2013	UNESCO	13.3	2015	UNDP (HDI)	7.3	2015	UNDP (HDI)
Kyrgizstan	0.7628	99.5	2015	UNDP (HDI)	81.19	2015	UNESCO	13.13	2015	UNESCO	10.8	2015	UNDP (HDI)
Lao People's Democratic Republic	0.5254	79.9	2015	UNDP (HDI)	63.54	2015	UNESCO	10.91	2015	UNESCO	5.2	2015	UNDP (HDI)
Latvia	0.8131	99.9	2015	UNDP (HDI)	93.35	2014	UNESCO	13.36	2015	UNESCO	11.7	2015	UNDP (HDI)
Lebanon	0.6649	93.9	2015	UNDP (HDI)	63.43	2015	UNESCO	13.3	2015	UNDP (HDI)	8.6	2015	UNDP (HDI)
Lesotho	0.5324	79.4	2015	UNDP (HDI)	62.79	2014	UNESCO	10.74	2014	UNESCO	6.1	2015	UNDP (HDI)
Liberia	0.3772	47.6	2015	UNDP (HDI)	63.92	2000	UNESCO	9.9	2015	UNDP (HDI)	4.4	2015	UNDP (HDI)
Libya	0.7173	91	2015	UNDP (HDI)	94.38	2003	UNESCO	13.4	2015	UNDP (HDI)	7.3	2015	UNDP (HDI)
Liechtenstein	0.8237	99.00	2014	UN E-GOV Survey	86.91	2015	UNESCO	14.71	2015	UNESCO	12.4	2015	UNDP (HDI)
Lithuania	0.8323	99.8	2015	UNDP (HDI)	94.82	2014	UNESCO	13.41	2015	UNESCO	12.7	2015	UNDP (HDI)
Luxembourg	0.7803	99.00	2014	UNESCO	77.31	2012	UNESCO	13.9	2015	UNDP (HDI)	12	2015	UNDP (HDI)
Madagascar	0.4822	64.7	2015	UNDP (HDI)	66.20	2014	UNESCO	10.50	2014	UNESCO	6.1	2015	UNDP (HDI)
Malawi	0.4720	65.8	2015	UNDP (HDI)	69.12	2011	UNESCO	10.72	2011	UNESCO	4.4	2015	UNDP (HDI)
Malaysia	0.6987	94.6	2015	UNDP (HDI)	68.93	2015	UNESCO	12.93	2015	UNESCO	10.1	2015	UNDP (HDI)
Maldives	0.6754	99.3	2015	UNDP (HDI)	76.76	2003	UNESCO	12.7	2015	UNDP (HDI)	6.2	2015	UNDP (HDI)
Mali	0.2558	38.7	2015	UNDP (HDI)	51.08	2011	UNESCO	8.4	2015	UNDP (HDI)	2.3	2015	UNDP (HDI)
Malta	0.7973	94.1	2015	UNDP (HDI)	85.04	2015	UNESCO	15.59	2015	UNESCO	11.3	2015	UNDP (HDI)
Marshall Islands	0.7301	98.27	2011	UNESCO	74.62	2002	UNESCO	12.32	2002	UNESCO	10.9	2011	UNESCO
Mauritania	0.3467	52.1	2015	UNDP (HDI)	52.55	2015	UNESCO	8.84	2015	UNESCO	4.3	2015	UNDP (HDI)
Mauritius	0.7308	90.6	2015	UNDP (HDI)	81.28	2015	UNESCO	14.89	2015	UNESCO	9.1	2015	UNDP (HDI)
Mexico	0.7044	94.4	2015	UNESCO	77.76	2014	UNDP (HDI)	13.30	2014	UNESCO	8.6	2015	UNDP (HDI)
Micronesia	0.6889	94.00	2014	UNESCO	75.43	2004	UNESCO	11.7	2015	UNDP (HDI)	9.7	2015	UNDP (HDI)

Table 15. Human Capital Index (HCI) and its components (continued)

