The deployment of e-governance systems in Africa

Final Report

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International Cooperation and Development

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Abbreviations

AFIS	automatic fingerprint identification system
AU	African Union
CEN-SAD	Community of Sahel-Saharan States ([1])
CERT	computer emergency response team
Comesa	Common Market for Eastern and Southern Africa ([2])
EAC	East African Community ([3])
ECCAS	Economic Community of Central African States ([4])
Ecowas	Economic Community of West African States ([5])
eGA	e-Governance Academy of Estonia
EU	European Union
FAQ	frequently asked questions
ICT	information and communication technologies
ID	identity
ITU	International Telecommunication Union
NeGSt	national e-government strategy (Senegal)
NGO	non-governmental organisation
OSI	Government Online Services Index
SADC	Southern African Development Community ([6])
UN	United Nations
Unicef	United Nations Children's Fund
Unctad	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
WEF	World Economic Forum

([1]) Benin, Burkina Faso, Central African Republic, Chad, Comoros, Côte d'Ivoire, Djibouti, Egypt, Eritrea, Ghana, Guinea, Guinea-Bissau, Libya, Liberia, Kenya, Mali, Mauritania, Morocco, Niger, Nigeria, Senegal, Sierra Leone, Somalia, São Tomé and Príncipe, Sudan, The Gambia, Togo, Tunisia.

([2]) Burundi, Comoros, Democratic Republic of the Congo, Djibouti, Egypt, Ethiopia, Eritrea, Kenya, Libya, Madagascar, Malawi, Mauritius, Rwanda, Seychelles, Sudan, Swaziland, Uganda, Zambia, Zimbabwe.

([3]) Burundi, Kenya, Rwanda, South Sudan, Tanzania, Uganda,

([4]) Angola, Burundi, Cameroon, Central African Republic, Chad, Congo, Democratic Republic of the Congo, Equatorial Guinea, Gabon, Rwanda, São Tomé and Príncipe.

([5]) Benin, Burkina Faso, Cape Verde, Côte d'Ivoire, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone, The Gambia, Togo.

([6]) Angola, Botswana, Lesotho, Malawi, Mauritius, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Zambia, Zimbabwe.

Executive summary

We are experiencing a global digital revolution of the same magnitude as the Industrial Revolution of the 19th century. Digital technologies — relying on information and communication technologies (ICT) — and the services they support are enablers of sustainable development and inclusive growth. Africa, with over 400 million mobile internet users and numerous sectoral leap-frogging innovations, is experiencing unprecedented growth in digital technologies. Africa is not homogeneous, but there are some similarities between countries. Often, the full potential of digital technologies is not used, despite their rapid development, although there are large differences between urban and rural areas. There are unique opportunities to use ICT to achieve economic growth, increases in productivity and better service delivery. It is more timely than ever for governments to create strong, enabling e-governance systems. Governments should ensure the best possible use of digital technologies for the benefit of the people and act as facilitators, enablers and regulators, involving all stakeholders through transparent cooperation.

Implementing e-governance should be a comprehensive process, in which organisational and regulatory issues are addressed in addition to technological issues. The process should be adapted to suit each country, as e-governance should not be seen as separate from the general governance of the state. There is a need for support from top political leadership and for high-level coordination. The recognition of what e-governance means is still in its infancy and there is no clarity on key concepts. Generally, it should include some interactivity in addition to electronic access to information. For this study, the term 'e-governance' is used as a wide concept that includes services for a public purpose carried out as a private service.

This report lists and analyses the steps needed to achieve e-governance, leading to suggestions on how they can be supported. Each country will need to take a different number of steps, and in a different order, depending on its ICT availability and use, the current status of e-governance and its structure of, and choices for, governance in general. The report contains an analytical composite of what e-governance consists of and outlines the situation in different countries. Data gathering, mapping and inventory of existing approaches and activities has been undertaken, based on publicly available data from international organisations — including rankings drawn up by international organisations — as well as independent data gathering and analysis by experts at the e-Governance Academy of Estonia (eGA).

Key elements of e-governance can be divided into two complementary sections: digital elements directly connected to technology and analogue elements supporting technology.

Key digital elements include:

- government portals;
- digital databases and digitisation of records;
- secure exchange of data;
- secure digital identity and digital signature;
- infrastructure issues;
- sectoral solutions (tax administrations are examined as an example).

Key analogue elements include:

- international frameworks;
- the legal framework (legislation and regulations enabling digital transactions and protecting privacy);
- coordinating institutions;
- political will and change management;
- access to services;
- awareness raising.

The situation in Africa regarding these elements is as described in the following paragraph. There are government portals in most African countries, although in some cases these are limited to, for example, the president's office or they lack updated information. The status of portals has been determined based on the indexes evaluating them or governments' performance in delivering online services plus additional research by eGA experts. The extent of digital databases and the digital exchange of data is difficult to identify, as it is spread between many different organisations, often without centralised handling, but most countries are in the process of digitising records even if a lot of data are still in analogue form. The indicator used to assess digital identity/signature is the existence of national IDs (identities) with some electronic components that can be used for digital authentication purposes. At least 12 African countries had (in 2016) such IDs. The most ambitious ongoing project is the Economic Community of West African States (Ecowas) biometric identity card. Regarding infrastructure matters and access to ICT, there is quite a lot of information available through various organisations, such as the International Telecommunication Union and the World Bank, looking at broadband and telephone and similar subscriptions, although some data are outdated or use less relevant indicators. The access to broadband internet is often not very well developed, although the situation in north Africa and in the Southern African Development Community countries is better than elsewhere. The penetration of mobile telephony and to some extent mobile internet is high in almost all parts of Africa. The analysis of tax administrations, performed by eGA experts, shows how an e-governance service is provided in practice, and it provides a thorough analysis of ease of access to information and availability of electronic services. We found large differences between countries, in some cases differing from the situation reported by existing indexes.

With regard to analogue elements, the efficiency of supporting international frameworks cannot be measured with quantitative indicators but is based on eGA experts' analysis. The qualitative analysis is supplemented with data on the status of signing and ratifying international agreements such as the Convention for the Protection of Individuals with regard to Automatic Processing of Personal Data (Data Protection Convention) and the Convention on Cybercrime. The legislative situation is indicated by listing existing legal acts and analysing them and the general legal situation to the greatest extent possible. e-Governance does not require a lot of designated legislation but rather an analysis of the overall legal situation and of legislation to ensure recognition of electronic identities/signatures and electronic documents. Attention should be given to data protection. There are various regional efforts, such as the 2014 African Union Convention on Cyber Security and Personal Data Protection, which, however, has very few parties. Ecowas has adopted an act on data protection, the East African Community the Framework for Cyberlaws and the Common Market for Eastern and Southern Africa the Model Law on Electronic Transactions. Cybercrime legislation exists or is being developed in many countries. As for supporting organisations, the lack of a clear focal point for introducing e-governance and coordinating digitisation is a problem all over the world, including in Africa. The types of organisations responsible for e-governance vary significantly between countries. The analogue elements include 'soft' matters, such as political will and awareness, which are assessed based on expert analysis, existing surveys and the study of policy documents that signal political commitment. Overcoming resistance to change is one of the greatest challenges for implementing effective e-governance. The cross-governmental nature of the changes that need to be implemented adds complexity.

For ease of reference and overview, the report divides countries into three main groups. The first consists of 12 countries (Botswana, Cape Verde, Egypt, Ghana, Kenya, Mauritius, Morocco, Namibia, Rwanda, Seychelles, South Africa, Tunisia) that have implemented various services, have an organisational structure and at least basic regulation and, in most cases, some form of digital identity and interoperability. Online services are generally accessible and well presented. These countries have preconditions for continued development and can act as regional examples and leaders. The second group is the largest one (26 countries) and the most diverse, so it has been further sub-divided into three tiers (1: Algeria, Benin, Lesotho, Nigeria, Swaziland, Tanzania, Uganda, Zimbabwe; 2: Angola, Burkina Faso, Côte d'Ivoire, Gabon, Madagascar, Mozambique, São Tomé and Príncipe, Senegal, Togo, Zambia; 3: Cameroon, Comoros, Ethiopia, Liberia, Libya, Mali, Sudan, The Gambia). These countries have undertaken some work towards e-governance but not reached the same level as those in group 1. Finally, the third group contains 15 countries (Burundi, Central African Republic, Chad, Congo, Democratic Republic of the Congo, Djibouti, Eritrea, Equatorial Guinea, Guinea, Guinea-Bissau, Malawi, Niger, Sierra Leone, Somalia, South Sudan) with a low level of development or unrest or extreme poverty that are lagging behind in many respects. Even if e-governance can be useful for such countries and may allow them to leap-frog to faster development, there may be issues with finding adequate national capacity for knowledge transfer and for maintaining the sustainability of reforms.

The benefit of grouping countries is that it highlights what types of activities and thus what types of support are suitable. For the countries in group 1, support can be given in the form of advanced sectoral solutions (e.g. tax administrations, customs, education) or cross-sectoral enablers (interoperability, secure digital identity) to build upon existing solutions. Projects can include more than one country, so that several countries at a similar level but with existing solutions in different domains can share expertise and experience, or states that have reached a higher level can support others by sharing examples of good practice. For countries in group 2, it is likely that more basic support may be needed, especially in tier 3 (such as awareness raising, basic regulatory adjustment or technical support). Projects in this group should also be regional or at least involve more than one country. Countries in group 3 can benefit from basic assistance and the example of more advanced countries.

Steps to move countries to a higher level include adopting specific and workable strategies and programmes as well as necessary legislation; creating and/or empowering a responsible organisational structure; improving the availability and accessibility of online information and services; awareness-raising initiatives; introducing or improving e-identification; improving the technical infrastructure; and increasing involvement in international (regional, cross-border) initiatives. A country that wants to build e-governance should assess its current level in terms of the prerequisites and, if necessary, bring that level up to the appropriate minimum.

The report proposes a matrix as a tool for indicating the level of e-government and determining the key elements that should be addressed; work on different issues can then proceed in parallel. A roadmap shows the various steps in a brief but comprehensive manner. Both the matrix and the roadmap can serve as a checklist for individuals responsible at the national level and for the EU for evaluating progress and developing policy. In addition, specific activities are suggested, per group, to support national capacity building and the creation of clear organisational structures (including ensuring high-level leadership, financing, proper analysis of the legal framework, citizen engagement, digital identity, digital data handling, interoperability) and to support regional cooperation both outside and within existing regional and sub-regional organisations to achieve mutual support and synergies between countries at different levels and in different situations.

Chapter 1. Introduction

Digital technologies — relying on information and communication technologies (ICT) — and the services they support — are enablers of sustainable development and inclusive growth. The role of governments in the creation of a modern information society that ensures the best possible use of digital technologies for the benefit of the people is to act not only as facilitators and leaders but also as enablers and regulators. Given the limited resources of governments, the involvement of all stakeholders through transparent cooperation is essential. In this way, the benefits of digital technologies can be used to improve the lives of all categories of people, including those in poorer states and regions. One important potential benefit of digital technologies is the improved accessibility and transparency of governance ([7]).

Even if the focus is not primarily on technology, it does not mean that the connectivity and affordability of ICT are not relevant concerns. A lack of access to ICT prevents the development of e-services using digital technologies ([8]). The implementation of e-governance ([9]) should, however, be a comprehensive process — not focused primarily on technology but a process in which organisational and regulatory issues are addressed. If this is not done, there is a danger of a situation arising in which, instead of fully benefiting from modern technologies, there will be problems such as digital data and transactions having no legal meaning; data not being re-used; service delivery processes simply being copied from the paper era with no changes; computers used as typewriters; and even online application forms printed out in government offices and data being submitted manually. With an exclusively technology-focused approach, there may be functional technology in place, but it may not be integrated into government processes in a sustainable way with proper institutional and legislative support, and there may be a lack of trained personnel. Such a situation often means that few services are in place, which leads to a vicious circle, as e-governance will then be seen as ineffective and it may take years to convince government departments and their legal offices or citizens to use the technology.

In addition it being necessary for the process to be comprehensive, it must also be adapted for the country where it is taking place. The system of governance is a core part of the identity of the state and something that it would be unsuitable, as well as unethical, for external forces to impose on sovereign countries. e-Governance is an integral and indivisible part of the governance of a country. In this respect, it is important to keep in mind that e-governance is a way to conduct **governance** — not something separated from the governance of the state. Digital technologies are used to improve governance and not for their own sake. There are many different ways in which e-governance can support society, including open public data, involvement of citizens in the decision-making process or providing services such as paying taxes online. The many aspects of e-governance explain why**, in** order to properly implement the changes necessary for successful e-governance, there is a need for support from top political leadership and for high-level coordination among government departments as well as among other stakeholders. Such interventions support the creation of sustainable social and economic environment that, in turn, supports the creation of new forms of entrepreneurship and civil society, diminishes bureaucratic barriers and separation lines and avoids the creation of 'information have' and 'information have-not' social groups and regions. Without such support from the country in question, it will not be possible to implement sustainable e-governance.

The abovementioned nature of the process of e-governance dictates the parameters for identifying the various steps needed and analysing for each step what is needed and how this can be supported. Each country will need to take a different number of these steps, and in a different order, depending on the current status of its e-governance but also on its structure of, and choices for, governance in general. The basis for the grouping of countries is an analytical composite of what e-governance consists of and the situation in different countries.

([7]) Commission Staff Working Document 'Digital4Development: mainstreaming digital technologies and services into EU development policy', Brussels, 02.05.2017, SWD(2017) 157 final, p. 5.

([8]) Heeks, R., 'Do information and communication technologies (ICTs) contribute to development?' *Journal of International Development*, 2010, 22(5), pp. 625-640.

([9]) Please see the definition in Annex 11 — Glossary.

1.1. Objective and scope of work

The objective of the study was to analyse the potential for e-governance in Africa and to suggest the best way to move forward towards increased e-governance. The work consisted of information gathering, consisting of compiling and assessing existing public data, as well as undertaking our own research. On the basis of this information, the report presents an evaluation and a ranking of countries. Furthermore, it suggests steps to be taken to progress towards improved e-governance.

Africa is a diverse continent but, even if the regional variations are large, it is true in most countries that the full potential of digital technologies is not yet being used. The level of development is very varied between countries: some may be advanced in some things but behind in others, without it being evident which of these aspects should carry more weight in the general evaluation. Within countries there are large differences between urban and rural areas, and there is evidence in many major urban centres in different countries of what may soon be to come. In such areas, many people have internet-capable devices, there are 3G networks up and running and 4G networks planned, as well as a growing wave of innovation in both public and private services. This shows the need for a narrative, and not just lists of numbers, to be able to explain the current status of e-governance. For example, Namibia is very advanced with interoperability of databases ([10]) — a key element of e-governance — whereas Nigeria is ahead when it comes to the implementation of an e-ID (electronic identity) by the National Identity Management Commission ([11]). Rwanda ([12]) has been ambitious regarding internet access for its population, while Morocco ([13]) has quite a large number of public e-services. Even a country such as Somalia, where government services are almost non-existent, does not present a clear picture, as it has a lively private ICT sector (albeit until recently in the absence of any regulatory framework) ([14]).

In cases in which African countries have gone further in their development of e-governance, various implementation issues can be identified that may be useful as lessons for other states. For example, in Ghana the central database infrastructure for electronic IDs was completed, but data capturing did not take place until 5 years later, which led to inconsistency between the number of citizens registered for the programme and those with recorded data ([15]).

There are many and increasingly important regional integration organisations in Africa. In addition to the African Union (AU), there are important sub-regional organisations, but the AU shows signs of increasing activity in different spheres ([16]). These include e-governance, with, for example, an agreement on African partnership for the provision of digital identification from April 2016, when African leaders and development partners agreed on 'a common approach for accelerating the provision of unique identification to millions of people in Africa as a means to foster more inclusive economies and greater regional integration' ([17]). The AU has expressed the potential for Africa to 'leap frog into digital era and harmonise e-governance rules at the very early stage to ensure true interoperability' ([18]). The role of regional organisations, both as a source of information and as a means to accelerate development, is an important element of our study.

The short overview in this section illustrates the variety of issues that African countries are faced with and that we identify, list and systematise, as well as analyse, in our report. We are aware that for some countries (such as South Sudan or the Central African Republic) there is little to report and analyse, but for most countries there is a variety and a multitude of relevant issues. Countries provide examples of e-governance in different spheres, but the objective of this report is to provide a roadmap on how to progress with e-governance in Africa and what avenues can be pursued to assist with this essential development. The report provides a comprehensive knowledge base for making policy choices to assist the process of developing e-governance.

([10]) http://ega.ee/project/governmental-interoperability-in-namibia

([11]) National Policy and National Identity Management Commission Act (Act No 23 of 2007), https://www.nimc.gov.ng/

([12]) http://statistics.gov.rw/node/756

([13]) http://www.egov.ma/fr

([14]) http://www.worldbank.org/en/news/feature/2017/10/02/legal-ict-framework-is-pivotal-moment-for-somalia

([15]) Akrofi-Larbi, R., 'Challenges of national identification in Ghana', *Information and Knowledge Management*, 2015, 5(4), http://www.iiste.org/Journals/index.php/IKM/article/view/21651

([16]) Nyman-Metcalf, K. and Papageorgiou, I., 'Democracy through regional integration' (Intersentia 2015), http://intersentia.com/en/shop/academisch/democracy-through-regional-integration.html

([17]) Press release, 'Africa in partnership for the provision of digital identification', 15 April 2016, https://au.int/web/en/pressreleases/20160415-0

([18]) https://eeas.europa.eu/delegations/brazil/8093/eu-african-union-collaboration-on-egovernance-a-potential-to-accelerate-development-and-good-governance_en

1.2. Methodology

An essential component of the study is data gathering, mapping and inventory of the existing diverse approaches taken by African countries to e-governance, showing the heterogeneity of the current situation and the preparedness of countries. Given the vastness of the geographical area to be studied and the substantial amount of data to be analysed, it has been necessary to scale back the level of detail that it was possible to research and to summarise the various indicators set out in the report. It is, however, possible to identify key digital and analogue elements for e-governance, illustrate the existing situation regarding the development of e-governance in African countries and determine the challenges and opportunities. To some extent, the method includes action research, as we combine knowledge production and policy development (in the form of actionable recommendations).

1.2.1. Mapping and inventory of data

The analysis is based on publicly available data gathered by various international organisations, including rankings of e-governance or matters relevant to e-governance performed by international organisations. This includes the World Bank, the International Telecommunication Union (ITU, with, for example, the ICT Development Index), the World Economic Forum (WEF) and the United Nations Conference on Trade and Development (Unctad). The United Nations (UN) has an E-Government Development Index that covers only some aspects of the elements we have identified as essential for the purpose of this report. On legislation and organisational matters, some information is gathered for a number of countries through international organisations (such as Unctad) or national agencies (such as data protection agencies) or privately by law firms and consultancies. Such listings are not complete, and there is some variation in how up to date the information is. Consequently, our work consisted of moving on from this initial and basic data gathering to both analysing what can be found from publicly available lists and compilations and filling in the gaps and verifying the information through original research by the experts at the e-governance Academy of Estonia (hereafter eGA experts).

Initially it was also intended to elicit expert opinions through questionnaires but, due to time constraints, the feedback from the questionnaires was too modest. Therefore, the answers gathered were not used in this report, as the sample threshold was not met. The questionnaire itself is in Annex 13.

1.2.2. Key elements of e-governance

The eGA experts divided the key elements of e-governance into two sections. One section is ‘digital elements’ and is directly connected to technology. The other section is ‘analogue elements’ and supports the technology with regulations, organisation, financing, change management, awareness raising and political will. These sections are not opposed to, but rather complement, each other.

A selection of key digital elements includes:

- government portal;
- digital databases and digitisation of records;
- secure exchange of data;
- secure digital identity and digital signature;
- infrastructure issues;
- sectoral solutions (in the report only one sector — taxation — is examined).

A selection of key analogue elements includes:

- international frameworks;
- legal framework (legislation and regulations enabling digital transactions and protecting privacy);
- coordinating institutions;
- political will and change management;
- access to services;
- awareness raising.

For a number of key elements there are no indexes or other quantitative indicators, as the issues do not permit quantification but require an analytical and qualitative approach. In most cases, this means that the report relies on the eGA experts' analysis.

1.2.3. Sectoral solution example — taxation

The abovementioned digital elements serve as the foundation of e-government. On top of these basic elements there is the potential to create an endless number of sectoral solutions, which can enable services in various areas: education, healthcare, taxation, law, economic development, agriculture, transport, etc. Sectoral solutions can be supported with broader sectoral programmes, for example, 'ICT for Schools,' 'Mobile Solutions for Farmers,' 'Modernisation of Public Transport and Ticketing', etc. As the development of sectoral solutions is the responsibility of many ministries and agencies or municipalities, it was not possible to focus on all of them in all African countries within the scope of this study. Therefore, the report focuses on one sector— tax administration — as an example of a country's ability to introduce e-governance. The reasons for choosing tax administration are as follows.

- It is a public office that exists in all countries and is unique in every country (it cannot be 'imported' as can some other examples of sectoral solutions).
- It can be studied in all countries and regions.
- It is an administration that deals with a large amount of personal data and data about companies.
- It needs access to data from other databases (e.g. the land registry, business registry).
- Many subjects (people and companies) need to interact regularly with the tax administration, often by filling in forms.
- It illustrates all the abovementioned elements of e-governance.

The analysis of tax administrations provides a litmus test and an illustration of how the various digital and analogue elements are represented and helps to group the countries.

1.2.4. Grouping of countries

The information used for the grouping and ranking of countries has not been previously gathered by international organisations into any comprehensive list, as it goes beyond the information available on websites and in the literature. In addition, the eGA experts have analysed, country-by-country, the existence and user-friendliness of government portals, together with the existence of digital services, identifying bodies that are responsible for e-governance in African countries.

The categorisation of the countries is based on the most recent data on the present level of the critical components of e-governance (key elements and indicators; see Annex 12). The analysis of the sources cited has been undertaken by experts, as the data are for the most part qualitative rather than quantitative. Given this nature of the elements to be evaluated, the rankings made by various international organisations are also based on expert evaluation of various components. We use this 'as is', without questioning the analysis behind these rankings, but using them as one of several inputs to our eGA experts' independent ranking. The analysis and ranking of countries in categories as presented in the report should be viewed with caution, as it was based on the relevant data available at the time, which may not necessarily be fully valid at the time the report was written.

The prerequisite key elements comprising e-governance were measured. Each key element was given a reference value and these were added up for each country. In the case of global rankings, data were converted into the African context, meaning that the higher ranking countries were attributed higher points, starting from 54 points as the best ranking. In the case of no data or non-existent key elements, 0 points were attributed to the country. All African countries are included in the ranking, as there is at least some information about all countries, even if some of them have very few digital activities. The calculation and division of countries into groups can be found in Annex 12 in a separate spreadsheet, 'Grouping'. The key indicators used for the ranking have equal weight.

The effects of a number of elements of equal weight or of weight depending on very specific circumstances in any given time and place can also be seen from the different positions that states are given in indexes made by different organisations (see Annex 8).

While countries in group 1 are leading on e-governance practices in most of the critical key elements, the countries in group 3 lack the majority of these key elements, or in many cases there are no comparative data available. It is not possible to use statistical analysis or other quantitative methods to group the countries, as the issues that determine the level of e-governance come from many domains in which quantitative analysis is not possible ([19]). For that reason, in grouping countries, experts' qualitative analysis in the form of their personal experience of a country and the key elements in question was used in upgrading and downgrading countries. Short narratives on experts' opinions, meaning the justification for moving countries from one group to another (whether upgrading or downgrading), is provided in the main report as well as in Annex 6.

The selection of the number of groups and the division of group 2 into three tiers were decisions made by the experts, based on the potential to distinguish recognisable factors denoting similarity and difference on which to define the various levels. At the same time, we stress that the division was made for the purposes of this study and based on the criteria transparently described. It does not purport to be a general categorisation of African countries for any other purpose.

1.2.5. Categorisation of the groups

Group 1	292-840 points
Group 2 — Tier 1	207-292 points
Group 2 — Tier 2	142-207 points
Group 2 — Tier 3	97-142 points
Group 3	Fewer than 97 points

1.2.6. Deploying the matrix and roadmap

Based on the analysis of the current situation in African countries, a deployment matrix is presented, differentiating the steps leading to the full deployment of e-governance systems and including key elements. The matrix can be considered a tool to indicate the level of e-government in a country and to determine the key elements that should be addressed to develop e-governance as well as how to advance from one level to another.

The matrix and roadmap provided are not tools for use in a pre-defined manner by external stakeholders but rather tools supporting the relevant governments to determine how to proceed with e-governance. Any country, regardless of its current level, can use the matrix to identify what key elements comprise e-governance to de-

([19]) Quantitative research is used to test or verify the appropriateness of existing theories to explain certain behaviour or phenomena, as opposed to developing new insights or constructing new theories to be able to understand social phenomena. See Chui, W.H., 'Quantitative legal research', in McConville, M. and Chui, W.H. (eds), *Research methods for law*, Edinburgh University Press, Edinburgh, 2017, p. 51. The description is applicable to social science research other than law and it adequately explains why quantitative research was not relevant for our study.

termine how to work towards achieving it. The exact order will have to be decided by each state, as there are many ways of achieving an equally good result.

1.2.7. Recommendations for deploying e-governance

The study presents guidelines and recommendations: a description of activities for deploying e-governance, identifying possible areas for pilot projects and digital transformation for groups of countries, focusing on selected categories.

1.3. Terminology

The recognition of what e-governance means is in many ways still in its infancy in many countries. The clarity of concepts is not helped by the fact that there is no coherent terminology, although, with the spread of certain technical and legal solutions, such terminology is gradually being created. Even the term 'e-governance' itself is not universally used in the same way. The Council of Europe in one of the relatively few international legal instruments on e-governance, Recommendation Rec (2004)15 ([20]), refers to electronic governance or e-governance without a definition but with the understanding that the term is self-explanatory ([21]). The Council of Europe employs the term 'eGovernment' and generally focuses on eGovernment in the context of open government services ([22]), thus looking at what the new forms of governance can be used for rather than the technology as such. This approach fits well with the EU's promotion of technology neutrality in its policies and legal acts. The World Bank also links the benefits of e-government to the definition: ' "E-Government" refers to the use by government agencies of information technologies (such as Wide Area Networks, the Internet, and mobile computing) that have the ability to 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.' ([23])

As shown above, the term e-government is used almost interchangeably with e-governance. For this study, the term 'e-governance' ([24]) will be used, as this concept is wider and is better able to include, for example, services that may be for a public purpose but carried out as a private service. It is, however, clear that countries talk about introducing e-governance or e-government when they facilitate access to information by electronic means, even without any interactivity. Legislation related to e-governance quite often only deals with rather basic use of ICT in public administration to facilitate administrative work ([25]). This study concentrates on services that include more than just accessing information, although there is also mention, where and when relevant, to existing access to information and tools. Such tools may, for example, be the first step towards creating interactive e-governance.

([20]) https://rm.coe.int/CoERMPublicCommonSearchServices/DisplayDCTMContent?documentId=0900001680645b44

([21]) Recommendation Rec (2004)15 adopted by the Committee of Ministers of the Council of Europe on 15 December 2004 and explanatory memorandum, www.coe.int/

([22]) For example https://joinup.ec.europa.eu/community/opengov/og_page/ogs-study

([23]) http://web.worldbank.org/ (e-Government — Definition of e-Government).

([24]) e-Governance is the application of information and communication technologies (ICT) for delivering government services, exchange of information, communication transactions, integration of various stand-alone systems and government-to-customer (G2C), government-to-business (G2B) and government-to-government (G2G) services, as well as back office processes and interactions within the entire government framework (Saugata, B. and Masud, R.R., *Implementing e-governance using OECD model (modified) and Gartner model (modified) upon agriculture of Bangladesh*, IEEE, Pitscataway, New Jersey, 2007).

([25]) As in some European examples, such as the French ordinance on electronic interactions between public services users and public authorities and among public authorities (Ordonnance No 2005-1516, 8 décembre 2005 relative aux échanges électroniques entre les usagers et les autorités administratives et entre les autorités administratives http://www.legifrance.gouv.fr/); the Polish 2005 Act on the Computerisation of the Operations of the Entities Performing Public Tasks (http://prawo.sejm.gov.pl/isap.nsf/DocDetails.xsp?id=WDU20050640565&type=3); the Swedish Open Government Action Plan, Bill 2009/10:175 Public administration for democracy, participation and growth (www.opengovpartnership.org/file/938/download).

Chapter 2. Prerequisites for successful e-governance

This chapter gives an overview of the basic key elements for successful e-governance, starting with the elements that have a specifically digital nature.

2.1. Basic digital elements

2.1.1. Government portal, digital databases and secure exchange of data

The central point of access to governmental online services is government service portals. Service portals play a crucial role when the efficiency of public administration, public services and user-centred benefits are analysed.

Such portals are the central information gateways to all government services, both offline and online. The value of the offline information (i.e. information to be read without interactive services) is often underestimated. The information about the services should be clear, well organised and well presented. It should help individuals to understand how the government can assist them in various situations: registration of births, getting married, finding a job, visiting a doctor, etc. Important improvements in the accessibility and user-friendliness of government portals can be achieved by harmonising explanatory text on the web pages of different institutions, good design and lay-out, mobile-friendly sites, and so on. A particular issue is the mobile messaging gateway, which provides the opportunity to send short messages (SMS) to mobile networks from the government portal. This can be a convenient and fast method of informing individuals, as a large number of people carry mobile phones. Mobile messaging can be used for individual or bulk messages (e.g. as a reminder to pick up a new driving licence or to warn people in a certain area of flooding).

From a technical point of view, government portals are usually divided into two layers: the presentation layer and the services layer. The presentation layer provides visual information, while the services layer allows the creation of services: application templates, data queries and submission of applications. If separated properly, changes in the visual layer (new visual outlook, changes in the text, etc.) do not affect the technical capabilities of the portal. For services, it is also important to develop a payment gateway that allows governments to receive online application forms together with payments of the government service fee.

Depending on the structure of the state, there may be only a centralised government portal or also federal state, regional, municipal or other level portals. Services may be provided by one or various levels, and what these levels are depends on the general structure of the administration and is normally not affected by e-governance as such, although in some states a given region may start with pilot projects, for example.

In creating e-governance, databases provide a backbone. During recent decades, most governments have turned their data from paper to digital format or are in the process of doing so. Electronic databases are a prerequisite for many e-governance services. Key databases (often referred to as registries) normally include the civil registry (population register), the real estate registry (buildings, land cadastre and property ownership) and the business registry. These are main databases, as many others use data from them, while other registries tend to be more specific and in many instances link data with the main ones. Many e-services will use data from different databases, so interoperability of databases can provide important improvements in efficiency.

The main registries normally provide single identifiers for each person, part of land and business unit, which is usually a numeric code. These are personal ID (identity) numbers, business ID numbers and property ID numbers or codes. This helps to differentiate people with the same name, to keep track of a company even if it changes its name, and so on. Such identifiers can be used to keep track of data, allow for combinations of different data

and promote e-services in other ways. Consequently, a clear and functioning system of identifiers is essential. It is common nowadays for new entries into main registries to be made digitally, while old records are in the process of being digitised. This can mean that there is a discrepancy between how data are kept, depending on when someone was born or when a company was formed, but such discrepancies are diminishing each year as the process of digitisation proceeds. But, in the absence of comprehensive records, digitisation will not solve problems. If the system of recording births does not function because people do not inform the authorities or if people unofficially change names or other details, such issues will only be transferred to the digital format unless there is a change in the underlying reasons ([26]).

