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# **Smart Digital Transformation in Government Consultancy Report prepared for UN ESCWA**

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## ACRONYMS

<b>A</b>		
	APM	Action Priority Matrix
	AWS	Advanced Wireless Services
<b>B</b>		
	BPM	Business Process Management
<b>C</b>		
	CDIO	Conceive, Design, Implement and Operate
<b>E</b>		
	EC	European Commission
	EGDI	E-Government Development Index
	EIA	Environmental Impact Assessment
	EPI	E-Participation Index
<b>G</b>		
	GCC	Gulf Cooperation Council
	GEMS	Government Electronic and Mobile Services
	GDP	Gross Domestic Product
<b>H</b>		
	HCI	Human Capital Index
<b>I</b>		
	ICT	Information and Communication Technology
	IoT	Internet of Things
	ITU	International Telecommunication Union
	ITU-T	ITU Telecommunication Standardization Sector
<b>K</b>		
	KPI's	Key Performance Indicators
	KSA	Kingdom of Saudi Arabia
<b>L</b>		
	LTE	Long Term Evolution
<b>M</b>		
	MENA	Middle East and North Africa
<b>N</b>		
	NRF	National Research Foundation
<b>O</b>		
	OSI	Online Service Index
<b>P</b>		
	PPP	Public Private Partnership
<b>S</b>		
	S.M.A.R.T. <sup>1</sup>	Specific, Measurable, Assignable, Realistic, Time-related
	S.M.A.R.T. <sup>2</sup>	Social, Mobile, Analytics, Radical-openness, Trust
	SDGs	Social Development Goals
	SME	Small and Medium Size Enterprise
	SNP	Smart Nation Platform

	SWOT	strengths, weaknesses, opportunities, and threats
<b>U</b>		
	UAE	United Arab Emirates
	UNDESA	United Nations Department of Economic and Social Affairs
	UNESCWA	United Nations Economic and Social Commission for Western Asia
	UNPAN	United Nations Public Administration Network
<b>V</b>		
	VoIP	<b>V</b> oice <b>o</b> ver <b>I</b> nternet <b>P</b> rotocol
<b>X</b>		
	XLTE	Faster LTE peak data speed networks, from Verizon.

## **THE GOAL**

*To assist governments in the Arab region in formulating smart government policies that meet the needs of citizens, achieve economic growth, increase employment and support a transition to digital economies.*

## EXECUTIVE SUMMARY

This report suggests a definition of the smart transformation paradigm from government and society viewpoint. The term *smart* has been generously used in the literature with hardly precise parameters that help to assist policy makers in their endeavour to apply smart transformation to government services in functional or geographical steps.

The report consists of 11 sections. In **Section 1**, a historical account of the development of governments throughout history and their alignment to relevant technological breakthroughs with their impacts of government development is presented. Government's conservative approach to ICT based applications began to change in the 1990's with more powerful software and hardware platforms that relied on networks and a paradigm shift to converged information and communication technologies, as well as better designed software tools and applications that made human-machine interaction more efficient and friendlier. Since then, technology, became key and a prerequisite element of change in government systems, its working procedures and the way services were provided to citizens and constituents.

**Section 2** deals with the transformation of the concept of in-house computer applications to open and transparent internet-based government services. The change also required some government applications to communicate with each other. The need to consider data standards, portability and interoperability was brought to the fore, and citizen (customer) satisfaction when dealing with government activities became a performance criterion.

**Section 3** discusses the role and function of disruptive technologies in creating novel and out of the box solutions to address unthought of, or unaddressed, domains in government handling of services in smarter more innovative manner.

Disruptive innovation is not limited to technology. It extends to include new procedures and regulations that may be considered disruptive to traditional rules and habits that may require radical reform. The impact of disruptive innovations and technologies vary from one community to another. Economics, social habits and mindsets play important roles in the adoption process and can make or break the introduction of changes and new applications.

**Section 4** deals with the *smart paradigm* from a variety of aspects related to the fuzzy and not so precise meaning and definition of the word. *Smart* could also be thought of as an acronym that represents **S**ocial, **M**obile, **A**nalytics, **R**adical-openness and **T**rust. The description can apply to a phone, a government, a society, a nation, or an individual citizen (beneficiary). The Action Priority Matrix and its associated Action Priority Matrix worksheet for assessment purposes is also introduced.

In addition, the *Holistic Smart Government Framework* is introduced, as a multidimensional framework encompassing policy, strategy, business practices, funding, technology, services supported by clear communication efforts, human capital management, and, finally, impact analysis.

The trend in national and local governments to adopt the concept of moving from e-Government to *smart government* is dealt with in **Section 5**. Several studies implicitly referred to *smart government* as part of the advanced maturity stage in the development of e-Government. Others treated it as a distinct stage. IDC summarised smart government characteristics in citizen participation in governmental business, information transparency in government and collaboration across government entities to deliver better citizen services. The top 10 strategic technologies for smart government is defined by Gartner. The most important of these technologies are: the digital workplace, multichannel citizen engagement, open and big

data, analytics and the Internet of Things. The World Economic Forum's Council developed what it called a *Smart Toolbox* to enable greater transparency of government actions through open data, empower citizens to effective and more reliable access to online services, strengthen responses to aid civilians in conflicts, explore risks and challenges of the digital world, and keep pace with fast changing innovative tools and technologies, minimize divides, which could expand, between the various user groups that may have problems with ease of use and protect data and information.

Examples of smart actions that could serve in the achievement of the seventeen Sustainable Development Goals are highlighted in **Section 6**.

Since *smart government* is not defined precisely as a distinct stage in the UNDESA e-Government surveys, the study adopted the assumption that a smart government is equivalent to the rank of *very high EGDI*<sup>1</sup> in the 2016 Survey. Case studies were selected in **Section 7** from the list of countries that attained such level. Bahrain and the UAE are the only Arab countries that *very high EGDI* level and their case studies are included in **Section 8**. This Section also deals with challenges that are facing the Arab countries. They include social, economic, infrastructural and management factors to be addressed as challenges in most of the countries in the region.

Three options are proposed in **Section 9** for smart transformation scenarios grouped under sector-centric, city-centric or a combination of the two. The choice is heavily determined by the geography and demography of countries as well as political, economic and social considerations. A modified Action Priority Matrix worksheet is used to assist decision makers in the selection of the most suitable scenarios for the intended smart transformation.

Except for the GCC, the remaining Arab governments have a long way to go in the e-Government maturity journey to reach the *smart* status. The present economic, political and security issues in the region are making such transformation even harder to reach. **Section 10** concludes by discussing the shortcomings and challenges faced in formulating the smart definition and provides directions to follow to reach a better understanding of the intended aim for transformation.

A set of recommendations on how to proceed with the selection and evaluation of scenarios for smart transformation led by government decision makers in consultation with the stakeholders involved is suggested in **Section 11**.

Smart transformation at all levels of government and society constitutes the demand side of an equation which requires a supply side to provides extensive infrastructure as well as products and services based on ICT and other technologies to meet the delivery needed for the smart transformation.



# 1. HISTORY OF GOVERNMENT AND TECHNOLOGY

## Governments

The agricultural revolution, which began around 10000 B.C. resulted in a population increase leading in a growth of villages into towns and cities and consequently empires. Several innovative, ambitious individuals from within communities felt that the population needed to be under some form of control, and thus came the establishment of governments, rules and codes to regulate the people.<sup>2</sup>

Early civilizations started in cities in Mesopotamia, Egypt, China, as well as few other places. The history of government was largely one of managing warfare. However, other functions also spawned. The laws of the Sumerian King Hammurabi, known as the *Hammurabi Code*, was a noteworthy achievement in inventions of rules and regulations for government functions. Extensive system of roads which connected parts of the Persian and Roman empires were constructed by a central government that covered and controlled vast territories<sup>3</sup>.

The Greek political philosopher, Aristotle, of the 4<sup>th</sup> century B.C. was the first to distinguish three main forms of government: monarchy, aristocracy and polity. However, the three types required to address issues such as, distribution of authority, divisions of government and functions, as well as the maintenance of authority. Since those days, governments recognized the principle that their public must be protected and served. In return, the citizen had to surrender a degree of sovereignty for protection of life and property, as well as the delivery of some basic and essential services<sup>4</sup>. The citizen had to pay taxes, and serve to defend the country through the government. Citizens' obligations in those days were far more than the services they received from their government.

Governments have been developed, in some sense, from the patriarchal, since all communities were influenced in their development by the family structure. Thus, they demanded from their citizens, in terms of taxes and defence more than they provided them services and remunerations.

## Technology

Technology went hand in hand with civilization. Early technological tools included writing, first invented independently in Ur, Mesopotamia and ancient Egypt, around 3200 B.C. The earliest traces of the Babylonian numerals date back to the same period<sup>5</sup>. Two other breakthroughs also improved the productivity of ancient governments: the decimal system, invented between the 1st and 4th centuries by Indian mathematicians, and disseminated later by the Arabs, through Spain, to Europe, in the ninth century<sup>6</sup>. The second invention, which happened several centuries later, was the printing machine by Johannes Gutenberg (1395–1468) in Germany<sup>7</sup>. These inventions made the administration of governments do and document work more efficiently. Dealing with information related to citizens and taxes obliged governments to introduce procedures and document information. When government workload grew larger, old governments employed more individuals to carry the increasing workload, and were required to issue instructions to employees to follow standard procedures. This signalled the birth of bureaucracy that has migrated from one state to another, as well as from one culture to another.

## Computers

The first electronic computers began appearing in the 1940's in the US and the UK. Their early use was in military and scientific applications. Soon after, the advantages of these machines were recognized by both the US and the UK governments for processing large data in government and commercial applications, such as the census, payroll and billing systems. These, relatively large, data-centric applications provided

government agencies with efficient means for processing and printing large amount of information. In those days, computers and their applications were used to help government agencies process data that was previously processed manually and required much time and human resources to do. The establishment and the civil service were the main beneficiary. The citizen was not a direct beneficiary target in those days. The interaction with these machines and the applications were carried out in what was turned to be called *batch* mode. Most government institutions did their own data processing, maintained their own records and prepared their own reports.

In the 1960's, more manual systems gradually moved to electronic systems. In the 1970's, basic record keeping and financial functions were the primary automated activities. And the convergence of computers and communication technologies, in the late 1970's and 1980's, made communicating with computers from a distance possible, and allowed several government users to share large computers, and sometimes, even shared data and applications. Arab countries followed the same development path at speeds that varied from one country to another.

In the late 1980's, government departments were feeling the pressures of citizen demands for more efficient and responsive services. They expected better levels of service instead of the lengthy, and, in many cases, fragmented and duplicative procedures.

Government's conservative approach to ICT based applications began to change in the 1990's with more powerful software and hardware platforms which relied on networks and a new paradigm shift to converged information and communication technologies, as well as better designed software tools and applications that made human-machine interaction more efficient and friendlier. Since then, technology, became a key and integral element in government systems, its working procedures and the way services were provided to citizens<sup>8</sup>.

## 2. FROM GOVERNMENT APPLICATIONS TO GOVERNMENT SERVICES

Several important issues with respect to government performance, became paramount in the 1990's:

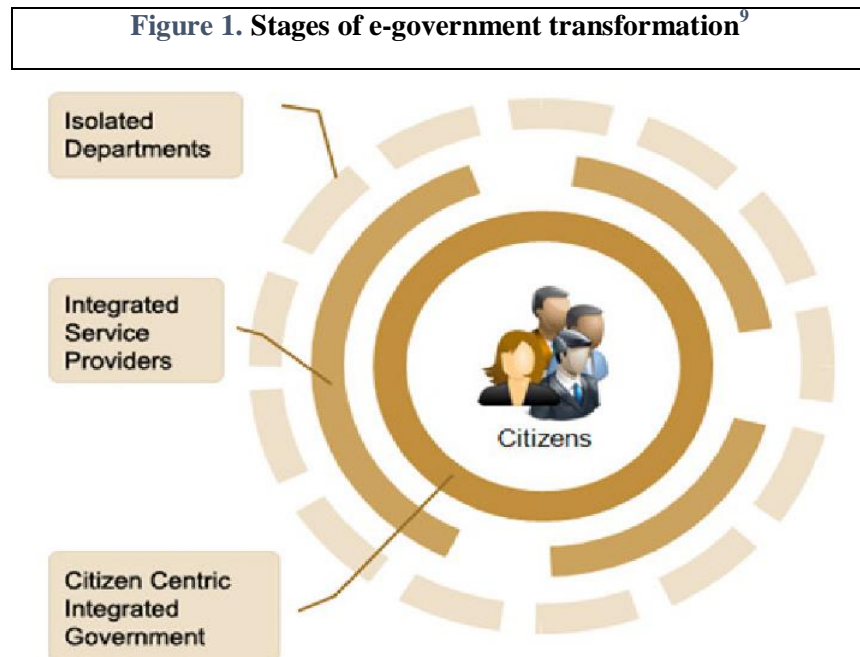
1. The need for some government applications to communicate with each other;
2. The need to consider data standards, portability and interoperability; and
3. Citizen (customer) satisfaction when dealing with government activities.

### **The wave of Internet Technology**

The real breakthrough came about in the 1990's with the commercialization and availability of the Internet and the world-wide-web. Concepts such as government services, citizen centricity and single entry point to government services became central issues for transformation to a more effective government. Information and communications technology (*ICT*) became the main enabler of this transformation.

Several government departments introduced orientation and awareness programmes, including short training courses and promotional campaigns in the media, to assist citizens on how to use the new services. Customer support services and call centres were also created for these services. Some departments even outsourced such services to private sector companies as a form of public-private-partnership (PPP). In retrospect, this could, perhaps, be considered as the first innovative step in the transformation to the *smart society*.

The name *electronic government* and its derivatives: *e-Government*, *digital government* and other names, became the vogue amongst senior government officials who were anxious for reform by providing better and more transparent services to the citizen as a customer. The various stages in the transformation are best illustrated in Figure (1).



### 3. THE DISRUPTIVE ROLE OF TECHNOLOGY

History of disruptive innovations is as old as the history of humankind. Technology allows organizations and individuals to add incremental improvements quickly. Products and services often overshoot the acceptable cost, thus becoming expensive and inconvenient for many customers. Consider the technological development of the laptop. Most of the advanced capabilities of laptops are irrelevant to most users —*they can do more than most consumers require. The majority laptop users spend a third of their online time simply checking emails or browsing the web; they don't necessarily need a terabyte of data or high-resolution graphic processors.*<sup>10</sup>

In the public sector, *the quest for higher and higher performance levels often results in increasingly complicated and expensive approaches. Airport security is a case in point. Screening techniques have improved dramatically since 9/11 but at a substantial cost, both in price and complexity.*<sup>11</sup>

However, there is an alternative, more desirable approach for disruption. Disruptive innovations in societies and government services can provide populations, including those classified as the *underserved* among them, a product or service that was previously available only to a few. Deloitte sums up the requirements for disruptive innovation as follows<sup>12</sup>:

- Usually introduced, or successfully taken to market by an outside organization;
- Typically targets an underserved, or entirely new market;

- Could initially be inferior to existing products;
- Be less expensive than traditional or current products.

In the context of government applications, several disruptive innovations in products and services drove applications to services, services to e-government, e-government to open government and mobile/smart government.

Examples of products and services that helped in the disruption process include, but are not limited to:

- The internet and world wide web (www);
- The laptop;
- Broadband access;
- Mobile phones and data;
- Short mobile messages (SMS)
- Smartphones and tablets;
- Voice over IP messaging and voice communications.

The impact of disruptive innovations and technologies vary from one community to another. Economics, social habits and mindsets play important roles in the adoption process and can make or break the introduction of changes and new applications. In addition, government policy can play a motivating, or a deterring role, in the adoption of a specific disruptive technology. An example is prohibition by government of VoIP outside the licensed network operators. Such unfair application of government power may entice citizens to find innovative and illegal ways of working around such prohibition.

Disruptive innovation is not limited to technology. It extends to include new procedures and regulations that may be considered disruptive to traditional rules and habits that may require radical reform.

#### **Box 1. The different meanings of disruptive technology**

The Christensen model of disruptive technology, later renamed *disruptive innovation*, defines a process through which disruption takes place. A small firm enters a market by providing cheaper and, possibly, inferior (but typically more technologically advanced) products at lower-value to consumers. Incumbent firms, meanwhile, remain concerned with the demands of their more profitable high-end customer base and initially pay little attention to the new entrant. Once the new entrant has established a foothold, technological improvements allow it to improve the quality of its products while maintaining its price advantage. In this way, the entrant out-competes the incumbents and disrupts the market.

This model can describe the process through which some industries have experienced disruption. For example, the personal computer (PC) emerged in the early 1980s as a lower-powered, cheaper alternative to minicomputers. Because this new technology initially appealed mostly to small businesses and individuals, minicomputer producers continued to cater to their established customer base of larger businesses and universities. Technological advances then improved the computing power and storage of the PC, which, eventually, largely displaced minicomputers.

Elsewhere, *disruptive technology* has different connotations. Although Schumpeter (1942) used the term *creative destruction*, is well known for his observation that capitalist systems progress by creating new structures while destroying existing ones. McKinsey Global Institute (2013) adopted an understanding of disruption along these lines, noting the potential for technology to ‘disrupt the status quo, alter the way people live and work, rearrange value










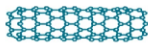


pools, and lead to entirely new products and services’, but also noted that ‘technology often disrupts, supplanting older ways of doing things and rendering old skills and organizational approaches irrelevant’.

Both definitions focus on the technologies themselves and the economic rewards that they may bring. While these definitions are appropriate to the context within which they are used, however, they place insufficient focus on the impact of these technologies on firms, workers and the business of governing.

Sources: Christensen, Raynor and McDonald (2015); McKinsey Global Institute (2013); Schumpeter (1942); Trout (2015)

Box 2 shows 12 examples of potentially disruptive technologies.