Country	HCI	Adult Literacy (%)			Gross Enrollment Ratio			Expected Year of Schooling			Mean Year of Schooling		
		Index Value	Year	Source	Index Value	Year	Source	Index Value	Year	Source	Index Value	Year	Source
Monaco	0.7901	99.00	2014	UN E-GOV Survey	99.00	2014	UNDP	11.8	2015	UNDP (HDI)	11.27	2017	estimation
Mongolia	0.7899	98.4	2015	UNDP (HDI)	87.90	2015	UNESCO	15.01	2015	UNESCO	9.8	2015	UNDP (HDI)
Montenegro	0.8172	98.7	2015	UNDP (HDI)	88.66	2010	UNESCO	15.13	2010	UNESCO	11.3	2015	UNDP (HDI)
Morocco	0.5278	72.4	2015	UNDP (HDI)	69.77	2012	UNESCO	12.05	2012	UNESCO	5	2015	UNDP (HDI)
Mozambique	0.3951	58.8	2015	UNDP (HDI)	61.52	2015	UNESCO	9.59	2015	UNESCO	3.5	2015	UNDP (HDI)
Myanmar	0.5127	93.1	2015	UNDP (HDI)	53.00	2007	UNESCO	9.1	2015	UNDP (HDI)	4.7	2015	UNDP (HDI)
Namibia	0.5850	81.9	2015	UNDP (HDI)	70.28	2006	UNESCO	11.7	2015	UNDP (HDI)	6.7	2015	UNDP (HDI)
Nauru	0.5619	92.00	2014	UN E-GOV Survey	56.13	2008	UNESCO	9.7	2015	UNDP (HDI)	7.12	2017	estimation
Nepal	0.4957	64.7	2015	UNDP (HDI)	72.93	2015	UNDP (HDI)	12.19	2015	UNESCO	4.1	2015	UNDP (HDI)
Netherlands	0.9206	99.00	2014	UNESCO	106.92	2012	UNESCO	18.12	2012	UNESCO	11.9	2015	UNDP (HDI)
New Zealand	0.9450	99.00	2014	UNESCO	105.67	2015	UNESCO	19.36	2015	UNESCO	12.5	2015	UNDP (HDI)
Nicaragua	0.5847	82.8	2015	UNDP (HDI)	70.00	2014	UNESCO	11.7	2015	UNDP (HDI)	6.5	2015	UNDP (HDI)
Niger	0.0894	19.1	2015	UNDP (HDI)	36.63	2012	UNESCO	5.4	2015	UNDP (HDI)	1.7	2015	UNDP (HDI)
Nigeria	0.4261	59.6	2015	UNDP (HDI)	55.64	2011	UNESCO	10.0	2015	UNDP (HDI)	6	2015	UNDP (HDI)
Norway	0.9025	99.00	2014		98.06	2015	UNESCO	17.68	2015	UNESCO	12.7	2015	UNESCO
Oman	0.7013	94.8	2015	UNDP (HDI)	76.54	2011	UNESCO	13.7	2015	UNDP (HDI)	8.1	2015	UNDP (HDI)
Pakistan	0.3682	58.7	2015	UNDP (HDI)	50.17	2015	UNESCO	8.24	2015	UNESCO	5.1	2015	UNDP (HDI)
Palau	0.8462	99.5	2015	UNDP (HDI)	97.67	2013	UNESCO	14.3	2015	UNDP (HDI)	12.3	2015	UNDP (HDI)
Panama	0.7137	95	2015	UNDP (HDI)	75.97	2013	UNESCO	12.80	2013	UNESCO	9.9	2015	UNESCO
Papua New Guinea	0.4778	64.2	2015	UNDP (HDI)	78.93	2012	UNESCO	9.9	2015	UNDP (HDI)	4.3	2015	UNDP (HDI)
Paraguay	0.6701	95.6	2015	UNDP (HDI)	71.59	2010	UNESCO	12.3	2015	UNDP (HDI)	8.1	2015	UNDP (HDI)
Peru	0.7274	94.5	2015	UNDP (HDI)	83.62	2010	UNESCO	13.4	2015	UNDP (HDI)	9	2015	UNDP (HDI)

Table 15.   Human Capital Index (HCI) and its components (continued)

