

# Building Open Data Capacity through e-Skills Acquisition

Mitrovic, Z. & Thakur, C.

## Abstract

Governments around the world, their agencies and various contractors accumulate enormous quantities of data through their everyday activities. Opening this data to the public and its use for socio-economic development is behind the idea of Open Government Data (OGD). Nowadays OGD is delivered and accessed by the use of the contemporary information and communication technologies (ICT), notably the Internet. This means that the providers of OGD (e.g. governments and agencies) and users (e.g. citizens) must possess certain skills in order to provide and use OGD effectively. These skills are often referred to as 'e-skills' and the importance of these skills within the OGD context is emphasised by a number of authors. The importance of e-skills is also recognised by many international organisations (e.g. UN, World Bank) and initiatives such as the World Summit on Information Society. On the other hand, it is widely reported that a considerable shortage of e-skills in developing countries inhibits citizen participation in the so-called information society and knowledge economies. The lack of e-skills in developing countries is also recognised as a stumbling block that prevents the effective provision and usage of open data. However, despite the reported importance of e-skills for successful OGD initiatives, there were no studies found reporting on this topic. Hence, using the case study methodology, this study has explored e-skills needed for efficient and effective provision of OGD by government officials and beneficial use of OGD by citizens in two developing countries: South Africa and Namibia. It is established that government officials and citizens should possess an array of e-skills in order to effectively provide or use OGD. The role of OGD intermediaries emerges as crucial in these processes. This study also suggests to policy-makers to focus their attention on the strategic, operational, technological and societal implications regarding OGD e-skilling. Being a first of this type, this study is by no means exhaustive, hence future exploration in this field is suggested.

**Keywords:** Developing countries, Open Government Data, ICT, e-Skills, Policy-making.

## 1 Introduction

Governments around the world, in response to recognition of the rights of citizens, have embraced the concept of 'Open Government' that includes three core elements: transparency, participation, and collaboration (UNDESA, 2013). Multinational initiatives, such as the Open Government Partnership in 2011, have been adopted by countries as diverse as the United States of America, Chile, Austria, Russia, Kenya, Malaysia, Tanzania and South Africa. Within these initiatives, data is increasingly seen as a valuable resource in its own right, capable of creating enormous wealth and powering the economy. Opening these data to the public and use for socio-economic development are reasons behind the initiatives for Open Data (OD) Open Government Data (OGD). Open data should be freely available for all stakeholders to access, use, reuse and publish without restrictions from copyright, patents or other mechanisms of control. The concept of Open Government Data (OGD) is aimed at use and re-use of government data (Ubaldi, 2013).

Many open data initiatives, particularly in the public sector, have been motivated by societal goals such as improving the transparency and accountability of institutions, and much has been written about the importance of these efforts (McKinsey Global Institute, 2013). The pertinent reports suggest that opening government data can have huge potential benefits including transparency, through accessing relevant government data by citizens; efficiency, through enabling better coordination and efficiency within government; innovation, through services that deliver social and commercial value (Puron-Cid et al., 2012).

The notions of OD and OGD are not new and have been around for some years. However, only in 2009 OGD started to become visible in the mainstream, when various governments (such as the USA, UK, Canada and New Zealand) announced new initiatives towards opening up their public information (Open Knowledge Foundation, 2012). Development of so-called Information Society through use of modern information and communication technologies (ICT) also sparked a generation of considerable interest for ODG among researchers, technology developers and practitioners in public administration (Hunnius & Krieger, 2014). Some authors (e.g. Hunnius & Krieger, 2014) refer to the present as living in 'data society' as information coming from data is the *"lifeblood of a robust democracy and productive economy"* (Australian Government, 2013).

It is important to emphasise that OD and OGD are not synonymous, as shown in Figure 1. Hence, this study is limited only to OGD but the results might be applicable to the provision and usage of open data of any kind (e.g. corporate or non-profit/non-government organisations open data).