**Box 2. Potentially economically disruptive technologies<sup>13</sup>**

	<b>Mobile Internet</b>	Increasingly inexpensive and capable mobile computing devices and Internet connectivity
	<b>Automation of knowledge work</b>	Intelligent software systems that can perform knowledge work tasks involving unstructured commands and subtle judgments
	<b>The Internet of Things</b>	Networks of low-cost sensors and actuators for data collection, monitoring, decision making, and process optimization
	<b>Cloud technology</b>	Use of computer hardware and software resources delivered over a network or the Internet, often as a service
	<b>Advanced robotics</b>	Increasingly capable robots with enhanced senses, dexterity, and intelligence used to automate tasks or augment humans
	<b>Autonomous and near-autonomous vehicles</b>	Vehicles that can navigate and operate with reduced or no human intervention
	<b>Next-generation genomics</b>	Fast, low-cost gene sequencing, advanced big data analytics, and synthetic biology (“writing” DNA)
	<b>Energy storage</b>	Devices or systems that store energy for later use, including batteries
	<b>3D printing</b>	Additive manufacturing techniques to create objects by printing layers of material based on digital models
	<b>Advanced materials</b>	Materials designed to have superior characteristics (e.g., strength, weight, conductivity) or functionality
	<b>Advanced oil and gas exploration and recovery</b>	Exploration and recovery techniques that make extraction of unconventional oil and gas economical
	<b>Renewable energy</b>	Generation of electricity from renewable sources with reduced harmful climate impact

SOURCE: McKinsey Global Institute analysis

#### 4. THE SMART PARADIGM

The word *smart* has been closely associated in recent years with *disruption* in designing systems and applications. The ubiquitous use of *smart*, despite its inexact meaning, is used these days in association with innovation and technology. Like the expression, *Internet of Things - IoT, Big Data and Cloud Computing*, it is applied to indicate any new product or service that use technology and innovation in a disruptive manner to come up with a solution that is predominantly new and would appeal to a large cross section of the targeted community.

For government and management consultants, SMART is also an acronym. The November 1981 issue of *Management Review* contained a paper by George T. Doran called *There's a S.M.A.R.T. way to write management's goals and objectives*. The acronym stands for<sup>14</sup>:

- **Specific** – target a specific area for improvement.
- **Measurable** – quantify or suggest an indicator of progress.
- **Assignable** –who will do it.
- **Realistic** – state what results can realistically be achieved, given available resources.
- **Time-related** – specify when the result(s) can be achieved.

More recently, the acronym S.M.A.R.T acquired yet an alternative definition in the context of e-government development<sup>15</sup>:

- **Social** – Personalized and citizen-friendly service delivery, allowing citizens and civil society to co-create with government
- **Mobile** – Using the latest mobile technologies to deliver information and services, and get contributions from citizens, wherever and whenever they want – by Apps, SMS, social media, and web-on-the-move – using mobile networks and cloud computing at the back-end
- **Analytics** – Using Big Data Analytics to drive policy action and to individualise communications and transactions
- **Radical-openness** –*Open by Default* transforms accountability and transparency and engages citizens in co-creation, as well as enable businesses to use data to innovative new services
- **Trust** – Effective cybersecurity so that services are resilient, available and protect privacy

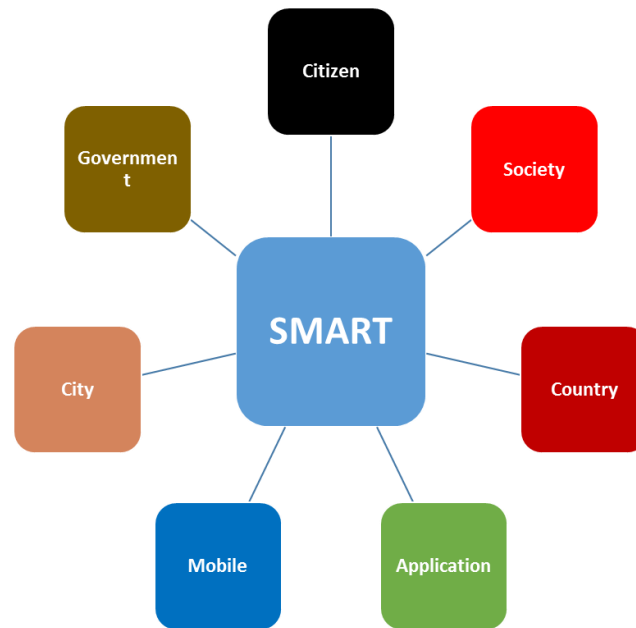
The word and both acronyms are fuzzy and inexact descriptions of certain innovative technological and/or procedural trends, or breakthroughs, in certain contexts. One should not attempt to load too much meaning into them, but should, nevertheless, understand the essence of what they intend to deliver.

For example, a *smartphone* is a mobile phone that performs many of the functions of a computer, typically having a touchscreen interface, Internet access, and an operating system capable of running downloaded apps and sending and receiving data<sup>16</sup>. The introduction of smartphones paved the way to the design of smart applications, abbreviated in smartphone culture to *smart apps*. In fact, the smartphone was also the main trigger for the *smart paradigm* in government services, and for many, the term smart government implied availability of government services through smartphones.

In addition, there is a large degree of overlap between the various terms associated with the adjective *smart*. For example, a *smart society* or a *smart citizen* could be part of a *smart city*, or a *smart nation*. A *smart government* could mean a local government in a *smart city*, or a national government aiming to create smart,



horizontal or vertical, standalone, or ultimately interconnected physical or virtual islands, in a *not so smart country*. Therefore, a national government may not be totally *smart*, but may undertake the responsibility of implementing a *smart paradigm* in the country in accordance with a predefined strategy. Smart associations is summarized in Figure 2.



**Figure 2. The Smart Associations**

Most of the recent international studies on the subject mainly focus on the development of smart urban areas, with the understanding that future societies are city-based rather than country-based societies. There are only few references to the development of smart national governments. One notable reference, is a report issued by Booz Allen Hamilton<sup>17</sup>, which will be discussed later.

According to Wikipedia, a *smart city* is an urban development that integrate multiple information and communication technology (ICT) and Internet of Things (IoT) solutions in a secure fashion to manage city's assets – they include, but are not limited to, local departments' information systems, schools, libraries, transportation systems, hospitals, power plants, water and electricity supply networks, waste management, law enforcement, and other community services<sup>18</sup>. A smart city should also consist of smart streets, where e-services and accessibility are available for all.

## IoT

The IoT is an important technological concept for smart infrastructures. It has been defined in Recommendation [ITU-T Y.2060](#) (06/2012) as a *global infrastructure for the information society, enabling advanced services by interconnecting (physical and virtual) things based on existing and evolving interoperable information and communication technologies*.<sup>19</sup> IoT brings the issue of frequency spectrum to the fore and provides a challenge to the telecom industry on standardization. To manage connectivity of things, networks should be able to handle horizontal, rather than vertical, entities. And despite the present growth of fibre optic networks, the development of high speed generations of wireless technology is vital to future smarter cities and communities. See Box 3.

### Box 3. 2G, 3G, 4G, 4G LTE, 5G – What are They?<sup>20</sup>

Quite simply, the *G* stands for Generation. Each generation is supposedly faster, more secure and more reliable. The reliability factor is the hardest obstacle to overcome. 1G was not used to identify wireless technology until 2G was released. That was a major jump in the technology when the wireless networks went from analog to digital. 3G came along and offered faster data transfer speeds, at least 200 kilobits per second, for multi-media use and was a long time standard for wireless transmissions.

It is still a challenge to get a true 4G connection, which promises upwards of a 1Gps, Gigabit per second, transfer rate if you are standing still and in the perfect spot. 4G LTE comes very close to closing this gap. True 4G may not be available until 5G arrives.

#### What are the Standards of the G's

Each of the Generations has standards that must be met to officially use the G terminology. Those standards are set by standards.

**1G** – A term never widely used until 2G was available. This was the first generation of cell phone technology. Simple phone calls were all it could do.

**2G** – The second generation of cell phone transmission. A few more features were added to the menu such as simple text messaging.

**3G** – This generation set the standards for most wireless technology. Web browsing, email, video downloading, picture sharing and other Smartphone technology were introduced in the third generation. 3G should be capable of handling around 2 Megabits per second.

**4G** – The speed and standards of this technology of wireless needs to be at least 100 Megabits per second and up to 1 Gigabit per second to pass as 4G. It also needs to share the network resources to support more simultaneous connections on the cell. As it develops, 4G could surpass the speed of the average wireless broadband home Internet connection. Few devices were capable of the full throttle when the technology was first released. Coverage of true 4G was limited to large metropolitan areas. Outside of the covered areas, 4G phones regressed to the 3G standards. When 4G first became available, it was simply a little faster than 3G. 4G is not the same as 4G LTE which is very close to meeting the criteria of the standards.

A 4G phone had to comply with the standards but finding the network resources to fulfill the true standard was difficult. People started buying 4G capable devices before the networks were capable of delivering true 4G to the device.

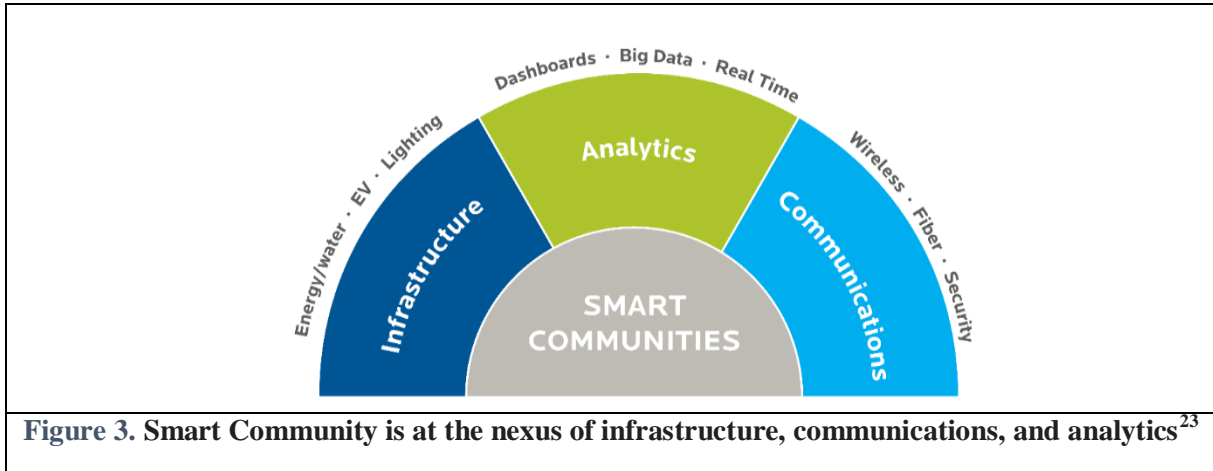
**4G LTE**– Long Term Evolution – LTE sounds better. This buzzword is a version of 4G that is fast becoming the latest advertised technology and is getting very close to the speeds needed as the standards are set. When you start hearing about LTE Advanced, then we will be talking about true fourth generation wireless technologies because they are the only two formats realized by the International Telecommunications Union as True 4G now.

Verizon, T-Mobile and Sprint have all advanced to the LTE technology with each carrier adding their own combination of wireless technologies to enhance the spectrum.

**5G** - 5G is coming soon. Then there is XLTE which is a bandwidth charger with a minimum of double the bandwidth of 4G LTE and is available anywhere the AWS (Advanced Wireless Services<sup>21</sup>) spectrum is initiated. 5G being tested although the specifications of 5G have not been formally clarified. It is expected that new technology to be rolled out around 2020 but in this fast-paced world it will probably be much sooner than that. 5G will be at speeds of 1-10Gbps.



Societies are progressively moving towards socio-technical ecosystems in which physical and virtual dimensions of life are more and more intertwined, and where people interaction often takes place with, or mediated, by machines. The scale at which this is happening, and the differences in culture, language and interests makes the problem of establishing effective communication and coordinated action increasingly complex and challenging<sup>22</sup>. A *smart society* or a *smart community* is a society that takes all these issues into consideration. The expression *smart nation* is also used when *smart* targets a whole country. A *smart citizen* is the basic element, or cornerstone, of a smart society. To create a smart society, one should ensure the transformation of the citizen into a smart citizen, who is likely to be reluctant to adapt without motivation, and in many cases, a change in the *mindset*. See Figure 3.



**Figure 3. Smart Community is at the nexus of infrastructure, communications, and analytics<sup>23</sup>**

In the development of government services, the term *electronic government* was first coined to mean providing government services delivered electronically, but predominantly over the Internet. The name was later abbreviated to e-Government, and when some of the e-Government applications were made available on mobile phones, experts coined the expression *mobile government* as a stage further in the maturity journey of government services. For many governments, the term was associated with the availability of government applications through smartphones, but later given wider coverage to include smarter ways of developing strategies and policies in government systems and applications<sup>24</sup>.

### Smart Government

IDC defines *Smart Government* as: *the implementation of a set of business processes and underlying information technology capabilities that enable information to flow seamlessly across government agencies and programs to become intuitive in providing high quality citizen services across all government programs and activity domains.*<sup>25</sup> To upgrade to *smart government*, government departments have to know citizens' communications preferences. In developed countries, *smart government* is more associated with metropolitan governments than with national governments. For national governments, a *smart government* equates to a government that has reached the highest *maturity level* in the e-Government development journey, with a *Very High E-Government Development Index (EGDI)*<sup>26</sup>, as will be discussed later.

### Smart Governance

*Smart Governance* is about greater efficiency, community leadership, mobile working and continuous improvement through innovation. It is about using technology to facilitate and support better planning and decision making and improving democratic processes, and transforming the ways public services are delivered<sup>27</sup>. It is also about enabling interoperability of government entities through technology

## Smart applications

*Smart applications* are those applications that include data-driven features that deliver actionable insights to users in the right context, at the right time.

By understanding what makes smart applications smart, developers, data scientists and executives should be able to come up with new, innovative cases that impact not just the bottom line requirements, but also propels innovation and topline growth<sup>28</sup>.

A *smart application* software must have the following key attributes<sup>29</sup>:

- Must have imported or embedded awareness data relevant to the business or government activity;
- A collaboration platform for users to create content needed for the activity;
- Business Process Management (BPM) tools for executing the steps involved in a business process;
- Document capture, document output and document management capabilities;
- Implied creativity and innovation;
- Embedded analytical tools.

The subject of smart applications deserves a separate study in its own right.

## 5. FROM E-GOVERNMENT TO SMART GOVERNMENT

During the 1980s and 1990s, governments started paying more attention than before to quality of service or response to the needs of citizens. There was increasing emphasis on professional management practices, as well as customer satisfaction and result oriented administration. Governments needed to create better connections with their citizens, improve access to public services and respond to social development. So, in the 1990s, e-government was introduced to enhance and support government reform and efficiency. In its early days, e-government used information and communication technology (ICT) to produce and distribute public information through the Internet. The information in those days was quite static. In a little more than a decade, e-government was developed to provide a wider variety of services with ICT and the Internet as enablers. that started providing better services more efficiently at lower cost<sup>30</sup>. A typical e-government journey through the years is taken from the experience of South Korea. Figure 4 gives a good realistic picture of the span of time needed for the various stages of development.

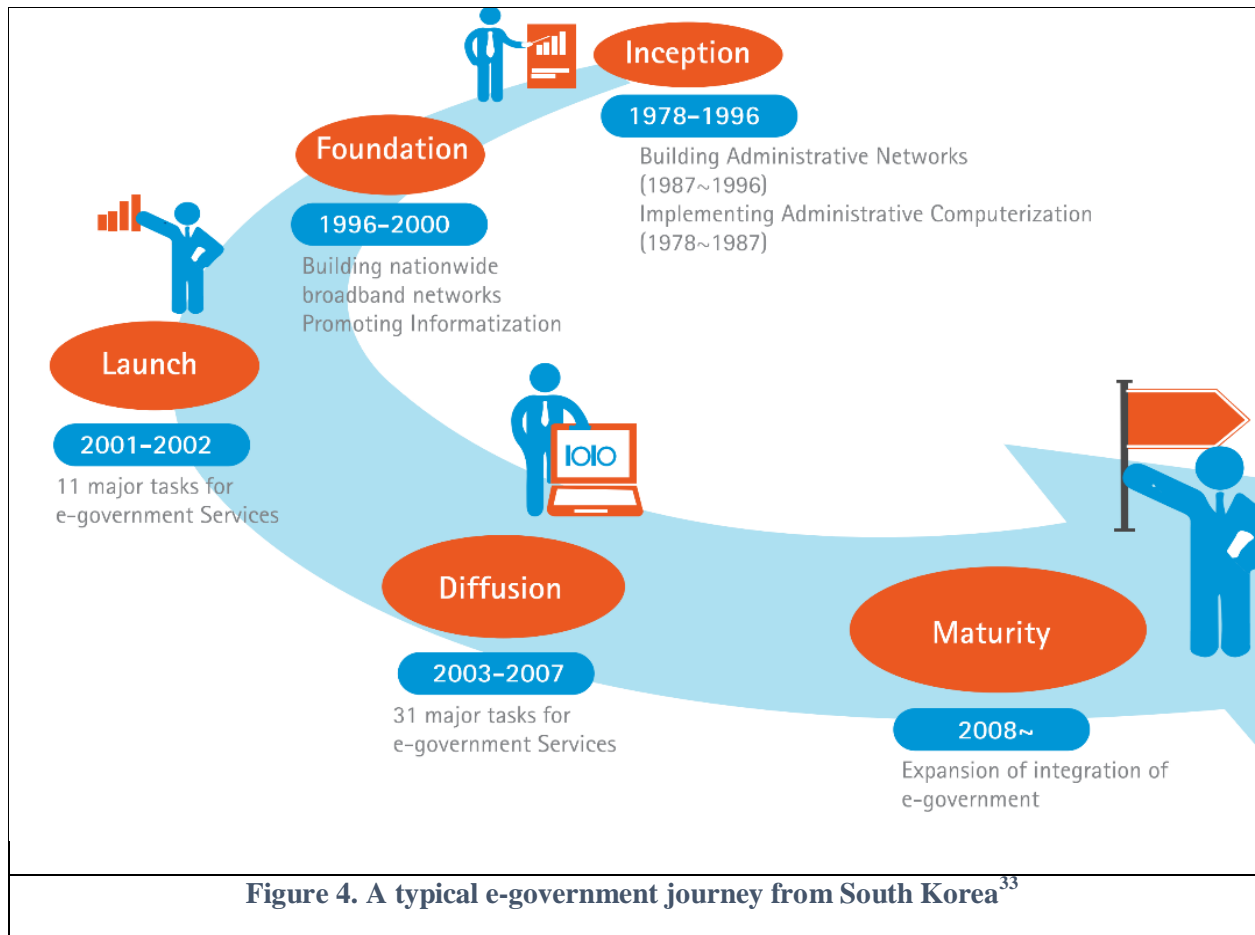
### Using UN e-Government Ranking to define Smart Government

Since 2001, the United Nations Department of Economic and Social Affairs (UNDESA) has been conducting surveys for e-Government worldwide. The Survey measures e-government effectiveness in the delivery of basic economic and social services to people in five sectors, namely: (1) education, (2) health, (3) labour and employment, (4) finance and (5) social welfare. The environment dimension was added to the Survey assessment in 2012<sup>31</sup>.