Country	HCI	Adult Literacy (%)			Gross Enrollment Ratio			Expected Year of Schooling			Mean Year of Schooling		
		Index Value	Year	Source	Index Value	Year	Source	Index Value	Year	Source	Index Value	Year	Source
Philippines	0.7170	96.3	2015	UNDP (HDI)	85.13	2013	UNESCO	11.7	2015	UNDP (HDI)	9.3	2015	UNDP (HDI)
Poland	0.8668	99.8	2015	UNDP (HDI)	95.23	2014	UNESCO	16.4	2015	UNDP (HDI)	11.9	2015	UNDP (HDI)
Portugal	0.8167	95.7	2015	UNDP (HDI)	98.58	2015	UNESCO	16.50	2015	UNESCO	8.9	2015	UNDP (HDI)
Qatar	0.6683	97.8	2015	UNDP (HDI)	60.02	2015	UNESCO	11.97	2015	UNESCO	9.8	2015	UNDP (HDI)
Republic of Korea	0.8743	99.00	2014	UNESCO	96.85	2015	UNESCO	16.52	2015	UNESCO	12.2	2015	UNDP (HDI)
Republic of Moldova	0.7274	99.4	2015	UNDP (HDI)	70.27	2015	UNESCO	11.63	2015	UNESCO	11.9	2015	UNDP (HDI)
Romania	0.7944	98.8	2015	UNDP (HDI)	83.82	2015	UNESCO	14.93	2015	UNESCO	10.8	2015	UNDP (HDI)
Russian Federation	0.8522	99.7	2015	UNDP (HDI)	95.15	2015	UNESCO	15.38	2015	UNESCO	12	2015	UNDP (HDI)
Rwanda	0.4815	70.5	2015	UNDP (HDI)	70.34	2015	UNESCO	10.55	2015	UNESCO	3.8	2015	UNDP (HDI)
Saint Kittis and Nevis	0.7491	97.80	2014	UNESCO	84.73	2015	UNESCO	14.39	2015	UNESCO	8.4	2015	UNDP (HDI)
Saint Lucia	0.7022	94.80	2014	UNESCO	73.53	2007	UNESCO	13.1	2015	UNDP (HDI)	9.3	2015	UNDP (HDI)
Saint Vincent and the Grenadines	0.6820	88.10	2014	UNESCO	78.28	2004	UNESCO	13.3	2015	UNDP (HDI)	8.6	2015	UNDP (HDI)
Samoa	0.7241	99	2015	UNDP (HDI)	71.32	2000	UNESCO	12.9	2015	UNDP (HDI)	10.3	2015	UNDP (HDI)
San Marino	0.8102	99.00	2014	UN E-Gov Survey	85.33	2012	UNESCO	15.11	2012	UNESCO	11.36	2017	estimation
Sao Tome and Principe	0.5830	74.9	2015	UNDP (HDI)	80.27	2015	UNDP (HDI)	12.96	2015	UNESCO	5.3	2015	UNDP (HDI)
Saudi Arabia	0.8100	94.7	2015	UNDP (HDI)	95.68	2014	UNESCO	16.11	2014	UNESCO	9.6	2015	UNDP (HDI)
Senegal	0.3427	55.7	2015	UNDP (HDI)	53.51	2015	UNESCO	8.98	2015	UNESCO	2.8	2015	UNDP (HDI)
Serbia	0.7896	98.1	2015	UNDP (HDI)	85.21	2015	UNESCO	14.55	2015	UNESCO	10.8	2015	UNDP (HDI)
Seychelles	0.7299	95.2	2015	UNDP (HDI)	77.23	2015	UNESCO	14.09	2015	UNESCO	9.4	2015	UNDP (HDI)
Sierra Leone	0.3081	48.1	2015	UNDP (HDI)	45.43	2001	UNESCO	9.5	2015	UNDP (HDI)	3.3	2015	UNDP (HDI)
Singapore	0.8557	96.8	2015	UNDP (HDI)	102.80	2014	UNESCO	15.40	2015	UNDP (HDI)	11.6	2015	UNDP (HDI)
Slovakia	0.8141	99.6	2015	UNDP (HDI)	81.85	2014	UNESCO	15.0	2015	UNDP (HDI)	12.2	2015	UNDP (HDI)
Slovenia	0.8923	99.7	2015	UNDP (HDI)	98.46	2014	UNESCO	17.35	2014	UNESCO	12.1	2015	UNDP (HDI)
Solomon Islands	0.4732	76.6	1999	UNESCO	55.42	2007	UNESCO	9.6	2015	UNDP (HDI)	5.3	2015	UNDP (HDI)
Somalia	0	24.00	2014	UN E-Gov Survey	17.00	2014	UNDP	2.40	2013	UNDP (HDI)	0.97	2017	estimation
South Africa	0.7291	94.3	2015	UNDP (HDI)	77.43	2014	UNESCO	13.34	2014	UNESCO	10.3	2015	UNDP (HDI)
South Sudan	0.2269	31.9	2015	UNDP (HDI)	38.00	2014	UNESCO	8.00	2014	UNESCO	4.8	2015	UNDP (HDI)
Spain	0.8884	98.1	2015	UNDP (HDI)	109.29	2015	UNESCO	17.88	2015	UNESCO	9.8	2015	UNDP (HDI)

Table 15. Human Capital Index (HCI) and its components (continued)