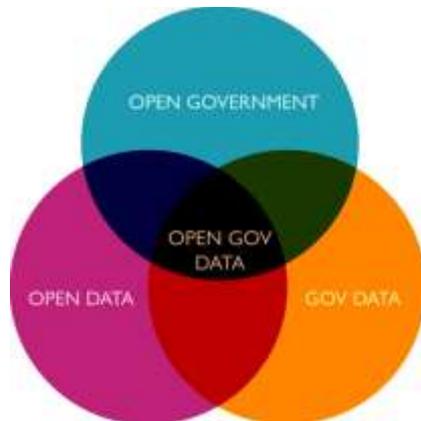


Figure 1: Positioning of Open Government Data (Source: UNDESA, 2013)

Making government data open, using contemporary ICT, however, does not guarantee that perceived or desirable benefits will be achieved. As the reviewed literature revealed, there are at least two conditions that must be met if benefits from OGD are to be achieved: (a) these data should be open in a specific, professional way and (b) potential users of OGD should be able to access and use these data for social, economic or political use. From the viewpoint of this study, this means that both the OGD providers (officials in government departments and agencies) and users (in the case of this study, citizens) should possess certain levels of ICT skills, also referred to as 'e-skills'. It is argued that *"data alone is not knowledge"* (Ohlhausen, 2014) and certain skills are needed to transfer data into usable information and knowledge.

## 2 Need for Open Government Data e-Skills

The complexity of the issues to be addressed by governments requires highly trained and specialised officials having flexible skills, able to perform various functions, as agility and adaptability are critical to effective and innovative governments (WEF, 2011). This description also refers to the skills-sets required by civil servants where the necessary skills, tools, mechanisms and guidelines are combined with sound judgement, strong ethics and integrity for an effective provision of open government data (Ubaldi, 2013). To illustrate a complexity of skills needed for the development of OGD and boost data use, the candidates for Data Evangelist at Data.gov were asked to show the following capabilities: (i) extensive outreach and communications skills and experience; (ii) extensive experience in designing and implementing open government systems; (iii) a proven research record for identifying and developing new technologies; and (iv) experience managing a complex data and information environment that encompasses both public and classified data. The job description also indicated working with multiple parts of the government, which implies understanding the various policy issues inherent in the release of OGD (FedBizOps, 2010).

The civil society sector, notable citizens, should also be equipped with skills to make the most use of OGD (UK Government, 2012) as it is advocated in a number of papers that OGD must be usable for all (G8 Charter, 2013). Special efforts should be made to reach people living in poverty through dedicated programmes (UN, 2014) as unequal distribution of skills can have a big impact on the socio-economic reach of the OGD usage (Ubaldi, 2013).

The reviewed literature suggests that some open data projects in developing countries adopted a framework for effective use of ICT (Gurstein, 2011). By developing country it is meant a country that is still in the economic development stages characterised by still underdeveloped industrialised production, lower standard of living and low Human Development Index (HDI) relative to other countries (e.g. O'Sullivan & Sheffrin, 2003). Gurstein's framework, in that regard, elaborates on seven important components that are required for empowerment from open data - one of them being digital skills or e-skills. The United Nations report (UN, 2014) on the data revolution for sustainable development also stressed the need for improving government's and citizens' capacity in data literacy in order to remove barriers between people and data. Strengthening national capacities in open data production and usage is considered as essential for any data revolution, particularly in developing countries where the basic infrastructure is often lacking (UN, 2014). Davies (2012) in his five-star approach to open data engagement echoes the need for open data skills and capacity development.

On the other hand, it is widely reported that considerable shortage of e-skills in developing countries inhibits citizen's participation in the information society and knowledge economies (e.g. IDRC, 2008; ITU-Summit, 2012). Although, there are a number of works suggesting what e-skills are needed to successfully participate in the emerging digital society and economies (e.g. Schofield, 2014; Mitrovic, Sharif & Taylor, 2014; Mitrovic et al., 2012; Gurstein, 2011), there are still no reports related to the e-skills needed for beneficial use of OGD.