**EGDI** is an acronym for: E-Government Development Index. It consists of three main components that have equal weights in the assessment process<sup>32</sup>:

- **OSI** Online Service Index

- **HCI** Human Capital Index
- **EIA** Environmental Impact Assessment



For detailed definitions of EGDI and its components, refer to the Appendix.

The e-participation index (**EPI**) is used as a supplementary index to EGDI. It focuses on the use of online services to facilitate provision of e-information sharing (governments to citizens) with stakeholders (“e-consultation”) and engagement in decision-making processes (“e-decision-making”)<sup>34</sup>

The latest 2016 DESA Survey, concludes that: *e-Government has grown rapidly over the past 15 years, since the first attempt of the United Nations to benchmark e-government in 2001-4.*<sup>35</sup> The term *smart government* has no distinct stage, nor a definition, in the 2016 Survey Report. However, a government which scored a very high mark in EGDI (OSI, HCI, EIA) as well as EPI, is considered a *smart government*.

In the Survey, 29 countries scored *very high*, with an e-government development index (*EGDI*) values in the range of 0.75 to 1.00, as compared to only 10 countries in 2003. Since 2014, all 193 Member States of the UN have been able to have some form of online presence. E-government is now ubiquitous in more countries, a stark contrast in comparison to 2003 – when 18 countries, about 10% of countries globally, were without any online presence. In the latest survey, 51 per cent of countries had *low EGDI* or *medium EGDI* values, as compared to over 73 per cent of countries in 2003<sup>36</sup>.

As discussed earlier, e-government has come about as an evolutionary step forward from the milieu of government applications of the 1970's and 1980's. The paradigm shift from government/department centric to citizen centric was made due to the fast-developing ICT sector, particularly the Internet and the web technology. Subsequent years witnessed, fast development of e-Government systems adopted fully across the world to deliver services to government clients including citizens, businesses and others<sup>37</sup>.

### **Government Maturity Models**

The United Nations developed a four-stage maturity model for e-government which was used for ranking the UN member states<sup>38</sup>:

- **Stage 1. *emerging information services*:** In this stage, e-government web sites provide static information;
- **Stage 2. *enhanced information services*:** In this stage, the presence is enhanced with one way or simple two-way communication;
- **Stage 3. *transactional services*:** In this stage, a two-way interaction with citizens is made possible;
- **Stage 4. *connected services*:** In this stage, Web sites are proactive in requesting citizens' feedback via Web 2.0 tools. Government agencies are citizen centric and services are customer centric.

Several studies implicitly referred to smart government as part of stage 4, while others allocated a separate Stage 5 for it. To find out more about the various maturity models in existence, please refer to the paper noted in the footnote below<sup>39</sup>.

### **UNESCWA Electronic and Mobile Services (GEMS) Maturity Index<sup>40</sup>**

ESCWA and the UAE Prime Minister's Office developed GEMS maturity index that is aimed to be applied across countries, while taking into consideration regional specificities. It is an assessment tool that can be used by policymakers to measure the level of digitization and sophistication in the delivery of e-government and m-government services to the public. The tool goes further than earlier methods, which generally focused on high-level assessments. This index combines key performance indicators (KPIs) measuring service availability and sophistication, service usage, and public reach. In addition to analyzing the services provided and their maturity, GEMS emphasizes the demand side of government services, i.e. actual usage by individuals and their satisfaction with the service.

The deployment of GEMS should encourage policymakers in government entities to increase the supply of sophisticated and mature digital services. GEMS was rolled out as a pilot in 10 Arab countries (Lebanon, Jordan, Palestine, Iraq, Bahrain, UAE, Oman, Sudan, Tunisia, and Morocco). The deployment of GEMS in these countries could encourage policymakers in government entities to increase supply of sophisticated and mature digital services. This, in turn, should improve the delivery of e-government services. However, GEMS has not yet collected enough data that could be used for comparative purposes and benchmarking. Without GEMS adoption by many countries worldwide, its benefit will be rather limited.

One direction that could be beneficial in the adoption of GEMS would be for UNESCWA to persuade UNDESA to incorporate GEMS into EGDI. The resulting enhanced EGDI will incorporate parameters closer to the measurement of the demand side and customer satisfaction of e-Government services. UNDESA incorporation of GEMS into EGDI will also bring worldwide adoption of the GEMS model of measurement.

### **IDC Smart Government Maturity Model**

The IDC Smart Government Maturity Model focuses on<sup>41</sup>:

**Citizen participation in governmental business** - Agencies are required to engage the public to enhance decisions through widely dispersed knowledge and increased public participation in government.

**Information transparency in government** - Agencies are required to utilize technology to put information about agency decisions and operations online and in forums available to the public.

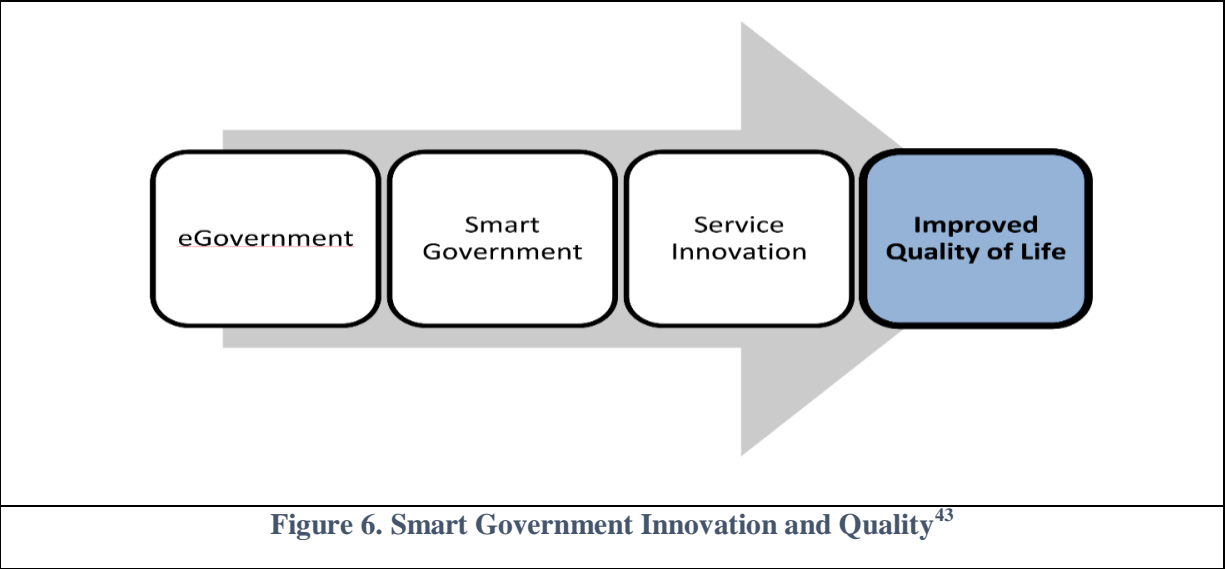
**Collaboration across government entities to deliver better citizen services** - Agencies are required to use innovative tools, methods, and systems to cooperate across all levels of government and engage the public in the work of their government. This may take the form of a shared government cloud or shared data centre.

The IDC model is divided into four stages, as shown in Figure 5.

	Stage 1	Stage 2	Stage 3	Stage 4
	<b>Information Availability</b>	<b>Meaningful Information</b>	<b>Purposeful Action</b>	<b>Smart Government</b>
<b>Citizen Participation</b>	<b>Government Monologue</b> Gov't makes info about its operations electronically available. Information is available via limited electronic channels (web sites) and is not necessarily well organized	<b>Widespread Government Monologue</b> Gov't disseminates information through more electronic channels (e.g. RSS feeds, FaceBook, etc). The information is better organized and encourages more citizen use	<b>Government Dialogue</b> Gov't pushes information to multiple electronic channels (e.g mobile devices) that enable citizens to receive real time information anywhere Gov't encourages citizens to provide feedback through these channels	<b>Citizen Directed Government</b> Gov't has multi-directional conversations with citizens agencies and constituents. Citizens have conversations with citizens. Feedback from citizens is incorporated for real-time, smarter, decision making
<b>Information Transparency</b>	<b>Open Data</b> A set of high value data is made available to the public. Policies for storage and protection of data are established	<b>Meaningful Data</b> The high value data, plus additional data sets are easier to find and use. Data is put into context for better comprehension and use	<b>Anywhere, Anytime Data</b> Contextualized data is easier to access from any location. Govt proactively broadcasts information to citizens who obtain it via technologies such as mobile devices	<b>Personalized Information</b> Citizens no longer need to "go and get" data from Govt. Government proactively pushes relevant, unique data to citizens based on their profiles
<b>Collaboration to Deliver Citizen Services</b>	<b>Online Information</b> A set of Government information is available electronically and kept up to date. The ability to share this information between entities is significantly limited	<b>Limited Online Collaboration</b> A majority of Government information is available electronically. Some of this information is shared electronically between government entities	<b>Cross Agency Collaboration</b> The majority of Government info is shared electronically between agencies. The info is available to government employees and citizens (with permission) anywhere, anytime	<b>360 Citizen Services</b> A 360 degree view of a citizen is created. This information is provided in real time. As changes occur to a citizen's circumstances, Government processes are triggered to provide the appropriate citizen services

**Figure 5. Smart Government Maturity Model<sup>42</sup>**

The nexus of e-government, smart government and innovation, leading to an improved quality of life is shown in Figure 6.



The Booz Allen Hamilton report on *smart governments* introduces an interesting definition for what it called: *Holistic Smart Government Framework*, which is a multidimensional framework encompassing policy, strategy, business practices, funding, technology, services supported by clear communication efforts, human capital management, and, finally, impact analysis<sup>44</sup>. The report provides brief general definitions to all these attributes, as shown in Table 1.

**Table 1. Holistic Smart Government Framework<sup>45</sup>**

<b>Smart Policies</b>	Use econometric modeling and big data analysis
<b>Smart Strategies</b>	Define responsive, adaptive and flexible strategies
<b>Smart Human Capital</b>	Adopt a robust but flexible organization that relies on smart sourcing and just-in-time expertise
<b>Smart Technology</b>	Adopt cloud based, subscription based ICT and advanced analytics
<b>Smart Funding</b>	Rely on various sources of funding to drive and maintain sustainable growth
<b>Smart Services</b>	Provide highly personalized services through customized service delivery
<b>Smart Strategic Impact</b>	Evaluate the socioeconomic impact of policies, strategies and services using robust data analytics

**Big Data:** With the rapid development of ICT, Internet technologies and services, huge amounts of data are generated, transmitted and stored at a very high rate of growth. Data generation by many sources, not only by sensors, cameras or network devices, but also by web pages, emails and social networks, as well as by other sources. Datasets are becoming so large and so complex and are arriving so fast that traditional data processing methods and tools are inadequate. Efficient analytics of data within reasonable times becomes a challenging issue. The concept to resolve such issues is called *big data*<sup>46</sup>.

The burst nature of workloads in smart applications, such as scalability and timeliness, makes *cloud computing* more appropriate for big data challenges. The big data ecosystems, which are supported in a cloud computing system context, are referred to as *cloud computing based big data*<sup>47</sup>

## **Strategic Technologies for Smart Government**

The top 10 strategic technologies for smart government is defined by Gartner<sup>48</sup>:

### **1) Digital Workplace**

The digital workplace promotes collaborative work styles; supports decentralized, mobile work environments; and embraces employees' personal choice of technologies. It is a concept that describes the way technology creates a virtual equivalent of the physical workplace and allows businesses and institutions to redesign their traditional processes to increase effectiveness and efficiency.

### **2) Multichannel Citizen Engagement**

Delivering an effective citizen experience requires a holistic approach to the citizen: (1) using data to capture and understand citizens' needs and desires; (2) leveraging effective social media and communications to actively engage citizens; (3) allowing the citizen to engage on his/her own terms; (4) understanding the citizen's preferred engagement channels; (5) affording seamless transitions among channels; and (6) ultimately delivering a more satisfying set of citizen interactions.

### **3) Open Any Data**

Open any data in government results from *open by default* or *open by preference* governance policies and information management practices. License-free data is made available in machine-readable formats to anyone who has the right to access it without any requirement for identification or registration. Open data is published as collected at the source (*raw*) at the lowest granularity, as determined by privacy, security or data quality considerations.

### **4) Citizen e-ID**

As government becomes more digitalized, digital identity should be more reliable to serve as the core for all digital transactions. Citizen electronic identification (e-ID) refers to the orchestrated set of processes and technologies managed by governments to provide a secure domain to enable citizens to access these core resources or services. Governments should require online authentication and identity proofing. In-person verification methods are becoming outdated for offering citizens integrated and seamless access to resources and services.

### **5) Analytics Everywhere**

Analytics is the collection and analysis of data to provide the insight that can guide actions to increase organizational efficiency or program effectiveness. The pervasive use of analytics at all stages of business activity and service delivery — analytics everywhere — allows government agencies to shift from the dashboard reporting of lagging indicators to autonomous business processes and business intelligence capabilities that help make better context-based decisions in real time.

## **6) Smart Machines**

In practice, smart machines are diverse combination of digital technologies that do what once thought only people could do. It includes deep neural networks, autonomous vehicles, virtual assistants and smart advisors that interact intelligently with people and other machines.

## **7) Internet of Things**

The IoT is the network of physical objects (fixed or mobile) that contains embedded technology to communicate, monitor, sense or interact with multiple environments. The IoT architecture operates in an ecosystem that includes things, communication, applications and data analysis. It is a critical enabler for digital business applications in all private-sector and public-sector industries. The business use cases and adoption rate by government agencies. Government business models are emerging that take advantage of the IoT; for example, pay-for-use or subscription-based taxation models, smart waste bin collection on city streets, and the remote monitoring of elderly patients in assisted-living settings.

But there are many more ways the IoT can help the energy industry, specifically water, electric, oil, and gas utilities. IoTs for utilities is fast growing as part of the smart paradigm in cities and communities. Smart meters have become the top IoT device among utility companies in the last few years. These devices are attached to buildings and are connected to a smart energy grid, which allows these companies to manage more effectively energy flow into buildings<sup>49</sup>.

## **8) Digital Government Platforms**

Governments face constant pressure to improve service delivery and save costs. Digital platforms reduce effort and facilitate user-centric design. Platforms can deliver services such as payments, identity management and verification, reusable application services and notifications, like SMS and email, that are commonly used across multiple domains. Governments are taking a platform approach to simplify processes, improve citizen interaction and reduce cost.

## **9) Software-Defined Architecture**

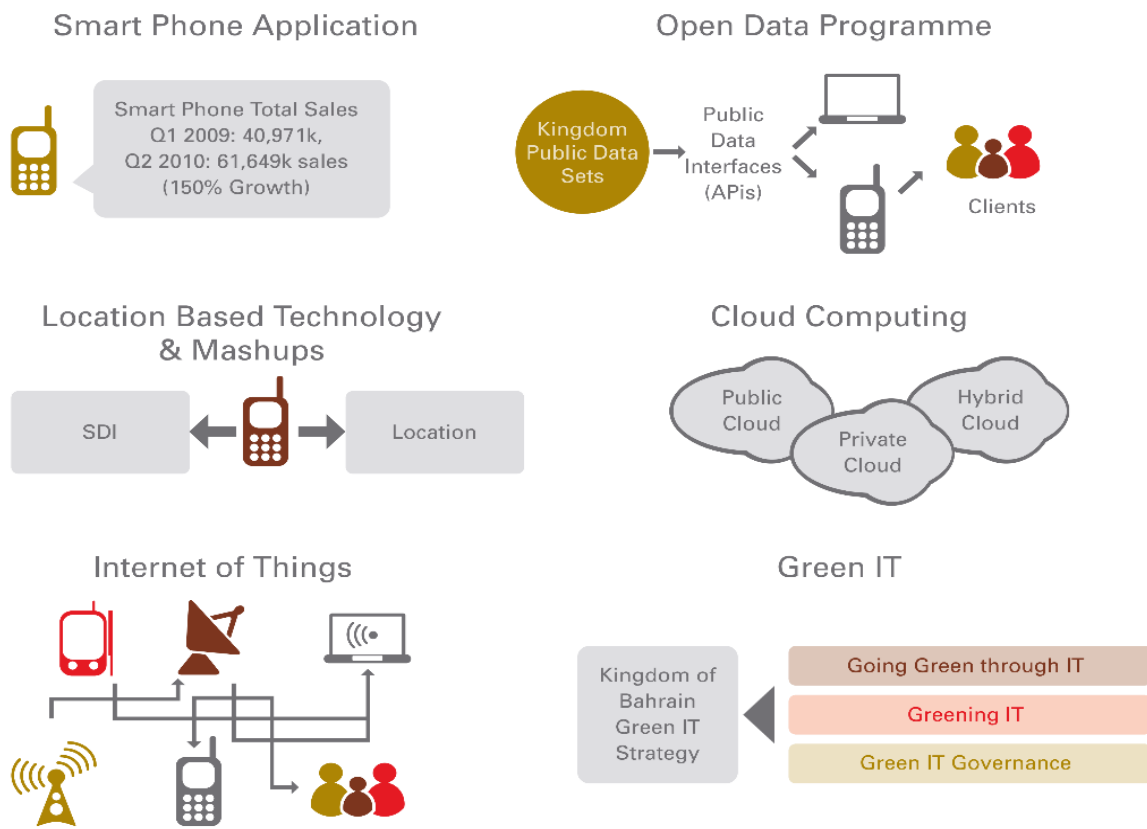
Software-defined architecture (SDA) inserts an intermediary between the requester and the provider of a service so that the service can change more dynamically — i.e., it is the IT equivalent of changing tires while a car is moving. Adding a layer of software to abstract and virtual networks, infrastructure or security has proved to be a useful way of deploying and utilizing infrastructure. The same technique, when applied to software architecture improves the manageability and agility of code so that the organization can respond to the fluidity requirements of digital government and the IoT. Some government organizations have begun implementing software-designed infrastructure (SDI), but the majority are still operating in traditional data centres.