Country	HCI	Adult Literacy (%)			Gross Enrollment Ratio			Expected Year of Schooling			Mean Year of Schooling		
		Index Value	Year	Source	Index Value	Year	Source	Index Value	Year	Source	Index Value	Year	Source
Sri Lanka	0.7451	92.6	2015	UNDP (HDI)	78.84	2013	UNESCO	13.99	2013	UNESCO	10.9	2015	UNDP (HDI)
Sudan	0.3873	75.9	2015	UNDP (HDI)	47.70	2013	UNESCO	7.21	2013	UNESCO	3.5	2015	UNDP (HDI)
Suriname	0.6808	95.6	2015	UNDP (HDI)	72.21	2002	UNESCO	12.7	2015	UNDP (HDI)	8.3	2015	UNDP (HDI)
Sweden	0.9366	99.00	2014	UNESCO	107.99	2015	UNESCO	18.60	2015	UNESCO	12.3	2015	UNDP (HDI)
Switzerland	0.8660	99.00	2014	UNESCO	88.89	2014	UNESCO	16.17	2015	UNESCO	13.4	2015	UNDP (HDI)
Syrian Arab Republic	0.4860	86.4	2015	UNDP (HDI)	50.60	2013	UNESCO	9.03	2013	UNESCO	5.1	2015	UNDP (HDI)
Tajikistan	0.7002	99.8	2015	UNDP (HDI)	69.73	2012	UNESCO	11.3	2015	UNDP (HDI)	10.4	2015	UNDP (HDI)
Thailand	0.7903	96.7	2015	UNDP (HDI)	95.35	2015	UNESCO	16.03	2015	http://hdr.undp.org/sites/default/files/reports/14/hdr2013_en_complete.pdf	7.9	2015	UNDP (HDI)
The former Yugoslav Republic of Macedonia	0.6924	97.8	2015	UNDP (HDI)	71.03	2015	UNESCO	13.12	2015	UNESCO	8.3	2016	UNESCO
Timor-Leste	0.5387	67.5	2015	UNDP (HDI)	81.79	2010	UNESCO	12.5	2015	UNDP (HDI)	4.4	2015	UNDP (HDI)
Togo	0.5058	66.5	2015	UNDP (HDI)	71.89	2011	UNESCO	12.0	2015	UNDP (HDI)	4.7	2015	UNDP (HDI)
Tonga	0.8038	99.4	2015	UNDP (HDI)	88.50	2003	UNESCO	14.3	2015	UNDP (HDI)	11.1	2015	UNDP (HDI)
Trinidad and Tobago	0.7195	99	2015	UNDP (HDI)	67.31	2004	UNESCO	12.7	2015	UNDP (HDI)	10.9	2015	UNDP (HDI)
Tunisia	0.6640	81.8	2015	UNDP (HDI)	80.63	2015	UNESCO	14.75	2015	UNESCO	7.1	2015	UNDP (HDI)
Turkey	0.8148	95	2015	UNDP (HDI)	100.27	2015	UNESCO	17.22	2015	UNESCO	7.9	2015	UNESCO
Turkmenistan	0.6626	99.7	2015	UNDP (HDI)	61.28	2014	UNESCO	10.80	2014	UNESCO	9.9	2015	UNESCO
Tuvalu	0.6422	98.00	2014	UN E-Gov Survey	72.33	2001	UNESCO	10.96	2001	UNESCO	6.93	2017	estimation
Uganda	0.4906	73.9	2015	UNDP (HDI)	61.32	2011	UNESCO	10.0	2015	UNDP (HDI)	5.7	2015	UNDP (HDI)
Ukraine	0.8436	99.8	2015	UNDP (HDI)	96.11	2014	UNESCO	15.31	2014	UNESCO	11.3	2015	UNDP (HDI)
United Arab Emirates	0.6877	93.8	2015	UNDP (HDI)	67.00	2014	UNESCO	13.33	2012	UNDP (HDI)	9.5	2015	UNDP (HDI)
United Kingdom of Great Britain and Northern Ireland	0.9200	99.00	2014	UNESCO	99.81	2014	UNESCO	17.94	2014	UNESCO	13.3	2015	UNDP (HDI)
United Republic of Tanzania	0.4759	80.3	2015	UNDP (HDI)	52.30	2013	UNESCO	8.9	2015	UNDP (HDI)	5.8	2015	UNDP (HDI)

Table 15. Human Capital Index (HCI) and its components (continued)

Country	HCI	Adult Literacy (%)			Gross Enrollment Ratio			Expected Year of Schooling			Mean Year of Schooling		
		Index Value	Year	Source	Index Value	Year	Source	Index Value	Year	Source	Index Value	Year	Source
United States of America	0.8883	99.00	2014	UNESCO	96.39	2014	UNESCO	16.54	2014	UNESCO	13.2	2015	UNDP (HDI)
Uruguay	0.7719	98.4	2015	UNDP (HDI)	87.91	2014	UNESCO	15.00	2014	UNESCO	8.6	2015	UNDP (HDI)
Uzbekistan	0.7396	99.6	2015	UNDP (HDI)	70.24	2016	UNESCO	12.29	2016	UNESCO	12	2015	UNDP (HDI)
Vanuatu	0.5675	85.2	2015	UNDP (HDI)	63.51	2004	UNESCO	10.8	2015	UNDP (HDI)	6.8	2015	UNDP (HDI)
Venuzuela (Bolivian Republic of)	0.7615	95.4	2015	UNDP (HDI)	87.78	2009	UNESCO	14.3	2015	UNESCO	9.4	2015	UNDP (HDI)
Viet Nam	0.6543	94.5	2015	UNDP (HDI)	66.00	2014	UNESCO	12.6	2015	UNDP (HDI)	8	2015	UNDP (HDI)
Yemen	0.4037	70.1	2015	UNDP (HDI)	54.78	2011	UNESCO	9.0	2015	UNDP (HDI)	3	2015	UNDP (HDI)
Zambia	0.5689	63.4	2015	UNDP (HDI)	85.0		UNDP	12.5	2015	UNDP (HDI)	6.9	2015	UNDP (HDI)
Zimbabwe	0.5668	86.5	2015	UNDP (HDI)	59.15	2013	UNESCO	10.3	2015	UNDP (HDI)	7.7	2015	UNDP (HDI)