A number of recent studies specifically confirmed a lack of skills relevant to effective provision and use of open data (e.g. Open Data Barometer, 2015; Davies, 2014; Stott, 2014;

OECD, 2014; Misuraca & Viscusi, 2014; Halonen, 2012; Davies, 2010). The Open Data Barometer for 2014 (published in January 2015) specifically points out that a “*sustained investment in supporting and training a broad cross-section of civil society and entrepreneurs to understand and use data effectively*” is needed – adding that the “*widespread availability of data skills training is also correlated with higher political impact*” (Open Data Barometer, 2015). This is particularly true for developing countries, the focal point of this study since the majority of individual citizens are not necessarily capable of using raw datasets effectively. On the other hand, most data producers in developing countries currently have rather a low level of knowledge and understanding of open data (Halonen, 2012).

Considering that open data is still in its infancy (Open Data Barometer, 2015), it is no wonder that the reviewed literature did not offer any report on e-skills for either efficient and effective providing or beneficial usage of open data or open government data. Hence, this study set out to:

- Establish what e-skills are needed for efficient and effective provision of OGD,
- Establish what e-skills are needed for beneficial use of OGD by citizens in South Africa and Namibia;
- Determine what is the role of intermediaries in this OGD supply-usage continuum;
- Explore the OGD related e-skilling policy-making implications and suggest further actions.

The aim of this study was to contribute to open data related capacity building, *thus suggesting how developing countries can implement OGD and to link it to beneficial outcomes*. The target was a development of a conceptual model containing e-skills needed for effective and efficient provision of OGD by government officials and beneficial use of OGD by citizens.

The structure of this paper is as follows: (i) approach to this study and research methodology is explained, (ii) definition of OGD and e-skills are given, followed by a brief discussion regarding needs for, benefits of, opportunities, barriers and possible negative sides of open data. This is followed by the identification of e-skills needed for effective and efficient provision and effective use of OGD. The final sections bring some OGD-related e-skills policy-making implications for developing countries, followed with the concluding remarks.

### **3 Research Methodology**

This study deployed a Case Study Methodology (CSM) (see Yin, 2009; Baxter & Jack, 2008) since it was found suitable for researching e-skills for the provisions and usage of OGD. This area of enquiry, in the context of developing countries, is considered as still uncharted territory (Ubaldi, 2013). The decision for selecting CSM was supported by the facts that open data is a recent phenomenon in an early stage of development (Janssen, Charalabidis & Zuiderwijk, 2012) and that e-skilling in the developing countries is very much contextually dependent (Mitrovic et al., 2012). More precisely, this research deployed a qualitative, exploratory CSM (e.g. Lotzkar & Bottorff, 2001; Campbell & Ahrens, 1998), involving cases from two developing countries: South Africa and Namibia.

These two countries are similar in a socio-economic and political way - yet different in, for example, size, and population or economic development. Also, the ranking of these two sub-Saharan countries by the Open Data Barometer for 2014 is different. South Africa is ranked as 41 out of 86 surveyed countries, improving its status by 11 places, and is categorised as “Emerging & advancing” country. However, despite the potential resources and capacities of government, the private sector and civil society, the country has not yet established a national project, nor does it include commitments to open data in its Open Government Partnership National Action Plan. However, the participant in this research the Western Cape Provincial Government is about to deliver an open data strategy. The City of Cape Town municipal government has already adopted an open data policy in September 2014 (Open Data Barometer, 2015). On the other hand, Namibia holds 77<sup>th</sup> position, slipping by 10 positions in last year, and is categorised as “Capacity constrained” country, having limited availability of relevant training and technical capacity for working with open data, which presents a challenge for both provision and use of open data. Nevertheless, it is believed that inclusion of these two countries gives this study plausible chance to be relevant to other countries in Southern Africa and, possibly, in other parts of the developing world.