Modern data handling provides opportunities to apply a 'once only' principle, meaning that governments can ask for information only once, following which government agencies must share the data if needed ([27]). What this means in practice is, for example, that the government cannot record the same data (such as an address) in several databases but only in, for example, the civil registry. To provide services, other government units will get the address from that registry and not ask it from the individual. This reduces the administrative burden for individuals and companies, as well as avoiding the risks related to data duplication and quality. In order not to add new risks when old ones are eliminated, there is a need to exchange digital data securely. There should not be any centralised databases, as this would provide risky single points of failure. Likewise, copies of data should not be sent by regular mail or on disks or flash drives. A secure data exchange solution should meet the following criteria.

- Both the sender and the receiver of the data should be registered and verified, meaning identified through agreed procedures and mechanisms.
- The confidentiality of the exchanged data should be ensured with encryption.
- The data transactions should be time-stamped, so that it is possible to verify later that at a certain moment the data in the database was as presented.
- Electronic records should be logged and archived to ensure a legal audit trail.
- Requests for data and responses should have a proper legal status.

Together with secure data exchange, digital information asset management should be organised, including proper information about the databases (registries), services and users' rights. Digitisation should not be introduced in a vacuum but as part of a set of structural measures to support the improvement of key databases such as civil registers — improving the integrity, effectiveness and completeness of such registries, which is not just a technology issue. The reasons for incomplete or faulty registers are manifold, and cultural issues, lack of accessible contact points with the authorities and fear of insufficient data protection are some of the factors.

2.1.2. Secure digital identity and digital signature

In Africa, as in most parts of the world, governments are increasingly using e-governance solutions ([28]). Starting with simple governmental information websites, the trend is towards integrated services that allow interaction with citizens, such as filing documents online or paying taxes. As soon as e-government services begin to include interaction, the importance of a secure identification system comes into play. Many states have made progress on introducing e-IDs, but the penetration of such identification systems among the population, as well as the number of services they can use varies, and, in general, needs improvement. Sometimes a digital identity is in fact only a personal code in the form of numbers, but it is not linked to any electronic functions. One problem is that a number of countries have several different identification numbers and systems, which when translated to the electronic world means a multitude of e-IDs, making their use complex and unattractive. This is the case, for example, in Tunisia, which has separate e-ID numbers for social security, pensions, hospitals, and so on, as well as in Nigeria, which has permanent voter's cards, bank verification cards, driver's licences and national identity cards, all of which are to some extent transitioning to an electronic format and approaching recognised e-IDs. Despite advances in the use of electronic means, African citizens still lose many hours that

([26]) Commission Staff Working Document, SWD(2017) 157 final, p. 21.

([27]) For this principle in Europe, see https://ec.europa.eu/digital-single-market/en/news/eu-wide-digital-once-only-principle-citizens-and-businesses-policy-options-and-their-impacts or https://www.scoop4c.eu

([28]) Based on an analysis of the trends in various performance indexes, for example in the ICT Development Index (by ITU) at https://www.itu.int/net4/ITU-D/idi/2016/index.html#idi2016rank-tab

could be spent productively because they need to go to the authorities, perhaps in far-away places, and stand in line to wait for services.

To use digital services, it is essential to have a digital identity and a digital signature that are secure enough to allow transactions to have legal value. Such identities must be securely connected to the physical identity and trusted by the government. The identities may be developed for specific services (such as taxation or social security), but having too many different identities risks making them less attractive to use, as people do not find it easy to remember the various codes and log-in details. It is possible to use the same identification systems for many services, including public and private services. Financial institutions often provide digital identification systems, which presents a good opportunity for public-private partnerships, as the requirements for a secure identification are similar to those for public services.

The method of identification may include an identity card, such as a smart card that contains machine-readable chips, containing not only the data fields visible on the card (including the person's photograph), but also data fields that may be readable only to particular state officials. However, a real digital identity should be possible to securely use online for different transactions. Cards carry a digital identity on a chip — a set of data and software — protected by cryptographic means. To use those cards, individuals must have card readers in a computer (or plugged into a computer via the USB port) as well as special shareware (software that is usually free of charge and publicly available). The card carries a specific piece of individualised software — called the key — and users enter a PIN (personal identification number) to use the card and usually a second number to provide a digital signature.

However, taking a global perspective, many people do not have access to computers, whereas access to mobile phones and mobile networks is very high. There is the potential to use a mobile IDs linked to SIM (subscriber identification module) cards. A similar set of data and software, used in smart cards and protected by cryptographic means, is transferred to the mobile phone user's SIM card. Technologies for secure digital identities and signatures may vary, and there is no need to use identical means in different countries, but a certain degree of interoperability and harmonisation, as well as tools for mutual recognition, are important.

Interoperability frameworks are an essential part of the whole-of-government approach and enable various technological platforms and solutions to be integrated into common solutions and services. From an e-governance perspective, interoperability refers to the collaborative ability of cross-ministerial and cross-border services for citizens, businesses and public administrations. Exchanging data can be a challenge because of language barriers, different specifications and formats and the variety of standards and categorisations.

If data are interpreted differently, collaboration is limited, takes longer and is not efficient. Hence, e-government applications need to exchange data in a semantically interoperable manner. This saves time and money and reduces the sources of errors. Practical uses are found in every policy area, be it justice, trade or participation. Good examples of the benefits of interoperability frameworks in practice are described in the European Interoperability Framework web pages ([29]).

2.1.3. Infrastructure issues

Providing access to the internet is a key factor in developing an information society, because it serves as the foundation for delivering and using e-government services. Access to the internet is usually provided by private telecommunication companies, which also run telecommunication networks. Access can be by wired or mobile networks, with mobile becoming increasingly common. For wired networks, the last few metres in the home or office can be either by cable or wireless access point connection (Wi-Fi). In some parts of the world, including Africa, the extent of wired networks for both internet and telephony is limited, with mobile being more common.

Modern internet connection is normally by broadband. Mobile network technologies are under continual development and keep coming up with better connections. Today, new mobile communication generations (e.g. NMT, 2G, 3G, 4G, 5G) are upgraded frequently. Mobile communications require radio frequencies, which is a natural limited resource regulated by international agreements and national law. Regulatory agencies handle the prac-

([29]) ISA², Interoperability solutions for public administrations, businesses and citizens, https://ec.europa.eu/isa2/eif_en

tical application of such rules. There are extensive common principles and international best practices on how users of the radio frequency spectrum are licensed and monitored.

2.2. Basic analogue elements

2.2.1. International frameworks

A number of international initiatives exist to benefit from the absence of physical borders in cyberspace and promote international cooperation. The 2030 Agenda for Sustainable Development adopted by the UN General Assembly in 2015 highlights the importance of ICT ([30]). The UN promotes initiatives linked to connectivity and infrastructure such as the United Nations Broadband Commission for Sustainable Development ([31]). These activities provide support to countries to make it possible for them to enjoy the benefits of the technologies, but there are also a number of international initiatives that benefit from what the technologies permit. In Europe, the EU Digital Single Market is one such very important idea. In Africa, there is no well-developed single market analogous to that in Europe, but regional organisations provide fora for cooperation on different issues, often modelled on, or inspired by, the EU.

2.2.2. Legal framework

According to the principles of the rule of law, the governance of a country is conducted through legislation, and all activities, including those of government institutions, should be carried out in accordance with the law. Therefore, it is vital to have appropriate regulation in place for e-governance. It is a common misconception that e-governance demands a lot of designated legislation. This is not the case, and such legislation may even be harmful, as it risks creating a parallel system of governance rather than improving governance. Only a few areas necessitate special legislation. This includes recognition of electronic identities and signatures as well as electronic documents. This can be done through special laws or amendments to existing laws, such as administrative and criminal procedure legislation and contract law. In addition, protection of privacy is essential. Such protection is a constitutional right in most countries in the world, as well as being protected by international human rights instruments. In many instances, the general rules are supplemented with specific data protection regulation — a concept that dates from the beginning of automated data processing. Electronic data does not necessarily mean increased risks for privacy, but the perception is still predominantly that this is the case. There are also situations in which technology does entail more or different risks.

Cyber security is a broad term used for various aspects of securing digital systems. It does not exist in isolation, but it is a fundamental part of developing e-government. It is integrated into legal work but also awareness raising and training, as many cyber incidents are simple human accidents or technical failures. Other incidents might be organised by criminals or terrorists or be part of military operations. What is essential to keep in mind about cybersecurity is that threats directly affect the normal functioning of national information and communication systems. Various electronic services may be subject to attacks, including: critical e-services such as passport and migration control and customs; the general critical infrastructure of the country, such as electricity production and distribution, drinking water and sewerage systems; or bank card payments.

To manage cyber threats, each country must have appropriate legislation and specifically designated government entities that are responsible for baseline cybersecurity and incident management. Legislation must designate the organisations with primary responsibility for cybersecurity and outline their competence. The type of legal Act or the exact nature of the organisation designated is not relevant. Countries also need legal acts and agencies for combating cybercrime and terrorism.

([30]) https://sustainabledevelopment.un.org/post2015/transformingourworld

([31]) http://www.broadbandcommission.org/Documents/reports/bb-annualreport2016.pdf

2.2.3. Coordinating institutions

There is a need for high-level coordination of e-government activities between various units of the government, as well as other agencies, to identify the capacity to introduce e-government elements into the functioning mechanisms of government institutions ([32]). The idea of coordination is not to centralise decision-making and technical capacities, but to support the innovation and service delivery modernisation in every government institution in a harmonised manner, avoiding duplication and overinvestment. The tools for coordination are policies, legislation and regulations; budgeting; monitoring; common standards; allowing nationwide re-use of data; data exchange; re-use of the software solutions; and rapid development of online services.

According to the principles of good governance ([33]), it is appropriate to separate the levels of decision-making: strategic decisions, supervision, coordination and implementation are better kept in separate institutions. There should be clear roles, mandates and responsibilities between the institutions. In addition to existing organisations, it may be necessary to create a new central coordination unit or otherwise to explicitly give this task to an existing organisation. This might be an independent agency or be housed, for example, in the office of the prime minister. The central coordination unit must have clear mandate from the parliament, president or cabinet of ministers. It is important that the central coordination unit reports directly to the prime minister (or possibly president), to make sure that decisions and progress will have high-level political support and appropriate resources. If a ministry is in charge of e-developing governance, there is a danger that other ministries — normally in a horizontal hierarchy — may question why this one ministry is determining issues for all ministries. It is recommended to centralise the development of policies and standards and decentralise their implementation.

Supervisory institutions that monitor the proper implementation of legislative and regulative norms are an important supplement to the implementing institutions. These can include data protection agencies, ICT regulatory agencies, consumer protection agencies and national audit offices. Important support for the development of e-governance can also be provided by organisations uniting ICT professionals and companies, universities and other research and development institutions, open data communities, digital human rights groups and other community organisations.

2.2.4. Political will and change management

To secure long-term changes, political will and leadership is required ([34]). At least a critical mass of members of the parliament must be aware of the benefits of e-governance and the trends and progress in the country. With this knowledge, they can support the important legislative process. Personal leadership matters at both the political and the administrative level.

The whole e-governance implementation process is not only about technology. It is also not about transferring services from paper to computer: it is re-inventing public services. Or, even broader, it is re-inventing governance. The key question for change management is how to release energy and ideas for the re-engineering of the existing public services and related business processes in the government. New skills such as computer skills, including typical office solutions as well as sophisticated software (design, planning, technical design, etc.), are needed, as well as new competences, such as analysing big data, understanding links between public services and their impact and designing new services based on such knowledge ([35]).

([32]) On the relevance of institutions, see Echebarria, K., *Government modernization and civil service reform: democratic strengthening, consolidation of the rule of law, and public policy effectiveness* (No 80485), Inter-American Development Bank, Washington, District of Columbia, 2001, p. 1.

([33]) As outlined, for example, by the Council of Europe, https://www.coe.int/en/web/good-governance/12-principles-and-eloge

([34]) F. Bouaziz, F., 'E-government project risk management: taking stakeholders in perspective in', in Al Ajeeli, A.T. and Al-Bastaki, Y.A.L. (eds), *Handbook of research on e-services in the public sector: e-government strategies and advancements*, Information Science Reference, IGI Global, Hershey, Pennsylvania, 2011, pp. 147-163 at p. 156.

([35]) Bekkers, V.J.J.M., Edelenbos, J. and Steijn, A.J., *Innovation in the public sector: linking capacity and leadership*, Palgrave Macmillan, New York, 2011; Hazlett, S.-A. and Hill, F., 'E-government: the realities of using IT to transform the public sector', *Managing Service Quality: An International Journal*, 2003, 13(6), pp. 445-452.

2.2.5. Access to services and awareness raising

A very important element of the implementation of e-governance is to increase the awareness of individuals and organisations of the opportunities it presents. Without that, e-services will not be used and therefore there will be no need to invest in them.

Many aspects need to be considered including the following.

- Cultural — individuals might be accustomed to the existing governance culture, preferring physical visits to offices and face-to-face contact with officials.
- Economic — the costs of access to online services may still be high for individuals.
- Religious — in some religions, numbers instead of names (such as a personal ID number) might be unacceptable.
- Security and privacy — individuals may be concerned about how their data are collected, handled and stored.

There is no single recipe for how to deal with cultural, economic, religious or security aspects for every country, as cultural, religious, historical and economic factors vary society by society. But all questions can and should be clearly answered to the general public, stakeholders' groups and experts. As e-governance can provide transparency, the implementation of e-governance tools and programmes must also be transparent.

Chapter 3. Current status of e-governance in Africa

This chapter places the abovementioned elements in the African context. The details of each element are found in the annexes, and the text below summarises the key findings and refers to the relevant annex in which data for the countries can be found.

3.1. Basic digital elements

3.1.1. Government portal, digital databases and secure exchange of data

Government portals — whether interactive or just as sources of information — are essential digital tools of governance and in many ways a first step towards creating e-governance.

The elements to assess the efficiency of public administration are:

- the existence of government portals;
- the quality of governments' delivery of online services, measured by the UN Online Service Index — OSI;
- the ICT Development Index, developed by the ITU.

There are government portals in a large number of African countries (see Annex 1). Some African countries lack functioning government portals or have such portals, but they are limited to only, for example, the president's office or lack updated information. The Democratic Republic of the Congo, the Central African Republic, Djibouti, Eritrea, Guinea, Mauritania and Sudan are among such countries.

The OSI assesses governments' performance in delivering online services to citizens (see Annex 7). The governments of Morocco, Egypt, Tunisia, Ethiopia, Mauritius and Rwanda are the leaders in delivering online services in their countries. These countries have high levels of e-governance deployment. For comparison, Morocco ranks 85th in the UN E-Government Development Index, in the ITU ICT Development Index it ranks 96th and in the WEF Network Readiness Index it ranks 78th. Burundi, Chad and Guinea are at the other end of the OSI, with less activity in the provision of online services to citizens. A comparison of the UN, ITU and WEF indexes shows that the lowest ranked countries are Burundi, Chad and Guinea.

The extent of digital databases and digital exchange of data is very difficult to identify. Most countries are in the process of digitising records but, in almost all cases, this process is ongoing with a lot of data still only in analogue form. For example, as of 2016, South Africa's Department of Home Affairs had 286 million records, 90 % of which were in paper format. The country launched a comprehensive digitisation project in 2016 so that new entries are now made digitally while old records are digitised. As the project's goal is to digitise 5.8 million old birth records per year, this process can be expected to take several decades. South Africa has a wealth of information-rich websites but it has been slow in moving to transactional websites ([36]).

In 2017 the AU launched '.africa', a new geographic top-level domain. A campaign to establish this new domain was launched at the 29th AU summit in Addis Ababa, Ethiopia, in July 2017. The hope is that the '.africa' campaign will establish a new, united, cross-cultural digital identity for the continent, and that this will allow Africa to contribute more to the global digital economy ([37]).

([36]) Naidoo, G., Singh, H. and Levine, N. (2011) 'An overview of internet developments and their impact on e-government in South Africa', in Al Ajeeli, A.T. and Al-Bastaki, Y.A.L. (eds), *Handbook of research on e-services in the public sector: e-government strategies and advancements*, Information Science Reference, IGI Global, Hershey, Pennsylvania, 2011, pp. 63-77 at p. 76.

([37]) https://au.int/en/pressreleases/20170703/dotafrica-africa-roadshow-launches-african-union-headquarters

The EU through the EU Emergency Trust Fund for Africa is helping to consolidate the civil registers of Mali and Senegal and to establish the appropriate environment and legal framework (including data protection legislation as well as equipping local authorities with computers and software suitable for digitisation and biometric registration campaigns) ([38]).

3.1.2. Secure digital identity and digital signature

The indicator that was used to assess secure digital identity and digital signature is the existence of national IDs with an electronic component that can be used for digital authentication purposes.

A detailed narrative of the situation in African countries regarding digital identity can be found in Annex 2. The main findings are as follows.

A 2016 review of national identity programmes around the world conducted by the ITU ([39]), since updated in 2017, identified at least 11 African countries that had national IDs with some electronic components (usually either a microchip or a machine-readable barcode): Angola, Algeria, Egypt, Ghana, Kenya, Morocco, Nigeria, Sudan, Tanzania, Uganda and Zambia (see Annex 2). The list is not exhaustive and, given the rapid developments many African countries are experiencing in this area, it is bound to become out of date soon, especially if countries that are either in the planning or pilot stages are added to it.

The most ambitious ongoing project is the Economic Community of West African States (Ecowas) biometric identity card, which will contain chips that can carry digital identities and potentially allow the application of digital signatures. In the 46th ordinary session of Ecowas in December 2015, heads of state and government of the 15 member countries of the organisation approved the introduction of an interoperable biometric ID card with the vision of eliminating in the future the need for Ecowas citizens resident in another Ecowas state to hold residence permits ([40]). Based on an agreed framework of mandatory, optional and supplementary features, all cards are mandated to include a contactless chip and biometric information comprising at least two fingerprints ([41]).

The duty to issue the Ecowas biometric identity cards falls on each member state, and Senegal and Benin volunteered to begin issuing the cards first, and the other countries are expected to follow suit ([42]).Senegal began issuing these biometric cards in October 2016, and the authorities claimed to have enlisted nearly 2 million people and issued 350 000 ID cards by January 2017. As of January 2017 ([43]), Benin, Burkina Faso, Côte d'Ivoire, Mali, Niger, and Togo were allegedly piloting the development of their own cards.

Electronic national IDs are also increasingly common in the rest of the continent. South Africa launched its own smart national ID card in 2013, expecting a phased rollout over 7 years — by May 2017, 6.8 million cards had been issued ([44]). Cameroon also adopted the technology in 2016 ([45]). In north Africa, Morocco was a pioneer in smart cards when it launched its carte nationale d'identité electronique (CNIE) back in 2008 ([46]). The country was followed by Algeria in 2016 ([47]), and currently Tunisia and Egypt have projects to develop smart ID cards at an advanced stage ([48]). The recent expansion of national IDs with electronic components is a promising development.

([38]) Commission Staff Working Document, SDW(2017) 157 final, p. 22.
([39]) ICT Development Index 2017, https://www.itu.int/net4/ITU-D/idi/2016/index.html#idi2016rank-tab
([40]) http://www.ecowas.int/wp-content/uploads/2015/02/46th-ECOWAS-Summit-Abuja-15-Dec-20141.pdf
([41]) https://issuu.com/fsdafrica/docs/scaling-up-remittances-15.06.2017_f
([42]) http://www.pulse.ng/news/local/ecowas-biometric-ids-senegal-benin-begin-issuance-of-cards-id4651170.html
([43]) http://apanews.net/en/pays/senegal/news/senegal-two-millions-enrolled-for-ecowas-biometric-id-cards
([44]) http://www.htxt.co.za/2017/05/18/3-mil-smart-id-cards-to-be-issued-in-2017/
([45]) http://www.gemalto.com/govt/customer-cases/new-national-identity-card-for-cameroon
([46]) http://www.cnie.ma/
([47]) http://www.gemalto.com/govt/customer-cases/new-national-identity-card-algeria
([48]) http://geopolis.francetvinfo.fr/tunisie-le-projet-de-carte-d-identite-biometrique-fait-debat-151631

3.1.3. Infrastructure issues

There is quite a lot of information available through various organisations, such as the ITU and the World Bank, about the situation in different countries with regard to access to communications technologies.

The indicators to assess the state of infrastructures are:

- fixed broadband subscriptions;
- fixed telephone subscriptions;
- mobile cellular subscriptions;
- investments in telecommunications with private participation;
- secure internet servers.

These indicators are important, in particular to assess the current state of the digital transformation process in specific countries, as such access is a core foundation for successful e-governance.

The data for African countries on these indicators can be found in Annex 3. The following is a summary of the key findings.

In Africa, access to broadband internet is generally not very well developed, although the situation in north Africa and in the Southern African Development Community (SADC) countries is generally better than in other regions. Government offices and public authorities tend to have access to the internet, although speeds may not be very high, but among the population the access — albeit with important variations between countries as well as between regions in countries — is generally not good. This is especially true for fixed broadband, for which several countries have below 0.1 connections per 100 people. Only 12 countries of which only 8 are in sub-Saharan Africa, have more than 1 fixed broadband connection per 100 people (2015 data): Algeria, Botswana, Cape Verde, Djibouti, Egypt, Mauritius, Morocco, Namibia, Seychelles, South Africa, Tunisia and Zimbabwe ([49]).

However, the penetration of mobile telephony and to some extent of mobile internet is high in almost all parts of Africa. The penetration rate of mobile telephony in particular is very high, with 19 countries with more than 100 % mobile penetration (Algeria, Botswana, Cape Verde, Republic of Congo, Côte d'Ivoire, Egypt, Gabon, Ghana, Lesotho, Libya, Mali, Mauritius, Morocco, Namibia, Senegal, Seychelles, South Africa, The Gambia and Tunisia). Only Eritrea and South Sudan have less than 25 % penetration ([50]).

3.1.4. Example of a sectoral solution — taxation

The opportunities offered by e-government and information technologies are much wider than their present use. This applies not only to the ICT sector itself but also to every sector of the economy ([51]). Good harmonisation between these sectors permits efficiency gains and can make services more attractive to users, as they have to learn fewer ways to access them. We have analysed the situation in the taxation sector with the following indicators:

- whether the tax administration has a designated website;
- whether this site looks easy to navigate, has a lot of content and how this is displayed;
- whether it is possible to provide information online, to download forms, to ask for and/or send information electronically— thus, the level of interactivity.

The data for African countries on these indicators can be found in Annex 4. The following is a summary of the key findings:

Most, but not all, African countries have designated tax office websites. In some countries, government portals provide tax information, but there are also examples of countries with no online tax information. Downloadable forms exist in many instances, but mostly these cannot be filled in and submitted online.

([49]) http://data.worldbank.org/indicator

([50]) Ibid.

([51]) Commission Staff Working Document, SDW(2017) 157 final, p 5.

In many cases, additional information on tax questions can be obtained only by phone or in person. The frequently asked questions (FAQ) sections on websites are often limited, with no (interactive) chat possibility. The most interactive websites were in Kenya, Madagascar, Mauritius, Swaziland and Tanzania, where they also have online components.

3.2. Basic analogue elements

3.2.1. International frameworks

The efficiency of supporting international frameworks for digital technologies cannot be measured with quantitative indicators but is based on the eGA experts' analysis. One quantitative indicator that was used is the status of signing and ratifying the Council of Europe's Data Protection Convention ([52]) and the Convention on Cybercrime ([53]) (see Annex 12).

Developments in countries, as well as in regional organisations, show an increasing awareness of the important role of digital technologies for the development of any country and of the risks and challenges as well as the opportunities that this brings. The AU has, for example, created a Specialised Technical Committee on Communication and Information and Communication Technology, which held its first meeting in September 2016 ([54]).

International frameworks in Africa also exist on the donor side. The Seychelles East African Submarine Cable System to which the EU has made a considerable contribution is a project of wide impact. Other EU-supported initiatives include satellite-enhanced telemedicine and e-health for sub-Saharan Africa and the African Internet Exchange System, funded through the EU-Africa Infrastructure Trust Fund. The EU has supported the harmonisation of ICT policies in sub-Saharan Africa and in the Southern Mediterranean, as well as infrastructure projects for research and education institutions, linking such institutions in different countries, including African countries in the Mediterranean region (AfricaConnect) ([55]).

3.2.2. Legal framework

The legislative situation in Africa varies considerably between countries with regard to the extent to which relevant legal acts permitting e-governance exist and what types of acts these are. As explained in Section 2.2.2, e-governance does not require a lot of designated legislation. What is needed is legislation to ensure the recognition of electronic identities/signatures and electronic documents. This can be done through special laws or amendments to existing laws, such as administrative and criminal procedure legislation and contract law. In addition, attention should be given to the protection of privacy, including specifically data protection. The multitude of laws implicated in a transition to e-governance means that there is no single type of law to search for or any existing comprehensive international listings of the legal situation in different countries. There are, however, compilations of laws on certain issues, covering many countries, for example on data protection or cybersecurity.

The indicators to assess the performance of the regulatory environment are:

- existence of data protection legislation;
- laws relating to ICTs.

There are not many comparative analyses made of the level of ICT or e-governance specific regulatory environments in Africa. The WEF has dedicated separate efforts to highlighting the importance of regulatory environments in its *Global information technology report 2016* ([56]). This analysis of the performance of the regulatory environment of African countries is given in Annex 9. This particular index measures the quality of regulations

([52]) https://www.coe.int/en/web/conventions/full-list/-/conventions/treaty/108/signatures?p_auth=eEtCYk9I

([53]) https://www.coe.int/en/web/conventions/full-list/-/conventions/treaty/185/signatures?p_auth=eEtCYk9I

([54]) https://au.int/web/en/newsevents/31357/extraordinary-session-au-specialized-technical-committee-stc-communication-and-ict

([55]) Commission Staff Working Document, SDW(2017) 157 final, pp. 8-9.

([56]) http://reports.weforum.org/global-information-technology-report-2016/

pertaining to ICT and the capacity and the role of ICT in driving innovation and it represents the level of sophistication of ICT-related laws in a country. The top-ranked countries are South-Africa, Rwanda, Mauritius and Kenya.

An overview of data protection laws in Africa can be found in Annex 5. There follows a summary of the key findings. Several African countries have designated data protection legislation, often designed similarly to European laws (which are similar between European countries, based on EU rules as well as common principles provided by other organisations). Others may have data protection as part of general privacy rules, for instance as constitutional provisions, in various laws or in sub-legal acts. After Europe, Africa is the continent with the most data protection legislation ([57]). Still, the majority of African countries have no designated legislation or authorities for data protection, and in many countries the provision in terms of other (non-specific) legislation is also limited. Some African countries, namely Mauritius, Senegal and Tunisia, have joined the Council of Europe Data Protection Convention ([58]). It is noteworthy that many data protection laws are very recent, and it is thus too early to comment on how they are implemented and enforced.

In June 2014, the AU adopted a Convention on Cyber Security and Personal Data Protection ([59]). The convention aims to establish regional and national legal frameworks for cyber security, electronic transactions and personal data protection ([60]). However, the convention has, as of June 2017, only received one ratification (Senegal in August 2016) and, despite nine ([61]) more signatures, it is difficult to predict if it will ever enter into force.

Ecowas has adopted an Act on data protection ([62]), which is a binding regional agreement. It specifies the required content of data protection laws and requires member states to establish a data protection authority. Seven countries have enacted legislation in compliance with the agreement. The East African Community (EAC) has developed the EAC Framework for Cyberlaws, adopted in 2010, which recommends that each member state develops a regulatory regime for data protection, but makes no specific recommendations on the content of legislation ([63]). The EAC is also working on establishing a legal framework regarding cyberlaws that 'provides guidelines on the enactment and enforcement of laws that promote the deployment of e-government and e-commerce services' ([64]).

The Common Market for Eastern and Southern Africa (Comesa) has developed the Model Law on Electronic Transactions and Guide to Enactment 2010, which is a report regarding a programme for member countries concerning e-legislation, so as to assist member states to establish 'appropriate legislation to support e-commerce'. A study was done, followed by two workshops on 'e-legislation' in general and e-commerce laws specifically. The report discusses issues concerning e-signatures, consumer protection, and a wide variety of other matters ([65]).

Based on the National Cyber Security Index ([66]) produced by the eGA, South Africa is placed 17th out of 26 countries and Kenya is placed 21st. The ranking also compares how cybersecurity is handled in view of the general development of the ICT sector in a country. On this score, both countries pay much more attention to general ICT development than to cybersecurity, which is common almost everywhere. Only a few countries address cybersecurity matters with the same high priority as they do other ICT issues (including the Czech Republic, Lithuania, Ukraine and to some extent also Pakistan).

South Africa has a good capacity to provide cybersecurity policies and provide baseline security as well as to react to incidents. It has the capacity to provide e-identification but scores less well on providing a secure

([57]) Unctad, *Data protection regulations and international data flows: implications for trade and development*, 2016, p. 42, http://unctad.org/en/PublicationsLibrary/dtlstict2016d1_en.pdf

([58]) The Convention for the Protection of Individuals with regard to Automatic Processing of Personal Data, 1981, ETS 108, www.coe.int/en/web/conventions/full-list/-/conventions/treaty/108/signatures

([59]) https://au.int/en/treaties/african-union-convention-cyber-security-and-personal-data-protection

([60]) Unctad, 2016, p. 35.

([61]) Benin, Chad, Congo, Ghana, Guinea-Bissau, Mauritania, Sierra Leone, São Tomé and Príncipe, Zambia, https://au.int/sites/default/files/treaties/29560-sl-african_union_convention_on_cyber_security_and_personal_data_protection.pdf

([62]) Supplementary Act A/SA.1/01/10 (2010).

([63]) Unctad, 2016, p. 35.

([64]) https://www.eac.int/infrastructure/communications-sector/ongoing-projects

([65]) Comesa Model Law on Electronic Transaction and Guide to Enactment, 2010, http://programmes.comesa.int/attachments/article/166/COMESA%20Model%20Law%20and%20%20Guide%20to%20Enactment%20(fin).pdf

([66]) http://ncsi.ega.ee/ncsi-index/

environment for services or dealing with cybercrime. Kenya scores well on its ability to react to cybersecurity incidents and for dealing with cybercrime, but it lacks the potential to analyse cyber threats or provide a secure environment for e-services. It does have some capacity to develop policies and provide education ([67]).

Cybercrime legislation exists or is being developed in many African countries. Mauritius and Senegal have joined the Council of Europe Convention on Cybercrime, known as the Budapest Convention. South Africa was among the initial signatory states but has not ratified the convention ([68]). Nigeria has a Cybercrimes (Prohibition, Prevention, etc.) Act from 2015 that provides a legal, regulatory and institutional framework for the prohibition, prevention, detection, prosecution and punishment of cybercrimes in Nigeria.

With regional instruments having a limited effect, countries look to examples of other countries in the region for inspiration in creating legislation. The South African Protection of Personal Information Act is regarded as meeting best international standards ([69]). This Act was based on, and is compatible with, the EU Data Protection Directive and includes an information regulator and an independent national privacy regulator ([70]).

For any legal provisions related to e-governance, it is important to stress that it is not essential to have similar types of acts in different countries, but the focus should be on enabling provisions and the absence of obstacles — not on the form or name of the acts ([71]).

3.2.3. Coordinating institutions

The existence and efficiency of supporting organisations cannot be measured with quantitative indicators but is based on eGA experts' analysis. The WEF Networked Readiness Index (2016) ([72]), as one possible indicator, was also used (see Annex 8).

The lack of a clear focal point for introducing e-governance and coordinating digitisation, creation of interoperability and e-services is a common problem in countries all over the world, including Africa. The types of organisations that can be responsible for e-governance vary significantly between countries.

However, in recent years, several African countries have developed further and have either created special agencies or designated some organisations in government structures to help introduce e-government elements. For example, in 2017 Senegal created an agency for ICT development (Agence de Développement d'Informatique de l'Etat — ADIE) at the president's office. Nigeria has the National Information Technology Development Agency (NITDA), set up in 2007, as the national authority responsible for planning, developing and promoting the use of ICT and which, among other things, issues guidelines on data protection. As far as the eGA experts are aware, good governance principles are applied to some extent in these agencies. Supervisory regimes have not been analysed in this report.