## **10) Risk-Based Security**



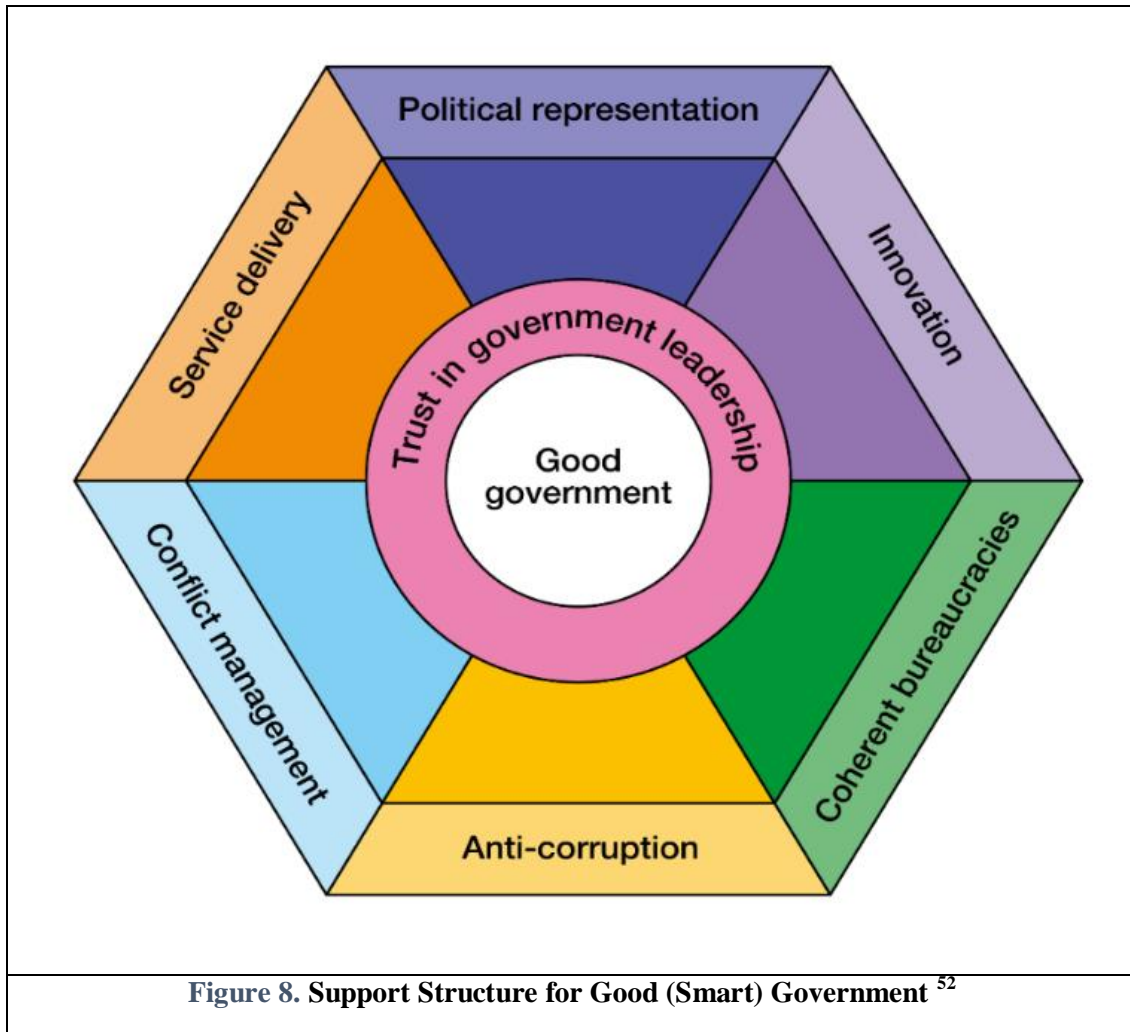
The cybersecurity threat environment is evolving constantly, but it represents only one dimension of a complex, multifaceted set of threats and risks. CIOs in government departments must adopt a threat-aware, risk-based security approach that allows governments to make knowledgeable and informed decisions about risks in a holistic fashion, allowing for a wiser allocation of resources; more sound decisions about risks and their impacts on government missions, operations, assets and people; and engagement of senior leadership in risk-based decisions.

Focus on ensuring that proper planning for strategic technology is usually carried out across the government adoption body of common technology will be essential for driving efficiency and standardization. Governments should follow a more collaborative and performance-based culture, leveraging a number of government-wide systems. Security and back up should also be considered to reduce disruption of services. Several next Generation technologies for deployment should be considered (e.g. Internet of Things)<sup>50</sup>. Examples of the technologies which can be used for smart transformation is shown in Figure 7.



**Figure 7. Technologies for the Smart Transformation<sup>51</sup>**

The support structure is shown in Figure 8.



### The Action Priority Matrix

The Action Priority Matrix shown in Figure 9 shows how to prioritize the application of the 10 strategic technologies according to their impact and the effort required for implementation<sup>53</sup>. This is useful, because we rarely have time to complete all of the tasks and projects of the 10 strategic technologies. The matrix has four quadrants:

- Quick wins.
- Major projects.
- Fill ins.
- Thankless tasks.

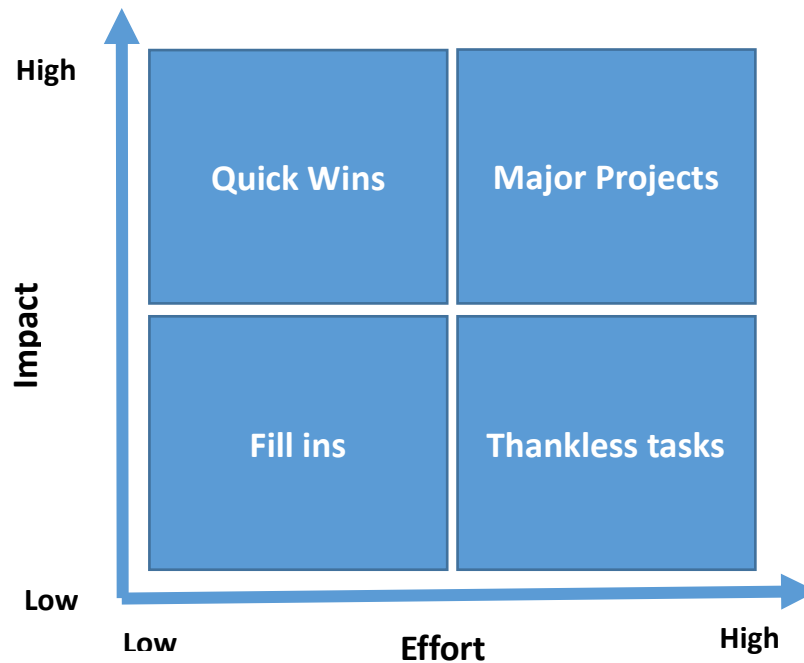


Figure 9. The Action Priority Matrix<sup>54</sup>

To use the matrix, make a list of your ongoing activities and goals. Score each task on impact and effort, using a 0 to 10 scale. Next, plot your activities on the matrix, and then prioritize, delegate, or drop activities appropriate.

When we use the matrix to choose activities intelligently, we can spend more time on the high-value activities that keep us moving forwards and can drop, or postpone activities that contribute little. Some of the strategic technologies may have good returns, but they could be time-consuming. This means that one technology can *crowd out* many quick wins. Try to avoid these activities. Not only do they give little return, they also soak up time that you should be using on quick wins. The steps to implement the 10 strategic technologies according to the Action Priority Matrix is as follow<sup>55</sup>:

**Step 1**

List the major activities that you want to or need to complete.

**Step 2**

Score these on impact (from, say, 0 for no impact to 10 for maximum impact), and on effort involved (from, say, 0 for no real effort to 10 for a major effort). See the worksheet in Table 2.

**Step 3**

Plot the activities on the Action Priority Matrix, based on your scores.

**Step 4**

Prioritize appropriately, and delegate or eliminate low-impact activities.

**Table 2 .Action Priority Matrix Worksheet**

<b>Strategic Technology</b>	<b>Impact (0 -10)</b> No impact 0 Maximum impact 10	<b>Effort (0-10)</b> No effort 0 Maximum effort 10
1. Digital Workplace		
2. Multichannel Citizen Engagement		
3. Open Any Data		
4. Citizen e-ID		
5. Analytics Everywhere		
6. Smart Machines		
7. Internet of Things		
8. Digital Government Platforms		
9. Software-Defined Architecture		
10. Risk-Based Security		

Literature survey has shown that the smart paradigm is focused on government policy and strategies to transform cities, rather than a whole country, into smart status with smart local government and communities. It is assumed that creation of such cities will ultimately transform the urban parts of the country into smart areas for smart citizens and communities to enjoy a better life.

### **WEF Toolbox**

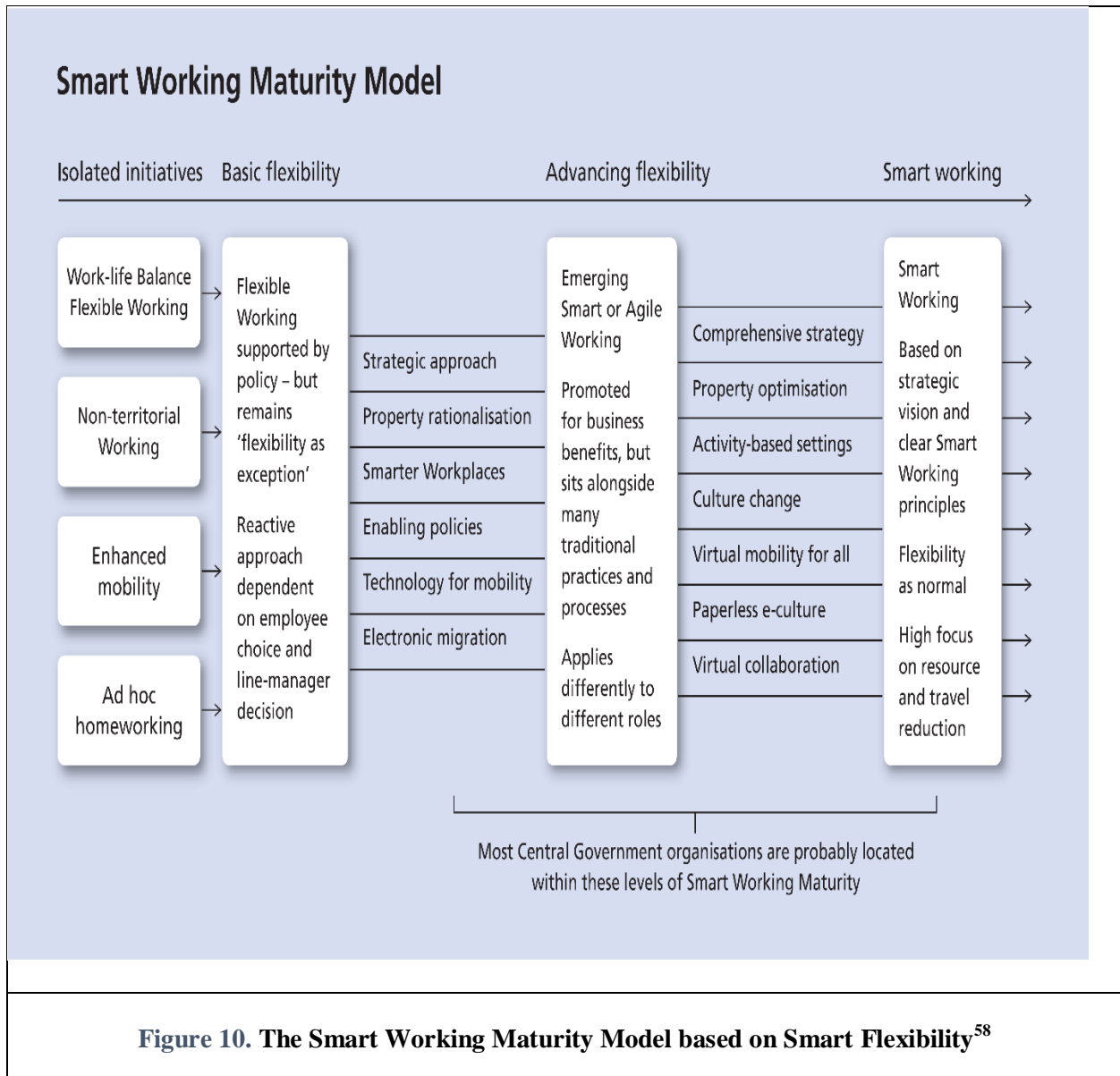
To show how technology can support governments through decisions, the World Economic Forum's Council on the Future of Government developed what it called a *Smart Toolbox* for<sup>56</sup>:

- Enabling greater transparency of government actions through open data;
- Empowering citizens to effective and more reliable access to online services;
- Strengthening responses to aid civilians in conflicts;
- Exploring the risks and challenges of an ever-increasing digital world, and keeping pace with fast changing innovative tools and technologies;
- Minimizing the divides, which could expand, between the various user groups that may have problems with ease of use;
- Protecting data and information.

Information and communication technology (ICT) could reshape governments in the next decade or two through the strengthening of <sup>57</sup>:

- Trust in government;
- Leadership;
- Delivery of services;
- Political representation;
- Anti-corruption;
- Bureaucratic cooperation;
- The management of conflict; and
- Innovation.

The model outlines typical stages to be followed to bridge the gap from one phase to another. Government departments can use this Maturity Model to estimate where they are positioned on the road to better ways of working, and to decide on priorities in moving forward. See Figure 10. A coherent citizen-centric strategy that ensures the transformation of citizen’s mindset into accepting innovation technologies that improve performance is essential for the paradigm shift.



To transform into a smart government, the present bureaucracy must undergo a major reform. A report issued by the British Government entitled: ‘The Way We Work: A Guide to Smart Working in Government’ proposed a smart working maturity model that describes the main phases to embrace smart and flexible working in a strategic and integrated environment in government<sup>59</sup>.

The UK report claims that moving to *Smart Working* should be based on a clear idea of the benefits to be achieved. To monitor progress through evidence gathered, metrics can include, but not limited to the following:

- Increased productivity;
- Improved business outcomes;
- Improved specific business processes and practices that target change;
- Savings in cost;
- Savings in energy / carbon reduction;
- Reduced office space;
- Improved staff satisfaction with space and IT driven management culture;
- Reduced travel–business and commute travel;
- Reduced absenteeism;
- Improved staff retention;
- Improved wellbeing.

## 6. SUSTAINABLE DEVELOPMENT GOALS AND SMART GOVERNMENT

Smart government/society initiatives can contribute in many ways to the achievement of the SDGs. The effect of implementing smart transformation should take into account its impact on the progress of achieving the SDG's and can be incorporated in the Action Priority Matrix Worksheet shown in Table 2, as will be discussed later.

The following checklist provides linkages between the 17 SD Goals and possible Smart actions in this context mostly quoted from the 2016 UNPAN Report<sup>60</sup>.

SDG's	SMART Action
<b>Goal 1:</b> End poverty in all its forms everywhere	Facilitation of access to basic services for people living in poverty, preferably free of charge, promoting the concept of entrepreneurship and innovation through on line training programmes and competitions. Encouragement of banks and funding organizations to give special considerations for projects presented from people living in poverty.
<b>Goal 2:</b> End hunger, achieve food security and improved nutrition and promote sustainable agriculture	Provide online education programmes for farmers and consumers and raise awareness on the production and consumption of nutrition and healthy food through online databases and awareness courses. Educating mothers and farmers on healthy foods and nutrition.
<b>Goal 3:</b> Ensure healthy lives and promote well-being for all at all ages	Data on health and health services should be made available online for all to access with focus on people living in poverty and those with special needs. For certain countries in the Arab Region, information regarding conflict medicine and conflict related diseases and injuries is essential.
<b>Goal 4:</b> Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all	Data about public education in schools and universities should be made accessible to all. Announcement of incentives for scholarships and research work should be available for all to access and apply for. Grants for special students should be announced and made available for all. Improving education as a major goal, together with cultural issues.
<b>Goal 5:</b> Achieve gender equality and empower all women and girls	Should promote the availability of gender sensitive data online. Ensure gender sensitive policy decision making and conduct public online surveys and polling on sensitive gender issues.
<b>Goal 6:</b> Ensure availability and sustainable management of water and sanitation for all	Making data on water and sanitation accessible to all. Dissemination of data about water-borne diseases in specific locations. Mapping water shortages and droughts, also water and sanitation needs of people living in poverty.