This study used the Ensemble View of the IT Artefacts (e.g. Orlikowski & Iacono 2001; Päivärinta & Sæbø, 2008) combined with a Genre System of Organisational Communication (e.g. Yates & Orlikowski 1992; Orlikowski & Yates 1994; Bazerman 1994; Yoshioka et al. 2001; Yates & Orlikowski 2002) as its theoretical lenses. In other words, the Ensemble View of the IT Artefacts helped in situating this research by determining: (i) context (developing countries), (ii) organisational social structure (government and citizens), (iii) task (e-skills related capacity building) and (iv) technology (ICT in function of provision and usage of OGD). The Genre System of Organisational Communication, defined as a typified and recurrent communicative action proposing ‘5W1H’, was used in the following way: (i) the ‘why’ element relates to expectations of an effective providing and beneficial use of OGD, (ii) ‘what’ element in this study refers to the OGD related capacity building through e-skilling, (iii) ‘who or whom’ relates to the OGD related stakeholders, primarily to government and citizens, (iv) ‘where’ refers to the spatial location of this study: South Africa and Namibia, (v) ‘when’ refers to the temporal issues, which in the case of this study, has twofold character: (a) a limitation of this research to three months as an initial phase (b) that could be followed by pilot projects in these or possible other countries (as recommended by this study), and (vi) ‘how’ in this study relates to the identification of a set of e-skills needed for an effective provision and beneficial use OGD, coupled with the policy-making recommendations.

Following the literature review, the empirical research data was collected by interviewing government officials (11 in South Africa and 8 in Namibia), interviewing citizens (40 in South Africa and 40 in Namibia). The citizen sample ranged from small business owners and students to social workers, engineers, ICT professionals and legal advisors. The government officials sample included ICT professionals, middle-level managers and the departmental executives. A focus group of 12 ICT professionals as possible OGD intermediaries was also included in this study. Finally, five e-skills specialists were interviewed in order to obtain their input in regard to mapping e-skills to the identified OGD considerations.

The “case” or “unit of analysis” (Miles & Huberman, 1994) in this study was the interviewee’s or the focus group member’s answer perceived to contain information relevant to e-skills needed for either effective provision or beneficial use of OGD. The data were analysed using the Grounded Theory Methodology (GTM) method of identification and constant comparison of the emerging patterns as well as the ‘memoing’ technique for recording and comparing findings.

Finally, it is important to state that this study was done on the assumptions that the ICT infrastructure is in place and that governments are willing to: (i) publically provide open data according to the principles mentioned in the next section, (ii) promote and support usage of OGD by citizens, and (iii) promote and support OGD-related capacity development within the government departments and agencies as well as among its citizenry. Hence, this study does not include either ‘core’ technological component or social and political issues that might be related to the topic of this study.

#### **4 Open Government Data Definition and Characteristics**

The open data movement is a relatively new but ostensibly significant and potentially very useful as OD as a public resource can be used to support citizen participation, to improve the delivery of public services or to support innovation and enterprise (Davies, 2014). The idea behind this concept is to make public (local, regional and national, including some international) data available in a form that allows for direct manipulation using contemporary ICT - notable Internet and the software tools for data management and manipulation. However, the reviewed literature shows that there is no a single, commonly accepted definition of open data or open government data. This prompted some authors to advocate for a generally accepted definition since a clear and agreed upon definition for what “open data” means will help to “realise the full benefits of openness, and avoid the risks of creating incompatibility between projects and splintering the community” (Open Knowledge Foundation, 2014). However, there are also different views. It is believed by some authors that, although open data represent a worldwide movement, “some national governments will continue to differ with respect to their definition and implementation of these ideas” (WEF, 2011). Hence, a *“flexibility is needed in the application of definitions of open data to allow locally relevant and effective open data debates and advocacy to emerge”* (Davies, 2014).