3.2.4. Political will and change management

Overcoming resistance to change is one of the greatest challenges for implementing effective e-governance. Some reforms may interfere with behaviours that are deeply ingrained in the culture of public institutions or even contradict the corporate interests of government bureaucracies. The cross-governmental nature of the changes that need to be implemented further adds complexity to this. To navigate this scenario, political leaders

([67]) Ibid.

([68]) http://www.coe.int/en/web/conventions/full-list/-/conventions/treaty/185/signatures

([69]) Unctad, 2016, p. 4.

([70]) Unctad, 2016, p. 46.

([71]) Nyman Metcalf, K., 'e-Governance: a new reality for legislative drafting', *International Journal of Legislative Drafting and Law Reform*, 2017, 5(1), pp. 39-51 at p. 40.

([72]) WEF Networked Readiness Index Report 2016, http://reports.weforum.org/global-information-technology-report-2016/networked-readiness-index/ (accessed August 2017). The Networked Readiness Index (NRI) looks at what the different stakeholders in society, both private and public, can do to contribute and coordinate the country's networked readiness. The four key categories of indicators are: (1) the overall environment for technology use and creation (political, regulatory, business and innovation); (2) networked readiness in terms of ICT infrastructure, affordability and skills; and (3) technology adoption/use by the three groups of stakeholders (government, the private sector and private individuals).

need to stay engaged and commit time, budget and even political capital to the cause of e-governance. While there is no perfect measure of political will towards e-governance across African countries or change management, the following can signal the level of commitment from the political leadership:

- publication of a government-wide e-governance strategy;
- institutionalisation of a coordination mechanism for e-governance;
- the existence of a government chief information officer or a similar position;
- public statements from the head of government in support of e-governance;
- The WEF Index of Importance of Government Vision of the Future ([73]).

Within these parameters that can signal the level of commitment from the political leadership, some African countries have demonstrated political commitment to e-governance, particularly through the publication of medium- or long-term e-governance strategies. In Western Africa, Senegal stands out for its comprehensive Digital Senegal strategy 2016-2025 ([74]) and the inclusion of a chapter on ICTs and e-services in its Plan for an Emerging Senegal ([75]), which aims to make Senegal an emerging country by 2035. In December 2015, the Senegalese president volunteered the country to be the first Ecowas member to start issuing the new Ecowas biometric identity card, a promise it has already started to fulfil. Another west African country, Nigeria has attributed political priority to e-governance — it has the national e-government strategy organisation (NeGSt) ([76]) and a well-formulated ICT policy — the Nigeria ICT Roadmap 2017-2020 ([77]). Presently, an e-governance section is prominently displayed on the Nigerian national web portal and the NeGST has a dedicated website (http://www.negst.com.ng) ([78]).

In Eastern Africa, the highlights are Mauritius, Kenya, Rwanda and Zimbabwe. These four countries currently have government-wide strategies for e-governance: Kenya's National ICT Master Plan 2014-2017 ([79]), Rwanda's SMART Rwanda Master Plan 2015-2020 ([80]), Mauritius's e-government strategy 2013-2017 ([81]) and Zimbabwe's National Policy for ICT ([82]). In central Africa, the enthusiasm for ICTs among political leaders has been more limited, with the possible exception of Cameroon ([83]), which has articulated a long-term vision for e-governance in the country through a strategic plan for a digital Cameroon by 2020. The EAC has several ongoing projects concerning e-governance, including the East African Community Broadband ICT Infrastructure Network, a project aiming to establish and operate a cross-border broadband infrastructure network within the EAC ([84]).

Comesa is working to promote the use and awareness of ICT with the aim of contributing to socioeconomic integration. They have developed a regional framework concerning e-governance, as well as a portal to 'harmonise e-Government efforts in the region and to assist the Member States in implementing e-Government'. A key partner for Comesa in the implementation of their e-governance programme is the UN Public Administration Network (UNPAN) ([85]).

In the southernmost sub-region of the continent, South African presidents have reinforced yearly their political commitment to provide digital services to the country's citizens in their state of the nation addresses. The country also has the National Strategy and Roadmap for Digitizing Government Services ([86]), the most updated

([73]) http://www3.weforum.org/docs/GITR/2014/GITR_DataTable8_2014.pdf

([74]) https://www.sec.gouv.sn/sites/default/files/Strat%C3%A9gie%20S%C3%A9n%C3%A9gal%20Num%C3%A9rique%202016-2025.pdf

([75]) https://www.sec.gouv.sn/IMG/pdf/PSE.pdf

([76]) http://www.negst.com.ng

([77]) http://www.commtech.gov.ng/Doc/Nigeria_ICT_Roadmap_2017-2020.pdf

([78]) Ayo, C.K. and Fatudimu, I.T., 'The Nigerian e-Government Strategies (NeGST): a strategic approach to poverty eradication in Nigeria', in Al Ajeeli, A.T. and Al-Bastaki, Y.A.L. (eds), *Handbook of research on e-services in the public sector: e-government strategies and advancements*, Information Science Reference, IGI Global, Hershey, Pennsylvania, pp. 93-105 at p. 100.

([79]) http://www.ict.go.ke/wp-content/uploads/2016/04/The-National-ICT-Masterplan.pdf

([80]) http://www.minecofin.gov.rw/fileadmin/templates/documents/sector_strategic_plan/ICT_SSP__SMART_Rwanda_Master_Plan_.pdf

([81]) http://mtci.govmu.org/English/Documents/eGovStrategyfinalv201393.pdf

([82]) Zimbabwe National Policy for Information and Communications Technology (ICT) (2016), https://www.techzim.co.zw/wp-content/uploads/2015/12/Zimbabwe-Draft-National-ICT-Policy-2015-.pdf

([83]) http://cameroundigital.com/en/strategic-plan/

([84]) https://www.eac.int/infrastructure/communications-sector/ongoing-projects

([85]) http://www.comesa.int/what-we-do/#information-networking

([86]) https://www.gov.za/sites/www.gov.za/files/40772_gon341.pdf

version of which was published in April 2017. Another worthy mention in the region is Namibia, which successfully implemented a data exchange platform based on the Estonian X-Road in 2016 and has an e-government strategic action plan.

Finally, in north Africa, e-governance seems to have declined in importance among the priorities of political leaders in Algeria and Morocco. The strategies e-Algérie 2013 ([87]) and Digital Morocco 2013 ([88]) have not yet been replaced by more up-to-date planning exercises. Tunisia has a current digital strategy, with a vision for 2020 but, as of 2017, only 5 % of the projects had been executed and 20 % were ongoing, although political commitment seems to remain ([89]). Similarly, Egypt has its comprehensive ICT 2030 strategy ([90]), but so far implementation has also been a challenge.

On a broader and international level, the WEF ([91]) has made a comparative analysis of the vision and implementation plan regarding the information society, extensive use of ICTs and recognition of the leading role of government in this process. Its Index of Importance of Government Vision of the Future assesses to what extent the government has a clear implementation plan for utilising ICTs to improve a country's overall competitiveness (see Annex 10). This indicator demonstrates governments' efforts to improve the regulatory environment. The higher the index — the clearer the vision a government has. The top ranking African countries with a high index are Rwanda, with an index of 5.8, Kenya (4.8), Côte d'Ivoire (4.5), Cape Verde (4.5), Mauritius (4.4) and Morocco (4.3). In addition, these countries have enforced more developed and sophisticated laws pertaining to ICTs, supported by an index assessing laws relating to ICTs (see Annex 9).

3.2.5. Access to services and awareness raising

Properly introduced and applied e-governance can increase efficiency, make authorities more accessible to people and help to combat corruption. Such progress will make the country more attractive for business, including foreign investment. e-Services must be part of a general overhaul of regulation, as merely digitising services that are overly complex or un-transparent will not by itself solve all problems. There are no quantitative indicators for the quality of services, although it is possible to make assessments of the quality of a government's delivery of online services and how effectively the public sector is using digital technologies to deliver services to citizens. The UN E-Government Development Index (2016) was used as one possible indicator (see Annex 8) ([92]). The existing assessments are supplemented by eGA expert analysis.

Many African countries suffer from slow and inefficient bureaucracies, making them unattractive for conducting business. In eight countries, the time required to start a business is 50 days or more (Chad, Republic of Congo, Equatorial Guinea, Eritrea, Gabon, Namibia, Somalia and Zimbabwe). The time spent by senior management dealing with government regulations is up to 46.5 % in Tunisia and is nearly one quarter in Algeria, Burkina Faso, Mail and Niger ([93]).

The fact that Tunisia is one of the more advanced countries on the African continent as far as e-governance is concerned illustrates that the introduction of e-services by itself does not reduce bureaucracy, but it needs to be coupled with a thorough overview of how e-services can really be employed for greater efficiency. The information also illustrates that there are no regional differences, but there are variations within regions.

([87]) http://www.algerianembassy.ru/pdf/e-algerie2013.pdf

([88]) http://www.courdescomptes.ma/upload/MoDUle_20/File_20_418.pdf

([89]) http://www.huffpostmaghreb.com/2017/02/16/tunisie-digitale_n_14796854.html

([90]) http://www.mcit.gov.eg/ICT_Strategy

([91]) *Global information technology report 2016*, http://reports.weforum.org/global-information-technology-report-2016

([92]) UN E-Government Knowledgebase, E-Government Development Index, 2016, https://publicadministration.un.org/egovkb/Data-Center (since updated with data for 2018). The E-Government Development Index measures e-government instructions' effectiveness in the delivery of basic economic and social services to people. It is based on three of the most important dimensions of e-government: (1) scope and quality of online services (Online Service Index, OSI); (2) development status of telecommunication infrastructure (Telecommunication Infrastructure Index, TII); and (3) inherent human capital (Human Capital Index, HCI).

([93]) http://data.worldbank.org/indicator

Chapter 4. Categorisation of countries

The methodology used for the categorisation of African countries based on their current status of e-governance is described in Section 1.2, Methodology.

4.1. Groups

The first group consists of 12 countries that have implemented various services, that have an organisational structure and at least basic regulation and that in most cases have some form of digital identification and interoperability. These countries also have the necessary preconditions for continued development. They can act as regional examples and leaders. The second category consists of 26 countries that we have further sub-divided into three tiers (8-10-8 countries). These countries have undertaken some work towards e-governance but have not reached the same level as those in the first group. Finally, we have in our third group listed 16 countries that have a very low level of development, that due to unrest or extreme poverty are lagging behind in many respects and in most cases their development can be expected to be difficult or slow. For these countries, some specific and more limited work may be possible.

The ranking is based on expert evaluation of all relevant factors, of which quantitative or quantifiable data make up only a relatively small part. Existing indexes have also been used as a supporting rather than as a decisive element, as the value added by this report is to provide information that is not available simply through merging existing rankings into one. Such explanations are given here and in Annex 6.

4.1.1. Group 1 (292-840 points)

The group of countries that ranks highly in the UN, ITU and WEF indexes (see Annexes 8 and 12) are Egypt, Morocco and Tunisia in north Africa and Cape Verde, Mauritius, Seychelles, Botswana and South Africa. To this advanced group Namibia can be added, as it scores highly in the abovementioned indexes and has implemented an advanced system of interoperability of databases through a bilateral Estonian-Namibian project. Ghana and Kenya can also be added to this group of countries, as they are near the top 10 on the various indexes and have many e-governance initiatives. Rwanda does not rank very highly in the various indexes, but its development is very rapid and its level of services is quite high and well organised.

The countries in group 1 are as follows:

1. Botswana
2. Cape Verde
3. Egypt
4. Ghana
5. Kenya
6. Mauritius
7. Morocco
8. Namibia
9. Rwanda
10. Seychelles
11. South Africa
12. Tunisia

If a country shows signs of serious attention being paid to e-governance by political and other leaders, including organisational structures or plans for development of such structures, this is a reason to rank the country more highly than would be the case based only on existing rankings or quantifiable elements. Accessibility and good presentation of online services is another aspect that merits additional points, through which some states have moved up in the ranking. Some of the indicators used in existing rankings are somewhat outdated and/or not suited to African realities — such as the existence of fixed broadband, which has largely been supplanted by mobile — which is why the rankings are not suitable as the only or main element on which the categorisation is based. It is essential to recall that the evaluation is for e-governance, with in this context the stress on 'governance' and not on technologies.

4.1.2. Group 2

Group 2 is the largest group and the one in which the differences between the states are the largest. These are countries that are not as advanced or where the progress is more uneven than in those in our first group but where there are examples of projects, reforms and initiatives that can be built upon. We have divided this group into three tiers, to illustrate the difference between the states in this group. The first tier is close to the first group, but for various reasons these countries are somewhat less advanced. As for the third tier, these are countries where there has not been very much development, or it has been halted for various reasons, but there are still better prospects than for the countries we have included in our third group. Consequently, tier 2 of group 2 is in between tiers 1 and 3.

The countries in group 2 are as follows:

Tier 1 (207-292 points)

1. Algeria
2. Benin
3. Lesotho
4. Nigeria
5. Swaziland
6. Tanzania
7. Uganda
8. Zimbabwe

Tier 2 (142-207 points)

1. Angola
2. Burkina Faso
3. Côte d'Ivoire
4. Gabon
5. Madagascar
6. Mozambique
7. São Tomé and Príncipe
8. Senegal
9. Togo
10. Zambia

Tier 3 (97-142 points)

1. Cameroon
2. Comoros
3. Ethiopia
4. The Gambia
5. Liberia
6. Libya
7. Mali
8. Sudan

4.1.3. Group 3 (< 97 points)

There are a number of countries in Africa that come in at the low end of all rankings, even if their exact positions at the low end of the scale vary more than those at the high end. Several of these countries are not included in many of the indexes and data are to a large extent lacking. Concerning our test case of tax administrations, for most of these countries there is either no available website or, if there is, it contains very limited information or is not updated. Many of these countries lack government portals or have limited portals, for example only for the presidency or similar, with no services available. These countries to a large extent are experiencing or have recently experienced armed conflict and/or famine, the regimes are in many instances not democratic or the countries are among the least developed and poorest states of the world. Even if e-governance initiatives can be very useful for such countries and, in some cases, may allow them to leap-frog towards faster development, there could be issues with finding adequate national capacity for knowledge transfer and maintaining the sustainability of reforms. This does not mean that these countries should be excluded from any assistance (and they could well feature in the regional or other groupings that we suggest), but the design of assistance might have to be quite different than that for countries with high levels of achievement in the sphere of e-governance.

The countries are:

1. Burundi	6. Djibouti	11. Malawi
2. Central African Republic	7. Eritrea	12. Niger
3. Chad	8. Equatorial Guinea	13. Sierra Leone
4. Congo	9. Guinea	14. Somalia
5. Democratic Republic of the Congo	10. Guinea-Bissau	15. South Sudan

The reason for placing countries in this group, even if the various existing rankings and quantitative data might indicate a different position, is the same as explained above. In this case, the process of determining the weight of various factors has meant that these countries are seen more negatively than a superficial determination would suggest. Mainly, this is due to a lack of credibly expressed political will or external circumstances (such as war, famine, absence of governmental control) that make serious reform work impossible or nearly impossible. For some countries, such circumstances have occurred or been exacerbated recently and thus after many of the existing rankings were made. In selecting the countries to be put in group 3, we have evaluated what the actual potential for reform would be, looking beyond statements and projects if these do not appear realistic. In this context, the fact that e-governance is a part of governance and not just a technical matter is very important, as there may be situations in which even a country in political crisis can work on infrastructure matters, but it is unlikely that it can undertake sustainable governance reforms.

We have not dealt with Western Sahara, which is not a member of the UN, although it is a member state of the AU.

The benefit of the grouping of countries is to highlight what type of activities and thus what type of support would suit them. For the countries in group 1, a number of specific activities already exist. Support can be given in the form of advanced sectoral solutions (for tax administrations, customs, education, and so on) or in the form of cross-sectoral enablers (such as interoperability of databases, secure digital identity). For such countries, the next steps will be to build upon such existing solutions to undertake projects to either increase the implementation of e-governance to further sectors or to use the cross-sectoral solutions for more purposes. The choice of which next steps to take is evidently to be made by each county independently and this choice may include requests for expert assistance. As we recommend, projects could include more than one country, both in the sense that several countries at a similar level (but perhaps with existing solutions in different domains) can cooperate and share expertise and experience and also in the sense that states that have reached a higher level can support others by presenting their examples of good practice. Such a presentation of African examples of good practice to other African countries promises to be both efficient and ethical. The grouping of countries provides a basic indication of which countries are most suitable to be the providers of good examples (group 1) to other countries (primarily group 2).

In the countries in group 2, there are some elements of e-governance in place. As opposed to group 1, it is likely that group 2 countries will need more basic support, especially in the lower tier of the group. This means that projects to support e-governance and the digitalisation of society in the form of more general awareness raising, support for basic regulatory adjustment and basic technical support may be useful, if the state so requests. Projects should, in accordance with our recommendations, be regional or at least involve more than one country — in the manner described above or in an even wider setting, through regional integration organisations (as the more general issues, as opposed to details of e-governance, can also be handled in a wider regional setting).

What countries in group 2 will have to do to progress to the level of group 1 depends fully on the situation in each country. As stressed throughout this report, there is no single way to achieve e-governance or a set order of steps to take. The following are examples of the kind of activities and initiatives that would be expected to advance countries to a higher position, mirroring the matters we have taken into consideration in our ranking:

- adopting specific and workable strategies, programmes or other policy documents with clear plans for their implementation;
- creating and/or empowering a responsible organisational structure for e-governance;
- improving the availability and accessibility of online information and services;

- analysing legislation to identify the need for legal reforms to enable e-governance and, if necessary, adoption or amendments of legislation;
- giving attention to awareness raising among the population, educational issues;
- introducing or improving e-identification;
- improving the technical infrastructure;
- increasing involvement in international (regional, cross-border) initiatives.

For countries in group 3, their political situation and development level means that very few solutions have been adopted and there are obstacles to the rapid introduction of e-governance. In order not to leave any countries totally behind, regional solutions, especially through regional integration organisations, can also include such countries, so that a basic knowledge and awareness level can be built up. In practice, this could mean conferences or working groups introducing and discussing the basics of e-governance, such as going through the digital and analogue elements listed in Chapter 2 of this report and explaining what they mean in the sense of practical steps. To do this using good examples from the African countries in group 1 and to some extent group 2 will make the discussions more relevant.

The steps that have to be taken to proceed to a higher category are essentially the same as those mentioned above, with the difference being in degree rather than in substance:

- adopting strategies, programmes or other policy documents;
- identifying an organisational structure for implementing e-governance (and/or for creating the policy documents mentioned);
- creating or updating and improving government web portals
- analysing legislation to identify the need for legal reforms to enable e-governance;
- improving technical infrastructure;
- getting involved in international (regional, cross-border) initiatives.

Chapter 5. Deployment matrix

The development of e-governance requires certain organisational and technological capabilities. Any country that wants to build e-governance should assess its current level in terms of the prerequisites and, if necessary, bring that level up to the appropriate minimum. We described the relevant prerequisites in Chapter 2 and gave an overview of the situation in Africa in Chapter 3, which provides examples of how countries have met these key prerequisite elements. Here we present the matrix — a tool for indicating the level of e-governance in a country and for determining the key elements that should be addressed first and foremost, even if the work on different issues should proceed in parallel. The first column of the matrix in Table 1 lists the key elements of e-governance in descending order of importance.

In Chapter 6, we present the roadmap for proceeding towards the highest level of accomplishment for each of the key elements and how to advance from one level to the next.

Table 1. Deployment matrix

Key elements of e-governance	Minimum level	Basic level	Useful level	Sustainable level
Political will and change management	There is no political support to e-governance and existing digital systems are operating under sectorial ministries functions ☐	High level political leadership, for example, head of state is an e-governance spokesman ☐	Policy documents have been adopted at high level, for example 'Fundamentals of Information Policy' or 'Digital Agenda' ☐	The development of e-governance has been a national priority for a long time, for example at least 3 years of governance ☐
Coordinating institution	Existing digital systems operate and are developed without coordination ☐	Such institution is established and mandated ☐	Policy papers and related documents; E-governance strategy, budget and action plans are drafted ☐	Manages overall e-governance architecture and developments from a holistic point of view ☐
Coordinating institution: financing model	Existing digital systems budgeting is based on ICT procurement with no impact analysis ☐	Each ministry and government agency have an ICT budget record ☐	At the state level, the e-governance total costs and how much resources are planned for e-governance each year is known ☐	The national e-government financial model is in line with the long-term e-governance strategy which helps ministries and authorities to manage the risks arising from cyclical planning of the state budget ☐

Table 1. Deployment matrix (continued)

Legal framework	Existing legislation includes basic ICTs related legislation based on international requirements ☐	There is readiness to supplement the existing legislation with details arising from e-governance solutions, for example, add a provision like '... the right to receive information electronically' ☐	A minimum number of legal acts of specific relevance for e-governance have been adopted. For example, regulation for data protection; electronic identity and signature; civil registers ☐	All legal acts take into account the details of e-governance solutions ☐
International frameworks	No or very limited activity in international frameworks ☐	Member in and participating in international frameworks but not undertaking activities related to e-governance ☐	Takes part in and benefits from cooperation ☐	Active participant in projects linked to e-governance ☐
Access to services and awareness rising	Poor awareness, few (if any) services available and no demand from people ☐	Some services available, basic information available on how to use them and some limited information campaigns ☐	Information campaigns have been held, many services exist and more of the people concerned know how to use them ☐	Wide range of services available and very good knowledge on how to use them ☐
Government portal	Information sharing takes place at different government websites with no regular updating ☐	The government portal only shares information ☐	e-Services are also available on the government portal ☐	Information and e-services are securely accessible in various e-channels using any devices ☐
Government portal: catalogue of data and services	No catalogue of data and services available ☐	Technical solution deployed and governance organisation established ☐	A significant amount of government registers and databases are described in a catalogue ☐	All government registers and databases are described in a catalogue. Coordination process established ☐
Government portal: digital database	Some digitised databases are deployed ☐	Some digitised databases are deployed and some of the data are shared ☐	A significant amount of government registers and databases are digitised. All digitised data are described and the meaning of the data shared ☐	All government registers and databases are digitised. All digitised data are described and the meaning of the data shared ☐

Table 1. Deployment matrix (continued)

Government portal: secure exchange of data	Data exchange takes place in some cases with bilateral technical implementation ☐	Technical solution deployed and governance organisation established ☐	A significant amount of government registers and databases exchange data over the secure data exchange layer ☐	All government registers and databases and some private sector information systems are connected to the exchange data layer and reported readiness for cross-border data exchange exists ☐
Secure digital identity	There are several different technological methods for digital user authentication at different government institutions ☐	Identity register established and unique personal identification mechanism agreed ☐	ID card issuing system established and significant amount of citizens have ID cards. Personal identification information is usable electronically ☐	Secure technology used for digital identity ☐
Digital signature	Technical solution is planned ☐	Technical solution deployed ☐	The regulation is in place ☐	Digital signature is used to a significant degree in everyday life ☐
Secure digital identity and digital signature: interoperability framework	Interoperability takes place on bilateral agreements between different government institutions ☐	The requirements for technical interoperability are described ☐	The syntactic and semantic interoperability (agreed common data format and sharing the meaning of the data) are described ☐	The organisational interoperability is described ☐
Secure digital identity and digital signature: security framework and the system of security measures	Cyber security responsibility is at ICT systems operations level at different government institutions ☐	Cyber security has been assessed and the awareness of the actual situation noted (e.g. completed questionnaire for cybersecurity index). The institution that is responsible for coordination of cybersecurity issues has been established and mandated ☐	The national CERT has been established and mandated; furthermore, the system of security measures has been drafted ☐	All ministries and government agencies use the system of security measures and an appropriate audit process is established ☐
Infrastructure issues	Access to telecommunication infrastructure and services is limited to only selected institutions ☐	Telecommunication network infrastructure developed by dedicated companies with international connectivity ☐	Competitive telecommunication services market with incentives for continuous innovation and coverage improvement ☐	Private and public cloud (managed by principle of public-private partnerships) and automated development environment ☐

NB: CERT, computer emergency response team.

Chapter 6. Roadmap to implement the matrix

This roadmap aims to show in a brief but comprehensive manner what different steps are included in developing e-governance. Both the matrix and the roadmap can serve as a checklist for those responsible in a state for developing e-governance as well as in the EU for evaluating progress and developing policy. In addition, eGA experts propose a set of activities for capacity building in African countries, which help to raise the level of expertise among those involved in the development and implementation of e-governance.

The components of each key element contained in the matrix can — and, in many instances, should — to a large extent be handled in parallel, as the various issues are closely connected. The steps do not need to be taken in any specific order, and each country can decide on the order, whether steps are taken consecutively or in parallel, and so on. It would thus be futile and not in line with best practice to attempt to draw up an order of importance or a chronological order in which the steps should be taken to advance the level of e-governance in a particular state or group of states. To illustrate what this means, a state can introduce widespread interoperability of databases for more efficient administration without even providing services directly to the public, in which case personal digital identification does not have to be a priority. It is equally possible to provide many electronic services to the public in a sectoral manner, without interoperability of all or the majority of databases. To further emphasise this point, we refer to some European examples ([94]). We can see examples in Europe of a state (the United Kingdom) with a high ranking in terms of e-governance, thanks to the wide availability of electronic information and downloadable forms, although the country lacks not only a single digital online identity but also a single digital identifier as such; there is also the example of a state with many online services, despite the absence of interoperability of databases (Sweden) ([95]). States at various levels in the development of e-governance will have dealt with some of the issues adequately already, but the factors listed below include matters that are of relevance for any state — whether starting out or perfecting existing e-governance.

The key factors in capacity building are as follows.

- **Transfer of expertise:** expert visits, study trips, seminars, presentation of international best practices, education and training of designated officials or other means of consultation. Topics to be considered include opportunities and challenges of a digital society and e-governance, how to use ICT, social media and mobile tools for clean and transparent government, inclusive and participative governance, international best practices regarding cataloguing of data and services, digital databases and technical solutions for secure exchange of data, trust services, national computer emergence response team's (CERT's) responsibilities, system of security measures and appropriate audit processes, best practices of regulatory authorities, etc.
- **Practical support through assistance on drafting.** The areas to be considered include needs assessment for training and development of e-governance, e-governance strategy and roadmap formulation, e-governance coordination and institutional capacity building plan, budget and financial management to ensure transparency and accountability, legal analysis to help identify potential legal inconsistencies, drafting of law and at a more advanced level support for regional- and AU-level legislation harmonisation, drafting of cooperation strategy, providing information regarding international organisations and encouraging participation in international cooperation, corporate social responsibility action plans (to support ICT and mobile use among young and less favoured groups), education plan for e-governance-related topics, including civic society, non-governmental organisations (NGOs), the telecom-ICT industry and government, agile methods suitable for development and planning, drafting of catalogues, drafting of organisational interoperability, creation and regulation of national CERT.

([94]) Examples are also available from other parts of the world. See Chatfield, A.T. and Alhujran, O., 'A cross-country comparative analysis of e-government service delivery among Arab countries', *Information Technology for Development*, 2009, 15(3), pp. 151-170.

([95]) https://publicadministration.un.org/egovkb/en-us/Reports/UN-E-Government-Survey-2016

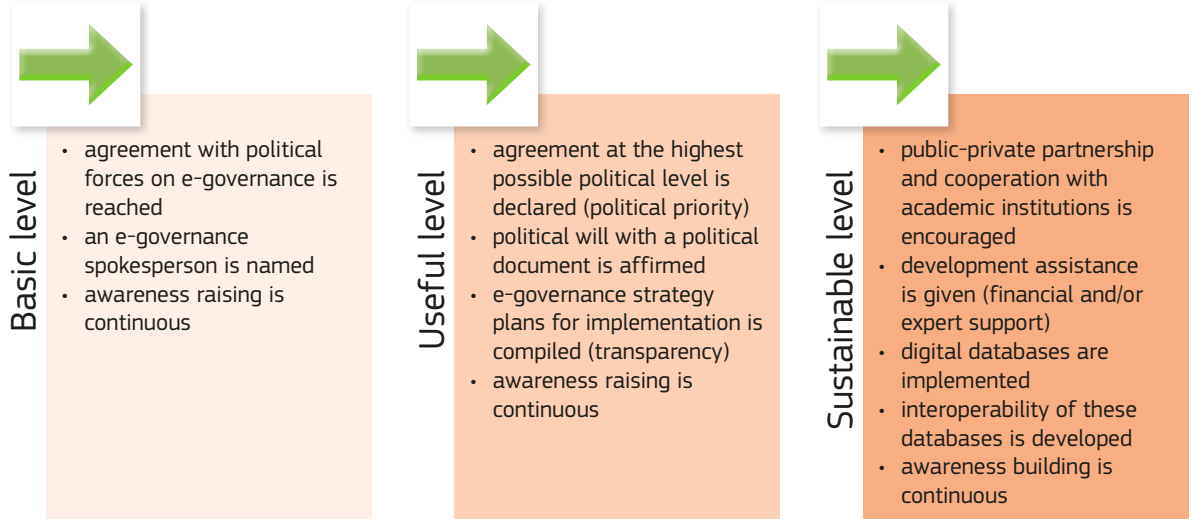
- **Practical support through assistance on:** information campaigns or other activities to inform citizens and NGOs of e-governance services, providing contacts and twinning opportunities with suitable counterparts in other countries.
- **Implementation support on:** donor coordination activities, creating networks for multinational projects for budget planning and compiling budgets, developing open, transparent and competition-supportive ICT regulations, IT development, cybersecurity assessment.
- **Financial support on:** digitisation of databases, digital information management, development of physical infrastructure, support to cover travel expenses and/or networking expenses, cost of drafting of legal framework.

6.1. Political will and change management

This component includes ensuring high-level political leadership that leads to the adoption and implementation of relevant policies and agendas. The introduction of e-governance should be a political priority, and an agreement between all political forces in the country is desirable. Political will must be declared at the highest possible political level, for example the president or the parliament. For this to have proper effect, it is important to identify roles and determine responsibilities for coordination and implementation and for encouraging public-private partnership and cooperation with academic institutions. The agreement should state that the use of digital technologies is successive and one of the main methods of developing society as well as of addressing the challenges and problems of society. Political will, if possible, should be affirmed with a political document, such as *Fundamentals of information policy*, which will be a guarantee of such will.

By definition, government is by the people and for the people. It is also is run by people. To change the daily routines of the people working in government requires motivation, and government officials can be motivated. Change management is about releasing their energy and stimulating their ideas to re-engineer existing public services and related operations within government. Government and its leaders must be able to change the mindsets of officials at all levels. As already stated, political leaders need to stay engaged and commit time, budget and even political capital to the cause of e-governance ([96]).

In addition, ongoing open government and e-governance capacity building is necessary. The steps below can in most instances beneficially be taken in parallel.