Note: Last accessed December 2017

Sources: UNESCO Institute of Statistics http://data.uis.unesco.org/

http://hdr.undp.org/en/data

Table 16. Regional and Economic grouping for E-Government Development Index (EGDI)

Country	Region	Sub-Region	EGDI Level	Level of Income	GNI Per Capitas (US dollars)
Afghanistan	Asia	Southern Asia	Middle EGDI	Low Income	1970
Albania	Europe	Southern Europe	High EGDI	Upper Middle Income	11350
Algeria	Africa	Northern Africa	Middle EGDI	Upper Middle Income	14390
Andorra	Europe	Southern Europe	High EGDI	High Income	43270***
Angola	Africa	Middle Africa	Middle EGDI	Upper Middle Income	6090
Antigua and Barbuda	Americas	Caribbean	High EGDI	High Income	22090
Argentina	Americas	South America	High EGDI	High Income	19500
Armenia	Asia	Western Asia	High EGDI	Lower Middle Income	9020
Australia	Oceania	Australia and New Zealand	Very High EGDI	High Income	45210
Austria	Europe	Western Europe	Very High EGDI	High Income	50530
Azerbaijan	Asia	Western Asia	High EGDI	Upper Middle Income	16130
Bahamas	Americas	Caribbean	High EGDI	High Income	21640
Bahrain	Asia	Western Asia	Very High EGDI	High Income	44170*
Bangladesh	Asia	Southern Asia	Middle EGDI	Lower Middle Income	3790
Barbados	Americas	Caribbean	High EGDI	High Income	17180
Belarus	Europe	Eastern Europe	Very High EGDI	Upper Middle Income	17220
Belgium	Europe	Western Europe	Very High EGDI	High Income	45900
Belize	Americas	Central America	Middle EGDI	Upper Middle Income	7930
Benin	Africa	Western Africa	Middle EGDI	Low Income	2170
Bhutan	Asia	Southern Asia	Middle EGDI	Lower Middle Income	8160
Bolivia(Plurinational State of)	Americas	South America	High EGDI	Lower Middle Income	7100
Bosnia and Herzegovina	Europe	Southern Europe	High EGDI	Upper Middle Income	12190
Botswana	Africa	Southern Africa	Middle EGDI	Upper Middle Income	16680
Brazil	Americas	South America	High EGDI	Upper Middle Income	14810
Brunei Darussalam	Asia	South-Eastern Asia	High EGDI	High Income	83010
Bulgaria	Europe	Eastern Europe	High EGDI	Upper Middle Income	19190
Burkina Faso	Africa	Western Africa	Middle EGDI	Low Income	1730
Burundi	Africa	Eastern Africa	Middle EGDI	Low Income	770
Cambodia	Asia	South-Eastern Asia	Middle EGDI	Low Income	3510
Cameroon	Africa	Middle Africa	Very High EGDI	Lower Middle Income	3540
Canada	Americas	Northern America	Middle EGDI	High Income	44020
Cabo Verde	Africa	Western Africa	Middle EGDI	Lower Middle Income	6220
Central African Republic	Africa	Middle Africa	Low EGDI	Low Income	700
Chad	Africa	Middle Africa	Low EGDI	Low Income	1950
Chile	Americas	South America	High EGDI	High Income	22540
China	Asia	Eastern Asia	High EGDI	Upper Middle Income	15470
Colombia	Americas	South America	High EGDI	Upper Middle Income	13900
Comoros	Africa	Eastern Africa	Low EGDI	Low Income	1540
Congo	Africa	Middle Africa	Middle EGDI	Lower Middle Income	5380
Costa Rica	Americas	Central America	High EGDI	Upper Middle Income	15750
Côte d'Ivoire	Africa	Western Africa	Middle EGDI	Lower Middle Income	3590
Croatia	Europe	Southern Europe	High EGDI	High Income	22630

Table 16. Regional and Economic grouping for E-Government Development Index (EGDI) (continued)