The reviewed literature shows that there are short and long definitions of OD and OGD. For example, UNDESA (2013) gives two-element definition stating that OGD can be defined as a material which anyone can use for any purpose, without restrictions adding that government data is any data produced or commissioned by public sector bodies. Geiger & van Lucke (2011) define OGD as *“all stored data of the public sector which could be made accessible by government in the public interest without any restrictions on usage and distribution”* and Janssen, Charalabidis & Zuiderwijk (2012) define open data as *“non-privacy-restricted and non-confidential data which is produced with public money and is made available without any restrictions on its usage or distribution”*.

Open data are seen as the lowest level of abstraction from which information and then knowledge are derived (Ubaldi, 2013; Venkatraman, 1998). A number of authors define open data as having four characteristics: (i) accessibility (OD can be used by large number of

people), (ii) machine readability (OD can be used by computers), (iii) costing (low cost or charge free) and (iv) licence free (rights to be reused, re-analysed and redistributed (e.g. Open Knowledge Foundation, 2014; Ballivan & Weil, 2014; McKinsey Global Institute, 2013; Alfred & Alfred, 2013). There is also a ‘five stars’ Berners-Lee’s (2010) open data definition. However, for this research, a comprehensive definition of OD or OGD that will allow for analysing it in the e-skills context was needed. Such a definition was found at the Working Group on Open Government Data (Open Knowledge Foundation) website, which defines OGD in accordance with eight principles stating that OGD should be: (i) *complete*, (ii) *primary*, (iii) *timely*, (iv) *accessible*, (v) *machine processable*, (vi) *non-discriminatory*, (vii) *non-proprietary* and (viii) *license-free* (Work Group on OD, 2007).

A majority of the reviewed literature reports on the potentials of OD and OGD (Open Data Barometer, 2015; McKinsey Global Institute, 2013; Shadbolt & O’Hara, 2013; Geiger & von Lucke, 2012) picturing an optimistic view of the benefits of open data (e.g. Jetzek, Avital & Bjorn-Andersen, 2014; G8, 2013; Bertot, McDermott & Smith, 2012; Janssen, 2011; McDermott, 2010; Involve, 2009). There are, however, a number of reports that include barriers and possible undesirable side of open data (e.g. Zuiderwijk & Janssen, 2014; Cowan, Alencar & McGarry, 2014).

In order to establish OGD characteristics related to the effective provision and beneficial usage, this study considered a number of relevant concepts ranging from strategies, policies, steps in supplying and managing open data, to barriers and issues that can hinder either provision or usage of OGD or both. Such concepts, which also represent the OGD provision and usage considerations, are given in Table 1.

Table 1: Open Government Data Areas of Consideration (*Source: Author*)

OGD Area of Consideration	Characteristic or Activities	Reference
<b>Open Government Data Provision</b>		
<i>Strategy and Policy-making</i>	<i>Strategy:</i> Strategic ignition, data analysis steps, concept formation, implementation, routinisation, and citizen-centricity. <i>Policy-making:</i> selection criteria for ODG release, policy reasons for data, definitional issues, data processing and dissemination, data stewardship, use of metadata, data accessibility, strengthening data management and release practises, roles and responsibilities, privacy and confidentiality, coordination, accountability, resources.	Hunnius & Krieger, 2014; Cowan, Alencar & McGarry, 2014; Kucera & Chlapek, 2014; USA Open Data Policy, 2013; Cooper, 2012
<i>Data management</i>	Dataset selection, organisation and publication, pricing, keeping the data current, appropriate stakeholder analysis to improve the understanding of needs and capabilities of a wide variety of users.	Dutch Government, 2014; Cowan, Alencar & McGarry, 2014; Goldstein & Dyson, 2013; Yu & Robinson, 2012; Klischewski, 2012; European Commission, 2011; Dawes and Helbig, 2010