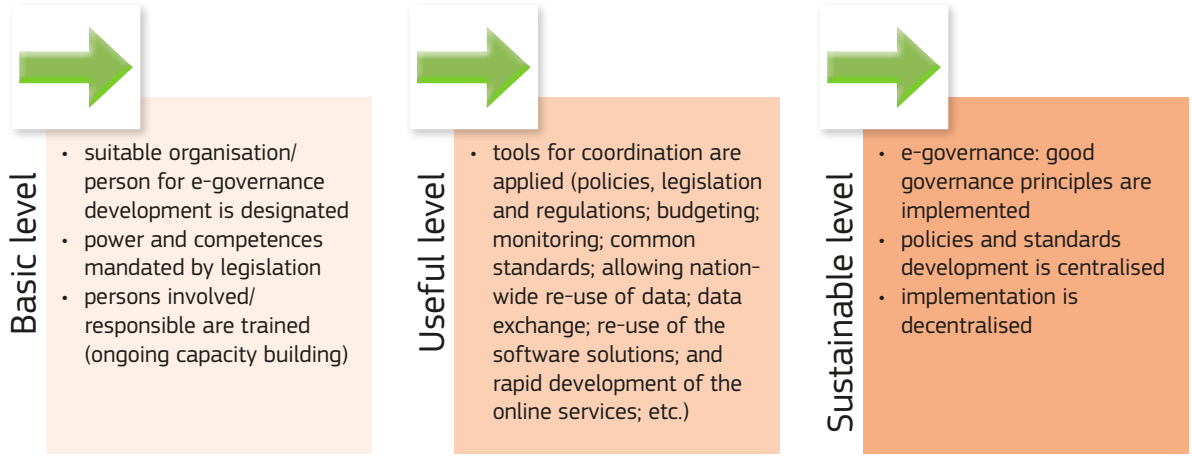


([96]) Astok, H., *Introduction to e-government*, e-Governance Academy, 2017, https://www.ega.ee/publication/introduction-to-e-government/

6.2. Coordinating institution including financing model

6.2.1. Coordinating institution

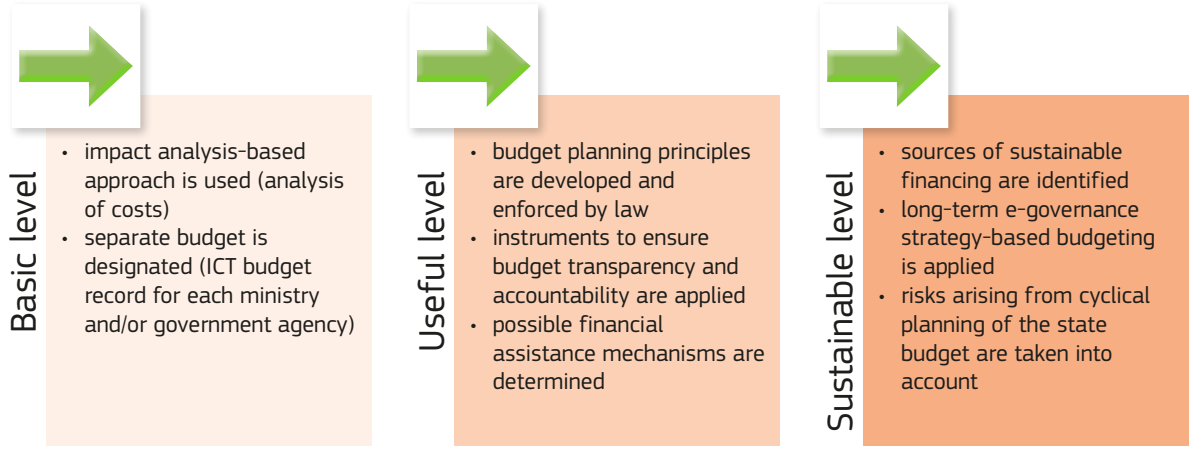
This component includes designating an institution that will have the mandate to take decisions on e-governance for the entire administration. It is possible to have regional (federal state) solutions, but in any event coordination will be needed. This does not mean centralising but rather ensuring that relevant decisions are properly coordinated. The coordinating institution is responsible for the strategic planning necessary for a state building e-governance and, more generally, an information society. The higher in the hierarchy the appointed unit is, the better the chances of directing ministries and agencies. The power and competences of the coordinating institution should be determined by legislation.



6.2.2. Financing model

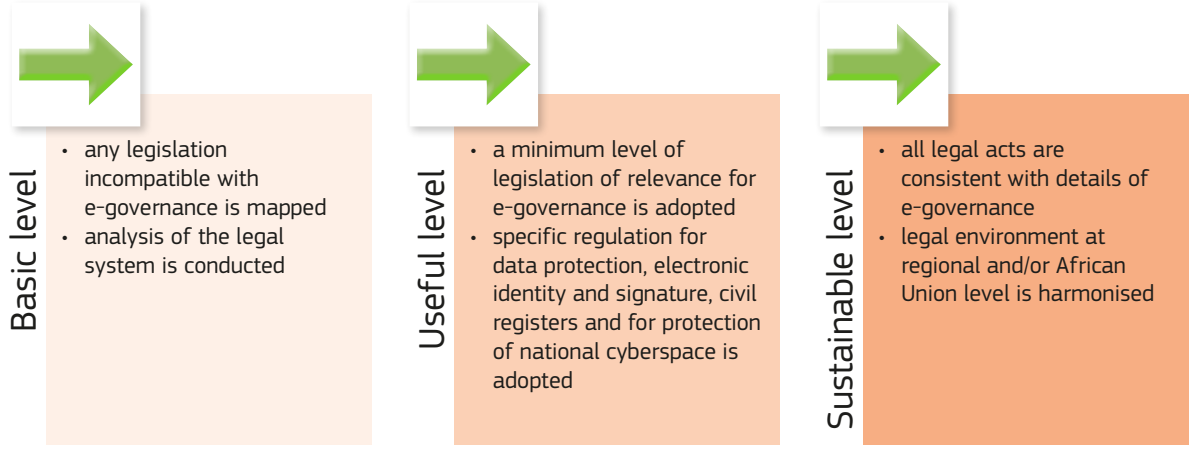
General financing and financial models for e-services need to be developed to ensure sustainability. For every e-governance solution, the total cost of ownership of the solution must be planned ([97]). The introduction of e-governance will have a cost, even if it will soon lead to savings in other respects, so it is essential that there is adequate provision for the necessary funds in a sustainable manner. The provision can be made centrally but also at the level of specific institutions, but in any event sufficient finance should be provided on a medium- to long-term basis preferably through multi-annual budgeting. The authorities must be able to manage the risks arising from cyclical planning of the state budget. For example, in the state financial forecast a separate budget line is allocated for the development of e-governance. To support that allocation, legislation should establish the procedures of planning the e-governance budget and managing the use of budgetary resources. In principle, the financial model needs to be transparent and accountable.

([97]) Van Bon, J., *Service strategy based on ITIL V3: a management guide*, Van Haren Publishing, Zaltbommel, 2008 (see section 5.1 Financial management).



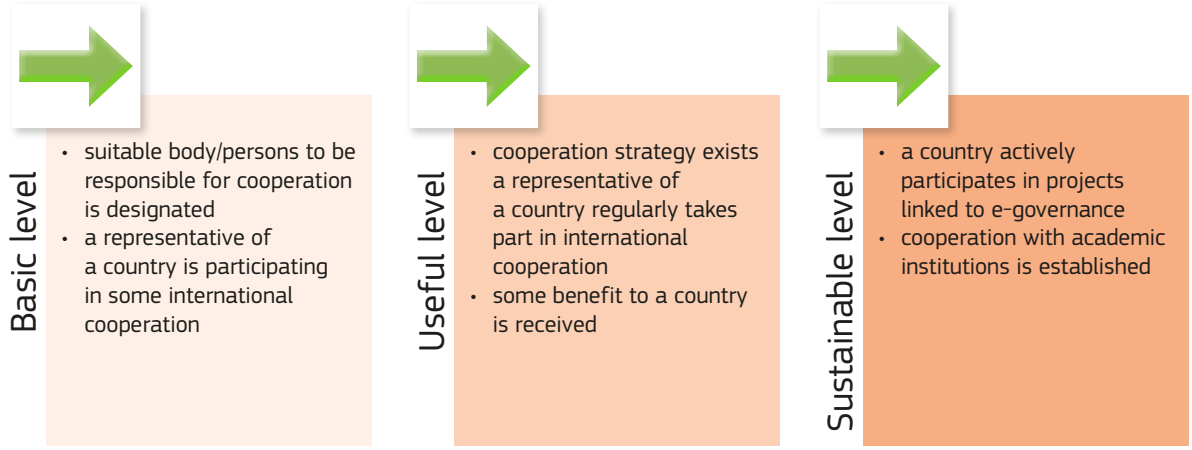
6.3. Legal framework

There are no legal prerequisites for starting the process of introducing e-governance. This means that it is irrelevant if the country has a continental or civil law system, for example. There are, however, a number of laws that need to be looked at, and this legal overview should be made in the early stages of developing e-governance. The more innovative the e-governance solution, the more it changes the existing workflow. Larger changes in the workflow often require more fundamental changes in legislation. It is essential to identify whether any changes are needed to be able to accept electronic information, for example. Some additional legislation may be needed on electronic signatures and data protection legislation may require strengthening, but what exact legal work is required is very country-specific. In addition to laws, strategies and plans need to be developed and drafted, thus clearly indicating the connection between the legal component and the governance one. Political will plays an important role in changing the legislation.



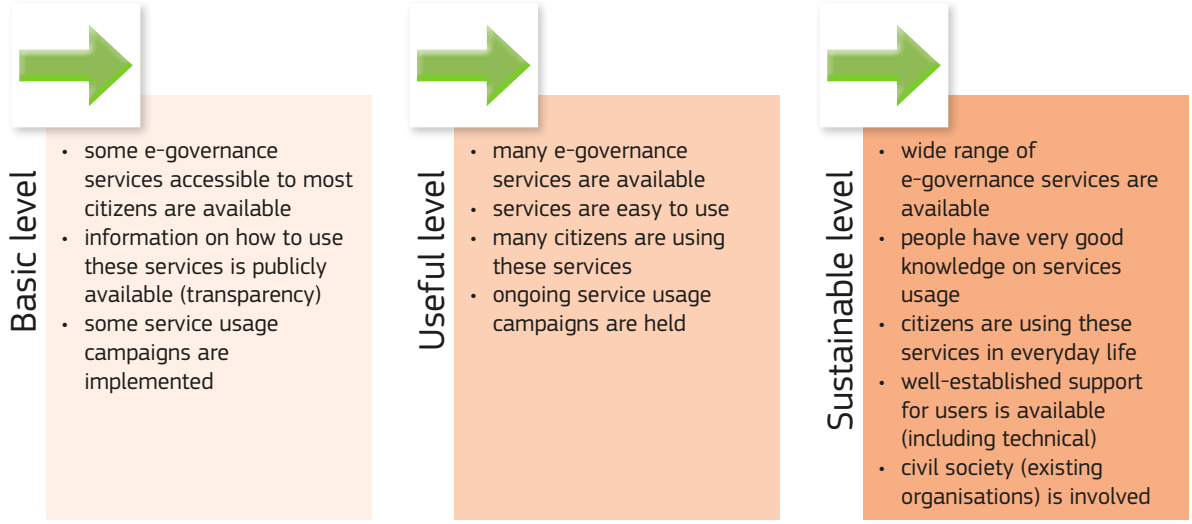
6.4. International framework

To benefit from the advantages that e-governance can provide for international relations (trade, free movement, research and education, etc.) it is very good for states to participate in international frameworks (regional or other). In addition, such cooperation can help states to learn from one another, to create joint projects, and so on.



6.5. Access to services and awareness raising

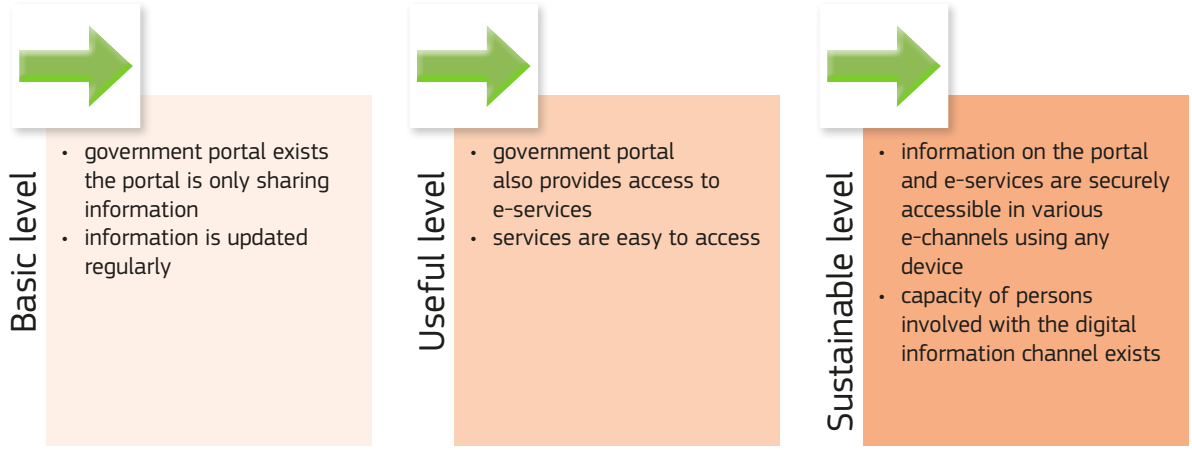
A parallel and overarching issue is that of citizens' engagement. For successful e-governance, it is beneficial to examine how it may be possible to support civil society and encourage citizens to engage. This is a part of the process of awareness raising about the digital society and developing general computer literacy.



6.6. Government portal, including catalogue of data and services, digital databases and secure exchange of data

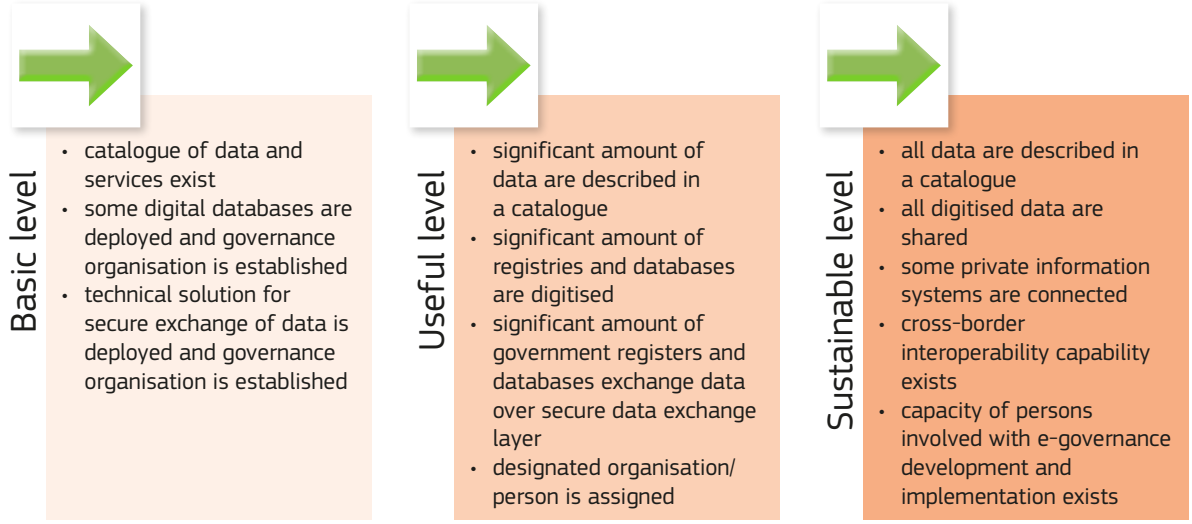
6.6.1. Government portal

To communicate with the public, the administration must establish a device- and technology-neutral digital information channel, such as a government portal that will operate on different devices. The information channel is used to provide both information services and procedural services. A well-functioning digital information channel will transform government services into a single whole and improve the availability of public services. In Africa, the priority is to develop services for mobile devices.



6.6.2. Catalogue of data and services, digital databases and secure exchange of data

A clear overview of the existence of data and services is essential to be able to continue the complete digitisation of databases and establish a means for the secure exchange of data. At the same time, the catalogue provides a service in itself by giving an overview of what is available so that new services can be established, the usefulness of services determined, and so on. The digitisation of public services means that ministries and government agencies capture and process data in a machine-readable format. Developing e-governance requires at least some digital databases and the ability for digital data exchange between databases. It is desirable to create or organise a personal identity database as soon as possible ([98]).

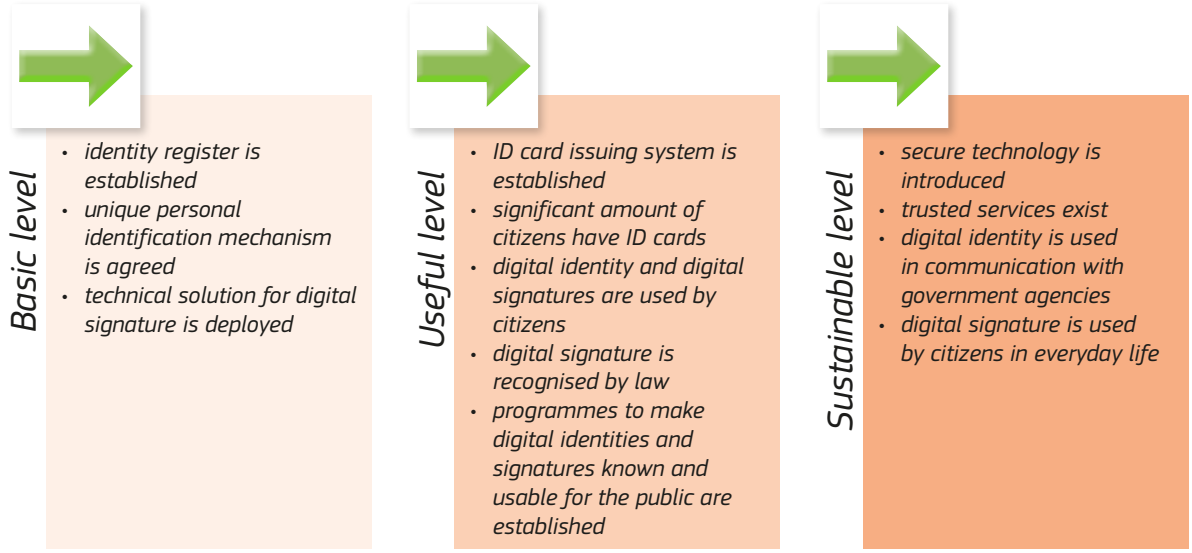


6.7. Secure digital identity and digital signature, including interoperability framework and security framework

6.7.1. Secure digital identity and digital signature

The digital identity concept and tools must be developed. If e-governance services are to be useful for all types of governance tasks, it is essential that the people using them can identify themselves in a secure manner. This includes mobile or digital identification by computer, including a digital signature. Signatures must be secure enough to be recognisable as evidence in court or similar situations.

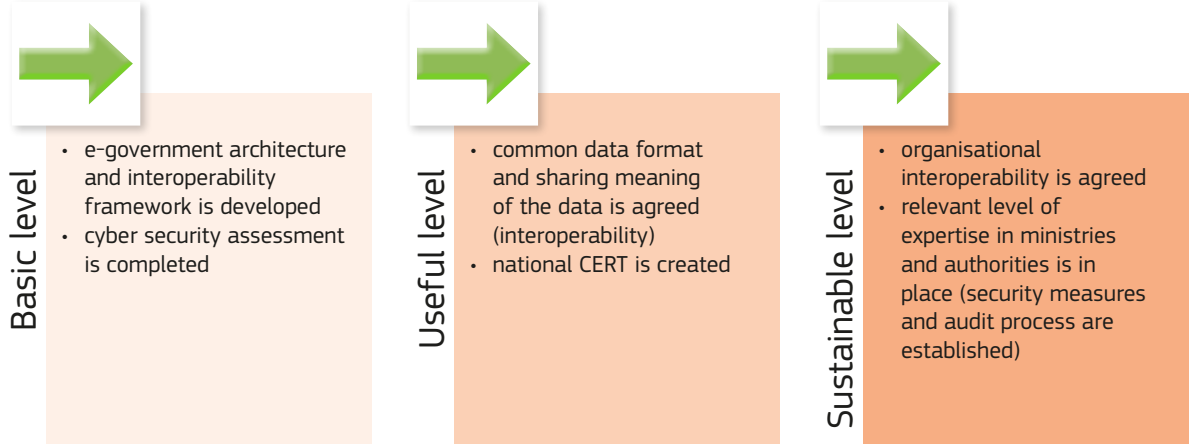
([98]) http://www.id4africa.com/



6.7.2. Interoperability framework and security framework

The interoperability framework is part of the secure digital identity. The requirements for technical interoperability need to be described at an early stage. Syntactic, semantic and organisational interoperability need to be developed gradually. e-Governance solutions that create value for society are created in various ministries and government agencies. It is necessary to agree on a minimum set of rules that will ensure the development of emerging e-governance solutions. These rules for coordination need to be agreed in political, organisational, legal and technical terms ([99]). The design of the interoperability framework should be the responsibility of the coordinating institution. The initial version of the interoperability framework should be established as soon as possible, and compliance with it must be made compulsory for all parties. Compliance with the agreed rules helps to use the existing state resources expediently. The interoperability framework will evolve as key elements of e-governance are developed.

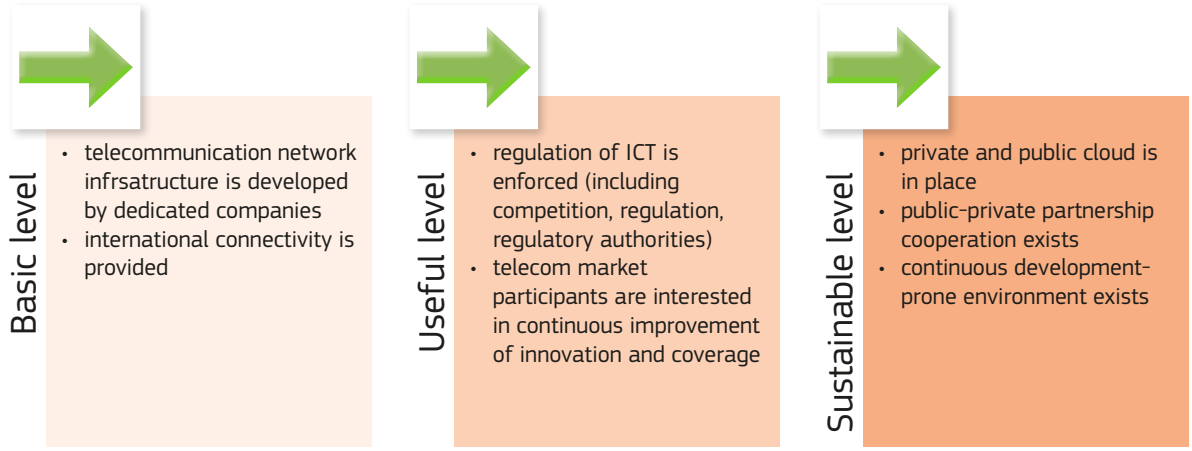
The growing cyber threats around the world require administrations to focus on ensuring e-governance security measures. It is important to be aware of the threats and the security level of e-governance. The coordinating institution is required to organise the development, monitoring and supervision of relevant cyber security rules and measures. A designated organisation in the form of a CERT should be established, proper audit processes established and all ministries and authorities should be aware of and use adequate security measures. The cybersecurity framework and the system of security measures should be established by legislation.



([99]) https://ec.europa.eu/isa2/eif_en

6.8. Infrastructure issues

Access to ICT is essential as a basic prerequisite for e-governance. It is, however, not the core focus of this report, as access to ICT is not only or primarily linked to e-governance, but a much wider issue. Consequently, assistance for infrastructure capacity building should not normally be part of e-governance support activities. A minimum level of ICT infrastructure capacity is instead a prerequisite to proceeding with e-governance projects. Communications networks are built by commercial companies. The state's task is to regulate the development of the networks and provide favourable conditions for the residents to access the network. For example, electronic communications legislation should be developed and enforced. It is the responsibility of the state to connect all state and local government agencies, schools, libraries, hospitals and other public authorities using the existing network. To accomplish this task, for example, an agency should be set up to plan and manage the use of existing, or construction of new, broadband network connections necessary for public authorities.



Chapter 7. Guidelines and recommendations

The guidelines and recommendations presented in this chapter should be seen in relation to the roadmap. They aim to provide guidance for the comprehensive development of the digital transformation of the African continent. There is no consecutive or necessary order of preference in which to introduce or increase the use of e-governance, as it depends on the present level of e-governance deployment but also on the national priorities and roadmaps, which in most cases are yet to be defined. These recommendations suggest general ways of proceeding in a more effective fashion, given the abovementioned diversity and plurality in the way that states will move towards increased e-governance. This chapter also includes some recommendations tailored to specific groups of countries; it needs to be stressed, however, that these recommendations are only broadly indicative. eGA firmly believes that whether or not to implement different components of e-governance and the exact type of support needed are issues to be decided/established in consideration of each country's needs, and therefore the roadmap and set of recommendations may vary considerably within groups as well as having similarities between groups.

1. **Support national capacity building and the creation of clear organisational structures** for implementing e-governance in the country. It is essential that there are clear structures with an established mandate and competence for implementing e-governance. In the absence of this, there is a risk of uncoordinated work and a lack of sustainability. The relevant organisations would also be responsible for the national coordination and international cooperation mentioned above. The designated organisation would have the main responsibility for implementing the roadmap and will be able to participate in regional initiatives to support such implementation.

   Specifically for group 1: political and technical awareness and capacity building.

   Support for the development and capacity building of designated organisation(s) through study trips, expert visits, seminars and drafting assistance. Support for establishing the roadmap for e-governance deployment in such a way that it is in harmony with broader national development policy goals and supports them with digital capacities. Drafting assistance for budgeting and financial management to ensure transparency and accountability, legal analysis to help identify potential legal inconsistencies and legal drafting assistance.

   Specifically for group 2: roadmap planning and implementation support.

   Assistance with designation of and/or initial training of the designated organisation(s). Education and training of designated officials or other means of consultation. Assistance with e-governance coordination and institutional capacity-building plan. Budgeting for e-governance roadmap with clear financial and organisational plan for implementation. Financial support for digitisation of public administration working processes and databases, digital information management and development of physical infrastructure. Drafting enabling legal frameworks that support the implementation of the e-governance roadmap with enforcement capacity building.

   Specifically for group 3: starting up flagship initiatives with high digital impact on national development goals.

   Advanced knowledge transfer on the specific competences to help design, plan, implement and administer e-governance services under the responsibilities of national coordination authorities. Roadmap management, private-public partnership models, advanced sandbox regulations and drafting support to facilitate innovation in e-governance.

2. **Support the idea of regional cooperation outside existing regional organisations**, especially for knowledge transfer between countries. The level of development of e-governance in the African continent varies, but there is a lot of relevant expertise in many countries. Examples from one country may be very useful for another, especially in the same region. There may be similarities that can benefit from a similar

treatment or potential for cross-border services and harmonisation. Centres of excellence can be created in some countries, providing a focal point for the region.

Although there are many benefits from using existing structures, as set out above, there may be a need to create new bodies either independently or in some other form as part of existing organisations. The reason is the need to have a focused expert body for the specific tasks needed to introduce and strengthen e-governance, with the ability to design projects, attract the relevant competences, form suitable teams, and so on. Such centres of excellence may group together countries at different levels of development of e-governance to allow the transfer of ideas and knowledge and to carry out technical assistance projects for countries at lower levels. Projects should normally be designed so that they include countries from all different groups in our categorisation of states. Such varied participation may be a condition of financial support for projects from external or African donors and funders.

Although it is not advisable to undertake pilot projects for the reasons explained in the introductory paragraph of this chapter (as the process of governance is too country specific), it is possible to benefit from models and good examples from other countries. The best way to do this without risking an excessively top-down and inadequately culture-conscious approach, is to conduct projects in groups of countries that transfer knowledge and experience as elements of the cooperation.

Specifically for group 1: identify the specific strengths of these countries, together with the beneficiary countries, and suggest the most effective ways to share these best practices in the region. For example, hold an experience-sharing seminar and develop materials on best practices.

Specifically for group 2: provide practical support for information campaigns or other activities to inform citizens and NGOs of e-government services; provide contacts and twinning opportunities with suitable counterparts in other countries.

Specifically for group 3: provide practical support (travel or networking costs), as well as education to enable countries to benefit from regional best practices. Provide implementation support for donor coordination activities. Provide support to enable knowledge transfer initiatives, learning from and teaching peers. In cases of need, provide practical support on managing particular advanced support services for less advances countries in areas such as practical cybersecurity, hosting of data centres and managing specific applications.

3. **Support existing regional structures in Africa**, primarily the AU, so that a regional approach can be taken, making use of the benefits of scale, the added attraction of e-governance solutions, thanks to their cross-border effect, and ensuring a seamless introduction of e-services. Fragmentation is avoided, and e-governance can support businesses and individuals across the whole continent by laying the groundwork to permit mutual recognition of documents, facilitated cross-border trade and travel, simplified cross-border transfers of assets, mutual cooperation on cybersecurity, and so on.

   The AU has launched a number of initiatives concerning various e-governance-related issues. These initiatives could be supported and built upon, thus benefiting from the work already undertaken as well as making use of existing institutional structures. Matters that benefit especially from a cross-border approach include e-identities, harmonisation of standards and creating interoperability frameworks that can be used internally or cross-border. The AU — given its pan-African nature — is especially useful in adopting common principles for future development of e-governance. Using the AU with its wide membership allows all countries to benefit from activities, in the manner and to the extent that it is suitable for their level of readiness for e-governance (as described in our categorisation).

   Specifically for group 1: in conjunction with the states in this group, provide advanced level support for regional- and AU-level harmonisation of legislation and drafting of cooperation strategies.

   Specifically for group 2: create networks for multinational projects for budget planning and compilation of budgets, develop open, transparent and competition-supportive ICT regulations, support IT development, conduct cybersecurity assessment.

Specifically for group 3: recognise evolving best practices and flagship initiatives, support knowledge transfer in the most experienced cases. Cover travel expenses and/or networking expenses. Provide implementation support for donor coordination activities.

4. **Support sub-regional organisations in Africa**, such as EAC, Ecowas, SADC and others, in addition to pan-African cooperation through the AU. The sub-regional organisations have in many cases been active on specific solutions for practical matters in their regions, linked, for example, to free movement and trade. Such initiatives can benefit from e-services.

   Several sub-regional initiatives exist that are related to matters of importance for e-governance, and it is efficient to build on existing initiatives as well as the organisational set-up related to these. The smaller and more focused organisations may provide a more workable environment for implementing specific projects than the AU. Similarly, as with the AU, albeit in the smaller contexts, the use of organisations permits many states to benefit from activities. In addition, states that currently for different reasons are unlikely to be able to undertake projects can gain some insight through their membership of regional organisations and have a framework for participation when circumstances allow.

   Specifically for groups 1 and 2: in conjunction with the states of this group, provide advanced level support for regional- and AU-level harmonisation of legislation and drafting of cooperation strategies. Create networks for multinational projects for budget planning and compilation of budgets, develop open, transparent and competition-supportive ICT regulations, support IT development, conduct cybersecurity assessment.

   Specifically for group 3: recognise evolving best practices and flagship initiatives, support knowledge transfer for the most experienced cases. Cover travel expenses and/or networking expenses. Provide implementation support for donor coordination activities.