Country	Region	Sub-Region	EGDI Level	Level of Income	GNI Per Capitas (US dollars)
Cuba	Americas	Caribbean	Middle EGDI	Upper Middle Income	5880^
Cyprus	Asia	Western Asia	Very High EGDI	High Income	32200
Czech Republic	Europe	Eastern Europe	High EGDI	High Income	32350
Democratic People's Republic of Korea	Asia	Eastern Asia	Low EGDI	Low Income	506~
Democratic Republic of the Congo	Africa	Middle Africa	Middle EGDI	Low Income	780
Denmark	Europe	Northern Europe	Very High EGDI	High Income	50290
Djibouti	Africa	Eastern Africa	Low EGDI	Lower Middle Income	2200&&
Dominica	Americas	Caribbean	High EGDI	Upper Middle Income	10620
Dominican Republic	Americas	Caribbean	High EGDI	Upper Middle Income	14480
Ecuador	Americas	South America	High EGDI	Upper Middle Income	11030
Egypt	Africa	Northern Africa	Middle EGDI	Lower Middle Income	10980
El Salvador	Americas	Central America	High EGDI	Lower Middle Income	8220
Equatioral Guinea	Africa	Middle Africa	Low EGDI	High Income	18290
Eritrea	Africa	Eastern Africa	Low EGDI	Low Income	1500^
Estonia	Europe	Northern Europe	Very High EGDI	High Income	29040
Eswatini	Africa	Southern Africa	Middle EGDI	Lower Middle Income	8310
Ethiopia	Africa	Eastern Africa	Middle EGDI	Low Income	1730
Fiji	Oceania	Melanesia	Middle EGDI	Upper Middle Income	8710
Finland	Europe	Northern Europe	High EGDI	High Income	43780
France	Europe	Western Europe	Very High EGDI	High Income	42000
Gabon	Africa	Middle Africa	Very High EGDI	Upper Middle Income	16720
Gambia	Africa	Western Africa	Middle EGDI	Low Income	1630
Georgia	Asia	Western Asia	Middle EGDI	Lower Middle Income	9510
Germany	Europe	Western Europe	High EGDI	High Income	49690
Ghana	Africa	Western Africa	Very High EGDI	Lower Middle Income	4150
Greece	Europe	Southern Europe	High EGDI	High Income	27150
Grenada	Americas	Caribbean	Very High EGDI	Upper Middle Income	13720
Guatemala	Americas	Central America	High EGDI	Lower Middle Income	7750
Guinea	Africa	Western Africa	Middle EGDI	Low Income	1840
Guinea-Bissau	Africa	Western Africa	Low EGDI	Low Income	1550
Guyana	Americas	South America	Low EGDI	Lower Middle Income	7800
Haiti	Americas	Caribbean	Middle EGDI	Low Income	1790
Honduras	Americas	Central America	Middle EGDI	Lower Middle Income	4410
Hungary	Europe	Eastern Europe	Middle EGDI	High Income	25360
Iceland	Europe	Northern Europe	High EGDI	High Income	51170
India	Asia	Southern Asia	Very High EGDI	Lower Middle Income	6490
Indonesia	Asia	South-Eastern Asia	High EGDI	Lower Middle Income	11220
Iran (Islamic Republic of)	Asia	Southern Asia	High EGDI	Upper Middle Income	20010
Iraq	Asia	Western Asia	High EGDI	Upper Middle Income	17210
Ireland	Europe	Northern Europe	Middle EGDI	High Income	56920
Israel	Asia	Western Asia	Very High EGDI	High Income	36810

Table 16.   Regional and Economic grouping for E-Government Development Index (EGDI) (continued)