	Promote IoTs for water management.
<b>Goal 7:</b> Ensure access to affordable, reliable, sustainable and modern energy for all	Disseminating energy data about household, commercial and industrial consumption, governments can better monitor and manage energy. Government data also can improve investments in renewable energy infrastructure, create awareness and educate people about the importance of conserving energy. Promote IoTs for energy management.
<b>Goal 8:</b> Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	Government data can lead to significant economic opportunities. It helps to transform sectors of the economy and to promote innovative services to increase employment and public value. This trend should be promoted to overcome endemic economic issues and unemployment, particularly amongst youth. labour market information systems for government vacancies as well as other institutions should be made accessible. Youth should be considered as agents of change rather than merely recipients of change. They will not be empowered through improvement of investment only. The need to match educational output, specially higher education, with skill requirements in the work place. Emphases on the need for good and upgraded educational systems and educational content within a more relaxed modern educational process which makes provision for creativity and innovation.
<b>Goal 9:</b> Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation	Promote innovation through the development of new smart services. Increase access of SMEs to business opportunities.
<b>Goal 10:</b> Reduce inequality within and among countries	Data can play an important role by providing information in open standards about vulnerable groups. It can support decision making and provide national and local communities with appropriate tools to work more effectively with such groups.
<b>Goal 11:</b> Make cities and human settlements inclusive, safe, resilient and sustainable	Data can have positive impacts in support of sustainability, providing information about urban planning, finance, job availability, times and arrivals of transportation and access to education, healthcare and other facilities. Open government data, promotes innovation and co-creation of public value in service delivery.
<b>Goal 12:</b> Ensure sustainable consumption and production patterns	Help inform people about consumption and production patterns and raise awareness to encourage more responsible behaviours. Providing online information about bidding through an e-procurement online platform will increase transparency and efficiency, ensure



	sustainable production patterns and open economic opportunities. Small and Medium Enterprises (SMEs) should easily access information regarding government tenders and follow bidding processes. E-procurement increases economic growth, cut costs by producing government savings and enhance competitiveness.
<b>Goal 13:</b> Take urgent action to combat climate change and its impacts	Data on climate, weather, land and other natural resources, combined with Big Data analytics and the Internet of Things can help preserve the planet by tackling environmental issues more effectively. Further, data-driven analysis can help devise comprehensive strategies to address flooding challenges, and thus lead to significant savings.
<b>Goal 14:</b> Conserve and sustainably use the oceans, seas and marine resources for sustainable development	Government Data can help monitor and better manage sea pollution. Disseminating data about fishing patterns. Governments can also help monitor compliance with national regulations and better manage this resource.
<b>Goal 15:</b> Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss	Government data can help disseminate information about natural resources to enhance preservation and management. Combined with Big Data and other types of data, governments can support the development of knowledge networks and services. This brings governments, businesses and communities to work together toward forest preservation. Global Forest Watch combines the latest satellite technology, open data and crowdsourcing to guarantee access to timely and reliable information.
<b>Goal 16:</b> Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels	Government data should support access to justice for all and build effective, accountable and inclusive institutions at all levels in many ways. Opening and sharing data about campaign finance is also important to promoting a more transparent and accountable government.
<b>Goal 17:</b> Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development	Government Data can support management and delivery of aid. Government can have a wide variety of goals: improve aid management; ensure accurate and predictable aid reporting; assist in preparing quality government budgets that respond to people's needs; enable better coordination between development partners and government; encourage better coordination between development partners; and reduce overlap and address development priority areas more effectively.

## 7. INTERNATIONAL CASE STUDIES FOR SMART TRANSFORMATION

Success in the smart paradigm in existing implementations has been focused on the creation of smart cities by national governments that support and encourage urban areas to develop technologically driven societies that provide smarter services to their citizens, thus creating the smart citizen, who is the basic building block for a smart community, a smart economy and a more collaborative and innovative society leading to a happier and more satisfied citizen. If a national government succeeds in transforming its cities into smart cities, it can then claim that a substantial part of the country has been transformed into a smart state of wellbeing.

So, it is fair to assume that a not *so smart national government* can and should plan to have smart cities with smart local governments that will achieve the transformation of their citizen, communities and economy into smarter status.

The selected international case studies consist of different forms of smart entities. A smart national government is an open government that has reached the highest possible maturity phase in e-government implementation, or in UNPAN terms, governments with high EGDI. Governments with high EGDI can be considered smart. This is assumed to be an implicit Holistic Smart Government Framework, as outlined in the section on the smart paradigm. It is also assumed that such national government can support the development of smart cities, smart societies within cities or sections of societies at national level, support the transformation of economic sectors into smarter sectors, and also apply smart governance into their work.

The top 10 countries that scored very high EGDI in the 2016 report are shown in Table 3.

Country	Region	OSI	HCI	TII	EGDI	EGDI Level	2016 Rank	Ranking Trendline (2003 - 2016)
United Kingdom	Europe	1.0000	0.9402	0.8177	0.9193	Very high	1	
Australia	Oceania	0.9783	1.0000	0.7646	0.9143	Very high	2	
Republic of Korea	Asia	0.9420	0.8795	0.8530	0.8915	Very high	3	
Singapore	Asia	0.9710	0.8360	0.8414	0.8828	Very high	4	
Finland	Europe	0.9420	0.9440	0.7590	0.8817	Very high	5	
Sweden	Europe	0.8768	0.9210	0.8134	0.8704	Very high	6	
Netherlands	Europe	0.9275	0.9183	0.7517	0.8659	Very high	7	
New Zealand	Oceania	0.9420	0.9402	0.7136	0.8653	Very high	8	
Denmark	Europe	0.7754	0.9530	0.8247	0.8510	Very high	9	
France	Europe	0.9420	0.8445	0.7502	0.8456	Very high	10	

The selected case studies in this section include different forms of smart transformation that provide guidance to planners and decision makers in their endeavour to conceive, develop, implement and operate smart projects:

Case Study 1 outlines the United Kingdom strategy for e-Government. The UK is ranked as number 1 in the UN e-Government Survey 2016.

Case Study 2 is for Singapore with its strategy for building a *Smart Nation*. Singapore is ranked number 4 in the UN e-Government Survey 2016.

Case Study 3 is for Finland, which is ranked number 5 in the UN e-Government Survey 2016.

### **Case Study 1. The United Kingdom Strategy for a Smarter e-Government**

UK is becoming a smarter society. Four factors have been highlighted as underpinning progress:

- The society's willingness to embrace the digital revolution;
- The capacity for design and creativity;
- The deep institutional architectures for knowledge sharing; and
- The ability to link up, join or combine multiple agendas to create value.

As with any technical, economic and social shift of this scale, society must continue to evolve to keep on benefiting.

The research has identified five areas for the next wave of smart society developments<sup>62</sup>:

#### **(1) A data friendly culture, reinforced by trust and responsibility**

Every now and then we hear the pronouncement 'data is the new oil'. Whether that is entirely true is open to debate, but what is beyond doubt is that data is the currency of the smart society. Flows of information are at the core of almost all its benefits. The growing popularity and applications of big data are creating countless possibilities out of the rapidly increasing volume, velocity and variety of data. However, just as the veracity of data is becoming increasingly important, these possibilities will not be realised without a culture of trust and confidence about how data is used.

On the one hand, we need a society that is more proactive and ambitious in generating, using and consenting to the use of data for genuinely beneficial purposes. On the other, we need those who are entrusted with data to exercise responsibility and good stewardship, thus reinforcing a virtuous circle of trust and responsibility. Over time the virtuous circle becomes a norm, and when widely embraced by society it becomes an integral part of the culture.

#### **(2) Empowered and digitally literate citizens as enablers of the smart society**

A key element of building trust is developing understanding and knowledge. It is important that consumers understand the benefits of sharing data – that they know when and where they are taking risks. This means knowing how to avoid sharing data with organisations which they do not trust, not unlike most email users who by now are sufficiently prudent to disregard attachments or hyperlinks from suspicious senders or spam.

This ability of citizens to be in control of their own data was highlighted by several panellists as a vital enabler of greater trust in data and a way to drive the responsible use of data across the ecosystem. This may also require thinking very differently about data ownership as well as data education.

The smart society and digital technology in general have the potential to be an incredible force for inclusion. The Internet is a fantastic open source of knowledge, and many digital markets have low access barriers and require only low levels of capital for start-ups.

### **(3) Empowering public institutions offering smart leadership**

Smart is much more than a technology issue. The case of smart cities shows the complex interactions between technology, citizens and democracy. There are increasing opportunities for the government to help invest in platforms, relationships and networks that are needed to for new opportunities for a smart society.

Radical innovations and many of the smart society advances identified above depend on the formation of new markets to bring people together in new ways. The formation of new markets is, however, complicated and inherently prone to market failure. A key strength to date has been the UK's ability to support the emergence of new activities. The work of the Technology Strategy Board, the new Catapult Centres and the Cabinet Office was highlighted by many panellists as crucial to future success.

Nevertheless, more investment in this type of activity will be an important enabler. It is also essential that these institutions can work with regulators to help them to adapt flexibly to the new regulatory environments demanded by new markets. For instance, this can mean championing the emergence of new general purpose technologies, such as 3D printing and digital applications of big data.

### **(4) Enabling infrastructures**

The rise of digital technologies is inevitably making increasing demands on the infrastructure. Increasing public and private investment will be required to meet these demands and to put in place an environment in which creativity and innovation can flourish.

It is important to consider both hard and soft enabling infrastructures. Several panellists identified one area of data management as a key enabler: the idea that more consistent data regulations across Europe could help open new possibilities.

Panellists suggested that by moving towards a more complete EU single market could help to transform the scale of the UK market for digital solutions. However, the success of any changes will depend on consumers having trust in arrangements and confidence that their privacy is maintained.

### **(5) Enabling open platforms and open markets**

Connectivity, a theme that is central to a smart society, is not just about technology. It is also very much about people; in fact, it is *ultimately* all about people. Success in building a smart society will depend on the ability to bring people together. This agenda is not about citizens in isolation, nor businesses, governments or universities on their own. It is not even about the bilateral interactions alone. It is about engagement in smart networks. The collective efforts of all are needed to co-create

open platforms, new products and services, and new markets that will ultimately serve the purposes and needs of society. The importance of concerted efforts is well expressed by Charles Leadbeater:

*A smart society also requires greater civic and public sector involvement,  
not just the private sector driving it.*

The ability to establish open platforms, where networks of individuals and communities can share ideas and information, and mobilise collective action, is an indication of how ready we are to enter the era of smart. The most optimal architectures for data-sharing must not come from businesses alone, but also from individuals actively participating in shaping those architectures – the HAT, for example – that will ultimately affect the way they live, work and play. Business models can no longer be developed in isolation from what consumers need or want. Instead, smart business models are those that are co-created with those who will eventually consume the products or services. Similarly, public services of the future are not just about across-the board digitisation to enable remote access, or the stripping back of red tape to increase efficiency. Instead, they must also be about enabling truly joined-up services, which can be best created only when the public engage with the government to shape them. The private and public sectors must work alongside the third sector, universities and individuals using open innovation approaches to stand the best chance of spawning solutions that can truly, and effectively, improve lives. Getting this right is an agenda for us all.

The UK strategy sets out how the government becomes digital by default. It fulfils a government commitment made in the Civil Service Reform plan.

Digital by default, means digital services that are so straightforward and convenient that all those who can use them will choose to do so whilst those who can't are not excluded. It was estimated that moving services from offline to digital channels will save between £1.7 and £1.8 billion a year<sup>63</sup>.

The UK Government is improving the way it provides information by moving to a single website, [GOV.UK](http://GOV.UK). Transactional services now present the biggest opportunity to save people time and save government money. People will only choose to use government services digitally if they are far more straightforward and convenient. The clear majority of the UK population is online but most people rarely use online government services.

The UK Government provides more than 650 transactional services. There is only a handful of these services where a significant majority of people who could use the online option do. Many have a digital option, but few people use it. Half of these don't offer a digital option at all.

The UK Government promise to:

**Improve departmental digital leadership**

Departmental executive boards will include an active digital leader. Transactional services handling over 100,000 transactions each year will be redesigned, operated and improved by a skilled, experienced and empowered service manager.

**Develop digital capability throughout the civil service**

All departments will ensure that they have the right levels of digital capability in-house, including specialist skills. Cabinet Office will support improved digital capability across departments.

### **Redesign transactional services to meet a new Digital by Default Service Standard**

All departments will undertake end-to-end service redesign of all transactional services with over 100,000 transactions each year.

There are 7 departments which between them handle most central government transactions:.

- HM Revenue and Customs (HMRC)
- Department for Transport (DFT)
- Department for Work and Pensions (DWP)
- Ministry of Justice (MOJ)
- Department for Business Innovation and Skills (BIS)
- Department for Environment Food and Rural Affairs (Defra)
- Home Office

Each of these departments will agree 3 significant exemplar service transformations with Cabinet Office. These were identified and published in departmental digital strategies in 2012, alongside delivery plans. Departments started to redesign these exemplar services in April 2013.

### **Complete the transition to GOV.UK**

Corporate publishing activities of all 24 ministerial departments will move onto GOV.UK, with agency and arm's length bodies' online publishing to follow.

### **Increase the number of people who use digital services**

Departments will raise awareness of their digital services so more people know about and use them, and look at ways to use incentives to encourage digital adoption.

### **Provide consistent services for people who have rarely or never been online**

It is important we do not leave anyone behind in this move to a digital by default approach. Departments will recognise and understand the needs of people who can't use digital services. We will provide appropriate support for these people to use digital services and other ways to access services for people who need them.

### **Broaden the range of those tendering to supply digital services including more small and medium sized enterprises**

Cabinet Office will offer leaner and more lightweight tendering processes, as close to the best practice in industry as our regulatory requirements allow.

### **Build common technology platforms for digital by default services**

Cabinet Office will lead in the definition and delivery of a new suite of common technology platforms, to underpin the new generation of digital by default services.

**Remove unnecessary legislative barriers**

Cabinet Office will work with departments to amend legislation that unnecessarily prevents us from developing straightforward, convenient digital services.

**Base service decisions on accurate and timely management information**

Departments will supply a consistent set of management information, as defined by Cabinet Office, for their transactional services.

**Improve the way that the government makes policy and communicates with people**

Departments will encourage policy teams to use a wider range of digital tools to communicate with and consult people, both within the UK and overseas.

**Collaborate with partners across public, private and voluntary sectors to help more people go online**

Departments will build digital inclusion into all relevant policies and programmes, and collaborate with private and third sector organisations to remove barriers to internet use, whether caused through lack of skills, motivation, access or trust.

**Help third party organisations create new services and better information access for their own users by opening government data and transactions**

Departments will undertake cross-government discovery work with GDS to understand user needs for services delivered outside GOV.UK, and what APIs and open standards might be required to support them; and GDS will undertake development work on GOV.UK to make all information held on it easily reusable.

This strategy is just the beginning. We recognise that the changes required will be far from easy. Our existing processes and ways of working can get in the way, and many will need to change.

In December 2012, departments published their own departmental digital strategy explaining what actions they would take to contribute to this strategy. These actions provide a framework for continuing improvements in their services.

Cabinet Office will operate an annual review process to track departments' progress against the actions in this strategy.

The strategy does not cover local government services or the NHS. It also does not deal with the expansion of the broadband network which is being led by Department for Culture Media and Sport (DCMS).

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<p><a href="#">Citizenship and living in the UK</a> Voting, community participation, life in the</p>	<p><a href="#">Environment and countryside</a> Includes flooding, recycling and wildlife</p>	

## Case Study 2. Singapore's Smart Nation<sup>64</sup>

Singapore strives to become a Smart Nation to support better living, stronger communities, and create more opportunities, for all.

For a start, Singapore identified five key domains that will have significant impact on the citizen and society, and in which digital technology can have a needle moving impact: transport, home & environment, business productivity, health and enabled ageing, and finally, public sector services.

In these areas, citizens and businesses are looked at to co-create impactful solutions to address challenges. On the Government's part, the infrastructure, policies, and enablers are put in place to encourage innovation. Singapore strives to create the space for experimentation and risk taking.

### ENABLERS

Smartness is not a measure of how advanced or complex the technology being adopted is, but how well a society uses technology to solve its problems and address existential challenges. Citizens are at the



heart of Singapore's Smart Nation vision, not technology! The government strives to facilitate innovations by the public and the private sector. It puts in place appropriate policies and legislations to nurture a culture for experimentation, encourage innovation and the eventual adoption of new ideas.

### **Facilitating smart solutions**

Smart Home technologies are being test bedded in HDB estates as part of the *Smart HDB Town Framework*. Residents in Yuhua estate are the first to experience 'Smart Living' in an existing HDB estate; feedback from residents who signed up will help determine their viability and suitability, and how some of these smart solutions can better integrate with their day-to-day living, before selected smart initiatives may be introduced and rolled out more extensively in other HDB estates, such as Punggol Northshore. Committee on Autonomous Road Transport for Singapore (CARTS) was set up to chart the strategic direction for Autonomous Vehicle-enabled land mobility concepts in Singapore. The Centre for Healthcare Assistive and Robotics Technology (CHART) at Changi General Hospital facilitates collaboration between academia, industry and research institutions, to develop healthcare solutions leveraging on robotics and assistive technology.

### **Nurturing a culture of experimentation and sustaining innovation**

#### Open Data & Connectivity

- Singapore has enhanced the government open data portal, and will continue to release more government data in machine readable format so that the public and third party developers can glean useful insights and put them to good use.
- The Smart Nation Platform (SNP) is an infrastructure being built to enable greater pervasive connectivity, better situational awareness through gathering and sharing of useful data between agencies. The data which is anonymized and analyzed, provide insights that will contribute towards forming solutions that can help improve the lives of citizens.
- Singapore has brought some of the fastest connectivity to every home and business. In the McKinsey Globalization Institute - Digital Globalization Full Report (March 2016), Singapore tops the McKinsey Connectedness Index based on inflows and outflows of goods, services, finance, talent and data.

#### Investment in Research & Development

Government continues to sustain its R&D spending at about 1 per cent of GDP. The National Research Foundation (NRF) recently announced the Research, Innovation and Enterprise 2020 (RIE2020) master plan, and a next tranche of \$19 billion in funds set aside to support and translate research into solutions that address national challenges, build up innovation and technology adoption in companies, and drive economic growth through value creation.

#### Living laboratory

Singapore has set aside spaces for companies and researchers to develop, prototype and pilot their technological solutions. This includes one-north district as Singapore's first test site for self-driving vehicle technologies and mobility concepts, where the Institute for Infocomm Research (I2R) and the Singapore-MIT Alliance for Research and Technology (SMART) have been carrying out trials along the six-kilometer test route. There are avenues for big ideas to be experimented on, refined and brought to life in Singapore and beyond our shores. With a single layer of governance in a small but globally connected city-state, we can test, develop and deploy solutions quickly and efficiently.

### **Industry and Start-up ecosystem**

- Start-up accelerators in JTC’s Launchpad, IIPL BASH, Cleantech Park; a strong presence of venture capitalists and MNCs; and the new Jurong Innovation District (JID), help to nurture creative innovations and bridge innovation and enterprise.
- Singapore ranks #10 in the world and the best in Asia for a start-up ecosystem (according to the Global Start-up Ecosystem report by Compass). 60% of start-ups in
- Singapore gets follow-up funding, and 40 per cent of start-up acquisitions in Asia happens here. We have also been ranked #1 for ease of doing business (by the World Bank).

### **Cybersecurity and Data Privacy**

Cybersecurity is a key enabler of our Smart Nation. The Government recognize the possible risks and has prioritized safeguarding relevant systems and networks that relates to security of citizens and privacy of data. The government, industry and public must all play their part and take measures to safeguard data, and ensure that critical control systems are protected even as we make them smart.