<i>Quality aspect of data</i>	Availability, accessibility, understandability, error-free, security assured, accuracy, consistency, permanency, ability to promote analysis, appropriateness and safety of data formats, usefulness for intended users, adequate technical and organizational support.	Bogdanović-Dinić, Veljković & Stoimenov, 2014; Veljković, Bogdanović-Dinić & Stoimenov, 2014; Ren & Glissmann, 2012; Puron-Cid et al., 2012; Klischewski, 2012; Lee & Kwak, 2011; Tauberer, 2012; European Commission, 2011; Socrata, 2011; Berners-Lee, 2010; Dawes, 2010; Dawes & Helbig, 2010
<i>Standards</i>	Standard definition, data quality standards, unambiguous licencing system, , consensus on technical standards.	Cowan, Alencar & McGarry, 2014; Misuraca & Viscusi, 2014; European Commission, 2011; Noveck, , 2009
<i>Ecosystem</i>	Building OGD ecosystem that includes: data, policies, developers, resources and stakeholders. This can also include a particular ecosystem such as Ecosystem of data producers, Ecosystem of infomediaries (intermediaries) or Ecosystem of users.	Jaakkola et al., 2014; Delloite Analytics, 2014; Goldstein & Dyson, 2013; Ubaldi, 2013
<i>Data Maturity</i>	Characterized levels of by development: any format, machine-readable, structured, non-proprietary, semantic annotation; inexistent, emerging, existent, and advanced; aggregation, integration, integration with nongovernment formal data, and integration with social data; compliance with.	Sayogo, Pardo, & Cook, 2014; Veljković, Bogdanović-Dinić & Stoimenov, 2014; Solar, Concha & Meijueiro, 2012; Lee & Kwak, 2012; Kalampokis, , Tambouris & Tarabanis, 2011
<i>Benchmarking and evaluation</i>	Characterized by indicators: completeness, primary nature, timeliness, accessibility, machine processability, discriminatory, proprietary licence status, authenticity, data transparency and reusability, number of open datasets, number of application developed on open data, uptake by citizens standards; existence of pervasive applications and effects of open data that can justify continued investment.	Veljković, Bogdanović-Dinić & Stoimenov, 2014; Höchtl et al., 2014; Davies & Frank, 2013; Ren & Glissmann, 2012; Tauberer, 2012; Lee & Kwak, 2011; European Commission, 2011
<i>Issues and Challenges</i>	Data Divide, data quality mismatch, deciding what OGD to make open and maintain with limited resources, supporting data redundancy, governance of restricted data, Integration of obsolete systems still in use and new web-based applications needed for opening up government data, linking and combining a large number of datasets from a large number of different sources and limitations in the data formats, providing right tools for managing and exploring OGD.	Davies, 2014; Castro, 2014; Cowan, Alencar & McGarry, 2014; Misuraca & Viscusi, 2014; Lakomaa & Kallberg, 2013; Puron-Cid et al., 2012; Raman, 2012; Klischewski, 2012; Gurstein, 2011; WEF, 2011; Davies (2010); Dawes and Helbig, 2010
<i>Barriers and negative sides</i>	Institutional, task complexity, technical readiness, risk of violating legislation by opening data, difficulties with data ownership , unintentionally violence of privacy, biased publishing , negative consequences for governments, decisions made on poor information/data quality, timeliness related to embargo period prohibits the publication of recent data, opening data as an afterthought, little attention for public value and solving societal problems, unclear responsibility and accountability, preventing users from finding	Zuiderwijk & Janssen, 2014; Misuraca & Viscusi, 2014; Cowan, Alencar & McGarry, 2014; Remiti, 2012; Janssen, Charalabidis & Zuiderwijk, 2012;

	datasets on the websites of public agencies, wasting resources to publish invaluable data, technical skills and extensive knowledge of the context of data that are beyond the reach of a large part of the population, no priority given to data publication, citizens are not benefiting from OGD.	
<i>Legal issues</i>	Legislation, licencing, ensuring privacy of individuals and property	Cowan, Alencar & McGarry, 2014; Open Knowledge Foundation, 2014; Misuraca & Viscusi, 2014; Gundersen, 2013; Kulk & van Loenen, 2012; Janssen, Charalabidis & Zuiderwijk, 2012; Geiger & Lucke, 2011; Berners-Lee, 2010
<b>Open Government Data Usage</b>		
<i>Search and Access</i>	Access to ICT, search for data, access to data, download data	Alexopoulos, Loukis & Charalabidis, 2014; Gurstein, 2011
<i>Interpretation</i>	(i) Interpreting particular facts, (ii) creating information out of data	Alexopoulos, Loukis & Charalabidis, 2014; Gurstein, 2011; Davies, 2010
<i>Application</i>	(i) reuse of data by creating data interface, (ii) sharing data with others, (iii) transforming data into services, (iv) using data for decision-making	Alexopoulos, Loukis & Charalabidis, 2014; Ubaldi, 2013; Gurstein, 2011; Davies, 2010;