List of annexes

Annex 1 — Government portals

Country	Government portal
Algeria	http://www.el-mouradia.dz/
Angola	http://www.governo.gov.ao/
Benin	http://gouv.bj/
Botswana	http://www.gov.bw/
Burkina Faso	http://www.gouvernement.gov.bf/
Burundi	http://www.burundi.gov.bi/
Cameroon	http://www.spm.gov.cm/
Cape Verde	http://www.governo.cv/
Central African Republic	http://www.rca-gouv.net/
Chad	http://www.gouvernement.td/en/
Comoros	http://beit-salam.km/
Congo	http://www.presidence.cg/accueil/LenouveaugouvernementduCongo.php
Côte d'Ivoire	http://www.gouv.ci/
Democratic Republic of the Congo	http://www.presidentrdc.cd/
Djibouti	http://www.presidence.dj/
Egypt	http://www.egypt.gov.eg/
Equatorial Guinea	http://www.guineaecuatorialpress.com/
Eritrea	http://www.shabait.com/
Ethiopia	http://www.ethiopia.gov.et/
Gabon	http://www.gouvernement.ga/
Ghana	http://www.ghana.gov.gh/
Guinea	http://www.presidence.gov.gn/
Guinea-Bissau	http://www.gbissau.com
Kenya	http://www.mygov.go.ke/
Lesotho	http://www.gov.ls/
Liberia	http://www.emansion.gov.lr/
Libya	http://www.pm.gov.ly/
Madagascar	http://www.presidence.gov.mg/
Malawi	http://www.malawi.gov.mw/
Mali	http://www.primature.gov.ml/
Mauritania	http://www.mauritania.mr/
Mauritius	http://www.govmu.org/
Morocco	http://www.maroc.ma/
Mozambique	http://www.presidencia.gov.mz/
Namibia	http://www.gov.na/
Niger	http://www.gouv.ne/
Nigeria	http://www.nigeria.gov.ng/
Rwanda	http://www.gov.rw/
São Tomé and Príncipe	http://www.saotome.st/
Senegal	https://www.sec.gouv.sn/
Seychelles	http://www.gov.sc/
Sierra Leone	http://www.statehouse-sl.org/

Country	Government portal
Somalia	Different ministries websites available
South Africa	http://www.gov.za/
South Sudan	http://www.goss-online.org/
Sudan	http://sudan.gov.sd/
Swaziland	http://www.gov.sz/
Tanzania	https://www.tanzania.go.tz/
The Gambia	http://statehouse.gov.gm/
Togo	http://www.republicoftogo.com/
Tunisia	http://www.tunisie.gov.tn/
Uganda	http://www.statehouse.go.ug/
Zambia	http://www.statehouse.gov.zm/
Zimbabwe	http://www.zim.gov.zw/

Annex 2 — Digital identity in African countries

The following table lists general comments on e-governance in African partner countries and gives specific information on digital identity, if such information is available. The table provides additional data on the situation in the countries concerning matters that are not included in the quantitative tables made available by various international organisations, as it is based on narratives drawn from different organisations, media outlets, academic articles, and so on. Sources are provided so that the relevance and veracity of the information can be assessed. The table is not intended to replace rankings but to provide additional narrative. The absence of information is consequently also informative, as it shows that thorough searches of various sources by eGA experts have not yielded any information. This indicates that no plans exist or, if they do, they are not transparent. The searches for information were carried out throughout the writing of the report in 2017.

Key: no reference — no national ID; national ID — exists but it is not e-ID (at least on a card); e-ID — electronic national ID exists (at least partially).

Country	General comments on e-governance	ID cards	Sources
Algeria	**E-Algeria:** the Algerian action plan is organised around 13 major axes; for each axis a portfolio was developed followed by a definition of specific and key objectives to be achieved by the year 2013. Algeria has opted for a highly centralised and closed structure with many (all of them public) players with overlapping prerogatives and without much coordination. Designed in 2000, the process was expected to result in the deployment, by 2013, of more than 300 online services to the benefit of Algerian citizens and businesses. Unfortunately, many of the goals set were never achieved mainly because of a shift in priorities dictated by regional changes (such as security issues) and delays in the deployment of the necessary infrastructure.	e-ID (electronic national identification) Launched in January 2016, the new Algerian biometric ID card is emblematic of the country's modernisation goals.	http://www.sobiad.org/eJOURNALS/journal_IJEBEG/arhieves/2013_1/Djilali-Idou.pdf http://www.gemalto.com/govt/customer-cases/new-national-identity-card-algeria
Angola	**Angola national ID card programme:** the Angolan government decided to replace its outdated national ID documents in the mid-2000s with an ID card system that was not only counterfeit resistant and durable, but would also provide proof of identity to its entire population of 24.3 million citizens — a daunting task given that 62 % of the population lives in widely dispersed urban areas and 38 % live in hard to access rural areas.	e-ID The ID card programme was implemented by 2015.	HID case study, https://www.hidglobal.com/sites/default/files/resource_files/hid-gov-id-angola-cs-en.pdf
Benin	Benin's government plans to convert the country into a platform of digital services for Western Africa by 2021. One of the goals is to ensure nationwide and affordable access to the internet, a systematic and stepwise establishment of a national plan that is likely to enable over 3 000 km of fibre optics to be installed by 2019.	National ID Benin has been issuing national ID cards (carte d'identité), which are paper-based identification, since 1992.	http://news.xinhuanet.com/english/2017-05/18/c_136293525.htm World Bank, *The state of identification systems in Africa — country briefs*, 2017, http://pubdocs.worldbank.org/en/940071497322166382/ID4D-country-profiles-report-final.pdf
Botswana	The e-government strategic plan faces big infrastructure challenges and lacks a variety of front-end e-governance applications that individual citizens can access, creating a top-bottom approach, where citizens and businesses might feel 'left out'.	e-ID The government of Botswana in May 2017 selected a contractor, Morpho South Africa, to develop a single multi-biometric platform for all the identification requirements of various government departments. Currently in phase IV of the original project.	https://books.google.com.br/books?id=YwmXBQAAQBAJ&pg=PA160&lpg=PA160&dq=botswana+digital+government&source=bl&ots=hTZBQYKNTw&sig=uuGN9TVBcVYNwM6xrig3Ra8KLBw&hl=pt-BR&sa=X&ved=0ahUKEwjqwtXetfHVAhXEDZAKHRpsDREQ6AEIQTAE#v=onepage&q=botswana %20digital %20gover"&"n';"Book

Country	General comments on e-governance	ID cards	Sources
			http://pubdocs.worldbank.org/en/940071497322166382/ID4D-country-profiles-report-final.pdf https://www.morpho.com/en/media/government-botswana-selects-morpho-south-africa-provide-single-multi-biometric-platform-all-identification-requirements-various-government-departments-20170502
Burkina Faso	**eBurkina:** going digital is seen by the government as an engine of growth and a high-potential sector for the country; therefore, it should come as no surprise that ICT is part of the five key points of the development programme set forth by the presidency. Some of the e-services were developed with support from the World Bank.	National ID The National Identification Office is the government agency responsible for issuing national ID cards. There is a project outline by a government agency for upgrading of the ID card, but it is a vision for 2020.	http://blogs.worldbank.org/ic4d/burkina-faso-s-digital-ambition-transforming-through-egovernment-and-digital-platforms http://pubdocs.worldbank.org/en/940071497322166382/ID4D-country-profiles-report-final.pdf
Burundi	No initiatives were found.	e-ID In 2013, Burundi launched a pilot programme to issue machine-readable national ID cards to individuals aged 16 and older. The current status of this initiative is unclear. However, in 2014, the Independent National Electoral Commission of Burundi announced that Burundians would no longer need the national biometric ID card to register for general elections in 2015. Thus, in 2014, Burundi started a pilot of machine-readable ID cards, but people were reluctant to provide all information requested, such as bank accounts and properties, resulting in low uptake. Has not been possible to find data on the current status of the project.	http://pubdocs.worldbank.org/en/940071497322166382/ID4D-country-profiles-report-final.pdf http://mobile.nation.co.ke/news/Burundi-National-Identity-Cards-East-African-Community/1950946-2254804-format-xhtml-r004q3z/index.html
Cameroon	Cameroon has the ambition of becoming a tech hub in Africa; therefore, it created the **Digital Cameroon** initiative. Expected to be fully implemented by 2020, its goals are developing broadband structure; increasing production and offer of digital content; promoting digital culture; improving governance and institutional support, among other things.	e-ID Cameroon began issuing electronic ID cards in 2013. These were meant to be used for multiple electronic services, such as civil identification and health and social services. Biometric ID cards were introduced in August of 2016. As of early 2017, Cameroon was in the process of reviving its national identification programme.	Strategic plan for a digital Cameroon by 2020, May 2016, http://cameroundigital.com/en/strategic-plan/ http://pubdocs.worldbank.org/en/940071497322166382/ID4D-country-profiles-report-final.pdf http://www.yourcommonwealth.org/social-development/democracy-participation/cameroon-introduces-new-id-cards/

Country	General comments on e-governance	ID cards	Sources
Cape Verde	Cape Verde took its first steps towards e-governance solutions in 1998. In almost 20 years many goals have been accomplished: (1) a private telecommunication network; (2) a data centre; (3) a 'factory' for software development; and (4) more than 70 e-governance applications, and counting, some of them award-winning.	e-ID A national ID card was implemented in 2014, incorporating electronic storage of biometric information. The biometric technology on the card includes a digital photograph, fingerprints and digital signature.	http://pubdocs.worldbank.org/en/940071497322166382/ID4D-country-profiles-report-final.pdf http://www.identity-cards.net/record/cabo-verde
Central African Republic	No initiatives were found.	National ID — paper-based. Biometric passports since 2012. Recently, there has been discussion regarding a partnership between the government and a private firm to launch biometric identification and delivery of electronic identification to all Central African Republic citizens.	http://pubdocs.worldbank.org/en/940071497322166382/ID4D-country-profiles-report-final.pdf
Chad	No initiatives were found.	National ID Chad has had a national identity system since 2002. There are two generations of national identification in circulation and Chad is currently using biometric voter's cards.	http://pubdocs.worldbank.org/en/940071497322166382/ID4D-country-profiles-report-final.pdf http://theconversation.com/biometric-voting-in-chad-new-technology-same-old-political-tricks-58663
Comoros	Very few Comoros government institutions have developed websites and only 50 % of these satisfied the web presence phase of the e-government implementation models. They deal with providing basic online information on government activities. Telecommunication infrastructure and human capital are key limitations. In 2008, Comoros started the development of an e-government strategy focused on the transforming public sector finance by 2019.	National ID For biometric enrolment in the national ID card scheme, a citizen must submit a request for authentication, capture all 10 fingerprints, take a digital photograph and provide personal data.	https://books.google.com.br/books?id=kFC5BgAAQBAJ&pg=PA133&lpg=PA133&dq=comoros+electronic+government&source=bl&ots=VBVBY-yvh6&sig=waYMzgFH24Izw-mTEbC8oJOVMGnk&hl=pt-BR&sa=X&ved=0ahUKEwj8ra-ni5_HVAhUDF5AKHVOuCM0Q6AEIUTAF#v=onepage&q=comoros %20electronic %20government&f=false http://pubdocs.worldbank.org/en/940071497322166382/ID4D-country-profiles-report-final.pdf
Congo	No initiatives were found.	e-ID Congo has an electronic national registry and database to store information about its biometric ID card, e-passport, resident card, police card, voter registration and electronic access control. The biometric database centre, including automatic fingerprint identification system (AFIS), serves as a base for a variety of government ID applications, including census, elections and ID documents, e-passports, driver's licences and health cards.	http://pubdocs.worldbank.org/en/940071497322166382/ID4D-country-profiles-report-final.pdf

Country	General comments on e-governance	ID cards	Sources
Côte d'Ivoire	No initiatives were found.	e-ID Two systems exist: (1) the National Identification Office (Office national d'identification, the public institution that since 2001 has issued identity documents to Ivorians and foreigners in Côte d'Ivoire; (2) the biometric identification system for the almost 4 million people covered by Caisse Nationale d'Assurance Maladie, the national health insurance fund. The latter e-ID card, among other things, also provides a mechanism for authentication.	http://pubdocs.worldbank.org/en/940071497322166382/ID4D-country-profiles-report-final.pdf The United Nations Refugee Agency, http://www.refworld.org/docid/585a87444.html
Democratic Republic of the Congo	No initiatives were found.	National ID The main form of national identification is paper based. The Ministry of Interior set out to issue national ID cards in 2014; to date this has not been possible. There have been efforts by private parties such as banks to issue their own, robust forms of identification. A refugee ID card exists, which is equivalent to a residence permit.	http://pubdocs.worldbank.org/en/940071497322166382/ID4D-country-profiles-report-final.pdf
Djibouti	Government-run Djibouti Telecom has made an agreement with Europe to boost data traffic through French internet exchange operator France-IX, helping the connectivity of another six countries — Ethiopia, Somalia, Yemen, Madagascar, Mauritius and Seychelles.	Djibouti does not have a robust identification system. Instead, it has a few separate, insular identification programmes with their own databases. These databases are fragmented and are neither interoperable nor harmonised. In 2012, a new national ID card was introduced, but because of the high cost, instead of an expected 250 000–300 000, only 9 000 had been issued as of 2014 (World Bank report). The only new initiative found was the delivery of a multi-biometric ID documents platform, February 2017.	https://data-economy.com/djibouti-telecom-turns-south-europe-boost-content-traffic-africa/ http://pubdocs.worldbank.org/en/940071497322166382/ID4D-country-profiles-report-final.pdf http://www.securitydocumentworld.com/article-details/i/13085/

Country	General comments on e-governance	ID cards	Sources
Egypt	**Egypt's ICT 2030 strategy:** MCIT strives to achieve a digital economy through the use of ICT tools to provide prosperity, freedom and social equity for all. Its mission is to enable the development of a knowledge-based society and a strong digital economy relying on equitable and affordable access to knowledge, digital rights and the development of a competitive, innovative national ICT industry. Vision 2030 is a national strategy of the Egyptian government that plans to achieve the goal of a creative and innovative society producing science, technology, innovation and knowledge to face challenges and meet national objectives. It also looks for technological transformation in the various stages of education, developing interactive content, providing training to raise the efficiency of teachers and administrators and integrating persons with disabilities into the community, especially with modern technology and high-speed internet access for schools.	The only initiative found was a news item from 2014 about the world leader in government identity solutions, Morpho, signing a contract with the Arab Organisation for Industrialisation to locally produce national e-ID cards for Egypt. Accordingly, in 2014 the Egyptian e-ID card was designed to be one of the most secure in the world. In addition to embedding a smart chip allowing e-services and digital signature applications with match-on card, the Egyptian e-ID card inlay should incorporate other complex security features, including 3D technology, to protect against fraudulent use.	http://www.itwebafrica.com/ict-and-governance/254-egypt/237883-egypts-vision-2030-hinges-on-it-in-education https://www.morpho.com/en/media/20141128_morpho-signs-contract-aoi-electronics-locally-produce-national-eid-cards-egypt
Equatorial Guinea	Equatorial Guinea's head of state has agreed that Africa needs to embrace the use of ICT to provide solutions to challenges in various sectors, but no concrete initiative has been found. As of 2010, the only government website was the federal one.	N/A	http://gov.rw/news-detail/?tx_ttnews %5Btt_news %5D=1761&cHash=2a76ff80eddf730b81138fbb-0bfa1888 *Government Information Quarterly*, http://www.global.asc.upenn.edu/fileLibrary/PDFs/Carnegie_Rorissa.pdf
Eritrea	No initiatives were found.	National ID In 2010, Eritrea began issuing electronic ID cards to replace the old paper documents. In an effort to curb illegal migration, false documentation and forged paper documents, the government announced that it will discontinue ID cards issued before 1993, the year Eritrea declared independence. According to the World Bank, it is not clear how the current system is migrating to the electronic cards as the paper documents are phased out.	http://pubdocs.worldbank.org/en/940071497322166382/ID4D-country-profiles-report-final.pdf

Country	General comments on e-governance	ID cards	Sources
Ethiopia	The **e-government strategy for Ethiopia** has been designed with a focus on facilitating effective delivery of government services to customers (residents, businesses and visitors). The strategy envisages implementation of 219 e-services comprising 77 informational and 134 transactional services over a 5-year period. The implementation is proposed to be done through 12 priority projects and service delivery would be through four channels (portal, call centre, mobile devices and common service centres). The plan was approved in 2011 and all 219 e-services were slated for completion by 2015.	National ID Only paper cards exist and they differ in content and appearance across the country and have no security features. The issuing officer verifies the card after confirming the user's identity. These cards are used for many private and public sector transactions (for food aid).	http://unctad.org/meetings/en/Presentation/CSTD_2013_WSIS_Ethiopia_E-Gov_Strategy.pdf http://aigaforum.com/articles/Ethiopia-stride-e-government.pdf http://pubdocs.worldbank.org/en/940071497322166382/ID4D-country-profiles-report-final.pdf
Gabon	Gabon has adopted a plan for the development of e-government, but it is slow to implement due to many challenges, including lack of budget, aggravated by the oil crisis; inadequate broadband communication infrastructure; lack of regulation of the information society, electronic transactions and cyber criminality sectors; and insufficiently qualified people. The country's e-government plan has three main components: (1) a 'front-office' platform consisting of online services for citizens and companies; (2) a 'back office' platform consisting of business and administration applications, services and collaborative tools to enhance government staff productivity; and (3) dashboards and decision-support tools for state decision-makers.	National ID **Gabon's e-ID** was approved in 2011 and introduced in 2013 for local elections. A reliable national biometric registry was built to replace paper-based records with digital records. According to the World Bank, Gabon's government is currently implementing key public infrastructure to facilitate integration of the national biometric ID programme into future e-government services.	http://www.ijettcs.org/Volume6Issue3/IJETTCS-2017-05-19-22.pdf Public sector case study, http://www.gemalto.com/brochures-site/download-site/Documents/gov_gabon_bio_id.pdf http://pubdocs.worldbank.org/en/940071497322166382/ID4D-country-profiles-report-final.pdf
Ghana	Ghana's e-government interoperability framework (**e-GIF**) is a set of policies, technical standards, and guidelines covering ways to achieve interoperability of public sector data and information resources, ICT and electronic business processes.	e-ID Ghana national e-ID cards enable identification of individuals based on biometric information, specifically fingerprints. The card also carries the holder's signature. According to the World Bank report 2017, the National Identification Authority is planning to upgrade the existing identification system to accommodate institutional identity service requirements and to harmonise all ID systems in Ghana.	Ghana e-Government Interoperability Framework, https://www.ghanahealthservice.org/downloads/Ghana_eGIF_Main.pdf http://waset.org/publications/10003316/overview-of-e-government-adoption-and-implementation-in-ghana https://www.ghanaweb.com/GhanaHomePage/regional/artikel.php?ID=329552 http://pubdocs.worldbank.org/en/940071497322166382/ID4D-country-profiles-report-final.pdf

Country	General comments on e-governance	ID cards	Sources
Guinea	No initiatives were found.	National ID 2D bar codes based national ID cards have been issued. Currently, there is an initiative under way supported by the World Bank to provide all residents with a unique ID number associated with biometric data. Thus, the national ID register exists, which serves the purpose of the identity database. By the end of 2014, it contained data on nearly 5 million individuals of voting age. The registry includes biometric and biographic data and date of birth.	http://pubdocs.worldbank.org/en/940071497322166382/ID4D-country-profiles-report-final.pdf
Guinea-Bissau	No initiatives were found.	e-ID In 2013 the new integrated ID card was introduced. It includes a civilian AFIS to reduce potential internal fraud, eliminate duplicate identities and precisely verify the identity of legitimate cardholders. According to the World Bank, Guinea-Bissau plans to issue more than 1 million national ID cards in the next 5 years.	http://pubdocs.worldbank.org/en/940071497322166382/ID4D-country-profiles-report-final.pdf
Kenya	Kenya is a successful case of e-governance. A strategy planned in 2013 and in 2015 had already led to the following e-governance platforms: a new website; an e-citizen platform; an open data platform containing census data and government reports; and one-stop shops (Huduma centres) for those who need individualised IT support to engage with government services, such as submitting tax returns online. The Kenyan government has sought to engage the public through social media and mobile services, most notably the development of applications that integrate with the nation's company registry, allowing people to search company and business names by mobile phone.	e-ID According to the World Bank, thus far, Kenya has issued 24 million ID cards, but this total may include duplicates as well as the inactive cards of deceased individuals. There are about 1.2 million new registrations each year. National e-ID is central to multiple civic activities. In 2015, MasterCard planned to develop a **smart card ID** with Kenyan banks that will be used to pay for government services and distribute welfare, according to regional media. The programme contained a goal to integrate all services offered through the centres, thus providing a cash payment option for government services.	https://www.itworld.com/article/2694577/it-management/kenya-increases-e-government-efforts—burnishing-international-image.html http://pubdocs.worldbank.org/en/940071497322166382/ID4D-country-profiles-report-final.pdf http://www.securitydocumentworld.com/article-details/i/12290/

Country	General comments on e-governance	ID cards	Sources
Lesotho	The objective of the **Lesotho e-government infrastructure project** is to enhance good governance by deploying a modern and secure e-government broadband infrastructure. The project focuses on the utilisation of ICT on governance frameworks that underpin the effectiveness of public sector institutions. Specifically, the project shall: (1) enhance coordination across ministries, key agencies and local governments; (2) strengthen existing government data centres and portals; and (3) improve provision of e-services for state building, such as automated administrative services including e-payroll, civil registration, e-health, e-procurement, e-customs and revenue management. As of 2014, Lesotho now issues an **e-passport**.	e-ID According to the World Bank, as of early 2017, around 800 000 national ID cards had been issued out of an estimated eligible population aged 16 and above of about 1.2 million (out of a total population of about 2 million) and this is growing steadily. The e-ID card contains a machine-readable fingerprint and biometric information as well as an online deduplication check, integrated with birth and death registration. In 2013, Lesotho started issuing comparable national identification that would consolidate all important information about its citizens in one secure document. Lesotho has launched a nationwide project, aiming at cleaning up the national citizen database and ensuring that abuse of the country's official documents (mainly in the form of passports) ends. The project is scheduled to be fully implemented by the end of 2018.	African Development Fund, https://www.afdb.org/fileadmin/uploads/afdb/Documents/Project-and-Operations/Lesotho_-_E-Government_Infrastructure_Project_-_Appraisal_Report.pdf http://pubdocs.worldbank.org/en/940071497322166382/ID4D-country-profiles-report-final.pdf http://www.saiia.org.za/opinion-analysis/african-integration-what-do-new-national-ids-in-lesotho-and-south-africa-mean
Liberia	The United States Agency for International Development (USAID), in collaboration with the Government of Liberia (GoL) launched the **USAID Digital Liberia and e-government project** in March 2017. In support of the GoL's e-government strategy, the Digital Liberia and e-Government project will improve the GoL's performance and bring it closer to the people through the development of internet and computer technology capability. This USAID-funded project will improve the GoL's connectivity and institutional capacity, which is necessary for the provision of effective services, progressing Liberia towards the creation of a sound national ICT platform now and for future generations. The project will also help identify sustainable government digital initiatives and help the GoL take advantage of various technologies to digitise institutional systems and processes.	National ID Issued since 2011. Starting in October 2015 a management team was assigned to establish or acquire the technical infrastructure and control procedures that will serve as the platform for implementing the national biometric identification system. This system will collect, organise, store, secure and grant access to secure biometric data collected from individuals applying for national biometric ID cards and other key documents, such as passports, driver's licences and social security cards.	https://lr.usembassy.gov/usaid-government-liberia-launch-new-ict-support-project/ http://pubdocs.worldbank.org/en/940071497322166382/ID4D-country-profiles-report-final.pdf

Country	General comments on e-governance	ID cards	Sources
Libya	No initiatives were found.	The Libyan government implemented in 2013 a national identity number and e-passport.	https://bradscholars.brad.ac.uk/bitstream/handle/10454/10689/khamallag_et_al_2016.pdf?sequence=1&isAllowed=y
Madagascar	No initiatives were found.	National ID Since 1961, a paper-based ID card has been issued to all citizens over 18 years of age. There are no data available regarding the issuance and coverage of the paper-based carte nationale d'identité.	http://pubdocs.worldbank.org/en/940071497322166382/ID4D-country-profiles-report-final.pdf
Malawi	The Malawian government has been implementing an e-governance model for the past 5 years, as a public-sector reform initiative to harness ICTs in the provision of government services and enhance efficiency, transparency and accountability for its citizens. The overall aim is to promote the country's socioeconomic development, supporting the aspirations of Vision 2020, with priority being given to ICT activities contributing to reducing poverty. The e-government element focuses on modernising and improving the efficiency of public services. Specific strategies have been designed to improve productivity, efficiency, effectiveness and service delivery through institutional and organisational reforms. **An e-legislation** project currently exists to set up a responsive ICT legal framework to facilitate competition, development and Malawi's participation in the information society.	e-ID The UN Development Programme (UNDP) is spearheading an effort to launch an electronic identity initiative programme known as the national registration and identification system (NRIS). This initiative will issue chip-based smart ID cards and set up a multi-modal biometrics database to register all Malawians aged 16 years or older. According to the World Bank, after completing the design of the infrastructure to use biometrically secure smart cards and obtaining necessary equipment, Malawi will begin mass registration of all eligible Malawians within the country — an estimated 9 million individuals. Malawi hopes to transition to a system of continuous registration in 2018. The mass registration process was planned in June 2017.	https://malawi24.com/2017/04/26/mass-national-id-registration-start-june/ http://pubdocs.worldbank.org/en/940071497322166382/ID4D-country-profiles-report-final.pdf
Mali	No initiatives were found.	e-ID Mali has been issuing national identification since 2010, and it introduced an electronic ID card in 2013. The e-ID card has been used for civil identification and voting. The credential is a static bar code-enabled card with biometric authentication. Thus, according to the World Bank, there is a need for interoperability and the inter-linking of databases in Mali. In addition, the Malian government is also developing biometric and electronic passports.	http://pubdocs.worldbank.org/en/940071497322166382/ID4D-country-profiles-report-final.pdf https://findbiometrics.com/oberthur-mali-e-passport-307203/

Country	General comments on e-governance	ID cards	Sources
Mauritania	No initiatives were found.	e-ID National ID cards have been issued since 2001. The present Mauritanian national e-ID card is a smart card that uses biometric and facial recognition. It can be used for e-services, but it does not contain a digital signature and cannot be used for remote online transactions.	http://pubdocs.worldbank.org/en/940071497322166382/ID4D-country-profiles-report-final.pdf
Mauritius	In its endeavour to develop Mauritius into a cyber island and to create an ICT-literate nation, the government has clearly identified e-governance as a key initiative that can radically transform the way the government interacts with citizens and businesses and define the nature of relationships across various ministries and departments in providing seamless, consistent and value-added public services. The vision of the government is to provide an effective and efficient delivery of services, on a 24/7 basis, to citizens as well as to the business community. In this respect, the government has invested in the necessary infrastructure, namely, the government online centre and the government web portal as a gateway to provide government services online. Mauritius is home to three mobile phone operators, namely Emtel, Orange and Mahanagar Telephone Mauritius. This is in addition to the fixed phone operator, Mauritius Telecom. The establishment of a new techno park and a third submarine fibre-optic cable, as well as enhanced integration of ICT and business, shows that the country is boosting competitiveness in the ICT sector. The country's ICT strength is in line with the government's **Smart Mauritius strategy**. The WEF last year identified Mauritius as the third best country when it comes to telecom and internet connectivity costs in its *Global information technology report*. In the coming years, Mauritius's new e-government strategy will include initiatives such as open government data to empower citizens and businesses with data building blocks for data analysis and development of mobile apps, as well as a data sharing policy, which will make it possible for government agencies to capture data once and share it among themselves. The strategy will also include an open source software policy to outline the country's willingness to develop an open source software industry.	e-ID The national e-ID card is chip based smart card. This card is linked to the population database to serve as an ID document, and prove identity and allow secure and reliable e-service transactions. In 2015, the Registrar-General Department (RGD) announced that Mauritius is planning to implement the second phase of its e-registry project (MeRP) to provide e-services and facilitate e-submission of documents, e-payment of fees, e-registration, e-search, and e-delivery of registered documents. According to the World Bank, presently, 99 percent of the population in Mauritius has either has a national ID or a voter ID.	ICT Export Portal, http://ictexport.govmu.org/English/ICT_in_Mauritius/E-Government/Pages/E-government-initiatives-in-Mauritius.aspx http://www.itwebafrica.com/ict-and-governance/386-mauritius/235982-mauritius-has-highest-ict-development-index-in-africa http://www.itwebafrica.com/ict-and-governance/386-mauritius/237677-mauritius-strategises-to-retain-top-e-govt-ranking http://pubdocs.worldbank.org/en/940071497322166382/ID4D-country-profiles-report-final.pdf

Country	General comments on e-governance	ID cards	Sources
Morocco	**eGov Morocco:** the main objective is to use e-governance projects to modernise government agencies and local governments offering services for citizens and businesses. This brings into play ICT to reconfigure the processes in depth, make them more effective, efficient and fully geared towards serving citizens and businesses. There are currently more than 80 operational e-services.	National ID The national ID card is the citizens of Morocco' identification. This is an official document that allows any citizen to prove their identity. The national ID card is in the form of a credit card and it has been claimed to be biometric and provide citizens with a birth certificate, residence certificate and extracts of birth and citizenship certificates.	e-Government Program, http://www.egov.ma/en/vision-and-objectives
Mozambique	The information and communication technology policy for Mozambique was approved by Council of Ministers' Resolution No 28/2000 on 12 December 2000. The information and communication technology policy implementation strategy was approved by the Council of Ministers on 27 June 2002. The **e-government interoperability framework** for Mozambique was published by UTICT in October 2010. The **Mozambique e-government and communications infrastructure project (MEGCIP)** is an initiative funded by the World Bank and implemented by the Government of Mozambique over 6 years (2010-2016). The MEGCIP's main objectives were, first, to support the extension of geographical coverage of data communications networks and reduction of data communication services; and, second, to promote the use of e-governance platforms, applications and services to improve the provision of public services and the participation of citizens in the governance of the country.	National ID Mozambique's national identification is a laminated card with a magnetic strip that contains among other features a unique national ID number, biometrics (fingerprints) and the signature of the user. In 2017, Mozambique was to adopt a unique ID number system to gather together all the data on citizens. With the new system, the numbers on ID cards, driving licences, civil registration and passports will be the same, making it easier to obtain citizens' data.	http://www.ist-africa.org/home/default.asp?page=ictpolicies http://clubofmozambique.com/news/mozambique-adopt-single-electronic-identification-number-system/ Tallinn e-Governance Conference, May 2017, http://2017.tallinnconference.ee/programme/mozambique/

Country	General comments on e-governance	ID cards	Sources
Namibia	The **e-government project** provided a platform from which stakeholders could collaborate to develop the strategic action plan (see link in 'Sources' column) to offer online government services on a 24/7 basis through a 'one-stop shop' for the benefit of citizens, businesses, government institutions and visitors alike. Estimated date of completion: 2018.	National ID The national ID card-based solution contains among other features personal ID number (quasi-logic number), eye colour, biometrics (fingerprints) and a machine readable bar code. The personal ID number contains the cardholder's date of birth written backwards (YYYY-MM-DD), followed by four automatically generated numbers. Namibia is among a few countries in Africa to have digitised the national population register, which is fully integrated, combining the birth, ID, marriage and death registers under one profile. The new e-birth notification system is to be launched in 2017, while the ID track and trace features have been showcased as the first in Africa. The new system will notify the national population registration system as soon as a baby is born.	http://www.gov.na/documents/10181/18040/e-Gov+Strategic+Plan+for+the+Public+Service+2014+to+2018/cce8facc-309d-43cd-ab3d-e5ce714eaf69 http://pubdocs.worldbank.org/en/940071497322166382/ID4D-country-profiles-report-final.pdf https://southernafrican.news/2017/05/08/namibia-among-few-countries-to-implement-digital-ids/
Niger	No initiatives were found.	National ID A paper ID card exists, which does not have any additional security features beyond a gold ink print of the 'Republic of Niger'. The paper ID cards are produced by local commercial printers. Registration is completed manually and maintained in registration books. Although the Ministry of Interior, Public Safety and Decentralisation is responsible for both civil registration and civil identification, the data gathered under these two processes are not harmonised or interoperable.	http://pubdocs.worldbank.org/en/940071497322166382/ID4D-country-profiles-report-final.pdf