Country	Region	Sub-Region	EGDI Level	Level of Income	GNI Per Capitas (US dollars)
Italy	Europe	Southern Europe	Very High EGDI	High Income	38460
Jamaica	Americas	Caribbean	Very High EGDI	Upper Middle Income	8450
Japan	Asia	Eastern Asia	Middle EGDI	High Income	43540
Jordan	Asia	Western Asia	Very High EGDI	Upper Middle Income	8980
Kazakhstan	Asia	Central Asia	High EGDI	Upper Middle Income	22930
Kenya	Africa	Eastern Africa	Very High EGDI	Lower Middle Income	3120
Kiribati	Oceania	Micronesia	Middle EGDI	Lower Middle Income	3050
Kuwait	Asia	Western Asia	Middle EGDI	High Income	83150
Kyrgizistan	Asia	Central Asia	High EGDI	Lower Middle income	3410
Lao People's Democratic Republic	Asia	South-Eastern Asia	High EGDI	Lower Middle Income	6270
Latvia	Europe	Northern Europe	Middle EGDI	High Income	25530
Lebanon	Asia	Western Asia	High EGDI	Upper Middle Income	14070
Lesotho	Africa	Southern Africa	High EGDI	Lower Middle Income	3340
Liberia	Africa	Western Africa	Middle EGDI	Low Income	700
Libya	Africa	Northern Africa	Middle EGDI	Upper Middle Income	11210
Liechtenstein	Europe	Western Europe	Middle EGDI	High Income	115530
Lithuania	Europe	Northern Europe	Very High EGDI	High Income	28680
Luxembourg	Europe	Western Europe	Very High EGDI	High Income	69640
Madagascar	Africa	Eastern Africa	Very High EGDI	Low Income	1440
Malawi	Africa	Eastern Africa	Middle EGDI	Low Income	1140
Malaysia	Asia	South-Eastern Asia	Middle EGDI	Upper Middle Income	26900
Maldives	Asia	Southern Asia	High EGDI	Upper Middle Income	16710
Mali	Africa	Western Africa	High EGDI	Low Income	2050
Malta	Europe	Southern Europe	Low EGDI	High Income	35710
Marshall Islands	Oceania	Micronesia	Very High EGDI	Upper Middle Income	5370
Mauritania	Africa	Western Africa	Middle EGDI	Lower Middle Income	3760
Mauritius	Africa	Eastern Africa	Low EGDI	Upper Middle Income	20990
Mexico	Americas	Central America	High EGDI	Upper Middle Income	17160
Micronesia	Oceania	Micronesia	High EGDI	Lower Middle Income	4090
Monaco	Europe	Western Europe	Middle EGDI	High Income	186710^^^
Mongolia	Asia	Eastern Asia	Very High EGDI	Upper Middle Income	11420
Montenegro	Europe	Southern Europe	High EGDI	Upper Middle Income	17870
Morocco	Africa	Northern Africa	High EGDI	Lower Middle Income	7710
Mozambique	Africa	Eastern Africa	High EGDI	Low Income	1190
Myanmar	Asia	South-Eastern Asia	Middle EGDI	Lower Middle Income	5530
Namibia	Africa	Southern Africa	Middle EGDI	Upper Middle Income	10380
Nauru	Oceania	Micronesia	Middle EGDI	Upper Middle Income	17510
Nepal	Asia	Southern Asia	Middle EGDI	Low Income	2520
Netherlands	Europe	Western Europe	Middle EGDI	High Income	49930
New Zealand	Oceania	Australia and New Zealand	Very High EGDI	High Income	37190
Nicaragua	Americas	Central America	Very High EGDI	Lower Middle Income	5530
Niger	Africa	Western Africa	Middle EGDI	Low Income	970

Table 16.   Regional and Economic grouping for E-Government Development Index (EGDI) (continued)

Country	Region	Sub-Region	EGDI Level	Level of Income	GNI Per Capitas (US dollars)
Nigeria	Africa	Western Africa	Low EGDI	Lower Middle Income	5740
Norway	Europe	Northern Europe	Middle EGDI	High Income	61920
Oman	Asia	Western Asia	Very High EGDI	High Income	0
Pakistan	Asia	Southern Asia	High EGDI	Lower Middle Income	5560
Palau	Oceania	Micronesia	Middle EGDI	Upper Middle Income	14840
Panama	Americas	Central America	High EGDI	Upper Middle Income	20980
Papua New Guinea	Oceania	Melanesia	High EGDI	Lower Middle Income	4140
Paraguay	Americas	South America	Middle EGDI	Upper Middle Income	9050
Peru	Americas	South America	High EGDI	Upper Middle Income	12480
Philippines	Asia	South-Eastern Asia	High EGDI	Lower Middle Income	9390
Poland	Europe	Eastern Europe	High EGDI	High Income	26300
Portugal	Europe	Southern Europe	Very High EGDI	High Income	29940
Qatar	Asia	Western Asia	Very High EGDI	High Income	124760*
Republic of Korea	Asia	Eastern Asia	High EGDI	High Income	36570
Republic of Moldova	Europe	Eastern Europe	Very High EGDI	Lower Middle Income	5670
Romania	Europe	Eastern Europe	High EGDI	Upper Middle Income	22370
Russian Federation	Europe	Eastern Europe	High EGDI	High Income	24120
Rwanda	Africa	Eastern Africa	Very High EGDI	Low Income	1860
Saint Kittis and Nevis	Americas	Caribbean	Middle EGDI	High Income	25640
Saint Lucia	Americas	Caribbean	High EGDI	Upper Middle Income	12030
Saint Vincent and the Grenadines	Americas	Caribbean	Middle EGDI	Upper Middle Income	11380
Samoa	Oceania	Polynesia	High EGDI	Lower Middle Income	6230
San Marino	Europe	Southern Europe	Middle EGDI	High Income	52140^^^
Sao Tome and Principe	Africa	Middle Africa	High EGDI	Lower Middle Income	3250
Saudi Arabia	Asia	Western Asia	Middle EGDI	High Income	55750
Senegal	Africa	Western Africa	High EGDI	Lower Middle Income	2480
Serbia	Europe	Southern Europe	Middle EGDI	Upper Middle Income	13700
Seychelles	Africa	Eastern Africa	High EGDI	High Income	28380
Sierra Leone	Africa	Western Africa	High EGDI	Low Income	1320
Singapore	Asia	South-Eastern Asia	Middle EGDI	High Income	85020
Slovakia	Europe	Eastern Europe	Very High EGDI	High Income	29670
Slovenia	Europe	Southern Europe	High EGDI	High Income	31690
Solomon Islands	Oceania	Melanesia	Very High EGDI	Lower Middle Income	2140
Somalia	Africa	Eastern Africa	Middle EGDI	Low Income	107~
South Africa	Africa	Southern Africa	Low EGDI	Upper Middle Income	12830
South Sudan	Africa	Eastern Africa	High EGDI	Low Income	1700
Spain	Europe	Southern Europe	Low EGDI	High Income	36300
Sri Lanka	Asia	Southern Asia	Very High EGDI	Lower Middle Income	12200
Sudan	Africa	Northern Africa	High EGDI	Lower Middle Income	4290
Suriname	Americas	South America	Low EGDI	Upper Middle Income	14460
Sweden	Europe	Northern Europe	Very High EGDI	High Income	49420
Switzerland	Europe	Western Europe	Very High EGDI	High Income	63810