The reviewed literature also revealed the importance of steps related to both provision and usage of OGD. For example, Hunnius & Krieger (2014) suggest a four-step strategic process model for shaping data: (i) ignition, (ii) concept formulation, (iii) implementation and (iv) routinisation. The Dutch Government (2014) recommends five steps for effective data provision: (i) organising OGD, (ii) selecting datasets, (iii) legal check, (iv) organising the publication process and (v) making data findable and accessible. On the usage side, Gurstein (2011) suggests the steps of: (i) access, (ii) interpretation and (iii) usage of OGD.

The model shown in Table 1 suggest that, for an effective provision of OGD, government officials in charge of open data must be acquainted with relevant strategy and management skills, steps necessary for successful OGD provision, know how to set and/or use OGD standards and ecosystem, perform evaluation and benchmarking, be versed in the OGD quality and maturity, be familiar with relevant legislation and be able to address issues, challenges, barriers and negative side when they emerge. This finding confirms a statement that *“a sense that the open data task is complete once data is published online misses out on the greater potential of open data to act as the start of conversations and collaboration between those inside, and those operating outside of government”* (Davies, 2012)

On the usage side of OGD, users (citizens) must be able to access, manipulate and transform these data into information and knowledge that are needed for the action-oriented decision making for improving the quality of their lives (Ubaldi, 2013) as *“data are the lifeblood of decision-making”* (UN, 2014). Potential users should also be aware of issues, challenges, barriers and negative side of open data that might hinder the beneficial use of OGD.

## 5 E-Skills Definition and Classification used in this Study

E-Skills, *“essential survival skills for the 21<sup>st</sup> century”* (Chinien & Boutin, 2011: p. 8), as many other concepts, still has no commonly agreed upon definition (see for example definitions.

Based on WSIS (2003) and EESF (2004), South African National e-Skills Plan of Action 2010 has adopted the following definition of e-skills, which was also adopted by this study: “...*the ability to develop and use ICT within the context of a knowledge environment and associated competencies that enable the individual to participate in a world in which ICT is a requirement for advancement in business, government and civil society*” (NeSPA, 2010).

The reviewed literature offered various classifications of e-skills that could be useful for this study. It seems that the most relevant was *Data Literacy*, which denotes competence in finding, manipulating, managing, and interpreting data, including not just numbers but also text and images (Harris, 2013). Digital Literacy is regarded as an important civic skill that forms the foundation of an innovative knowledge economy and increasingly data-driven society (McAuley et al., 2010). This literacy also includes reading graphs and charts appropriately, drawing correct conclusions from data, and recognise when data are being used in misleading or inappropriate ways (Carlson et al., 2011).

A number of potentially useful e-skills were found in the South African National e-Skills Plans of Action (2010 and 2013): *ICT practitioner skills, ICT user skills, e-Business skills and e-Literacy, e-Participation & e-Democracy Skills, e-Government & e-Governance Skills and e-Community Skills* (Mitrovic et al., 2012; NeSPA, 2010), *e-Astuteness and e-Social Astuteness skills* (NeSPA, 2013; Mitrovic et al., 2013). The reviewed literature also revealed a number of other e-skills such as *e-Awareness, Technological Literacy, Information Literacy or Media Literacy*.