Country	General comments on e-governance	ID cards	Sources
Nigeria	The **national e-government strategy (NeGST)** project was designed to reduce the bureaucracy associated with government businesses in the country through the introduction of e-tax, e-learning, e-traffic, e-procurement, e-pricing, e-mail, e-tourism, e-payment, e-revenue, e-legislation, e-policing, e-judiciary, e-health, e-agriculture, e-services, e-kiosk, e-buka (e-cafeteria), etc. Presently the NeGST project has online presence at: http://www.negst.com.ng. Similarly, all the federal ministries are online, and the country has commenced online payment for services in such areas as tax, company registration, online booking, e-banking, etc.	e-ID Nigerian national identification is a microprocessor chip–based general multipurpose ID card, with 13 applications including ID verification, authentication and payment technology to help promote financial inclusion. The chip stores an individual's biometric information of 10 fingerprints and an iris scan. According to the World Bank report of 2017, so far in Nigeria 16 million of the total population of 173.6 million have been registered (i.e. 3.5 %) and 418 000 national e-ID cards issued. MasterCard is providing the prepaid payment element and it hopes that millions of Nigerians without bank accounts will gain access to financial services.	http://eprints.covenantuniversity.edu.ng/81/3/e-Government %20Strategies %20Final %20by %20Ayo %20C. %20K..pdf https://www.dailytrust.com.ng/daily/it-world/49411-from-south-korea-nigeria-takes-in-e-government http://pubdocs.worldbank.org/en/940071497322166382/ID4D-country-profiles-report-final.pdf http://www.bbc.com/news/world-africa-28970411
Rwanda	**RwandaOnline:** this is a project to make all government services available online. The country was expected to have 74 services online by the end of 2107, avoiding long queues of service seekers by using ICT. The 4G internet coverage will cover 95 % of the country by 2017.	e-ID Rwanda's national ID system is one the most advanced and well-functioning in Africa. According to the World Bank, in 2017 over 95 % coverage among the eligible population was achieved. Rwanda's national ID is a secure card with a 2D bar code on the back but without a chip. While there is currently no biometric verification, service providers can access a secure online portal where they can verify identity and biographic data using a person's national ID number. Rwanda is planning soon to introduce an optional multipurpose smart card, among other features enabling biometric verification and machine-readable features. The use of a highly developed system will allow identity to unlock social protection and healthcare programmes and make payments by mobile phone.	https://publicadministration.un.org/egovkb/en-us/Resources/Articles/articleId/50073 http://pubdocs.worldbank.org/en/940071497322166382/ID4D-country-profiles-report-final.pdf http://www.biometricupdate.com/201605/rwanda-to-introduce-new-eid-card

Country	General comments on e-governance	ID cards	Sources
São Tomé and Príncipe	Some early projects are indicated in the 'Sources' column.	National ID National ID cards are not mandatory. The current national ID card is laminated and contains an individual number. The national ID cards and birth certificates are not the same. According to World Bank mapping in 2017, São Tomé and Príncipe is heading for the next generation of national ID cards and planning to upgrade to CivID 2.0 software, which will allow biometric authentication and envisages a contactless chip for new national ID cards. No specific dates are known.	http://www.apdsi.pt/uploads/news/id703/PPT %20 Conferencia %20eGov %20CPLP_São_Tomé_e_Principe.pdf http://pubdocs.worldbank.org/en/940071497322166382/ID4D-country-profiles-report-final.pdf
Senegal	Senegal has an established national policy for ICT and policy for science and technology. ICT initiatives are currently ongoing at national level in the areas of e-government (eSenegal, Universal Service Fund, Social Impact of ICT in Senegal), Digital Divide (multimedia community centres programme, Senegal Observatory on Information Systems, Networks and Info Highways) research (Centre de Recherche et d'Essai Programme, Scan ICT project), e-infrastructures (Grid Computing project, Brain Gain initiative, education and research network, migration from analogue to digital broadcasting project), entrepreneurship (CTIC Dakar ICT incubator) and e-education (Virtual University of Senegal).	e-ID Senegal has been issuing e-ID cards since 2005 and 67 % of the population has either a national ID card or a voter ID card (World Bank report, 2017). The electronic ID card is used for multiple e-services.	http://www.ist-africa.org/home/default.asp?page=ictpolicies http://pubdocs.worldbank.org/en/940071497322166382/ID4D-country-profiles-report-final.pdf
Seychelles	No initiatives were found.	e-ID The national e-ID card can be used for remote transactions and to access the e-services gateway.	http://pubdocs.worldbank.org/en/940071497322166382/ID4D-country-profiles-report-final.pdf

Country	General comments on e-governance	ID cards	Sources
Sierra Leone	In 2016, President Koroma announced an e-governance platform to improve transparency and facilitate access to government services. One of the services created is **Pay No Bribe**, developed in partnership with the United Kingdom. Pay No Bribe is a reporting platform, supported by the UK government, through which citizens can anonymously report incidents of petty corruption and bribery. Citizens can register an incident via a hotline phone number, the Pay No Bribe website or using a mobile app. These data will allow the government of Sierra Leone to monitor public sector corruption trends and use quantitative evidence to design more effective anti-corruption policies and processes.	e-ID According to the Word Bank, Sierra Leone is issuing national e-ID cards with biometric information storing capability. The country is in the process of reforming its civil registration and national ID systems. Sierra Leone aspires to create an integrated national civil registration system, which will enrol the entire population using biometrics, and establish the institutional framework necessary for digital identity. In addition, records will be harmonised with those of the National Election Commission and the National Social Security and Insurance Trust. They are seeking for multi-application smart card.	http://www.publicfinanceinternational.org/opinion/2016/10/sierra-leone-launches-anti-bribery-platform http://pubdocs.worldbank.org/en/940071497322166382/ID4D-country-profiles-report-final.pdf
Somalia	No initiatives were found.	Somalia does not have a single national ID but rather several fragmented identity initiatives including an ID card and passport. The World Bank has recommended setting up a foundational ID system that can be used for multiple services such as banking, government transfers to the poor and other programmes. In 2014, Somalia took another step towards establishing law and order with the launch of two new citizen ID programmes: **a new national ID card and e-passport.**	http://pubdocs.worldbank.org/en/940071497322166382/ID4D-country-profiles-report-final.pdf https://www.hidglobal.com/press-releases/somalia-introduces-new-secure-national-id-and-e-passport-hid-global-and-their

Country	General comments on e-governance	ID cards	Sources
South Africa	The South African government has established statutory bodies to coordinate implementation of e-government projects. Among these are the State Information Technology Agency (SITA) and Government Information Technology Officers Council (GITO Council). SITA is responsible for the acquisition, installation, implementation and maintenance of IT in the public sector. The GITO Council, which consists of national and provincial IT officers, is responsible for consolidating and coordinating IT initiatives in government, including e-governance, to facilitate service delivery. For the South African government, the focus is on G2G (government-to-government), G2BC (government-to-business and citizen) and G2C (government-to-citizen) activities. Improved service delivery is facilitated by building e-governance awareness, being a model user in e-government centres of excellence, working towards one government information and communication channel (one portal, one call centre, etc.) and above all providing expertise on e-services. Among the ICT initiatives are the Cape Gateway project, Cape Innovation and Technology Initiative (CiTi), Telecentres in rural areas in South Africa initiative, SchoolNet South Africa project, Mindset Network and the Khanya project. Other examples include the eNatis online vehicle and transport management system, the e-Justice programme to improve judicial processes, the e-Hanis programme to streamline and integrate personal identification data across government departments through the use of unique identifiers and the National Automated Archival Information Retrieval System (NAAIRS) to facilitate access to public archived records.	e-ID In February 2015, the government of South Africa set up a pilot to roll out the national smart ID card in collaboration with the country's banks. The smart ID roll-out is expected to be a 7-year long process. Some of the goals of the digitisation project launched in 2016 by the Minister of Home Affairs, Mr Malusi Gigaba, are: — 5.8 million birth records to be digitised per year; — records will be indexed by ID number for easy retrieval; — immediate access to a digitised document irrespective of office location; — electronic records can be viewed/accessed by more than one person simultaneously.	https://www.dtps.gov.za/index.php?option=com_phocadownload&view=category&id=22:national-integrated-ict-policy-green-paper&Itemid=106 or https://www.dtps.gov.za/index.php?searchword=ict-policy-review-supplementary-insights-eservices&searchphrase=all&Itemid=101&option=com_search http://pubdocs.worldbank.org/en/940071497322166382/ID4D-country-profiles-report-final.pdf http://citizenshiprightsafrica.org/south-africa-minister-malusi-gigaba-launch-of-digitisation-of-birth-records/
South Sudan	No initiatives were found.	e-ID South Sudan launched official passports and ID cards in 2012. The national e-ID card is a bar code card that contains biometric (fingerprint) and biographic information, and it is presently used for civil and voting purposes.	http://pubdocs.worldbank.org/en/940071497322166382/ID4D-country-profiles-report-final.pdf http://www.sudantribune.com/South-Sudan-launches-passports-and,41183

Country	General comments on e-governance	ID cards	Sources
Sudan	A digital government initiative was recently launched. The ministry also announced completing a communication network that is expected to host about 1 000 e-services, which will be launched by the end of 2018. Sudan is on track to achieve this, with dozens of ministries, government departments and the private sector being gradually computerised. Public services have seen a substantial upgrade, with processing being made easier through integrated technology. The e-governance portal has processed large amounts in government fees in its first year — funds collected by the system have been estimated at about 1 billion dollars. One quarter million Sudanese students and citizens were able to gain access and benefit from public electronic services for universities, a statistic confirming that electronic operations are going smoothly.	e-ID Sudan began issuing electronic passports to its citizens in May 2009; the e-passport contains a microprocessor chip that contains the holder's information in addition to fingerprints. In 2011, Sudan started implementing a new civil registry procedure. According to the International Refugee Rights Initiative (IRRI), an organisation that promotes human rights during displacement and conflict situations (IRRI, n.d.), this procedure was introduced in May 2011 and is 'required for all residents and citizens'.	https://english.aawsat.com/saif/business/e-government-sudan-project-yields-1-bln-six-months http://pubdocs.worldbank.org/en/940071497322166382/ID4D-country-profiles-report-final.pdf
Swaziland	The Government of Swaziland has been user-friendly since July 2016, following the launch of e-governance that will enable people to make payments using credit and debit cards. Government transactions can be processed from anywhere at any time without having to go to offices. This followed the introduction of a point of sales facility that allows debit and credit card to be used when paying for government services. The country also boasts an e-health strategy comprising a client management information system, which was introduced early in 2017 in accordance with the World Health Assembly resolution of 2005.	National ID National identification, issued since 2000-2001, is an electronic ID card that captures a user's biometric information, which is saved in a database and used for deduplication.	http://mobile.apanews.net/en/news/swaziland-launches-e-government http://pubdocs.worldbank.org/en/940071497322166382/ID4D-country-profiles-report-final.pdf

Country	General comments on e-governance	ID cards	Sources
Tanzania	The e-government strategy was put in place in September 2012. The e-Government Agency is responsible for the design and implementation of ICT-enabled public services at a local and national level. The digital infrastructure in Tanzania has improved significantly with the fibre-optic network, investment in local internet exchange points, migration to IPv6 and construction of the National ICT Backbone (NICTBB), which is over 95 % complete. NICTBB connected to SEACOM in July 2009 and the Eastern Africa Submarine Cable System in April 2010. There is extensive use of VSAT internet (via satellite), GSM, 3G, 4G, LTE and microwave. The government has introduced a universal communication fund to facilitate telecommunications in rural areas. The cost of connectivity is very high in Tanzania, which creates barriers to the spread and use of the internet, as a major vehicle for the transfer of data and access to information. Many higher education institutions use VSAT for bandwidth internet. The Tanzania Education Research Network was established in 2008. Progress to date has been gradual and incremental.	e-ID The biometric national ID project was launched in 2011 with the aim of providing all citizens, legal residents, and refugees who are over 18 years old (approximately 25 million) with contactless multipurpose smart cards having an 80 KB capacity. E-ID as a smart card serves as a driver's license and enable digital payments. From 2013 to 2015, 6.3 million residents were registered and approximately 2.7 million of them received their national ID cards. Tanzania introduced electronic identification cards for its citizens as a way to prevent voter fraud ahead of its 2015 general elections.	http://www.ist-africa.org/home/default.asp?page=doc-by-id&docid=4324 http://pubdocs.worldbank.org/en/940071497322166382/ID4D-country-profiles-report-final.pdf http://news.trust.org//item/20130227092500-jm6av/
The Gambia	No initiatives were found.	National ID In 2009, The Gambia introduced a new biometric national identity, which is a chip-based smart card with biometric and biographic information, and captures two thumbprints. The Gambian government introduced biometric electronic passport, **Gambian e-passport**, in 2014.	http://pubdocs.worldbank.org/en/940071497322166382/ID4D-country-profiles-report-final.pdf ZETES case study, http://peopleid.zetes.com/en/reference/gambian-e-passport

Country	General comments on e-governance	ID cards	Sources
Togo	Since the year 2012, when the Togolese government adopted a proposition from the then Post and Telecommunications Ministry — now Post and Digital Economy Ministry — to modernise the public sector, its commitment to an efficient and more citizen-centred public administration has not changed. The e-government project in Togo has been divided into two phases. Phase 1 was launched in March 2015 and consisted of connecting 500 administrative sites with fibre optics over a 1-year period. These administrative sites include ministries, government agencies, public and private institutions, hospitals and schools. Now the Togolese government boasts an online presence for almost all its ministries, institutions and government agencies. Other projects have subsequently been put in place to address the problems of access divide and to ensure citizens' adoption of online services. — **Helim Zone project:** this project consists of providing affordable WiFi hotspots in major towns and cities of the country. — **Bluezone Togo:** this project is one of the major breakthroughs in providing internet access for all in Togo. — **e-village project:** this project consists of putting at the disposal of villages' chiefs and remote communities' leaders a number of free mobile phones with a monthly credit allowance.	National ID This has been issued since 2006 and is not an electronic ID card, but rather a plastic card with a personal ID number and a tamper-proof seal. These replace the old paper ID document, which was larger. The national ID cards are not mandatory and it is estimated that fewer than 10 % of all Togolese citizens have one. Starting in 2015, Togo started to issue biometric voter's cards.	https://unpanelearning.wordpress.com/2016/03/21/ensuring-e-government-uptake-through-internet-access-for-all-in-togo/ Contractor ZETE case study 2015, http://peopleid.zetes.com/en/reference/biometric-voter-registration-togo http://pubdocs.worldbank.org/en/940071497322166382/ID4D-country-profiles-report-final.pdf

Country	General comments on e-governance	ID cards	Sources
Tunisia	To make the use of ICTs more widespread, the Tunisian government has initiated two major initiatives. It encouraged Tunisian companies to use ICTs to increase their productivity and created specialised research centres and technology parks to strengthen the existing synergy between educational institutions and the private sector. These measures led to the successful widespread use of ICTs as a development tool, improving national productivity and yielding the emergence of new high-added value exportable goods (digital products). In 2000, the Tunisian government created the National Agency for Computer Certification in charge of setting the legal framework that will govern Tunisian digital activities. This entity was instrumental in the quick implementation (as early as 2001) of the electronic signature and e-payment process and the creation of the digital Tunisian dinars (e-dinar), a virtual currency. **e-Governance:** the implementation of Tunisian e-governance followed two steps: (1) creation of a governance structure; (2) definition of a long-term strategy (2009). In the Tunisian case, the first step was to establish trust by enacting the appropriate rules and regulations; in this way, all involved got a clear view of the direction they were being asked to follow and, with the proper guarantees covered by existing laws, the transition to a digital mode of operation presented very little risk.	e-ID Tunisian officials had launched an electronic ID card and moved to biometric passports by the end of 2016.	https://www.academia.edu/12758974/The_success_factors_of_e-government_strategy_in_North_Africa_A_comparative_study_between_Algerian_and_Tunisian_digital_strategy

Country	General comments on e-governance	ID cards	Sources
Uganda	An e-government masterplan has been put in place to guide e-governance implementation over the next 5 years. Uganda is currently implementing ICT-related initiatives in the areas of e-infrastructure (Research and Education Network Uganda, Broadband Services ERT programme, National Backbone, Migration from Analogue to Digital Broadcasting project, e-Network project), e-government (electronic government infrastructure, voter registration, national ID cards project, ICT4Democracy in East Africa project), technology-enhanced learning (Connect Ed project, National Curriculum Development Centre, VSAT project, SchoolNet Uganda, content development at national teacher's colleges, Connecting Classrooms project, Improving Learning Outcomes through ICT project, ITELE for ICT project, Helping teachers use ICT for Teaching project), e-health (improving healthcare delivery, Healthy Child Uganda project, electronic rural health information project, malaria diagnostic systems project), e-commerce (district business information systems, Reflect ICT resource centre, village phone Project), ICT for rural development and entrepreneurship (Microsoft Innovation Centre).	e-ID The national ID card is a secure card without a chip. According to the World Bank, in 2017, biographic verification services were planned. In addition, consolidation of data into a single social registry that will use unique identifiers based on e-identification and biometric verification will be implemented.	http://www.ist-africa.org/home/default.asp?page=doc-by-id&docid=2879 http://pubdocs.worldbank.org/en/940071497322166382/ID4D-country-profiles-report-final.pdf
Zambia	President Edgar Lungu launched in 2015 the e-government division, which he said will contribute to reducing transaction costs and improve productivity. The country's aim is to leverage on e-governance to increase productivity and reduce the cost of doing business by having a centralised and standardised government ICT infrastructure.	e-ID Since 2013, the Zambian government has issued a national registration card, which today is a low-tech national ID card that captures among other features biometric information (right thumbprint) on a chip. More than 83 % of the eligible population aged over 16 years has national e-ID cards. The project for launching the upgrading of national e-ID cards was sponsored by UNDP.	https://www.lusakatimes.com/2015/10/22/president-lungu-launches-e-government-division/ http://pubdocs.worldbank.org/en/940071497322166382/ID4D-country-profiles-report-final.pdf https://www.lusakatimes.com/2013/05/23/government-to-introduce-new-national-registration-cards-next-month/

Country	General comments on e-governance	ID cards	Sources
Zimbabwe	The Zimbabwe government is implementing its e-governance programme as part of the public sector reforms to re-engineer, re-invigorate and modernise public sector systems and processes to improve service delivery (speed, access, efficiency, effectiveness and affordability) to the people using ICTs. The implementation of the e-governance programme brings convenience to the people, as these are anytime and anywhere services. The implementation of the programme commenced in 2011 and progress has been made. **ZimConnect** is a Ministry of ICT online service that was launched in 2016 to provide people with an online alternative for accessing some state services. The site, which is fairly simple to use, offers a number of services that include visa applications, company registration, corporate name changing, deeds searching, processing of investment and mining licences, as well as licensing local government services such as operating a liquor store.	National ID Zimbabwe's national ID card has a bar code with biometric information (thumbprint) and contains security features such as a hologram, watermark and invisible personal information coded on the photo. Individuals have access to the Zimbabwe Population Registration System for acquiring data on registrations of births, deaths, national ID numbers, marriages, voting, passports and cattle brands. Biometric voter registration started in March 2017. It captures voters' unique biometric features, specifically fingerprints and facial imaging, which will be recorded in a database. However, the Zimbabwe Electoral Commission has announced that there will be no biometric voting or any form of electronic voting in 2018 and that the biometric system being put in place is strictly for registration.	http://www.zim.gov.zw/implementation-e-government-programme-zimbabwe https://www.techzim.co.zw/2016/03/zimbabwes-e-government-takes-shape-country-introduces-online-company-registration-licensing/ https://www.techzim.co.zw/2017/01/zimbabwe-rules-biometric-voting-2018-elections-electronic-system-registration/

Annex 3 — Statistics on infrastructure indicators ([100])

Country	Fixed broadband connections (per 100 people, 2015)	Fixed telephones (per 100 people, 2015)	Mobile phones (per 100 people, 2015)	Investments in telecoms with private participation (current USD, 2014)	Secure internet servers (per 1 million people, 2016)
	1	**2**	**3**	**4**	**5**
Algeria	5.58	8	106	742 340 000	4
Angola	0.67	1	61	0	5
Benin	0.67	2	86	51 000 000	3
Botswana	1.79	8	169	0	25
Burkina Faso	0,04	0	81	43 000 000	1
Burundi	0.03	0	46	0	1
Cape Verde	3.26	11	119	0	59
Cameroon	0.07	5	72	467 000 000	2
Central African Republic	0.013 (2012)	0	26	0	1
Chad	0.08	0	40	29 000 000	0
Comoros	0.26	2	55	N/A	1.349 (2013)
Congo	0.011 (2014)	0	112	19 500 000	2
Democratic Republic of the Congo	0	0	53	246 500 000	0
Côte d'Ivoire	0.52	1	119	195 200 000	5
Djibouti	2.69	3	35	N/A	7
Egypt	4.52	7	111	1 065 770 000	5
Equatorial Guinea	0.48	1	67	N/A	3
Eritrea	0.003 (2014)	1	7	0	N/A
Ethiopia	0.48	1	43	0	0
Gabon	0.63	1	161	15 700 000	18
Ghana	0.27	1	130	51 000 000	6
Guinea	0.01	0	87	62 000 000	0
Guinea-Bissau	0.06	0	69	10 000 000	2 (2015)
Kenya	0.29	0	81	417 000 000	11
Lesotho	0.1	2	101	0	5
Liberia	0.16	0	81	0	4
Libya	0.97	10	157	N/A	4
Madagascar	0.1	1	44	26 000 000	2
Malawi	0.03	0	38	56 000 000	2
Mali	0.02	1	140	75 000 000	2
Mauritania	0.24	1	89	0	3

([100]) http://data.worldbank.org/indicator; https://publicadministration.un.org/egovkb/Data-Center; https://www.itu.int/net4/ITU-D/idi/2016; http://reports.weforum.org/

Country	1	2	3	4	5
Mauritius	15.75	30	141	0	187
Morocco	3.38	7	127	881 380 000	7
Mozambique	0.16	0	74	0	2
Namibia	2.94	8	107	0	26
Niger	0.06	1	46	26 200 000	0
Nigeria	0.01	0	82	1 357 000 000	3
Rwanda	0.17	0	70	0	6
São Tomé and Príncipe	0.49	3	65	0	10 (2015)
Senegal	0.67	2	100	86 000 000	5
Seychelles	14.31	23	158	0	465
Sierra Leone	N/A	0	90	9 300 000	1
Somalia	0.74	0	52	0	0
South Africa	2.63	8	165	1 240 000 000	125
South Sudan	0	0	24	8 000 000	0
Sudan	0.07	0	71	301 000 000	0
Swaziland	0.47	3	73	0	16
Tanzania	0.2	0	76	108 400 000	2
The Gambia	0.18	2	138	0	5
Togo	0.88	1	68	26 000 000	7
Tunisia	4.34	8	130	113 740 000	13
Uganda	0.18	1	50	132 800 000	2
Zambia	0.15	1	74	39 000 000	5
Zimbabwe	1.09	2	85	129 500 000	8

Annex 4 — Taxation websites analysis outcome in African countries

Ranking on a scale from 0 to 5, with 5 being the best possible mark, is based on analysis of the following indicators:

- whether the tax administration has a designated website;
- whether this site looks easy to navigate and has a lot of content and how it is displayed;
- whether it is possible to provide information online, to download forms and to ask for and/or send information electronically, thus the level of interactivity.

Country	Taxation website (no/yes/partly)		Easy to navigate/a lot of content/ how displayed	Online tools and options	Alternative sites
Algeria	Yes	http://www.mfdgi.gov.dz/index.php	3	2	
Angola	Yes	http://www.agt.minfin.gv.ao/portalat/faces/institucional	4	2	
Benin	Partly	No specific tax office website available, but government website does contain some information on taxation	3	1	http://gouv.bj/ (government website) http://benin.eregulations.org/ (online platform)
Botswana	Yes	http://www.burs.org.bw/#	5	2	
Burundi	Yes	https://www.obr.bi/index.php http://41.79.226.26/asycudaworld/ (online platform)	1	1	
Burkina Faso	Yes	http://www.impots.gov.bf/	1	1	
Cape Verde	Yes	https://www.mf.gov.cv/index.php	4	2	
Cameroon	Yes	http://www.impots.cm/index.php?page=accueil&hl=en_US http://teledeclaration-dgi.cm/modules/Common/Account/Login.aspx?s=t (online platform)	3	3	
Central African Republic	No		0	0	http://www.rca-gouv.net/ (government website)
Comoros	Yes	http://www.finances.gouv.km/v1/	1	0	
Congo	No		0	0	
Democratic Republic of the Congo	Yes	http://www.dgi.gouv.cd/	3	1	
Côte d'Ivoire	Yes	http://www.dgi.gouv.ci/site/index.php?p=accueil	4	4	https://www.e-impots.gouv.ci/
Djibouti	No		0	0	
Egypt	Yes	http://www.incometax.gov.eg/	1	1	
Equatorial Guinea	No		0	0	http://www.guineaecuatorialpress.com/index.php
Eritrea	No		0	0	
Ethiopia	Yes	http://www.erca.gov.et/ https://etax.revenue.gov.et/remote/login?lang=en	3	3	
Gabon	No		0	0	
Ghana	Yes	http://www.gra.gov.gh/	5	2	

Country	Taxation website (no/yes/partly)		Easy to navigate/a lot of content/ how displayed	Online tools and options	Alternative sites
Guinea	No		0	0	http://www.presidence.gov.gn/ (government website)
Guinea-Bissau	No		0	0	http://www.guinebissaurepublic.com/ (government website)
Kenya	Yes	http://www.kra.go.ke/	5	5	
Lesotho	Yes	http://www.lra.org.ls/	5	3	http://ecustoms.lra.org.ls:81/ (customs portal)
Liberia	No		0	0	
Libya	No		0	0	
Madagascar	Yes	http://www.impots.mg/en https://entreprises.impots.mg/teledeclaration/index.php (online platform)	5	5	
Malawi	Yes	http://www.mra.mw/	4	4	
Mali	No		0	0	http://www.primature.gov.ml/ (government website)
Mauritania	No		0	0	
Mauritius	Yes	http://www.mra.mu/ https://eservices15.mra.mu/taxportal/taxpayerlogin.jsp (online platform)	5	5	
Morocco	Yes	https://portail.tax.gov.ma/wps/portal/DGI/Accueil	4	3	
Mozambique	Yes	http://www.at.gov.mz/por	4	2	
Namibia	Yes	http://www.mof.gov.na/home	4	1	
Niger	Yes	http://www.impots.gouv.ne/	2	0	
Nigeria	Yes	http://www.firs.gov.ng/Pages/Default.aspx	3	3	
Rwanda	Yes	http://www.rra.gov.rw/ https://etax.rra.gov.rw/ (online platform)	5	4	
São Tomé and Príncipe	No		0	0	http://www.saotome.st/index.php (government website)
Senegal	Yes	http://www.impotsetdomaines.gouv.sn/fr https://csfe.dgid.sn/etax/faces/login.jspx?_afrLoop=478098612316162&_afrWindowMode=0&_adf.ctrl-state=srt4qsldo_4 (online platform)	4	4	

Country	Taxation website (no/yes/partly)		Easy to navigate/a lot of content/ how displayed	Online tools and options	Alternative sites
Seychelles	Yes	http://www.src.gov.sc/Default.aspx https://eservice.egov.sc/egateway/homepage.aspx (online platform)	4	3	https://eservice.egov.sc/BizRegistration/WebBusinessRegsitration.aspx (business registration website)
Sierra Leone	No	http://nra.gov.sl/ (under construction)	0	0	
Somalia	No		0	0	http://mof.gov.so/en/
South Africa	Yes	http://www.sars.gov.za/Pages/default.aspx http://www.sarsefiling.co.za/ (online platform)	5	4	
South Sudan	No		0	0	Government websites: http://www.goss-online.org/about.html (archived website) http://www.goss.org/cgi-sys/suspendedpage.cgi (supposed new website)
Sudan	No		0	0	
Swaziland	Yes	http://www.sra.org.sz/index.php https://etax.sra.org.sz/	5	5	
Tanzania	Yes	http://www.tra.go.tz/index.php	5	5	
The Gambia	Yes	http://www.gra.gm/	4	1	
Togo	No		0	0	
Tunisia	N/A	http://www.tunisie.gov.tn/index.php?lang=english (currently unavailable)	N/A	N/A	
Uganda	Yes	https://www.ura.go.ug/	4	4	
Zambia	Yes	https://www.zra.org.zm/main.htm?actionCode=showHomePageLnclick	3	2	
Zimbabwe	Yes	http://www.zimra.co.zw/ http://efiling.zimra.co.zw/Pages/default.aspx (online platform)	4	4	

Annex 5 — Data protection legislation in Africa

Countries not mentioned in the list do not have specific data protection legislation.

Angola

- Data protection law exists (specifically and for ICT services) and is moderately enforced, Data Protection Law (Law no 22/11 of 17 June 2011) and Electronic Communications and Information Society Services Law (Law no 23/11 of 20 June 2011).

Benin

- Personal Data Protection Act Law no 2009-09 of 22 May 2009 on the framework of protection of personal data.

Burkina Faso

- Law on the Protection of Personal Data, 2004 (one of the earliest in Africa).

Cape Verde

- Data protection law exists and is moderately enforced, Data Protection Law (Law no 133/V/2001 (as amended by Law no 41/VIII/2013) and Law no 132/V/2001, of 22 January 2001.

Comoros

- Data protection law exists (since 2014).

Côte d'Ivoire

- Protection of Personal Data Law, 2013.

Egypt

- No special data protection law but various provisions in different laws and regulations as well as constitutional provisions on right to privacy.
- A law on freedom of data exchange and data protection has been drafted and is in the process of being adopted.
- Civil code governs the collection, use and processing of personal data.
- Penal code imposes criminal punishment for unlawful collection of images or recordings of individuals in private places.
- Specific provisions in the Labour Law, Banking Law, Civil Status Law, Regulations of Mortgage Finance Law, Telecommunications Law and Physicians' Code of Ethics.

Gabon

- Data protection legislation exists and a data protection commissioner has been appointed. Moderate enforcement.

Ghana

- Data protection legislation exists and is moderately enforced — Data Protection Act, 2012 (Act no 843).

Kenya

- Data Protection Bill, 2013 (not yet adopted).

Lesotho

- Data protection legislation exists — Data Protection Act — and a Data Protection Commission has been established.
- The right to privacy is recognised and protected in the Constitution of the Kingdom of Lesotho.

Madagascar

- Data protection law exists and is enforced to some extent — Law no 2014-038 relating to protection of personal data (16 December 2014, promulgated by the President in January 2015 and was expected to enter into full force in 2017).

Mali

- Data Protection Law adopted in 2015; data protection authority inaugurated in 2016.

Mauritius

- Data protection law exists and is enforced to some extent — the Data Protection Act 2004 (enacted on 1 July 2004, partially in force December 2004 — fully in force February 2009). The Act is largely based on Directive 95/46/EC.
- Member of the Council of Europe Data Protection Convention.

Morocco

- Data protection legislation exists and is enforced — Law no 09-08 of 18 February 2009 relating to protection of individuals with regard to the processing of personal data and its implementation — Decree no 2-09-165 of 21 May 2009.

Nigeria

- No special data protection legislation, but constitutional protection of privacy and some different laws.
- Industry-specific and targeted laws and regulations that provide some protection, such as the Child Rights Act, the Immigration Act, the Consumer Code of Practice Regulations issued by the Telecommunications Regulator (NCC) and other regulations by NCC as well as the Cybercrimes Prevention Act.
- Freedom of Information Act, 2011 protects personal privacy.
- The agency for ICT, NITDA, issues guidelines for organisations that obtain and process personal data.
- The National Identity Management Commission, which establishes, operates and manages the National Identity Management System (and operates a national identity database), has data protection provisions.

Senegal

- Data protection legislation exists and is moderately enforced. A Data Protection Commissioner exists (http://www.cdp.sn).
- Member of the Council of Europe Data Protection Convention.

Seychelles

- Data protection legislation exists but is not enforced — the Data Protection Act (enacted in 2003 but not enforced until 2015).