### **Building computational capabilities**

- IMDA Playmaker Programme exposes young children to technology through tactile and more kinesthetic educational experiences.
- Code@SG movement will introduce coding and computational thinking to more students in schools.
- At least 19 schools are offering programming as an ‘O’ Level subject next year.
- Upgrading programmes like SkillsFuture and partnerships with educators such as General Assembly help equip people with workplace-ready ICT skills at both pre-and-post education levels.
- Smart Nation Fellowship Programme invites experienced data scientists and engineers here or overseas to work with the government on short stints to help build solutions to solve national challenges.

### **Case Study 3. Digitalisation of Public Services in Finland<sup>65</sup>**

Digitalisation is high on the agenda of the government of Finland, which was appointed in May 2015. The goal for the next ten years is that Finland has made a productivity leap in public services and the private sector by grasping the opportunities offered by digitalisation, dismantling unnecessary regulation and cutting red tape.

The Programme stipulates that public services are to be primarily digital. As a part of the implementation of the Programme, the Prime Minister and Minister of Local Government and Public Reforms issued an open letter requesting proposals on how to contribute to digitalisation. As a response to the letter, over 260 proposals from public administration, businesses, NGOs and citizens were submitted.

The principles are aimed to be used in government administration and by municipalities in their work related to renewing their processes with the help of ICT. The principles are drafted in wide collaboration with stakeholders. The principles draw on good practices developed in Finland and abroad. For services to become primarily digital, amendments to current legislation are needed. The Public-Sector ICT has launched a process for renewing legislation to meet the demands required.

### **Open Government Action Plan 2015 - 2017**

In May 2015, Finland published its second Open Government Action Plan for year 2015 – 2017 that is the 100th National Action Plan published under the Open Government Partnership since its creation in 2011 whilst being the 2nd Action Plan of Finland. The plan commits Finland to make online services more consumer-friendly and focuses on the youth participation in Government and Open Data.

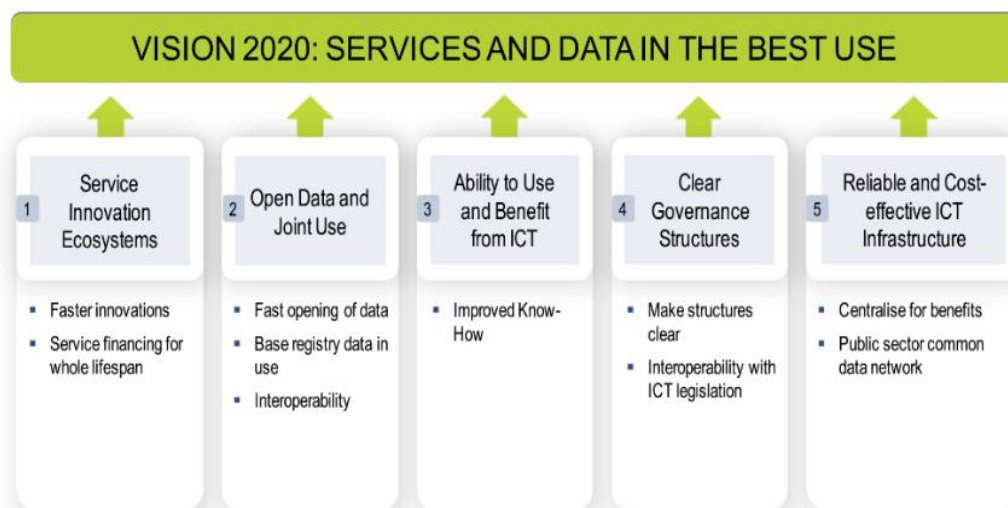
The three key teams of the 2015-2017 action plan are openness, accountability and enhancing engagement. In Finland, the Action Plan is being implemented on all levels of the government: ministries, state agencies and municipalities. Goals have been created under the commitments, but once the implementation starts, the commitments will turn into individual actions and measurable targets in ministries, municipalities and regional councils. These goals can be further clarified during the implementation. The goal is to get open government enhancement to be part of each development project and programme. Ministries, agencies and municipalities are not asked to set up individual open government projects, instead enhancing open government should be part of all work.

### ICT 2015 Strategy

In 2012 the Ministry of Employment and the Economy assigned the ICT 2015 work group. The report drafted by the group titled *21 paths to Frictionless Finland* was published in January 2013. The report is aimed to enhance growth and further accelerate innovation and eGovernment in Finland the growth of companies. The concept of *Frictionless Finland* describes a state of affair where best preconditions for the creation of competitive business generating well-being are enabled. More than 250 experts participated in the process. The report established a roadmap for long-term efforts to make Finland a leader in information technology applications over the next ten years. There are three crucial measures identified in the report that shall be implemented in the initial phase of the process, one of them being the building of common national service architecture. A steering group coordinating the implementation of measures has been set by the Government in January 2013.

## Public Sector ICT Strategy

- Services and information required by users are available and usable easily and securely
- Cooperation of public sector organisations, businesses and users at the leading edge of development



The Ministry of Finance drafted in wide collaboration with other central government authorities and local authorities a new public sector ICT strategy. The Public-Sector ICT Strategy is the first ICT strategy for both central government and local government administrations. The strategy was published in 2013, although it was never formally adopted. Despite the lack of Government's formal decision, several government's actions and measures have been taken align with the strategy.

## 8. THE SMART TRANSFORMATION IN THE ARAB STATES

Practically all countries in the Arab Region are committed to the implementation of e-Government services. They have, over the last decade, changed the way they deliver services by implementing strategies and plans at different level of complexity and have arrived at different stages of maturity, that vary from the elementary informational level to mobile and open government. Scores in UN e-Government Survey 2016 EGDI ranged from the *Very High* to *Low*. Based on the assumption made earlier that a government that scores *Very High EGDI* is considered a *smart government*, or close to it, then the Kingdom of Bahrain and the United Arab Emirates are the only countries that qualified to be smart governments.

Table 4. EGDI Ranking of Arab States in 2016<sup>66</sup>

Seq	Rank	Member State	OSI	HCI	TII	EGDI		Income
1	24	<b>Bahrain</b>	0.8261	0.7178	0.7762	0.7734		H
2	29	<b>UAE</b>	0.8913	0.6752	0.6881	0.7515		H
3	40	<b>Kuwait</b>	0.6522	0.7287	0.7430	0.7080		H
4	44	<b>Saudi Arabia</b>	0.6739	0.7995	0.5733	0.6822		H
5	48	<b>Qatar</b>	0.6739	0.7317	0.6041	0.6699		H
6	66	<b>Oman</b>	0.5942	0.5147	0.6796	0.5962		H
7	72	<b>Tunisia</b>	0.7174	0.6397	0.3476	0.5682		UM
8	73	<b>Lebanon</b>	0.5145	0.4911	0.6882	0.5646		UM
9	85	<b>Morocco</b>	0.7391	0.4737	0.3429	0.5186	(+)	LM
10	91	<b>Jordan</b>	0.4565	0.3458	0.7344	0.5123		UM
11	108	<b>Egypt</b>	0.4710	0.6048	0.3025	0.4594		M
12	118	<b>Libya</b>	0.1087	0.4291	0.7588	0.4322		UM
13	137	<b>Syria</b>	0.3261	0.2087	0.4864	0.3404		LM
14	141	<b>Iraq</b>	0.3551	0.1647	0.4803	0.3334	(-)	UM
15	150	<b>Algeria</b>	0.0652	0.1934	0.6412	0.2999	(-)	UM
16	161	<b>Sudan</b>	0.2174	0.1861	0.3581	0.2539		LM
17	174	<b>Yemen</b>	0.1449	0.1465	0.3829	0.2248		LM
18	184	<b>Mauritania</b>	0.0652	0.1536	0.3015	0.1734		LM

<p><b>Income Classifications:</b>  H= High Income,  UM= Upper Middle Income,  LM= Lower Middle Income.</p>	<p><b>EGDI Classifications:</b>  <b>Very High:</b> Greater than 0.75  <b>High:</b> 0.50 to 0.75  <b>Middle:</b> 0.25 to 0.50  <b>Low:</b> Less than 0.25</p>
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Table 4 shows the EGDI ranks obtained by the 17 Arab States. They seem to align with income categories, with the following exceptions:

- Morocco scored an EGDI value higher than its corresponding Income Category. This is a positive sign;
- Iraq and Algeria scored EGDI values lower than their corresponding Income Categories. This is a negative sign.

If the assumption that the smart government is an advanced stage in the maturity journey of e-Government, then Table 3 is indicative of the *smart* status of the Arab States with respect to their achievements in the smart transformation process. Bahrain and UAE qualify to be considered *smart* governments.

It is worth noting here that the use of new smart technologies is necessary, but not sufficient for the smart transformation of government and society. The Arab States must address the following challenges when undergoing holistic government reforms to achieve smart transformation:

**Management and administrative issues:**

- Relatively low level of transparency and innovative thinking;
- Centralization, coupled with slow bureaucratic procedures, in many government departments;
- Absence of the civil servant mentality in the treatment of government staff to citizens and constituents in general;
- Lack of training programmes that deal with good governance when dealing with constituents as customers;
- Over reliance on outsourcing as a means of implementation for e-government projects, with insufficient emphasis on the development of indigenous expertise within government;
- Lack of responsive/predictive services<sup>67</sup>;
- Limited partnership with the private sector to address socioeconomic challenges<sup>68</sup>;
- Relatively low salaries paid to government staff. The result is low motivation to improve performance and reduce overstaffing;
- A change management strategic plan with clear legitimacy adopted by government decision makers, new values defining clear objectives and will, and an operational capacity force for control through performance indicators and resources based on agile policies to realize results in time.
- In most Arab governments, excluding the oil rich countries (GCC mainly), governments are missing high skilled people where competencies like PMOs are critical to drive the challenging big projects in several crossing sectors.

### **Demographic and social issues:**

- Resistance to change existing practices and reluctance to try out innovative solutions;
- The prevailing mindset of people based on negative social and cultural traditions;
- Language problems and the high percentage of illiteracy.

### **Economic issues:**

- Low budget, usually assigned to management and technological reforms in governments;
- Insufficient flexibility and freedom in accepting innovative changes in government procedures for budgetary reasons;
- Lack of trust in banking systems, and reluctance by many people to use credit and debit cards, or perform electronic financial transactions over the Internet;
- The increasing corruption that takes different shapes and forms in government;
- Lack of good and timely data for making convincing feasibility and cost benefit analysis studies for reforms.

### **Infrastructure/connectivity issues:**

- Poor communication infrastructure, particularly in rural and poor areas in most of the non-Gulf States;
- No impact evaluation of electronic and mobile services;
- Limited delivery of e-Services;
- Suboptimal services prioritization;
- Limited access channels and services;
- Citizen engagement is limited and predominantly one-way, from government to citizens<sup>69</sup>;
- Lack of unified ICT strategy and ownership<sup>70</sup>;
- Internet is still unaffordable in many countries in the region. Speed and reliability of the Internet is also an issue.

The UN e-Government Survey 2016 shows only two countries in the region that ranked *very high EGDI*:

Bahrain, which ranked 24 (Case Study 4); and

UAE, which ranked 29 (Case Study 5).

In December 2016, Qatar released a short executive presentation which it called *Qatar Smart Nation*<sup>71</sup>. Excerpts from the presentation are in Box 4.

#### **Case Study 4. National eGovernment Strategy 2016, Kingdom of Bahrain<sup>72</sup>**

The Kingdom of Bahrain developed its first eGovernment (eGov) strategy, covering the period of 2007-2010, with the aim to bring the government closer to its people. The result was exemplary. The strategy translated into the establishment of 4 eGov channels and more than 200 e-Services.

A new Economic Vision 2030 was launched in October 2008, aiming to ensure the future economic sustainability of the Kingdom. The development of the Kingdom of Bahrain eGov strategy 2016

followed a structured 6-step approach, driven by a new eGov vision. The strategy takes a holistic view of all factors relevant to eGov by applying a wide range of frameworks to clearly define the eGov target and operating models. The resulting eGov road-to-implementation is delineated through a comprehensive master plan.

**VISION**

Building on a strong foundation from the previous period 2007-2010, the new eGov strategy aims for an ambitious yet achievable target. To encapsulate the key objectives, a new eGov vision, **ADVANCE**, has been put in place:

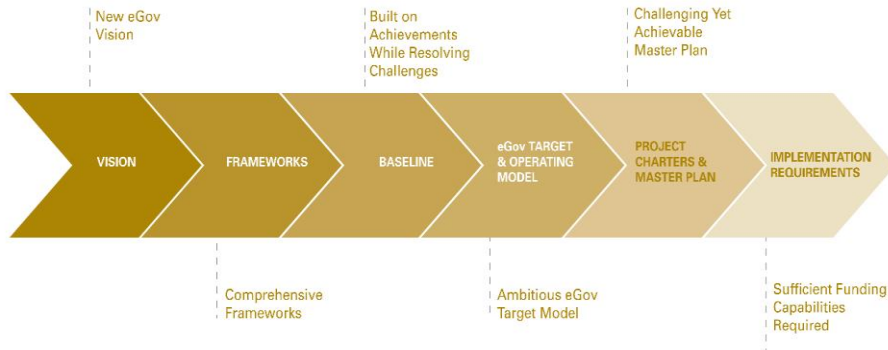
*Achieve next generation Government excellence by delivering high quality services effectively, valuing efficiency, advocating proactive customer engagement, nurturing entrepreneurship, collaborating with all stakeholders and encouraging innovation.*

**MISSION**

The new eGov mission encapsulates the new **ADVANCE** vision:  
*To realize the Kingdom of Bahrain eGov vision by defining and managing implementation of relevant strategies, setting and monitoring compliance to policies and standards, facilitating transformation of services and advocating incubation of next generation concepts, all in close collaboration with government entities and effective partnership with the private sector.*  
 This enhanced mission lays out the proper context for The Kingdom’s eGov Authority (eGA) to operate and interact with other national stakeholders as the eGov strategy 2016 is implemented.

**STRATEGIC OBJECTIVES**

To materialize the new eGov mission and realize its benefits, a set of key strategic objectives have been developed targeting various stakeholder groups and catering to their needs and preferences.



**eGovernment Strategy Development Approach**

- A**chieve next generation government excellence
- D**eliver high quality services effectively
- V**alue efficiency
- A**dvocate proactive customer engagement
- N**urture entrepreneurship
- C**ollaborate with all stakeholders
- E**ncourage innovation

**Elements of the New eGovernment Vision**

**BENEFICIARY STAKEHOLDER GROUPS**

At the core of both the **ADVANCE** vision and eGov mission and objectives is a pledge to positively impact three key identified stakeholder groups within the Kingdom of Bahrain: Individuals, Businesses and Government; where individuals refer to citizens, residents and visitors, Businesses refer to small, medium and large enterprises and their employees, and Government refers to government entities and their employees.



**Key Objectives of the eGovernment Strategy 2016**

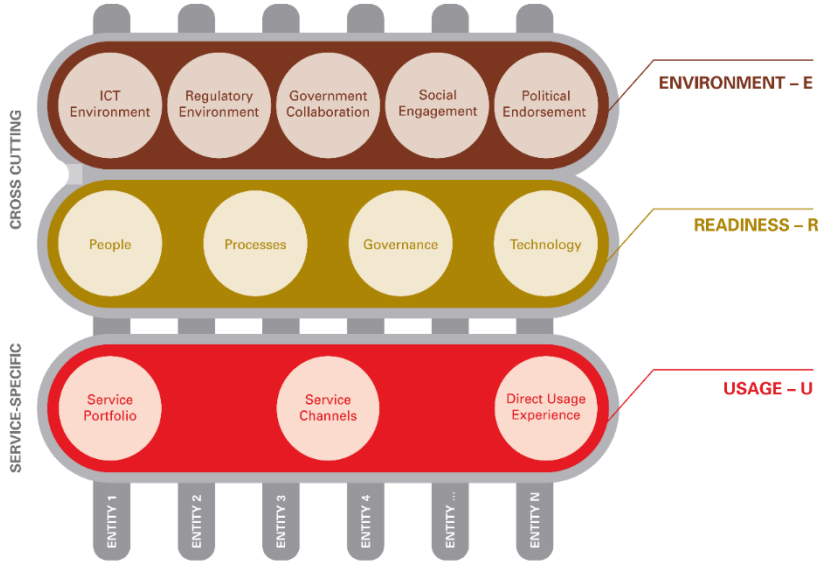
**COMPREHENSIVE EGOVERNMENT MODERNISATION FRAMEWORK**

To deliver against the new eGov vision and to achieve the key objectives set, a comprehensive Environment Readiness-usage (ERu) framework has been used which provides a holistic approach to eGov modernization.

**SOLID EGOVERNMENT ACTION PLAN**



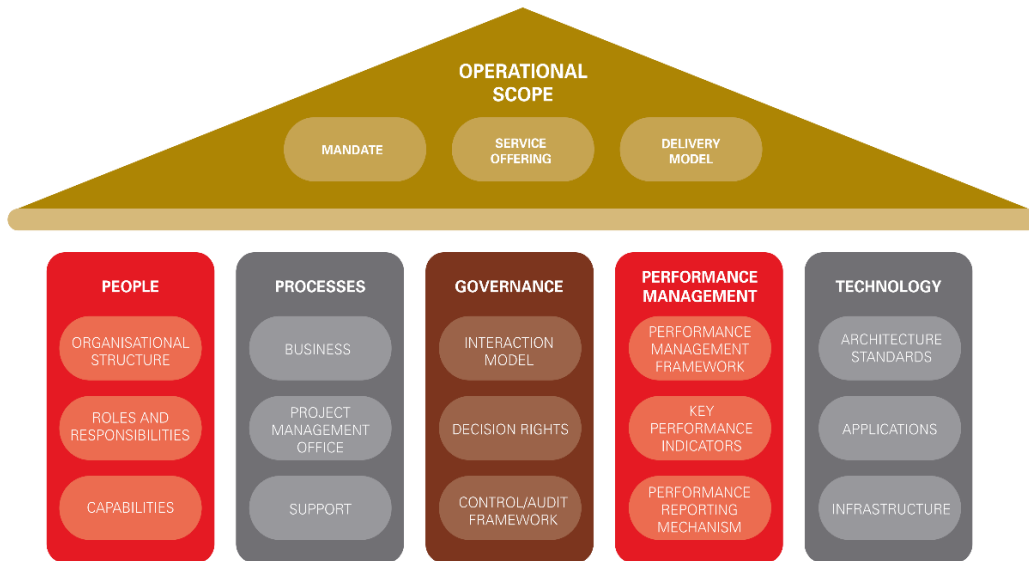
To bridge the gap between the current and target states, more than 90 projects across Environment, Readiness, and usage dimensions have been designed providing clear and measurable benefits.