Table 16.   Regional and Economic grouping for E-Government Development Index (EGDI) (continued)

Country	Region	Sub-Region	EGDI Level	Level of Income	GNI Per Capitas (US dollars)
Syrian Arab Republic	Asia	Western Asia	Middle EGDI	Lower Middle Income	1860&
Tajikistan	Asia	Central Asia	Middle EGDI	Lower Middle Income	3500
Thailand	Asia	South-Eastern Asia	High EGDI	Upper Middle Income	16070
The former Yugoslav Republic of Macedonia	Europe	Southern Europe	High EGDI	Upper Middle Income	14310
Timor-Leste	Asia	South-Eastern Asia	Middle EGDI	Lower Middle Income	3380
Togo	Africa	Western Africa	Middle EGDI	Low Income	1370
Tonga	Oceania	Polynesia	High EGDI	Upper Middle Income	5780
Trinidad and Tobago	Americas	Caribbean	High EGDI	High Income	31770
Tunisia	Africa	Northern Africa	High EGDI	Upper Middle Income	11150
Turkey	Asia	Western Asia	High EGDI	Upper Middle Income	24980
Turkmenistan	Asia	Central Asia	Middle EGDI	Upper Middle Income	16060
Tuvalu	Oceania	Polynesia	Middle EGDI	Upper Middle Income	5920
Uganda	Africa	Eastern Africa	Middle EGDI	Low Income	1790
Ukraine	Europe	Eastern Europe	High EGDI	Lower Middle Income	8190
United Arab Emirates	Asia	Western Asia	Very High EGDI	High Income	72830
United Kingoom of Great Britain and Northern Ireland	Europe	Northern Europe	Very High EGDI	High Income	41640
United Republic of Tanzania	Africa	Eastern Africa	Middle EGDI	Low Income	2740
United States of America	Americas	Northern America	Very High EGDI	High Income	58700
Uruguay	Americas	South America	Very High EGDI	High Income	21090
Uzbekistan	Asia	Central Asia	High EGDI	Lower Middle Income	6640
Vanuatu	Oceania	Melanesia	Middle EGDI	Lower Middle Income	3040**
Venuzuela (Bolivian Republic of)	Americas	South America	High EGDI	High Income	17410**
Viet Nam	Asia	South-Eastern Asia	High EGDI	Lower Middle Income	6040
Yemen	Asia	Western Asia	Low EGDI	Lower Middle Income	2490
Zambia	Africa	Eastern Africa	Middle EGDI	Lower Middle Income	3850
Zimbabwe	Africa	Eastern Africa	Middle EGDI	Low Income	1810

References

1   ITU (2014) Manual for Measuring ICT Access and Use by Households and Individuals. Available at: http://www.itu.int/dms_pub/itu-d/opb/ind/D-IND-ITCMEAS-2014-PDF-E.pdf

2   Note: The Internet is a worldwide public computer network. It provides access to a number of communication services including the World Wide Web and carries e-mail, news, entertainment and data files, irrespective of the device used (not assumed to be only via a computer – it may also be by mobile telephone, tablet, PDA, games machine, digital TV etc.). Access can be via a fixed or mobile network. (Ibid)

3   ITU (2017). Measuring the Information Society Report 2017. Volume 2. ICT country profiles. p. 249. Available at: https://www.itu.int/en/ITU-D/Statistics/Documents/publications/misr2017/MISR2017_Volume2.pdf

4   2014 E Government Survey

5   The World Bank. World Bank Country and Lending Groups. Available at: https://datahelpdesk.worldbank.org/knowledgebase/articles/906519 (Accessed on 22 February 2018)