South Africa

- Data protection legislation exists and is moderately enforced — the Protection of Personal Information Act of November 2013 (partially in force), which introduces an overarching regulatory framework for the processing of personal information. The Act provides for the establishment of an Information Regulator (established 2016) tasked with monitoring compliance with, and enforcement of, the law.

- The right to privacy is recognised and protected as a fundamental human right in the Bill of Rights of the Constitution of the Republic of South Africa.

Tanzania

- Data Protection Bill, 2013 (not adopted as law until present).

The Gambia

- Information and communication Act, 2009.

Tunisia

- Data protection legislation exists (modelled on Directive 95/46/EC) and is moderately enforced. A Data Protection Commissioner exists (www.inpdp.nat.tn).

- Member of the Council of Europe Data Protection Convention.

Uganda

- Data Protection and Privacy Bill, 2014 (not yet adopted).

Zimbabwe

- The Access to Information and Protection of Privacy Act (Chapter 10:247) contains provisions on data protection only for the use of personal data by public bodies.

- The protection of privacy is enshrined in Zimbabwe's constitution.

- Other laws include the Courts and Adjudicating Authorities (Publicity Restrictions) Act, the Census and Statistics Act, the Banking Act, the National Registration Act and the Interception of Communications Act.

- In August 2016 a revised ICT policy was adopted according to which the establishment of an institutional framework for enacting legislation dealing specifically with digital data protection matters and cybersecurity is anticipated.

Annex 6 — Narrative to categorisation of African countries

In addition to a narrative, this annex also provides justification for moving the countries from one group to another. The upgrading or downgrading is based on our expert analysis and experts' personal experience of the country in question. The results of upgrading or downgrading are presented in the form of a table below, listing the key positive and negative elements that affected the upgrading or downgrading from one group to another ([101]).

A6.1 Group 1

A6.1.1 Botswana

Botswana is no 8 in the UN E-Government Development Index, no 9 in the ITU ICT Development Index and no 11 in the WEF Network Readiness Index. It is not featured in the ITU Review of National Identity Programmes. About 72 % of births are registered. According to World Bank data, the level of fixed broadband and fixed telephony is low, as is typical in Africa, even if it is a bit higher than average (1.79 fixed broadband connections and 8 fixed telephones per 100 people). Mobile penetration is very high with 169 per 100 people. The number of secure internet servers is also high. The time needed to start a business or deal with regulations is average to high, according to World Bank data. However, Botswana is regarded as one of the least corrupt and best-governed countries in Africa. The country has undertaken some e-governance activities. As for our selected test case of the tax office, it has a professional website that is easy to use: it contains a lot of information for private individuals and businesses about various forms of taxation, and it provides many forms for download. It provides an online portal for private individuals and businesses to log onto, including online tax registration.

A6.1.2 Cape Verde

Cape Verde is no 6 in the UN E-Government Development Index and the ITU ICT Development Index and no 7 in the WEF Network Readiness Index. It is not featured in the ITU Review of National Identity Programmes. About 91 % of births are registered. Cape Verde has undertaken several activities with a view to introducing e-governance, including contact with eGA. There is a designated body for e-governance. The tax office website contains a lot of downloadable forms and some (albeit rather limited) information, but no online platform appears to be available. Data protection legislation exists.

A6.1.3 Egypt

Egypt is no 7 in the UN E-Government Development Index and the ITU ICT Development Index and no 9 in the WEF Network Readiness Index (see Annex 8). Its government-issued national ID card is featured in the ITU Review of National Identity Programmes. The UN Children's Fund (Unicef) does not include any data on birth registration in Egypt. According to World Bank data, the level of fixed broadband and fixed telephony is quite low, but considerably higher than in most parts of sub-Saharan Africa (4.52 fixed broadband connections and 7 fixed telephones per 100 people); the mobile penetration is very high with 111 per 100 people. The number of secure internet servers (see Annex 3) is quite low. As for the time needed to start a business or deal with regulations, the numbers are lower than average, according to World Bank data. Some data protection provisions exist, even without one designated law. The political turmoil in recent years in Egypt has affected administration, but reforms are proceeding, including in the sphere of e-governance.

([101]) This information — in table format — is included only for countries that are placed in a group other than that for which the quantitative data would appear to place them.

A6.1.4 Ghana

The tax office website is of high quality, containing quite a lot of information about taxation, as well as downloadable forms and an online tax registration platform, and accessible ways to contact the office including a Facebook page. Data protection legislation exists.

A6.1.5 Kenya

The political situation in Kenya, in autumn 2017, was dominated by elections: the supreme court annulled the original presidential election as not in accordance with legislation; a new election was scheduled, but some opposition supporters boycotted it, clashes became violent, and voting was postponed in five areas. In the run-up to the election, an election official who had been responsible for ICT use was found murdered and showing signs of torture. The resulting extraordinary situation rendered regular discussion of reforms difficult. However, Kenya has gone quite far in its introduction of e-governance, not least at the regional level, for example some provinces have focused not just on introducing services but also on teaching IT skills to vulnerable groups.

A6.1.6 Mauritius

Mauritius holds the top positions in the UN E-Government Development Index, the ITU ICT Development Index and the WEF Network Readiness Index. It is not featured in the ITU Review of National Identity Programmes, nor are there any data in the Unicef index on birth registration. Mauritius has had contact with eGA and held various events on the topic of e-governance. The country has data protection legislation and has joined the Council of Europe Convention on Data Protection.

A6.1.7 Morocco

Morocco is no 4 in the UN E-Government Development Index, no 5 in the ITU ICT Development Index and no 4 in the WEF Network Readiness Index — thus it is well within the top 10 of all indexes. Its electronic national ID card is featured in the ITU Review of National Identity Programmes. About 94 % of births are registered. e-Governance in Morocco is advanced and efforts are made to popularise services. For example, an annual reward is handed out for best e-governance service. Data protection legislation exists.

A6.1.8 Namibia

In a bilateral project with Estonia, Namibia has implemented a system of interoperable databases modelled on the Estonian X-road. The prime minister's office includes a designated office for e-governance. The necessary legislation is being developed to include sub-legal Acts to introduce an interoperability system, which is functioning and to which various services can be added. In the various indexes, Namibia is within or just near the top 10. The implementation of services is under way. The tax office website looks quite good, and information is available regarding taxation, including downloadable forms, but as yet there is no online platform and limited potential to make contact electronically.

A6.1.9 Rwanda

Rwanda is one of the fastest developing countries in Africa, both economically and in terms of administration reforms, even though the status of democracy is somewhat precarious. Procedures for starting businesses are less cumbersome than in many African countries. The tax office website is easy to use; it includes many kinds of information, numerous downloadable forms, an online platform for tax registration and a chat service for resolving questions. In addition, the RwandaOnline project aims to offer all government services online; the goal for year-end 2017 was 74 online services. Also by year-end 2017, 4G internet coverage was estimated to be 95 % of the country. Rwanda ranks highly in international indexes (Networked Readiness Index no 5; Importance

of Government Vision of the Future Index 5.8 (highest rank), ICT Laws Index 4.7 (highest rank) and no 19 in the UN E-Government Development Index).

A6.1.10 Seychelles

Seychelles is no 5 in the UN E-Government Development Index, no 2 in the ITU ICT Development Index and no 3 in the WEF Network Readiness Index — thus well within the top 10 of all indexes. It is not featured in the ITU Review of National Identity Programmes. The Unicef registry contains no data on registration of births. The country has data protection legislation, although it is not fully enforced.

A6.1.11 South Africa

South Africa is no 3 in the UN E-Government Development Index and no 2 in the ITU ICT Development Index and the WEF Network Readiness Index. It is not featured in the ITU Review of National Identity Programmes. About 85 % of births are registered. The legislative environment in South Africa operates at a high level, including legislation on digital transactions and data protection.

A6.1.12 Tunisia

Tunisia is no 2 in the UN E-Government Development Index, no 4 in the ITU ICT Development Index and no 6 in the WEF Network Readiness Index — thus well within the top 10 of all indexes. It is not featured in the ITU Review of National Identity Programmes, although it does have digital signatures. As for birth records, 99 % of births are registered. Tunisia is well advanced in terms of having many digital solutions, but it has struggled with ensuring that its digital services are used to a greater extent. One problem is that many different ID codes are used in the country, making use of a single digital identity more complex. The country has a designated office for e-governance. Data protection legislation exists. Several projects and events have been organised for e-governance, and there are academic and professional training initiatives on e-governance.

A6.2 Group 2

A6.2.1 Tier 1

Algeria

Algeria has launched various plans for to introduce e-services, but the deadlines for implementation have not been met and not many services are available (please see Annex 2). A biometric ID card was launched in 2016 ([102]). Birth registration is universal. The tax office website is quite good website with some possibilities for download but apparently no online interactivity. Algeria is ranked quite low in the UN E-Government Development Index (no 24), but it is higher in the ITU ICT Development Index (no 8) and the WEF Network Readiness Index (no 18). The legal framework is not developed, i.e. no data protection legislation is in place and its ranking on the ICT Laws Index is quite low (2.8).

Benin

Benin does not score highly in the various indexes, but the country has some e-governance initiatives. No specific tax office website is available, but a good government website includes information on taxation, and there is a form of online platform without interactivity but with information about where to go, what forms are needed, etc., for different government procedures. This information is well outlined. The plans both for e-governance services and internet access are good and some contacts have been established in the sphere. Benin is regarded as one of the more stable democracies in its region.

([102]) http://www.gemalto.com/govt/customer-cases/new-national-identity-card-algeria

Lesotho

Lesotho ranks near the centre of most indexes. However, it does have an e-government infrastructure project as well as a project to implement national identification for the whole population and a system of e-passports. The tax office website looks very good, with a lot of information available about taxation and registering businesses, as well as many forms and other tools available to download. An online platform is available but seemingly only for customs. Data protection legislation exists.

Nigeria

Nigeria has a national ID card as well as other forms of identification, including online identification. An ambitious national e-government strategies (NeGST) project was launched to reduce bureaucracy and link a range of services. All federal ministries are online and the country has commenced online payment for services**.** The tax office website looks good, with downloadable forms, although it is somewhat lacking in information and some pages show only an error message. It does link to different online platforms — for tax payment, registration, etc. — providing several alternatives for each one. Nigeria is near the middle of the indexes but in the upper half. Data protection provisions exist but are not designated by law.

Swaziland

Swaziland claims to have introduced e-government in 2016, although the range of available services appears to be limited. An e-health project began in 2015. The tax office website looks very good, contains downloadable forms and many kinds of information that is easy to find, for both businesses and private individuals. An online platform allows tax returns to be filed online. Contact information is readily available, and it looks easy to ask questions, even providing a link to a professional-looking Facebook page. All questions posed on the Facebook page seem to be swiftly replied to, and the page states that typically messages will be replied to within a few hours. In the various indexes, Swaziland mostly falls in the upper half.

Tanzania

Tanzania has had an e-governance strategy since 2012, and there is a designated agency responsible for e-governance. The country is no 15 on the UN E-Government Development Index but much lower on the ITU and WEF indexes. The tax office website looks good, with many forms available to download. It provides some form of online portal that seemingly provides the ability to file tax returns online and provides information for private individuals and business entities, including information on how to register a business. To accomplish this seems to require physically going to various governmental agencies. Although internet access has improved recently, the cost of connectivity is very high, which makes e-services less accessible and attractive.

Uganda

Uganda has an e-governance master plan in place as well as range of planned reforms to improve the accessibility and uptake of ICT. The country has a wide range of ideas for services that could involve e-governance, but implementation has been limited, although contacts have been made and work is in progress. Uganda ranks no 13 on the UN E-Government Development Index but is somewhat below average on the other indexes and ranks quite low in mobile phone subscriptions by African standards (50 per 100 people). The tax office website looks good: it provides an online portal for both individuals and businesses, provides many downloadable forms, contains a lot of information about various forms of taxation for individuals and business entities and provides easy ways to submit questions online.

Zimbabwe

Despite a precarious economic and political situation, the country has been successful in making various reforms, including implementation of e-governance as part of public administration reform (since 2011). A system called ZimConnect, started in 2016, allows access to various online services. The tax office website looks good, with a lot of information available, downloadable forms and a platform for filling tax returns online and submitting questions. Biometric voter registration began in 2017. In terms of indexes, the country comes near the middle. Data protection exists.

A6.2.2 Tier 2

Angola

Angola tends to be ranked in the middle of the various indexes. The country started introducing a new ID system in 2015, although it does not have an electronic ID system ([103]). The tax office has a good website with a decent proposed taxpayer portal, which was apparently still under construction. Data protection legislation exists.

Burkina Faso

The country has plans for digitisation and e-services, partly with World Bank support, but few concrete projects have been established. A biometric voter's card exists. The country ranks rather low on most indexes. A simple tax office website provides a decent amount of information about taxation and downloadable forms. It does not seem to have any online platform. The country has been the victim of recent terror attacks.

Côte d'Ivoire

Few e-governance services are available, although there is an initiative to promote ICT in education. The tax office has a good website with much information, an extensive FAQ section, downloadable forms, and a platform for online declarations. The country's ranking is low in the UN E-Government Development Index but better in the ITU and WEF indexes. Its infrastructure is not very advanced (0.52 fixed broadband connections per 100 people; 1 fixed telephone per 100 people). However mobile penetration is high with 119 per 100 people). The number of secure internet servers is quite low (5 per 1 million people). The legal framework has undergone some development, e.g. the Protection of Personal Data Law has existed since 2013.

Gabon

Gabon, one of the more stable countries in Africa, ranks in the upper part of the indexes. A national ID system has been used since 2011 and only for local elections since 2013. Plans for e-governance have been made, but many initiatives have halted or are moving slowly (please see Annex 2) and there are very few actual and sustainable activities, which indicates that the plans have not been made in a context in which they can be followed up. Although a tax office website should exist, it is unavailable. Data protection legislation at some level exists (please see Annex 5).

Madagascar

Madagascar ranks low or very low in the indexes, and few e-governance initiatives can be identified. At the same time, the tax office website looks very good, with lots of information available about taxation, business registration and much else. It contains many downloadable forms and an online platform for tax registration and declaration. There is a project to introduce national ID cards. Some data protection legislation exists.

Mozambique

Mozambique adopted ICT policies and strategies in 2000 to improve the use of technology in the country. Various projects, including those with World Bank funding, support reforms. In 2010 an e-governance interoperability framework was published. As of 2017, there is a plan for a system of unique ID numbers. The tax office has a quite good website and an online help service for asking questions, plus downloadable forms, but no platform for registration. The country ranks in the lower half of the various indexes.

São Tomé and Príncipe

Some early projects have been undertaken, including contact with eGA, and some initiatives on the institutional side. Political will to implement e-governance has been demonstrated. However, not much is available in terms of services. No designated tax office website is available and the government website is rather rudimentary, mostly containing tourist information. A website about starting a business in the country is under construction.

([103]) https://www.hidglobal.com/sites/default/files/resource_files/hid-gov-id-angola-cs-en.pdf

The country holds a low position in the UN E-Government Development Index and is not included in others. However, the country is heading for the next generation of national ID cards and planning to upgrade CivID 2.0 software, which will allow biometric authentication and envisages a contactless chip for new national ID cards. Birth registration is high.

Senegal

Senegal is ranked in the upper part of the indexes. It has various projects for e-governance in various spheres, most of which are under development. Senegal has been issuing e-ID cards since 2005 (please see Annex 2). Projects for smart ID cards and voter's cards have existed since 2015. The tax office website looks good with a lot of easy-to-use information about various types of taxation, many downloadable forms, and an online platform for tax registration. Data protection legislation exists. The infrastructure is not very advanced (0.67 fixed broadband connections per 100 people; 2 fixed telephones per 100 people). However, mobile phone penetration is high with 100 per 100 people). The number of secure internet servers is quite low (5 per 1 million people).

Togo

The position of Togo in indexes varies, but tends to be just above or just below the middle. A wide-ranging project to introduce e-governance and improve ICT availability was launched in 2012 and implemented in 2015. Biometric voter's cards have been issued since 2015. There is a limited online platform for the tax office.

Zambia

Zambia has national biometric ID cards, introduced with UNDP assistance in 2013. The president has created a designated e-governance division, responsible for introducing e-governance. The country ranks in the upper half, near the middle, of most indexes. The tax office website contains a decent amount of information about taxation and provides an extensive array of downloadable forms. An online registration service is available to log on to, although it is unclear whether it provides complete online registration. The infrastructure is not advanced at all (0.15 fixed broadband connections per 100 people; 1 fixed telephone per 100 people). Mobile penetration is compared with the upper-end countries is low with 74 per 100 people). The number of secure internet servers is quite low (5 per 1 million people).

A6.2.3 Tier 3

Cameroon

Cameroon began issuing electronic ID cards in 2013. Biometric ID cards were introduced in 2016 in the country, which faces political instability. There are various ambitious plans for e-governance and use of ICT but few concrete projects. The country tends to rank in the middle of indexes (no 26 on the UN E-Government Development Index, no 23 on the ITU ICT Development Index and no 24 on the WEF Networked Readiness Index). The tax office has a reasonable website, but with limited and somewhat unclear information (e.g. about the language). There is a limited platform for online declarations. The ease of navigation has been evaluated as good but quality of online tools poor. The infrastructure is not advanced (0.07 fixed broadband connections per 100 people; 5 fixed telephones per 100 people and mobile phone penetration 72 per 100 people).The country is experiencing political violence.

Comoros

Comoros uses websites to attract investment, and it has a good website with e-regulations and links to how to deal with various procedures. However, few ministries or authorities have websites. In the indexes it either comes in a low position or is not included (no 38 on the UN E-Government Development Index). The tax office website is limited and largely under maintenance, with seemingly no forms to download and no platform for online declaration. Data protection law has existed since 2014. Its national ID system includes biometric features.

Ethiopia

An e-governance plan was adopted in 2011 and an ambitious number of services are to be offered. The plan is in the implementation process but few services are yet available. The tax office website is quite good, with downloadable forms and a lot of information available, although online services are limited and there is some lack of clarity in the FAQ section. The level of access to mobile phones is low and the country tends to rank low in the indexes or have no information available.

Liberia

In 2017, Liberia, with support from USAID, launched a project for digitisation and e-government. The sustainability of the reform is yet to be seen. In indexes, it is ranked in the second half of the lists (no 34 in the UN E-Government Development Index, no 28 in the ITU ICT Development Index and no 30 in the WEF Networked Readiness Index). The legal framework is not developed, i.e. no data protection legislation is in place and Liberia is not featured in any other key indicators evaluating the legal level in the country. No tax office website is available. The infrastructure is not advanced and is ranked in the lower half of the groups.

Libya

Despite a precarious political situation, with rival factions in power in different parts of the country, and the latest power-sharing agreement to enable a unified government made only in 2017, Libya has made some progress on e-governance. However, the country still lacks a government that can exercise power over the entire country. Reforms include an e-passport and national ID number. The possibility of implementing such reforms is uncertain. In the UN E-Government Development Index it ranks no 9, but it is not even featured in the other indexes used in our categorisation. The tax office website is under construction. The infrastructure is well advanced with 0.97 fixed broadband connections, 10 fixed telephones and 157 mobile phones per 100 people. The number of secure internet servers is quite low (4 per 1 million people). We estimate the potential for sustainable reforms in Libya as low, even if some progress is made. It is mainly for that reason that Libya is classified in the third tier of group 2.

Mali

It is difficult to identify any e-governance initiatives in Mali, but the country has made some contacts to explore ideas, including contact with eGA. There is no tax office website and the government website is quite limited. The infrastructure is not advanced in Mali (0.02 fixed broadband connections per 100 people; 1 fixed telephone per 100 people). Mobile penetration is good with 140 per 100 people). The processes for starting a business are not overly cumbersome in the African context. The country ranks below or near average on most indexes. Unrest in Mali, amounting to civil war, has lasted several years. In September 2017, the UN imposed sanctions against those who disrupt the peace process — a peace accord was signed in June 2015, but it is fraught with difficulties.

Sudan

There is no tax office website. Sudan's ranking in the indexes varies from above or below the middle (or information is missing). Sudan is ranked no 28 in the UN E-Government Development Index and no 19 in the ITU ICT Development Index. The legal framework is not developed, i.e. no data protection legislation is in place and there is insufficient protection for human rights. Sudan is not featured in key indicators evaluating the legal level in the country. The level of infrastructure in Sudan is not advanced and is very much at the same level as Cameroon (0.07 fixed broadband connections per 100 people; mobile phone penetration 71 per 100 people). Ambitious reforms for introduction of e-governance exist; some have been tested but few have been applied. New civil registry procedures were introduced in 2011. The country has been subject to many political conflicts in recent years.

The Gambia

After recent political turmoil, the situation in the country has stabilised, although protection for human rights is still precarious. There are few e-governance initiatives. The tax office website looks quite good, with a fair

amount of information available and downloadable forms. It links to a page advertising an online platform, but this is under construction. Biometric passports have been introduced. Access to mobile phones is very high (mobile phone penetration 138 per 100 people). Access to fixed telephones is low (2 per 100 people in 2015) as is access to fixed broadband (0.18 per 100 people). Little information exists on The Gambia and the country is absent from many registries, which contributes to the difficulty in accessing credible information on e-governance activities. The country ranks below or near average on most indexes. Regarding the legal framework, the Information and Communication Act has been in force since 2009.

A6.3 Group 3

Burundi, Central African Republic, Chad, Congo, Democratic Republic of the Congo, Djibouti, Eritrea, Equatorial Guinea, Guinea, Guinea-Bissau, Malawi, Mauritania, Niger, Sierra Leone, Somalia, South Sudan.

These countries are either ranked in a low position in the indexes or are not included at all. The representation of national and electronic ID systems is very good. Their legal frameworks are rather inadequate, i.e. no data protection legislation has been enforced. Their levels of infrastructure are also at the low end. There is no ratification of the Council of Europe Convention on Cybercrime or the Data Protection Convention. Very few countries have designated tax websites, but where they do exist, the level of navigation and quality of online tools are not well advanced.

A6.4 Upgrading or downgrading of the countries

The table below shows key positive and negative elements that affected the upgrading or downgrading from one group to another. The quantitative data on the countries can be found in Annex 12, sheet 1, and the grading of the countries in Annex 12, sheet 2.

Threshold of the groups:

Group 1	292-840 points
Group 2 — Tier 1	207-292 points
Group 2 —Tier 2	142-207 points
Group 2 — Tier 3	97-142 points
Group 3	Fewer than 97 points

Upgrading or downgrading of the countries

Country	Expert opinion adjustment	+	-
Gabon	G1 to G2-T2	E-Government Development Index (no 14 African rank) Infrastructure — ICT Development Index (no 12) Infrastructure — mobile phone penetration 169 per 100 people	Coordinating institutions — Networked Readiness Index (no 25) Legal framework — ICT Laws Index 2.7 Tax administration — no designated tax website No evidence of actual activities to implement plans
Algeria	G1 to G2-T1	• Secure digital identity — existence of national ID • Infrastructure — ICT Development Index (no 8) • Infrastructure — fixed broadband 5.58 per 100 people • Infrastructure — fixed telephone 8 per 100 people • Infrastructure — mobile phone penetration 106 per 100 people • Infrastructure — investments in telecoms 0.7 billion (no 5African rank) • Tax administration — existence of designated tax website • Tax administration — ease of navigation 5/3 • Tax administration — quality of online tools 5/2	• Political will and change management — Importance of Government Vision of the Future Index 3.1 • Many delays in implementation • Coordinating institutions — Networked Readiness Index (no 18) • Few services available • Legal framework — (no data protection legislation) • Legal framework — ICT Laws Index 2.8
Rwanda	G2-T1 to G1 	• Political will and change management — Importance of Government Vision of the Future Index 5.8 (highest rank) • Strong support for business • Coherent implementation of administrative reforms • Coordinating institutions — Networked Readiness Index (no 5) • Legal framework (ICT Laws Index 4.7; highest African rank) • E-Government Development Index (no 19) • Government portal, digital databases and exchange of data — OSI 0.5 (no 3 African rank) • Secure digital identity — existence of national ID • Tax administration — existence of designated tax website • Tax administration — ease of navigation 5/5 • Tax administration — quality of online tools 5/4	• Infrastructure — no investments in telecoms have been recorded

Country	Expert opinion adjustment	+	-
Côte d'Ivoire	G2-T1 to T2	Political will and change management — Importance of Government Vision of the Future Index 4.6 (no 3 African rank) Secure digital identity — existence of national ID Infrastructure — mobile phone penetration 119 per 100 people Tax administration — existence of designated tax website Tax administration — ease of navigation 5/4 Tax administration — quality of online tools 5/5	International framework (no ratification of Treaties 185 and 108) E-Government Development Index (no 37) Government online service — OSI 1/0.17 Infrastructure — 0.52 fixed broadband connections per 100 people; 1 fixed telephone per 100 people Coordinating institutions — Networked Readiness Index (no 18) Infrastructure — secure internet servers 5 per 1 million people Few services available
Senegal	G2-T1 to T2	Political will and change management — Importance of Government Vision of the Future Index 4.1 (no 8 African rank) Legal framework (data protection legislation exists) International framework — Treaties 185 and 108 are ratified Secure digital identity — existence of national ID	E-Government Development Index (no 22) Infrastructure — 0.67 fixed broadband connections per 100 people; 2 fixed telephones per 100 people Infrastructure — secure internet servers 5 per 1 million people
Zambia	G2-T1 to T2	Political will and change management E-Government Development Index (no 16) Secure digital identity — existence of e-ID	Legal framework — (no data protection legislation) Infrastructure — 0.15 fixed broadband connections per 100 people; 1 fixed telephone per 100 people Infrastructure — secure internet servers 5 per 1 million people
Mali	G2-T1 to T3	• Secure digital identity — existence of e-ID • Legal framework (data protection legislation exists) • Infrastructure — mobile phone penetration 140 per 100 people	• Political unrest, which makes administrative (and other) reforms difficult • Difficult to identify actual measures undertaken • Coordinating institutions — Networked Readiness Index (no 28) • E-Government Development Index (no 42) • International framework — no ratification of Treaties 185 and 108 • Infrastructure — fixed broadband 0.02 connections, 1 fixed telephone per 100 people • Tax administration — no designated tax website
The Gambia	G2-T1 to T3	• Secure digital identity — existence of national ID • Infrastructure — mobile phone penetration 138 per 100 people • Legal framework — Information and Communication Act, 2009	• Absence of documented political will, recent political turmoil • E-Government Development Index (no 32) • Infrastructure — ICT Development Index (no 21) • International framework — no ratification of Treaties 185 and 108 • Not featured in OSI; difficult to access credible information • Infrastructure — fixed broadband 0.18 connections, 2 fixed telephones per 100 people • Legal framework — (no data protection legislation) • Deficient protection for human rights

Country	Expert opinion adjustment	+	-
Cameroon	G2-T1 to T3 	• Secure digital identity — existence of e-ID • Infrastructure — investments in telecoms USD 0.46 billion (no 6 African rank)	• Political turmoil with political violence, hindering administrative reforms • Indexes — E-Government Development Index (no 26), ICT Development Index (no 23) and Networked Readiness Index (no 24) • Infrastructure — fixed broadband 0.07 connections, 5 fixed telephones, mobile phone penetration 72 per 100 people • Quality of services low
Libya	G2-T1 to T3 	• Secure digital identity — existence of national ID • E-Government Development Index (no 9) • Infrastructure — fixed broadband 0.97 connections, 10 fixed telephones, mobile phone penetration 157 per 100 people	• Absence of a government that has control over the entire country • Not featured in ICT Development or Network Readiness Indexes or OSI • Infrastructure — secure internet servers 4 per 1 million people • Infrastructure — no investments in telecoms have been recorded • Tax administration — no designated tax website
Sudan	G2-T2 to T3 	• Secure digital identity — existence of e-ID • Infrastructure — investments in telecoms USD 0.3 billion (no 8 African rank)	• Recent history of political turmoil. • Political will and change management — not featured in Importance of Government Vision of the Future Index • Legal framework — no data protection legislation • Insufficient protection of human rights • International framework — no ratification of Treaties 185 and 108 • Infrastructure — fixed broadband 0.07 connections, mobile phone penetration 71 per 100 people • Tax administration — no designated tax website
Liberia	G2-T2 to T3 	• Secure digital identity — existence of national ID	• Indexes — E-Government Index (no 34), ICT Development Index (no 28) and Networked Readiness Index (no 30) • Legal framework — no data protection legislation • Infrastructure — 0.16 fixed broadband connections, 0 fixed telephones and mobile phone penetration 81 per 100 people • Infrastructure — no investments in telecoms have been recorded • Tax administration — no designated tax website • Lack of credible evidence of sustainability of initiated reforms
São Tomé and Príncipe	G2-T3 to T2 	• E-Government Development Index (no 33) • Secure digital identity — existence of national ID • Infrastructure — 0.49 fixed broadband connections, 3 fixed telephones and mobile phone penetration 65 per 100 people • Political will evidenced by national strategies as well as actively implemented plans for change, including international projects	• Legal framework — no data protection legislation • Tax administration — no designated tax website

Country	Expert opinion adjustment	+	-
Comoros	G3 to G2-T3 	• Secure digital identity — existence of national ID • E-Government Development Index (no 38) • Tax administration — existence of designated tax website • Legal framework (data protection legislation exists) • Good use of government websites	• Not featured in many indexes or other key elements
Guinea	G2-T2 to G3 	• Secure digital identity — existence of national ID	• Political instability • Legal framework — no data protection legislation • Tax administration — no designated tax website • No identified e-governance reform efforts
Congo	G2-T2 to G3 	• Secure digital identity — existence of e-ID • E-Government Development Index (no 29; highest in G3 countries) • Infrastructure — mobile phone penetration 112 per 100 people (highest in G3)	• Legal framework — no data protection legislation • Limited freedom of information • Tax administration — no designated tax website • No identified e-governance reform efforts
Mauritania	G2-T2 to G3 	• Secure digital identity — existence of e-ID	• Legal framework — no data protection legislation • Tax administration — no designated tax website • No identified e-governance reform efforts
Malawi	G2-T2 to G3 	• Secure digital identity — existence of e-ID • Legal framework (ICT Laws Index 2;5; highest in G3 countries) • Tax administration — existence of designated tax website • Infrastructure investments (USD 56 million) • Tax administration — ease of navigation 5/3 • Tax administration — quality of online tools 5/2	• Legal framework — no data protection legislation • No identified e-governance reform efforts
Democratic Republic of the Congo	G2-T3 to G3 	• Infrastructure investments (USD 0.2 billion) • Tax administration — existence of designated tax website • Tax administration — ease of navigation 5/2 • Tax administration — quality of online tools 5/3	• Severe political violence • Inadequate protection of human rights, constitutional violations • Secure digital identity — national ID only paper based • Legal framework — no data protection legislation

Country	Expert opinion adjustment	+	-
Sierra Leone	G2-T3 to G3 	• Secure digital identity — existence of e-ID	• Legal framework — no data protection legislation • Tax administration — no designated tax website • Effects of civil war still felt, difficulty in implementing sustainable reforms
Guinea-Bissau	G2-T3 to G3 	• Secure digital identity — existence of e-ID	• One of the poorest countries in the world, dependency on foreign aid • Legal framework — no data protection legislation • Tax administration — no designated tax website
Chad	G2-T3 to G3 	• Secure digital identity — existence of national ID	• Legal framework — no data protection legislation • Tax administration — no designated tax website • Inadequate infrastructure • Internal strife, political violence
Burundi	G2-T3 to G3 	• Secure digital identity — existence of e-ID • Tax administration — existence of designated tax website • Tax administration — ease of navigation 5/2 • Tax administration — quality of online tools 5/1	• Extreme poverty • Political instability, consequences remain of a brutal recent war • Legal framework — no data protection legislation
Equatorial Guinea	G2-T3 to G3 		• Regarded as one of the world's most brutal dictatorships • Inadequate protection of human rights • Secure digital identity — no national ID exists • Legal framework — no data protection legislation • Tax administration — no designated tax website
Niger	G2-T3 to G3 	• Tax administration — existence of designated tax website • Tax administration — ease of navigation 5/2 • Tax administration — quality of online tools 5/2	• Extreme poverty — one of the world's least developed nations • Inadequate protection of human rights • Secure digital identity — national ID only paper based • Legal framework — no data protection legislation

NB: G3 countries, the United States, Japan and the European Union; Treaty 185, Council of Europe Convention on Cybercrime; Treaty 108, Council of Europe Data Protection Convention.