**Environment-Readiness-Usage Framework**

**EGOVERNMENT AUTHORITY REFINED OPERATING MODEL**

To support the rollout of the new eGov strategy, the target operating model for eGA, has also been refined via a framework of 6 clear dimensions, addressing operational scope, people, processes, governance, performance management, and technology.



## eGovernment Authority's Operating Model Framework

### EGOVERNMENT AUTHORITY'S STRATEGIC DIRECTION

To support the eGov program going forward, eGA will play four main roles: it will be the eGov strategist, the IT policy and standard setter, the service transformation facilitator and the strategic incubator. In that respect, and over the next few years, eGA will start enabling entities to gradually take on the responsibility for more and more eService transformation.

#### eGOV STRATEGY DEFINITION AND MANAGEMENT

- Develop and refresh the eGov strategy
- Drive the eGov Programme and coordinate all its related efforts
- Monitor the progress of eGov programme implementation
- Communicate eGov programme goals and progress and ensure awareness and usage uptake of eServices
- Be informed of Government entities IT programmes and budgets

#### eGOV AND IT POLICY AND STANDARDS SETTING AND MONITORING

- Set and refine eGov & IT related policies and standards
- Educate concerned entities on eGov & IT related policies and standards
- Monitor and report adherence to eGov & IT related policies and standards to the SCICT



#### STRATEGIC INCUBATION

- On behalf of other entities, design and drive the implementation and operation of key foundational eGov components/services until they mature and can be completely transferred to such entity
- Setup and manage an innovation fund to solicit innovative eGov related solutions from the market

#### eSERVICE TRANSFORMATION FACILITATION

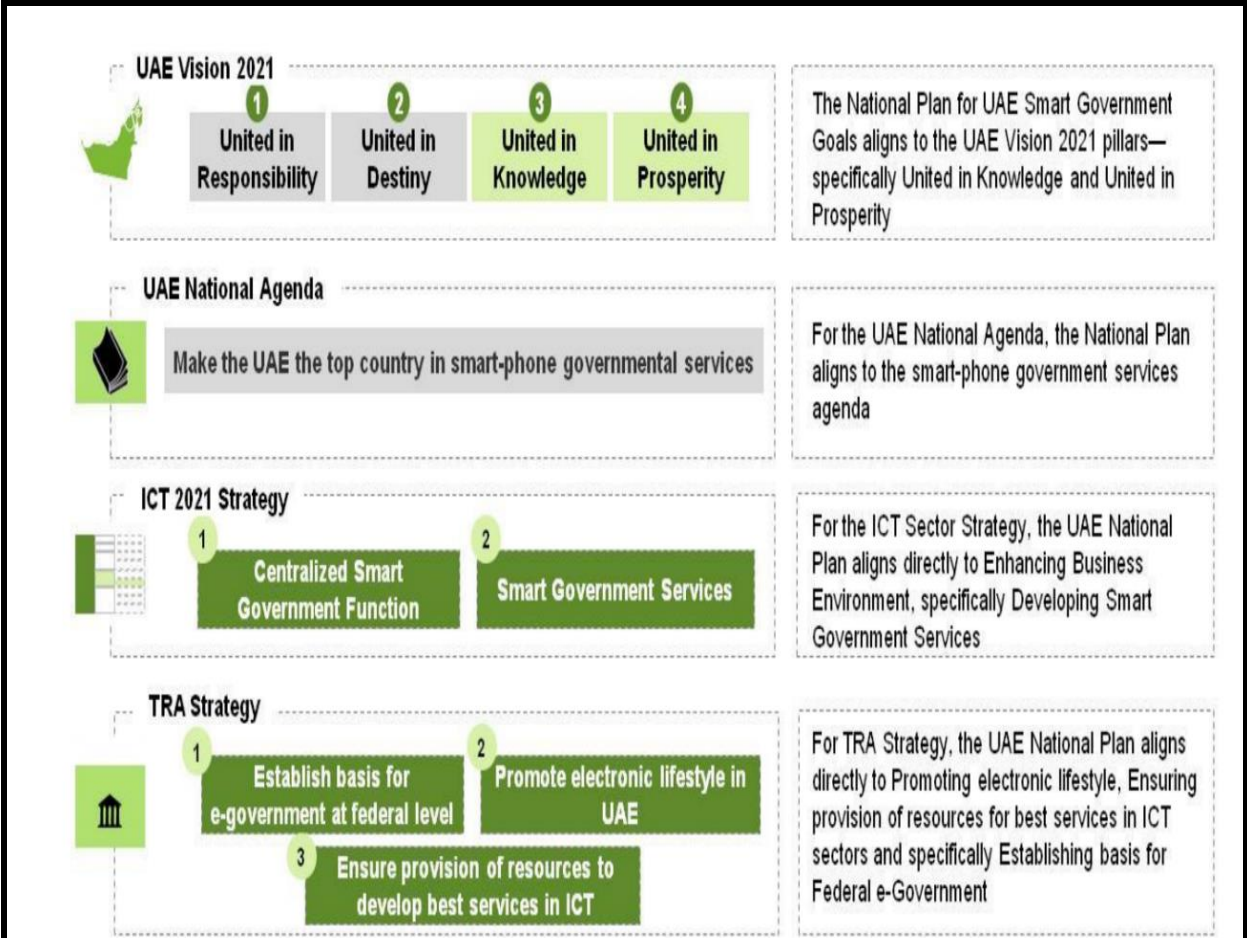
- Set the agenda for the deployment of Government eServices
- Oversee and drive implementation of high priority eServices as per prioritised master plan and in coordination with entities
- Drive revenue generation through eGov
- Develop a service transformation toolkit to enable entities to transform their eServices on their own or with the help of a third party

### Future Main Roles of eGovernment Authority

### Case Study 5. The National Plan for UAE Smart Government Goals<sup>73</sup>

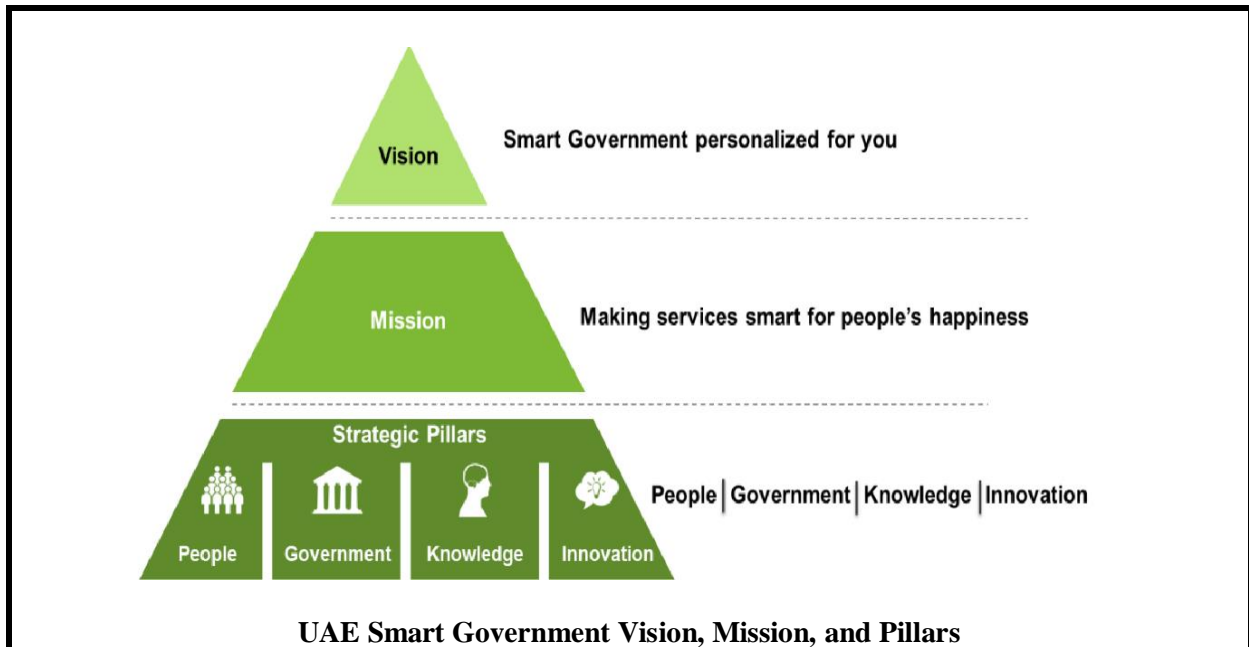
Telecommunications Regulatory Authority (TRA) was tasked to lead the development of the National Plan for UAE Smart Government Goals. The goal is to continue enabling and supporting government entities that are directing change while harnessing the benefits of technology to achieve uniform and consistent transformation.

The National Plan for UAE Smart Government Goals was initiated in 2014 in alignment with the national direction embodied in UAE Vision 2021, the UAE National Agenda, and the Information and Communications Technology (ICT) Sector Strategy.



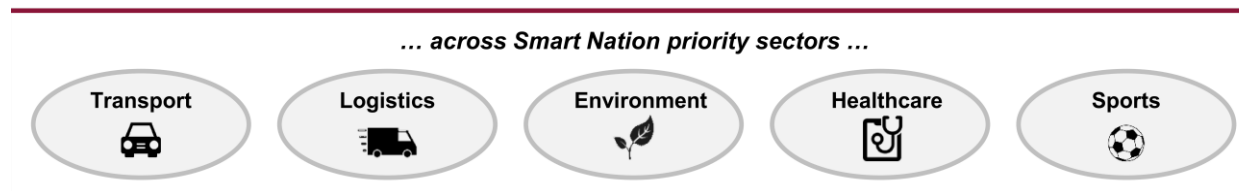
**National Plan Alignment**

The National Plan for UAE Smart Government Goals which guide and align the supporting planned investments organized in the 5-year roadmap (that builds on what was launched in 2013 following UAE’s announcement to transition to Smart Government and introduces a number of new initiatives reaching to 2018). Ultimately, the Smart Government program seeks to make government services personalized for people and increase their happiness.



#### Box 4. Qatar Smart Nation<sup>74</sup>

Qatar Smart Nation Program aims to harness technology and innovation to improve quality of life and help drive sustainable economic development across 5 priority sectors.



For each priority sector, Qatar Smart Nation focuses on bringing technology and innovative solutions to improve national and citizen outcomes by addressing key national challenges across the shortlisted sectors.

### Key National Challenges

**\$1.8 billion p.a.** or **0.9% of GDP** is lost due to traffic congestion

**~10 fatalities & 30 injuries per 100,000** residents recorded from road accidents

**+400** vehicles per 1,000 residents, compared to a global ratio of **131**



Costs to import are **40% above** regional average, increasing price of goods

Warehousing is **6 times** more expensive than other GCC countries

**\$150bn** on megaprojects require large scale logistics operations



Energy consumption per capita is **3 times** the global average

Water leakage accounts for **20-30%** of production while reserves last only **2 days**

**90%** of food is imported, while reserves last only **3 days**



**34%** of deaths are due to non-communicable chronic disease

Health costs are rising at **12.7% CAGR**, expected to reach **\$12bn p.a.** by 2024

Qatar has **28** physicians per **10,000** people, 25% below average rate of high income countries



**1m** expected international visitors for 2022 World Cup

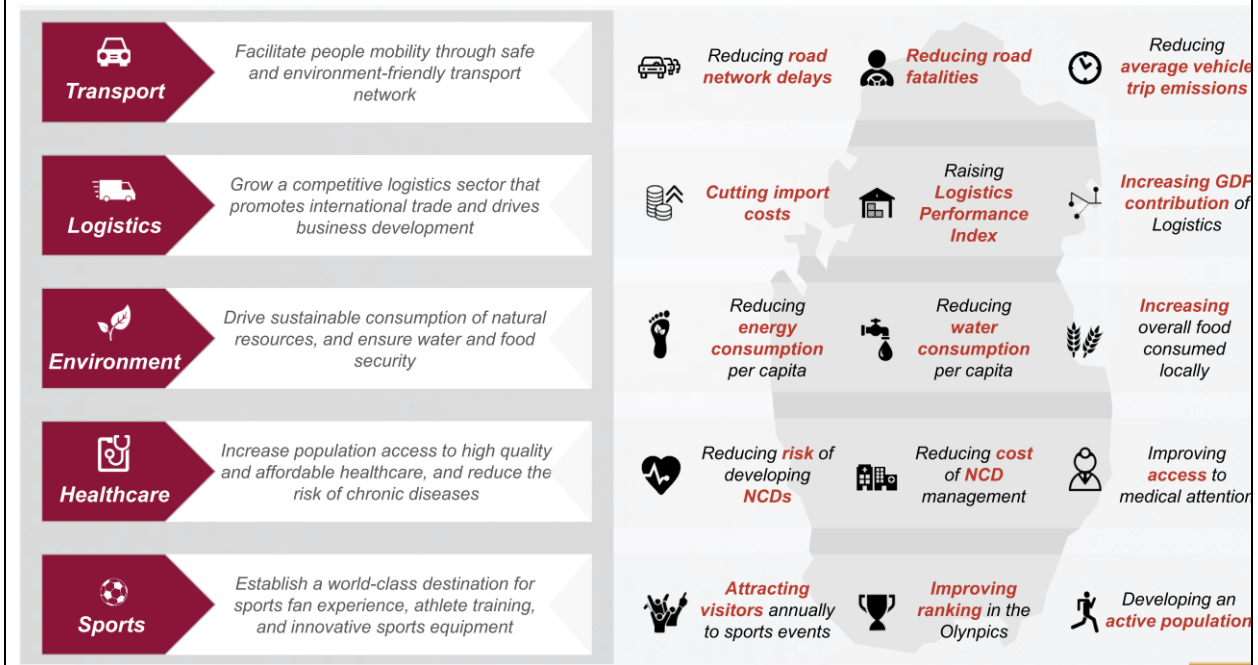
**At least 35%** of athletes are not born in Qatar, given an unclear pathway for development

**63%** of the working population does not engage in physical activity

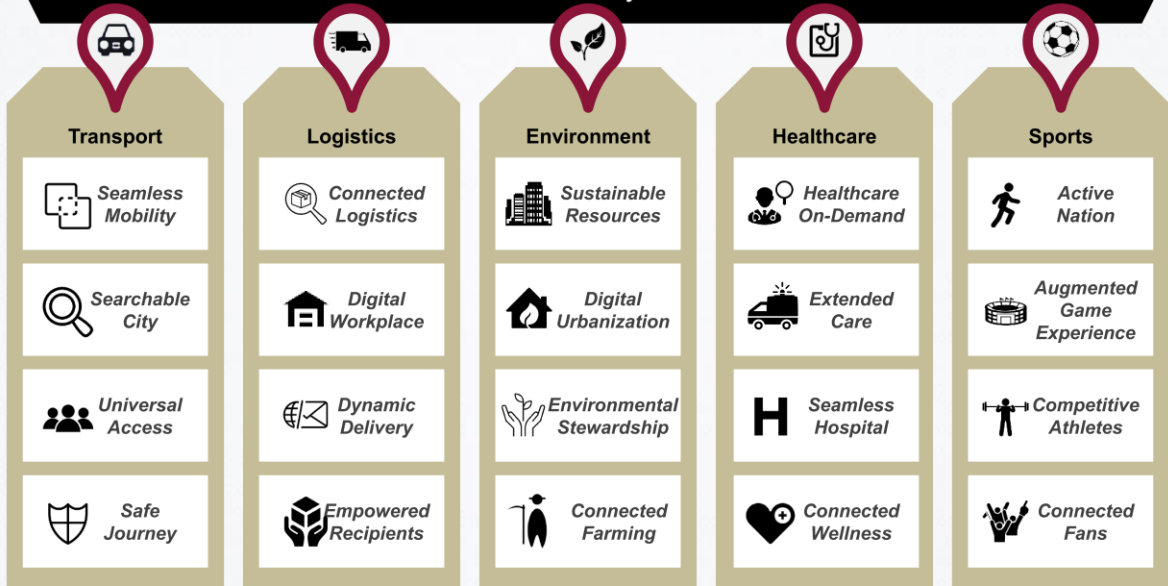


**Innovative applications of advanced technologies, particularly on a wide scale, can help address Qatar's national challenges**

As such, the proposed 5 key strategic thrusts and related objectives will form the mandate of the Smart Nation in Qatar and help address pressing national challenges that were grouped into 4 key strategic focus areas or themes per sector based on technology ecosystems, delivered experiences and sector value chain positioning.



Smart Qatar – Key Themes



## 9. SCENARIOS FOR FORMULATING SMART POLICIES AND STRATEGIES

National governments can initiate *smart transformation* as a strategy followed by an action plan, a roadmap and KPI's, as appropriate. The strategy is not about technology only. It should consider the socioeconomic factors affecting the transformation, as well as issues such as governance, security and trust.

Three main scenarios are available for the smart transformation, with several sub-options within:

### Scenario 1: Sector-centric smart transformation strategy (Figure 11):

Smart transformation strategy can focus on the national government. Transformation could be holistic targeting all sectors of the economy simultaneously, which may prove difficult in many developing countries. Alternatively, it could be staged according to a certain priority to target one specific sector at the time. For instance, a government may opt to address the industrial sector as a priority, while agriculture, health, tourism or education are priorities for other governments.

The strategy should also focus on the impact of transformation on the citizen and the various groups of the community. This scenario applies in relatively small countries with modest achievements, so far, in e-Government services.



Figure 11. Scenario 1: Sector-centric structure

### Scenario 2: City-centric smart transformation strategy (Figure 12):

The smart transformation strategy is focused on a metropolitan city. If the strategy is initiated by a national government, then it may choose to stage transformation of cities according to certain



predefined priorities. Again, a good part of the strategy should be devoted to its impact on the transformation of the various sections of the metropolitan community. Governance with independent municipalities management and policies to empower local governance are the main development engines for local smart transformation.