Annex 7 — Government Online Service Index (OSI) ([104])

The OSI captures a government's performance in delivering online services to its citizens.

The index computation methodology is worked out by the UN Department of Economic and Social Affairs and is based on expert opinion. There are four stages of service delivery: emerging, enhanced, transactional and connected. Online services are assigned to each stage according to their degree of sophistication, from the more basic to the more sophisticated. In each country, the performance of the government in each of the four stages is measured as the number of services provided as a percentage of the maximum services at that stage. Examples include online presence, deployment of multimedia content, the government's attempts to solicit citizens' input, widespread data sharing and use of social networking.

Scale: 0 (poorest) to 1 (best)

Government Online Service Index (2013) ([105])	
Côte d'Ivoire	0.17
Morocco	0.7
Egypt	0.6
Tunisia	0.6
Ethiopia	0.5
Mauritius	0.5
Rwanda	0.5
Kenya	0.4
South Africa	0.4
Botswana	0.3
Ghana	0.3
Mozambique	0.3
Namibia	0.3
Nigeria	0.3
Senegal	0.3
Seychelles	0.3
Tanzania	0.3
Zimbabwe	0.3
Cameroon	0.2
Cape Verde	0.2
Lesotho	0.2
Madagascar	0.2
Malawi	0.2
Algeria	0.1
Benin	0.1
Gabon	0.1
Liberia	0.1
Mali	0.1

([104]) *Global information technology report 2016*, also available from the Networked Readiness Index database, http://reports.weforum.org/global-information-technology-report-2016/networked-readiness-index/

([105]) Data Table 8.02, Government Online Service Index, p. 255.

Swaziland	0.1
Uganda	0.1
Zambia	0.1
Burundi	0.0
Chad	0.0
Guinea	0.0
Angola	N/A
Burkina Faso	N/A
Comoros	N/A
The Gambia	N/A
Libya	N/A
São Tomé and Príncipe	N/A
Sudan	N/A
Togo	N/A

Annex 8 — Performance of African countries in international indexes

Countries highlighted in green rank among the top 10 performers across the three indexes.

E-Government Development Index (by UN) [106]		
No	Country	Global rank
1	Mauritius	58
2	Tunisia	72
3	South Africa	76
4	Morocco	85
5	Seychelles	86
6	Cape Verde	103
7	Egypt	108
8	Botswana	113
9	Libya	118
10	Kenya	119
11	Ghana	120
12	Namibia	125
13	Uganda	128
14	Gabon	129
15	Tanzania	130
16	Zambia	132
17	Zimbabwe	134
18	Swaziland	136
19	Rwanda	138
20	Angola	142
21	Nigeria	143
22	Senegal	144
23	Togo	147
24	Algeria	150
25	Lesotho	154
26	Cameroon	155
27	Ethiopia	157
28	Sudan	161
29	Congo	162
30	Madagascar	163
31	Malawi	166
32	The Gambia	167
33	São Tomé and Príncipe	168
34	Liberia	170

[106] United Nations E-Government Knowledgebase, E-Government Development Index, 2016, https://publicadministration.un.org/egovkb/Data-Center (accessed August 2017). The E-Government Development Index (EDGI) measures e-governments' effectiveness in the delivery of basic economic and social services to people. It consists of three of the most important dimensions of e-government: (1) scope and quality of online services (Online Service Index, OSI); (2) the development status of the telecommunications infrastructure (Telecommunication Infrastructure Index, TII); and (3) inherent human capital (Human Capital Index, HCI).

35	Mozambique	172
36	Burundi	173
37	Côte d'Ivoire	175
38	Comoros	176
39	Benin	177
40	Democratic Republic of the Congo	180
41	Guinea-Bissau	181
42	Mali	182
43	South Sudan	183
44	Mauritania	184
45	Burkina Faso	185
46	Sierra Leone	186
47	Djibouti	187
48	Chad	188
49	Guinea	189
50	Eritrea	190
51	Central African Republic	191
52	Niger	192
53	Somalia	193

ICT Development Index (by ITU) ([107])		
#	Country	Global rank
1	Mauritius	73
2	Seychelles	87
3	South Africa	88
4	Tunisia	95
5	Morocco	96
6	Cape Verde	97
7	Egypt	100
8	Algeria	103
9	Botswana	108
10	Ghana	112
11	Namibia	120
12	Gabon	124
13	Kenya	129
14	Côte d'Ivoire	132
15	Zimbabwe	133
16	Lesotho	134
17	Swaziland	136
18	Nigeria	137

([107]) ITU ICT Development Index 2016, https://www.itu.int/net4/ITU-D/idi/2016/index.html#idi2016rank-tab (accessed August 2017). The ITU ICT Development Index (IDI) is a unique benchmark of the level of ICT development in a country. The IDI combines 11 indicators on ICT access, use and skills, capturing key aspects of ICT development. The two key categories of indicators are: (1) five **infrastructure and access indicators** (fixed telephone subscriptions, mobile phone telephone subscriptions, international internet bandwidth per internet user, households with a computer and households with internet access); (2) three **intensity and usage indicators** (individuals using the internet, fixed broadband subscriptions, and mobile-broadband subscriptions).

19	Sudan	139
20	Senegal	141
21	The Gambia	143
22	Zambia	147
23	Cameroon	148
24	Mali	149
25	Rwanda	150
26	Mauritania	151
27	Angola	154
28	Liberia	156
29	Uganda	157
30	Benin	158
31	Togo	159
32	Equatorial Guinea	160
33	Djibouti	161
34	Burkina Faso	162
35	Mozambique	163
36	Guinea	165
37	Madagascar	166
38	Tanzania	167
39	Malawi	168
40	Ethiopia	169
41	Dem Rep Congo	170
42	Burundi	171
43	South Sudan	172
44	Guinea-Bissau	173
45	Chad	174
46	Niger	175

Networked Readiness Index (by WEF) ([108])		
#	Country	Global rank
1	Mauritius	49
2	South Africa	65
3	Seychelles	74
4	Morocco	78
5	Rwanda	80
6	Tunisia	81
7	Cape Verde	85
8	Kenya	86
9	Egypt	96
10	Namibia	99
11	Botswana	101

([108]) WEF Networked Readiness Index Report 2016, http://reports.weforum.org/global-information-technology-report-2016/networked-readiness-index/. The Networked Readiness Index (NRI) looks at what the different actors in society, both private and public, can do to contribute and coordinate the country's networked readiness. The three key categories of indicators are: (1) the overall environment for technology use and creation (political, regulatory, business and innovation); (2) networked readiness in terms of ICT infrastructure, affordability and skills; (3) technology adoption/use by the three groups of stakeholders (government, the private sector and private individuals).

12	Ghana	102
13	Côte d'Ivoire	106
14	Senegal	107
15	The Gambia	113
16	Lesotho	115
17	Zambia	116
18	Algeria	117
19	Nigeria	119
20	Ethiopia	120
21	Uganda	121
22	Zimbabwe	122
23	Mozambique	123
24	Cameroon	124
25	Gabon	125
26	Tanzania	126
27	Mali	127
28	Benin	128
29	Swaziland	129
30	Liberia	130
31	Malawi	132
32	Guinea	134
33	Madagascar	135
34	Mauritania	136
35	Burundi	138
36	Chad	139

Annex 9 — Laws relating to ICT Index ([109])

The ICT Laws Index measures the quality of regulations pertaining to ICT and the capacity and the role of ICT in driving innovation as well as representing the level of sophistication of ICT-related laws in a country. ICT consists of, for example, e-commerce, digital signatures and consumer protection areas. The higher the index, the more developed and sophisticated are the laws enforced in a country.

Scale: 1 = highly undeveloped; 7 = well developed.

Laws relating to ICT Index (2014-2015) ([110])	
Algeria	2.8
Angola	N/A
Benin	2.5
Botswana	3.3
Burkina Faso	N/A
Burundi	2.4
Cameroon	3.1
Cape Verde	3.7
Chad	2.0
Comoros	N/A
Côte d'Ivoire	N/A
Egypt	3.2
Ethiopia	3.1
Gabon	2.7
The Gambia	N/A
Ghana	3.4
Guinea	2.2
Kenya	4.0
Lesotho	3.5
Liberia	N/A
Libya	N/A
Madagascar	2.6
Malawi	2.5
Mali	3.2
Mauritius	4.3
Morocco	3.7
Mozambique	3.0
Namibia	3.6
Nigeria	2.9
Rwanda	4.7
São Tomé and Príncipe	N/A
Senegal	3.9
Seychelles	3.9
South Africa	4.4

([109]) *Global information technology report 2016*, also available from the Networked Readiness Index database, http://reports.weforum.org/global-information-technology-report-2016/networked-readiness-index/

([110]) Data Table 1.02, Laws relating to ICTs, p. 203.

Sudan	N/A
Swaziland	2.6
Tanzania	3.2
Togo	N/A
Tunisia	3.4
Uganda	3.4
Zambia	3.6
Zimbabwe	2.5

Annex 10 — Importance of Government Vision of the Future Index ([111])

This index assesses to what extent the government has a clear implementation plan for utilising ICT to improve a country's overall competitiveness. This indicator also shows the government's effort to improve the regulatory environment. The higher the index, the clearer vision the government has.

Scale: 1 = not at all — there is no plan; 7 =to a great extent — there is a clear plan.

Importance of Government Vision of the Future Index (2014-2015) ([112])	
Algeria	3.1
Angola	N/A
Benin	3.2
Botswana	4.0
Burkina Faso	N/A
Burundi	3.0
Cameroon	3.6
Cape Verde	4.5
Chad	3.0
Comoros	N/A
Côte d'Ivoire	4.6
Egypt	3.2
Ethiopia	3.6
Gabon	3.6
The Gambia	N/A
Ghana	3.6
Guinea	3.0
Kenya	4.8
Lesotho	3.3
Liberia	3.3
Libya	N/A
Madagascar	2.9
Malawi	3.2
Mali	3.7
Mauritius	4.4
Morocco	4.3
Mozambique	3.6
Namibia	3.9
Nigeria	3.4
Rwanda	5.8
São Tomé and Príncipe	N/A
Senegal	4.1
Seychelles	4.0

([111]) *Global information technology report 2016*, also available from the Networked Readiness Index database, http://reports.weforum.org/global-information-technology-report-2016/networked-readiness-index/

([112]) Data Table 8.01, Importance of ICTs to government vision of the future, p. 254.

South Africa	3.2
Sudan	N/A
Swaziland	3.2
Tanzania	3.6
Togo	N/A
Tunisia	3.6
Uganda	4.1
Zambia	4.1
Zimbabwe	2.8

Annex 11 — Glossary

This glossary suggests a selection of appropriate definitions of key terms used in the context of e-governance, as adopted by different organisations, with references to the source. There is a multitude of different definitions available of which only a few are universally accepted or adopted in normative documents. In the main, most up-to-date ISO standard-based terms and definitions are used (https://www.iso.org/obp/ui/#search).

Term	Definition	Source
application	software that is dependent on the services of an operating system	https://www.iso.org/obp/ui/#search
audit trail	data collected for potential use in a security audit	https://www.iso.org/obp/ui/#search
bar code	optical machine-readable representation of data	https://www.iso.org/obp/ui/#sear
big data	extensive datasets/collections of linked data primarily characterised by big volume, extensive variety, high velocity (creation and use) and/or variability that together require a scalable architecture for efficient data storage, manipulation and analysis	https://www.iso.org/obp/ui/#sear
biometric verification	process of confirming a biometric claim through biometric comparison	https://www.iso.org/obp/ui/#sear
broadband	frequency band that is used for an application requiring a wide range of frequencies	https://www.iso.org/obp/ui/#search
broadband internet	passive infrastructure (ducts, cables, masts, premises) and active equipment component implementing the technology (transponders, routers and switches, control and management servers); services are also delivered	http://ec.europa.eu/newsroom/dae/document.cfm?doc_id=6908
bulk messages	bulk messaging is the dissemination of large numbers of short message service (SMS) messages for delivery to mobile phone terminals	https://en.wikipedia.org/wiki/Bulk_messaging
card reader	input unit that reads or senses the holes in a punched card, transforming the data from the patterns of holes to electrical signals	https://www.iso.org/obp/ui/#search
civil registry	authentic sources of information on the population under the control of a public administration	https://ec.europa.eu/isa2/sites/isa/files/isa_annex_ii_eif_en.pdf
contactless	radio frequency technology operating at very short ranges so that the user has to make a voluntary gesture so that communication is initiated between two devices by approaching them	https://www.iso.org/obp/ui/#sear
cybersecurity	(1) the security of cyber devices and; (2) security against threats created through the operation of cyber devices; security usually means a situation in which risks do not materialise	https://www.mkm.ee/sites/default/files/cyber_security_strategy_2014-2017_public_version.pdf
cybercrime	criminal activity in which services or applications in cyberspace are used for or are the target of a crime, or where cyberspace is the source, tool, target or place of a crime	https://www.iso.org/obp/ui/#sear
data	reinterpretable representation of information in a formalised manner suitable for communication, interpretation or processing	https://www.iso.org/obp/ui/#sear
data exchange	storing, accessing, transferring and archiving of data	https://www.iso.org/obp/ui/#search
data linking	matching and combining data from multiple databases	https://www.iso.org/obp/ui/#search
data protection	legal, administrative, technical or physical measures taken to avoid unauthorised access to and use of data	https://www.iso.org/obp/ui/#sear
digital data	data represented by digits, possibly together with special characters and the space character	https://www.iso.org/obp/ui/#search
digital identification system	or electronic identification scheme — a system for electronic identification under which electronic identification means are issued to natural or legal persons or natural persons representing legal persons	http://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32014R0910&-from=EN
digital identity	a set of data and software, protected by cryptographic means	Current report
digital information asset management	management of agreed descriptions of services, data, registries and interoperable solutions	http://eur-lex.europa.eu/resource.html?uri=cellar:2c2f2554-0faf-11e7-8a35-01aa75ed71a1.0017.02/DOC_3&format=PDF

Term	Definition	Source
digital signature	signature based upon cryptographic methods of originator authentication, computed by using a set of rules and a set of parameters such that the identity of the signer and the integrity of the data can be verified	https://www.iso.org/obp/ui/#search
e-commerce	transaction of buying or selling online	https://en.wikipedia.org/wiki/E-commerce
e-governance	or electronic governance is the application of information and communication technologies (ICT) for delivering government services, exchange of information, communication transactions and integration of various stand-alone systems and services from government to customer (G2C), government to business (G2B) and government to government (G2G), as well as back office processes and interactions within the entire government framework	Saugata, B., and Masud, R.R., *Implementing e-governance using OECD model (modified) and Gartner model (modified) upon agriculture of Bangladesh*, IEEE, Piscataway, New Jersey, 2007.
e-government	using the tools and systems made possible by ICT to provide better public services to citizens and businesses	European Interoperability Framework (EIF) for European public services. https://ec.europa.eu/isa2/sites/isa/files/isa_annex_ii_eif_en.pdf
e-ID	electronic identification means — a material and/or immaterial unit containing personal identification data and which is used for authentication for an online service	http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32014R0910
e-identification	or electronic identification — the process of using personal identification data in electronic form uniquely representing either a natural or legal person or a natural person representing a legal person	http://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32014R0910&-from=EN
e-services	electronic services — library services delivered by electronic means, whether from local servers or provided by networks	https://www.iso.org/obp/ui/#sear
electronic document	electronic representation of a page-oriented aggregation of text, images and graphic data and metadata that is useful for identifying and understanding that data, which can be reproduced on paper or other substrates, as well as rendered electronically on display devices, without significant loss of its information content	https://www.iso.org/obp/ui/#sear
electronic identity	see e-ID	
electronic signature	data in electronic form that is attached to or logically associated with other data in electronic form and which is used by the signatory to sign	http://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32014R0910&-from=EN
encryption	process of encoding messages (or information) in such a way that only authorised parties can read it	https://www.iso.org/obp/ui/#search
fixed broadband	an internet connection delivered by a phone line or through the provider's network of cables	https://www.broadbandchoices.co.uk/reviews/mobile-broadband-vs-fixed-line-broadband
ID	identifier — a number, whether personal, for businesses or property, aiming to help to differentiate people with the same name, to keep track of a company in the event of a change in its name or to identify a specific property	Current report
identification system	identification system consisting of all, and only, the following: — owner code: three letters; — equipment category identifier: one letter; — serial number: six numerals; — check digit: one numeral	https://www.iso.org/obp/ui/#search
interoperability	ability of two or more systems or components to exchange information and to use the information that has been exchanged	https://www.iso.org/obp/ui/#search
login	process by which an initiator obtains access to a set of device fetch agents	https://www.iso.org/obp/ui/#search
mobile communication	the use of technology that allows us to communicate with others in different locations without the use of cables	https://www.igi-global.com/chapter/communicame/81100
mobile internet	a general term used to describe high-speed internet access from mobile providers for portable devices	https://www.lifewire.com/what-is-mobile-broadband-p2-2377422
mobile messaging gateway	a mobile messaging gateway allows a computer to send or receive SMS transmissions to or from a telecommunications network	https://en.wikipedia.org/wiki/SMS_gateway
mobile network	wireless wide area network or metropolitan area network that provides continuous connectivity to mobile terminals	https://www.iso.org/obp/ui/#search

Term	Definition	Source
NMT, 2G, 3G, 4G, 5G	generations of wireless cellular technology (mobile telecommunications)	http://www.ijarcce.com/upload/2014/april/IJARCCE1C %20 %20 %20 a %20 %20Sachin %20Panchal %20 %20 Evolutionary %20steps.pdf
offline	pertaining to the operation of a functional unit when not under the direct control of the computer	https://www.iso.org/obp/ui/#search
online	operating in direct connection to the data processing	https://www.iso.org/obp/ui/#search
online services	service implemented by hardware, software or a combination of the two and provided over a communication line or network	https://www.iso.org/obp/ui/#sear
Of payment gateway	service located on a distant server for acceptance mobile payments	https://www.iso.org/obp/ui/#search
physical identity	definition depends on context: here the general definition is used — the qualities that make someone or something what they are and different from other people	https://www.macmillandictionary.com/dictionary/british/identity
PIN	personal identification number — string of numerical digits established as a shared secret between the cardholder and the issuer, for subsequent use to authenticate identity and validate authorised card usage	https://www.iso.org/obp/ui/#search
portal	web-based interface that provides a single access point to dispersed information	https://www.iso.org/obp/ui/#search
radio frequency	frequency within the range of frequencies suitable for utilisation in radio communication	https://www.iso.org/obp/ui/#sear
secure data exchange solution	solution that ensures that all data exchanges are done in a secure and controlled way; transfer mechanisms should facilitate information exchanges that are registered and verified, encrypted, time stamped and logged	https://ec.europa.eu/isa2/sites/isa/files/isa_annex_ii_eif_en.pdf
shareware	software usually free of charge and publicly available	Current report
SIM card	subscriber identification module — integrated circuit that securely stores the international mobile subscriber identity (IMSI) and the related key used to identify and authenticate subscribers on mobile telephony devices (such as mobile phones and computers)	https://www.iso.org/obp/ui/#search
smart card	device of credit card size incorporating an integrated circuit with microprocessor and memory	https://www.iso.org/obp/ui/#search
SMS	short message service that enables a mobile phone or a server to send messages of limited length to one or several mobile phone(s)	https://www.iso.org/obp/ui/#search
timestamp	time variant parameter that denotes a point in time with respect to a common time reference	https://www.iso.org/obp/ui/#search
trust services	means an electronic service normally provided for remuneration that consists of: (1) the creation, verification and validation of electronic signatures, electronic seals or electronic time stamps, electronic registered delivery services and certificates related to those services; or (2) the creation, verification and validation of certificates for website authentication; or (3) the preservation of electronic signatures, seals or certificates related to those services	EU REGULATION 910/2014, http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014R0910&from=EN
USB	A universal serial bus, is an industry standard that defines cables, connectors and communications protocols for connection, communication and power supply between computers and devices	https://en.wikipedia.org/wiki/USB
web page	digital multimedia object delivered from the internet on request to a client system	https://www.iso.org/obp/ui/#search
website	collection of logically connected web pages managed as a single entity and accessed through the same base	https://www.iso.org/obp/ui/#search
wired network	a physical connection to a physical location through a cable	https://broadbandmatters.com/what-are-wired-broadband-technologies
wireless access point (Wi-Fi)	device or piece of equipment that allows wireless devices to connect to a wired network	https://www.iso.org/obp/ui/#search

Annex 12 — List of indicators per country

digital/ analogue	analogue	analogue		analogue	analogue	analogue	analogue	analogue		digital	digital	
pre-requisite key elements	Political will and change manage-ment	Coordinat-ing institu-tions		Legal framework	Legal framework	Internation-al frame-work	Internation-al frame-work	Access to services and awareness raising		Government portal, digital databases and exchange of data	Secure digital identity	
Country/ indicator	Impor-tance of government vision of the future index 2014-2015 (scale 1-7,7 best)	Networked Readiness Index (WEF Global Rank)	Rank out of 54 countries (scale 54 points best)	Existence of data protection legislation (scale 1-5,5 best) 2017	Laws relating to ICTs index 2014-2015 (scale 1-7,7 best)	Signatures and ratifi-cations of Treaty 185 (1= sig-nature 2= ratification) 2017	Signatures and ratifi-cations of Treaty 108 (1=signa-ture 2= ratification) 2017	E-Gov-ernment Develop-ment Index (UN Global Rank) 2016	Rank out of 54 countries (scale 54 points best)	Govern-ment Online Service Index 2016 (OSI, scale 0-1,1 best)	Existence of national ID (scale 1=No; Yes; 2 = yes and e-ID at least part-ly) 2017	
Seychelles	4	74	52	3	3,9	0	0	86	50	0,3	2	
Mauritius	4,4	49	54	4	4,3	2	2	58	54	0,5	2	
South Africa	3,2	65	53	4	4,4	1	0	76	52	0,4	2	
Morocco	4,3	78	51	5	3,7	0	0	85	51	0,7	1	
Tunisia	3,6	81	49	4	3,4	0	2	72	53	0,6	0	
Cape Verde	4,5	85	48	4	3,7	0	0	103	49	0,2	2	
Botswana	4	101	44	0	3,3	0	0	113	47	0,3	2	
Egypt	3,2	96	46	3	3,2	0	0	108	48	0,6	0	
Ghana	3,6	102	43	4	3,4	0	0	120	44	0,3	2	
Kenya	4,8	86	47	4	4	0	0	119	45	0,4	2	
Namibia	3,9	99	45	0	3,6	0	0	125	43	0,3	1	
Rwanda	5,8	80	50	0	4,7	0	0	138	36	0,5	2	
Algeria	3,1	117	37	0	2,8	0	0	150	31	0,1	2	
Zimbabwe	2,8	122	33	1	2,5	0	0	134	38	0,3	1	
Nigeria	3,4	119	36	2	2,9	0	0	143	34	0,3	2	
Lesotho	3,3	115	39	5	3,5	0	0	154	30	0,2	2	
Tanzania	3,6	126	29	3	3,2	0	0	130	40	0,3	2	
Swaziland	3,2	129	26	0	2,6	0	0	136	37	0,1	1	
Uganda	4,1	121	34	4	3,4	0	0	128	42	0,1	2	
Benin	3,2	128	27	3	2,5	0	0	177	16	0,1	1	
Cote d´Ivoire	4,6	106	42	1	0	0	0	175	18	0,17	2	
Gabon	3,6	125	30	3	2,7	0	0	129	41	0,1	1	
Senegal	4,1	107	41	4	3,9	2	2	144	33	0,3	2	
Zambia	4,1	116	38	0	3,6	0	0	132	39	0,1	2	
Mozambique	3,6	123	32	0	3	0	0	172	20	0,3	1	
Sao Tome and Principe	0	0	0	0	0	0	0	168	22	0	1	
Burkina Faso	0	0	0	2	0	0	0	185	10	0	1	
Madagascar	2,9	135	22	4	2,6	0	0	163	25	0,2	0	
Angola	0	0	0	3	0	0	0	142	35	0	2	
Togo	0	0	0	0	0	0	0	147	32	0	0	
Mali	3,7	127	28	2	3,2	0	0	182	13	0,1	2	
Sudan	0	0	0	0	0	0	0	161	27	0	2	
Libya	0	0	0	0	0	0	0	118	46	0	0	
Liberia	3,3	130	25	0	0	0	0	170	21	0,1	1	
Cameroon	3,6	124	31	0	3,1	0	0	155	29	0,2	2	
Gambia	0	113	40	1	0	0	0	167	23	0	1	
Ethiopia	3,6	120	35	0	3,1	0	0	157	28	0,5	0	
Comoros	0	0	0	1	0	0	0	176	17	0	1	
Congo	0	0	0	0	0	0	0	162	26	0	2	
Malawi	3,2	132	24	0	2,5	0	0	166	24	0,2	2	
Guinea	3	134	23	0	2,2	0	0	189	6	0	1	
Mauretania	0	136	21	0	0	0	0	184	11	0	2	
Democratic Republic of Conge	0	0	0	0	0	0	0	180	15	0	0	
Sierra Leone	0	0	0	0	0	0	0	186	9	0	2	
Guinea Bissau	0	0	0	0	0	0	0	181	14	0	2	
Chad	3	139	19	0	2	0	0	188	7	0	1	
Burundi	3	138	20	0	2,4	0	0	173	19	0	2	
Equatorial Guinea	0	0	0	0	0	0	0	0	0	0	0	
Niger	0	0	0	0	0	0	0	192	3	0	0	
Djibouti	0	0	0	0	0	0	0	187	8	0	0	
South Sudan	0	0	0	0	0	0	0	183	12	0	2	
Somalia	0	0	0	0	0	0	0	193	2	0	0	
Central African Republic	0	0	0	0	0	0	0	191	4	0	0	
Eritrea	0	0	0	0	0	0	0	190	5	0	1	

	digital		digital	digital	digital	digital	digital		digital	digital		digital	digital
	Infrastructure		Infrastructure	Infrastructure	Infrastructure	Infrastructure	Infrastructure		Infrastructure	Tax administration		Tax administration	Tax administration
	ICT Development Index (ITU Global Rank) 2016	Rank out of 54 countries (scale 54 points best)	Fixed Broadband (per 100 people) 2015	Fixed Telephone (per 100 people) 2015	Mobile Cellular (per 100 people) 2015	Investments in telecoms with private participation (USD, per capita) 2010-2014	Investments in telecoms with private participation (USD current prices, 2014)	Rank out of 54 countries (scale 54 points best)	Secure internet servers (per 1 mil. people) 2016	Existence of designated tax web-site, 2017	2= Yes; 1= Partly; 0= No+0	Evaluation for navigation (scale 0-5,5 best) 2017	Evaluation for online tools (scale 0-5, 5 best) 2017
	87	53	14,31	23	158	9,1	0	0	465	yes	2	4	3
	73	54	15,75	30	141	29,3	0	0	187	yes	2	5	5
	88	52	2,63	8	165	22,9	1.240.000.000	53	125	yes	2	5	4
	96	50	3,38	7	127	25,7	881.380.000	51	7	yes	2	4	3
	95	51	4,34	8	130	10,2	113.740.000	41	13	0	0	0	0
	97	49	3,26	11	119	10,3	0	0	59	yes	2	4	2
	108	46	1,79	8	169	13,4	0	0	25	yes	2	5	2
	100	48	4,52	7	111	11,6	1.065.770.000	52	5	yes	2	3	1
	112	45	0,27	1	130	5,6	151.000.000	44	6	yes	2	5	2
	129	42	0,29	0	81	9,1	417.000.000	48	11	yes	2	5	5
	120	44	2,94	8	107	10,9	0	0	26	yes	2	4	1
	150	30	0,17	0	70	3,3	0	0	6	yes	2	5	4
	103	47	5,58	8	106	19,0	742.340.000	50	4	yes	2	3	2
	133	40	1,09	2	85	8,4	129.500.000	42	8	yes	2	4	4
	137	37	0,01	0	82	7,7	1.357.000.000	54	3	yes	2	3	3
	134	39	0,1	2	101	12,8	0	0	5	yes	2	5	3
	167	17	0,2	0	76	2,1	108.400.000	40	2	yes	2	5	5
	136	38	0,47	3	73	9,3	0	0	16	yes	2	5	5
	157	26	0,18	1	50	3,4	132.800.000	43	2	yes	2	4	4
	158	25	0,67	2	86	5,0	51.000.000	35	3	partly	1	3	1
	132	41	0,52	1	119	8,7	195.200.000	45	5	yes	2	4	4
	124	43	0,63	1	161	8,4	15.700.000	27	18	no	0	0	0
	141	35	0,67	2	100	5,9	86.000.000	39	5	yes	2	3	2
	147	33	0,15	1	74	2,5	39.000.000	33	5	yes	2	3	2
	163	20	0,16	0	74	2,8	0	0	2	yes	2	4	2
	0	0	0,49	3	65	12,0	0	0	10	no	0	0	0
	162	21	0,04	0	81	2,4	43.000.000	34	1	yes	2	1	1
	166	18	0,1	1	44	1,1	26.000.000	30	2	yes	2	5	5
	154	28	0,67	1	61	6,0	0	0	5	yes	2	4	2
	159	24	0,88	1	68	3,6	26.000.000	29	7	no	0	0	0
	149	31	0,02	1	140	4,4	75.000.000	38	2	no	0	0	0
	139	36	0,07	0	71	8,0	301.000.000	47	0	no	0	0	0
	0	0	0,97	10	157	0,0	0	0	4	no	0	0	0
	156	27	0,16	0	81	3,7	0	0	4	no	0	0	0
	148	32	0,07	5	72	21,0	467.000.000	49	2	yes	2	3	3
	143	34	0,18	2	138	0,0	0	0	5	yes	2	4	1
	169	15	0,48	1	43	0,0	0	0	0	yes	2	3	3
	0	0	0,26	2	55	0,0	0	0	1	yes	2	1	0
	0	0	0,011	0	112	4,0	19.500.000	28	2	no	0	0	0
	168	16	0,03	0	38	3,3	56.000.000	36	2	yes	2	3	2
	165	19	0,01	0	87	5,3	62.000.000	37	0	no	0	0	0
	151	29	0,24	1	89	36,8	0	0	3	no	0	0	0
	170	14	0	0	53	3,3	246.500.000	46	0	yes	2	3	1
	0	0	0	0	90	1,3	9.300.000	25	1	no	0	0	0
	173	11	0,06	0	69	5,8	10.000.000	26	2	no	0	0	0
	174	10	0,08	0	40	2,1	29.000.000	32	0	0	0	0	0
	171	13	0,03	0	46	2,8	0	0	1	yes	2	1	1
	160	23	0,48	1	67	0,0	0	0	3	no	0	0	0
	175	9	0,06	1	46	1,4	26.200.000	31	0	yes	2	2	0
	161	22	2,69	3	35	0,0	0		7	no	0	0	0
	172	12	0	0	24	0,7	8.000.000	24	0	no	0	0	0
	0	0	0,74	0	52	0,0	0	0	0	no	0	0	0
	0	0	0,013	0	26	1,8	0	0	1	no	0	0	0
	0	0	0,003	1	7	0,0	0	0	0	no	0	0	0

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