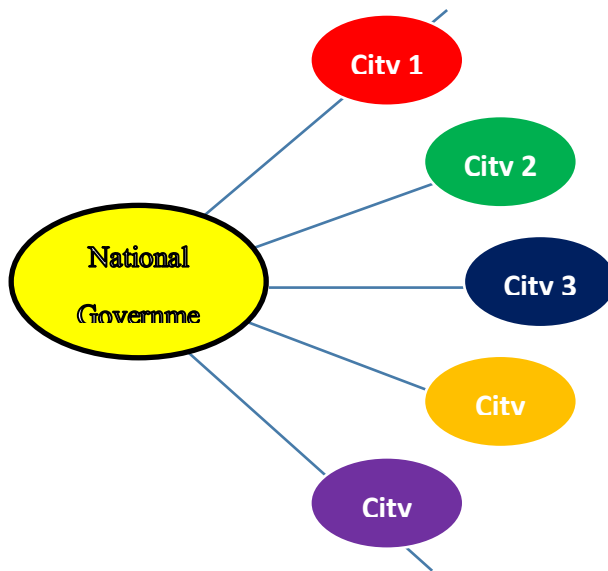
This scenario is suitable for countries with relatively large cities that have local governments with extensive responsibilities and generous budget allocations.

### Scenario 3: Combination of Scenarios 1 and 2:

Countries with large cities, as well as extensive e-Government services at the national level, may opt for ambitious plans to implement both options almost simultaneously. This hybrid scenario may prove difficult to implement in developing countries like the Arab States.

When selecting an appropriate scenario from the three options discussed, the Action Priority Matrix shown in Figure 6, and discussed in Section 5 can be used. The worksheet, shown in Figure 7, can be modified by adding a column to indicate the link of each strategic technology with the Social Development Goals (SDG's), which was discussed in Section 6. An additional column can also be used for the estimated cost. Scores from 0 to 10 can be used for the link of each strategic technology to SDG's. Table 5 shows the modified worksheet. The selected scenario(s)

- Maximum impact total;
- Minimum effort total;
- Maximum SDG's link total; and
- Minimum, or acceptable estimated total cost.



*Figure 12. Scenario 2: City-centric structure*



**Table 5. The Modified Action Priority Matrix Worksheet with SDG's**

<b>Strategic Technology</b>	<b>Impact (0 -10)</b> No impact 0 Maximum impact 10	<b>Effort (0-10)</b> No effort 0 Maximum effort 10	<b>SDG's (0-10)</b> No link 0 Max link 10	<b>Estimated Cost</b> \$
1. Digital Workplace				
2. Multichannel Citizen Engagement				
3. Open Any Data				
4. Citizen e-ID				
5. Analytics Everywhere				
6. Smart Machines				
7. Internet of Things				
8. Digital Government Platforms				
9. Software-Defined Architecture				
10. Risk-Based Security				
Total				

- Maximum impact total is best;
- Minimum effort total is best;
- Maximum SDG's link total is best; and
- Minimum, or desirable estimated total cost is best.

## 10. CONCLUSIONS

*Smart* is an evolving and an aspirational concept. Societies need to continue evolving and aspiring towards a better, smarter future. Such change should be spearheaded by a *smart government* that has clear visions and goals for the transformation. Development of a smart society will depend on the ability to build a data friendly culture, support the development of truly empowered digital *smart* citizens, develop the capacity of the public sector to support such work, invest in key elements of infrastructure, and collaborate to unlock new and open platforms.

The *Smart Paradigm* is a concept that lacks precision. It could apply to a variety of products, services and ideas. The use of *Smart* in the government domain was inspired from the name coined to the generation of mobile phones with sophisticated hardware and software features which qualified them to be commercially named *intelligent* or *smartphones*<sup>75</sup>. Developers of e-Government projects used the term *mobile government* to refer to the availability of e-Government services through mobile phones, which is considered a necessary development phase in the maturity journey of e-Governments, and was closely associated with other concepts such as *open government* and the pervasiveness of smartphones worldwide.

The term *smart government* has not, so far, been used in the United Nations Department of Economic and Social Affairs e-Government surveys as a distinct stage in the maturity journey of e-Governments<sup>76</sup>. However, for the purpose of this study, a government that ranked with *Very High EGDI* is considered to be a *smart government* or close to it.

The alignment of smart government assessment with *EGDI* ranking may be objectionable. The computation of *EGDI* and its subcomponents are marred with conundrums. UNDESA has not been publishing the detailed calculations of *EGDI* for verification purposes, nor thoroughly explain the methodology. However, *EGDI* has over 12 years of accumulated data and covers the largest number of countries worldwide, and thus is more amenable for use than any other index in the market. One direction that could be beneficial would be for UNESCWA to persuade UNDESA to incorporate GEMS into *EGDI*. The resulting enhanced *EGDI* will incorporate parameters closer to the measurement of the demand side and customer satisfaction of e-Government services. UNDESA incorporation of GEMS into *EGDI* will also bring worldwide adoption of the GEMS model of measurement.

The term *Smart City* occurs in the literature much more frequently than other *smart* descriptors associated with development of governments, societies and nations. There are several examples of smart cities from developed countries, such as the United States, Canada, United Kingdom, South Korea, Singapore and Japan. There are also plans in countries such as India, Malaysia and Brazil. Examples of implementing, or planning to implement, smart cities in Arab countries are also available. The most quoted case from the Arab region is Dubai. Dubai's smart city strategy includes over 100 initiatives and a plan to transform 1,000 government services into smart services. The project aims to encourage collaboration between the public and private sectors to achieve targets in six 'smart' focus areas: smart life, smart transportation, smart society, smart economy, smart governance and smart environment. The strategy relies on three basic principles: communication, integration and cooperation<sup>77</sup>.

There are other cities that have taken steps towards the smart transformation. These include Abu Dhabi, Jeddah and Amman. An interesting example of developing what is termed a *smart nation* was seen in the United Kingdom and Singapore. See case studies 1 and 2.

Except for the GCC, Arab governments have a long way to go in the e-Government maturity journey to reach the *smart* status. The present economic, political and security issues in the region is making such transformation even harder.

To implement smart transformation, the Active Priority Matrix Worksheet described in Section 5 is used. It can be augmented with an additional parameter, drawn from Section 6 for the effect of the selected strategic technologies towards the achievement of Social Development Goals for the specific country in question.

In the absence of a well-defined stage of e-Government development in the UN Survey, the rank of *Very High EGDI* can be considered equivalent to achieving a *smart government* status and can be used by decision makers in Arab governments for benchmarking their progress towards smart government.

It is important to highlight here the five enablers which the United Kingdom government stressed as enablers for the smart transformation. See Case Study 1. They include:

- 1) A data friendly culture, reinforced by trust and responsibility
- 2) Empowered and digitally literate citizens as enablers of the smart society
- 3) Empowering public institutions offering smart leadership
- 4) Enabling infrastructures
- 5) Enabling open platforms and open markets

For a country to succeed in the smart transformation process, it has to aim at achieving these goals.

The formulation of policy and strategy for the smart transformation, decision makers in the Arab region can benefit from the topics discussed in this report:

- 1) The three options which are outlined in Section 9 can be used to select a limited number of desirable scenarios for further consideration based on the issues discussed in the following sections:
  - a. The smart paradigm;
  - b. Disruptive strategic technologies;
  - c. Social development Goals (SDG's) and their links to strategic technologies;
- 2) The modified Action Priority Matrix Worksheet in Section 9 (Figure 13) can then be applied to each selected scenario giving grades for every strategic technology based on its impact, the effort needed, its link with SDG's and the estimated cost of implementation;
- 3) The various columns in the worksheet can be summed up and comparison is made between the various selected scenarios to choose which of the scenarios are the most suitable of implementation.

Smart transformation at all level of government and society constitutes the demand side of an equation which requires a supply side that provides extensive infrastructure as well as products and services based on ICT and other technologies to meet the smart transformation delivery. Such infrastructure is not indigenously available in most Arab countries and reliance on imported products is the order of the day.

Governments have to formulate strategies that enable them to implement the smart transformation out of the three options outlines in Section 9. In all implementation options, policy makers have to avoid rigid vertical implementation of smart transformation and opt for a decentralized horizontal approach with KPI's to monitor and assess progress. The modified Action Priority Matrix should provide decision makers with a useful tool for planning and implementing the smart transformation process.

## 11. RECOMMENDATIONS

For smart transformation in governments in the Arab countries, the following steps are actionable recommendations for decision makers to consider:

- 1) **Identifying** the stakeholders of the smart transformation in the community. This should include representatives of public and private sector institutions as well representatives of civil societies and various social sectors of the community;
- 2) **Planning** orientation programmes for the selected stakeholders as well as senior government officials and project leaders. Topics to be covered should include:
  - a. The development of governments and technologies, Sections 1 and 2;
  - b. The smart paradigm, Section 4;
  - c. The concept of disruptive technologies, Section 3;
  - d. Strategic technologies associated with the smart transformations, Section 4;
  - e. The Social Development Goals, Section 6;
  - f. The Action Priority Matrix method for comparing and selecting appropriate smart transformation scenarios, Section 9;
  - g. The UNDESA eGovernment Development Index (EGDI) and its components, Sections 7, 8 and the Appendix;
  - h. Presentation of success stories from developed countries and the region;
  - i. Priority applications, to be developed through discussions with stakeholders;
  - j. Challenges facing implementation;
  - k. The proposed process of conceiving, designing, implementing and operating the smart transformation, CDIO<sup>78</sup>.
- 3) **Conceiving**: Out of the three options outlined in Section 9, select a number of desirable scenarios for smart transformation for further analysis. The selected scenarios are predominantly governed by political and socioeconomic consideration. Government should lead stakeholders through consultation and collective thinking to select the smart transformation scenarios best suited for a country or city;
- 4) **Designing**: Use the Action Priority Matrix and the modified worksheet presented in Section 9 to rate the strategic technologies needed for the implementation of each scenario in terms of the following criteria:
  - a. Impact
  - b. Effort
  - c. Link with SDG's
  - d. Cost

The selected scenario(s) should high impact total. low effort total, high link with SDG's and low cost total. The process can also be supplemented by SWOT analysis<sup>79</sup> of the selected scenario(s);

- 5) **Implementing**:
  - a. Select a set of key performance indicators (KPI's)<sup>80</sup> to monitor progress of project implementation;

- b. Establish a project management office (PMO) and select a project manager for the smart transformation;
- 6) **Operating:** Ensure continuous monitoring and evaluation through KPI's and customer survey mechanisms to ensure effective and efficient operation.

## APPENDIX

### **Extracts from 2016 UNDESA eGovernment Survey<sup>81</sup> (Definitions of EGDI and its Components)**

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

The EGDI is used as a benchmark to provide a numerical ranking of e-government development across United Nations Member States. While the methodological framework for EGDI has remained consistent across the Survey editions, each edition of the Survey has been adjusted to reflect emerging trends of e-government strategies, evolving knowledge of best practices in e-government, changes in technology and other factors. In addition, data collection practices have been periodically refined.

#### **Telecommunication Infrastructure Index (TII)**

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

The definitions of the five components of TII are:

1. Internet users (per 100 inhabitants) refer to individuals who used the Internet from any location in the last three months.
2. Main fixed telephone lines (per 100 inhabitants) refers to telephone lines connecting a customer's terminal equipment (e.g., telephone set, facsimile machine) to the public switched telephone network (PSTN), which has a dedicated port on a telephone exchange. This term is synonymous with the terms main station or Direct Exchange Line (DEL), which are commonly used in telecommunication documents. It may not be the same as an access line or a subscription.
3. Mobile subscribers (per 100 inhabitants) are the number of subscriptions to mobile service in the last three months. A mobile (cellular) telephone refers to a portable telephone subscribed to a public mobile telephone service using cellular technology, which provides access to the PSTN. This includes analogue and digital cellular systems and technologies such as IMT-2000 (3G) and IMT-Advanced. Users of both post-paid subscriptions and prepaid accounts are included. It excludes subscriptions that have access to data communications (including the Internet) via mobile-cellular networks. It should include fixed WiMAX and any other fixed wireless technologies. It includes both residential subscriptions and subscriptions for organizations.

The TII has remained largely unchanged since 2002, except for the replacement of online population with

fixed-broadband subscription and the removal of number of television sets in 2008; the replacement of personal computer (PC) users with fixed Internet subscriptions in 2012; and the replacement of fixed Internet subscriptions with wireless broadband subscriptions in 2014.

### **Human Capital Index (HCI)**

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

The definitions of the four indicators of HCI are:

1. Adult literacy is measured as the percentage of people aged 15 years and above who can, with understanding, both read and write a short simple statement on their everyday life.
2. Gross enrolment ratio is measured as the combined primary, secondary and tertiary gross enrolment ratio, of the total number of students enrolled at the primary, secondary and tertiary level, regardless of age, as a percentage of the population of school age for that level.
3. Expected years of schooling is the total number of years of schooling that a child of a certain age can expect to receive in the future, assuming that the probability of his or her being in school at any particular age is equal to the current enrolment ratio age.
4. Mean years of schooling (MYS) provides the average number of years of education completed by a country's adult population (25 years and older), excluding the years spent repeating grades

The first two components, i.e. adult literacy rate and the combined primary, secondary and tertiary gross enrolment ratio have been used for the past Surveys since 2002. Recognizing that education is the fundamental pillar in supporting human capital, the 2014 Survey introduced two new components to the human capital index (HCI), namely, expected years of schooling; and mean years of schooling.

The preliminary statistical study commissioned by DESA/ DPADM validated the use of the new HCI, accentuating that the two new components has strengthened the HCI and it does not introduce any error (UNDESA, 2014).

The HCI is a weighted average composite of the four indicators. The human capital composite value for country "x" is the weighted arithmetic mean with one-third weight assigned to adult literacy rate and two-ninth weight assigned to the gross enrolment ratio, estimated years of schooling and mean years of schooling derived this way:

Then, the human capital composite value is normalized by taking its composite value for a given country, subtracting the lowest composite value in the Survey and dividing by the range of composite values for all countries.

### **E-Participation Index (EPI)**

The e-participation index (EPI) is used as a supplementary index to EGDI. It focuses on the use of online services to facilitate provision of e-information sharing (governments to citizens) with stakeholders ("e-consultation") and engagement in decision-making processes ("e-decision-making")

### **Online Service Index (OSI)**

To arrive at a set of Online Service Index (OSI) values for 2016, a total of 111 researchers, including UN experts and online United Nations Volunteers (UNVs) from over 60 countries with coverage of 66 languages assessed each country's national website in the native language, including the national portal, e-

services portal and e-participation portal, as well as the websites of the related ministries of education, labor, social services, health, finance and environment as applicable. The UNVs included qualified graduate students and volunteers from universities in the field of public administration.

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

The data collection and Survey research ran from May 2015 until the end of July 2015. Each country was assessed by at least two researchers who conducted the Survey in the country’s national language. After the initial assessment, the evaluations by the two researchers on each country were compared and questions with discrepancies were reviewed again by the researchers. The third phase, from July to August, was the final review by the Data Team Coordinators who analyzed all the answers and, where needed, carried out further review and verification processes using multiple methods and sources. The scores were then sent for approval by a senior researcher. Through this multilevel approach, all surveyed sites were thoroughly assessed by at least three people, one of whom has years of experience in assessing public sector online services, and reviewed by one of the Data Team Coordinators. Once the evaluation phase was completed, the statistics team produced the first draft of the OSI ranking. The data was extracted from the platform and the raw OSI scores were created.

Rankings were compared with previous OSI scores, and any discrepancies were reviewed thoroughly. Each question calls for a binary response. Every positive answer generates a new “more in-depth question” inside and across the patterns. The outcome is an enhanced quantitative Survey with a wider range of point distributions reflecting differences in levels of e-government development among countries.

The total number of points scored by each country is normalized to the range of 0 to 1. The online index value for a given country is equal to the actual total score less the lowest total score divided by the range of total score values for all countries.



## ENDNOTES

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- <sup>1</sup> EGDI = Electronic Government Development Index.
- <sup>2</sup> [http://www.answers.com/Q/When was the first government established](http://www.answers.com/Q/When_was_the_first_government_established)
- <sup>3</sup> <http://www.worldhistorysite.com/r&fCivI.html>
- <sup>4</sup> <http://www.scholastic.com/teachers/article/forms-government>
- <sup>5</sup> [https://en.wikipedia.org/wiki/History\\_of\\_mathematics](https://en.wikipedia.org/wiki/History_of_mathematics)
- <sup>6</sup> [https://en.wikipedia.org/wiki/Hindu%E2%80%93Arabic\\_numerical\\_system](https://en.wikipedia.org/wiki/Hindu%E2%80%93Arabic_numerical_system)
- <sup>7</sup> <http://www.biography.com/people/johannes-gutenberg-9323828>
- <sup>8</sup> G. David Garson, *Information Technology and Computer Applications in Public Administration*, Idea Group Inc (IGI), 1999 (Pages 44-45).
- <sup>9</sup> Ali M. Al-Khouri, 'An Innovative Approach for E-Government Transformation', *International Journal of Managing Value and Supply Chains (IJMVSC)* Vol. 2, No. 1, March 2011
- <sup>10</sup> Deloitte, 'How disruptive innovation can help government achieve more for less',
- <sup>11</sup> 10
- <sup>12</sup> Ibid from Sources: Clayton M. Christensen, *Innovator's Dilemma*; Clayton M. Christensen and Michael Raynor, *Innovator's Solution*; and Michael Raynor, *Innovator's Manifesto*.
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- The **CDIO** Initiative (CDIO is a trademarked initialism for "Conceive Design Implement Operate") is an educational framework stressing engineering fundamentals set in the context of conceiving, designing, implementing and operating real-world systems and products. Throughout the world, CDIO Initiative collaborators have adopted CDIO as the framework of their curricular planning and outcome-based assessment.
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**SWOT analysis** (alternatively **SWOT matrix**) is an [acronym](#) for *strengths, weaknesses, opportunities, and threats* and is a structured [planning](#) method that evaluates those four elements of a [project](#) or [business](#) venture. A SWOT analysis can be carried out for a company, product, place, industry, or person. It involves specifying the objective of the business venture or project and identifying the internal and external factors that are favorable and unfavorable to achieve that objective.

<sup>80</sup> [https://en.wikipedia.org/wiki/Performance\\_indicator](https://en.wikipedia.org/wiki/Performance_indicator)

A **performance indicator** or **key performance indicator (KPI)** is a type of [performance measurement](#). KPIs evaluate the success of an organization or of a particular activity or project in which it engages.

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