In order to assess the applicability of the above-listed skills in relation to the OGD provision and usage considerations, five e-skills specialists were interviewed. An advice was to consider grouping all e-skills literacies under a common umbrella since “*they essentially describe the same concept*” - as it was pointed out by one interviewed e-skills expert. Another e-skills expert pointed out that there is no commonly agreed upon the classification of these literacies, hence “*...it would be important to simplify classification for the interviewing purposes*”. Consequently, e-Literacy, Technological Literacy, Information Literacy and Media Literacy were included in a common concept here named as *e-Literacy Requisites*, which is defined by this study as a set of skills related to: (i) using hardware, software, networks and various ICT devices, (ii) identifying, accessing, organising, evaluating, interpreting, analysing, synthesising and applying information from all kinds of sources, (iii) understanding and dealing with content of variety of digital and non-digital formats. E-Literacy Requisites are considered by the interviewed specialists as a precondition for either effective provision or beneficial use of OGD.

The interviewed e-skills specialists also pointed out that e-Participation & e-Democracy Skills, e-Government & e-Governance Skills, and e-Community Skills are not clearly defined and can be rather considered as a dimension of e-User Skills. The interviewed e-skills specialists agreed that e-Astuteness can be useful skills, particularly on the OGD usage side, but should be also regarded as an aspect of other relevant e-skills.

Considering the input of the interviewed e-skills expert, a list of e-skills was compiled (Table 2), which was consequently used to ask the interviewed government officials and citizens to map them against the provision and usage considerations, respectively.

Table 2: Refined Classification of e-Skills (Source: Author)

e-Skill	Description	References
<i>e-Awareness</i>	Relates to user's awareness of ICT and appreciation of the relevance of these technologies in the information-based society. It is the capability to understand and adopt the lifelong-learning paradigm and the use of ICT as a medium to facilitate the individual or collective development of knowledge, skills and new capabilities in both social and professional life.	Bianchi, et al., 2006; Romani, 2009a
<i>e-Literacy Requisites</i>	Skills related to: (i) using hardware, software, networks and various ICT devices, (ii) identifying, accessing, organising, evaluating, interpreting, analysing, synthesising and applying information from all kinds of sources, (iii) understanding and dealing with the content of a variety of digital and non-digital formats.	Bawden, 2008; Livingstone et al., 2008; Romani, 2009a; Van Deursen & Van Dijk 2009; NeSPA, 2010; Eshet-Alkalai & Chajut, 2010; Ala-Mutka, 2011; Chinien & Boutin, 2011
<i>Data Literacy</i>	Skill related to finding, manipulating, managing, and interpreting data (including reading graphs and charts appropriately), draw correct conclusions from data in order to make informed decisions.	Sapp Nelson et al., 2014; Twidale, Blake & Gant, 2013; Mandinach & Gummer, 2013; Carlson et al., 2011; Harris, 2013; McAuley et al., 2010
<i>e-User Skills</i>	Skills focusing on enhancing the efficiency of public and private sector knowledge workers.	WSIS, 2003; EESF, 2004; NeSPA, 2010; Mitrovic et, al., 2012
<i>e-Business Skills</i>	Skills aimed at increasing organizational efficiency and productivity.	WSIS, 2003; EESF, 2004; NeSPA, 2010; Mitrovic et, al., 2012
<i>e-Practitioners Skills</i>	Skills aimed at enhancing the capacity of public and private sectors to manage, support and service ICT. The detailed description of these, the highest level skills in this classification) skills can be, for example, found in the Skills Framework for Information Age (SFIA).	WSIS, 2003; EESF, 2004; NeSPA, 2010; Mitrovic et, al., 2012; SFIA, 2014
<i>e-Leadership skills</i>	Skills needed to understand trends and impacts in the virtual environment; develop appropriate organisational responses in order to maximise opportunities, efficacy and effectiveness; establish collaborative platforms within and across stakeholder boundaries; articulate need and opportunities to increase understanding and commitment.	NCCFCG, 2013; Van Welsum & Lanvin, 2012; Avolio et al.. 2001)
<i>E-Astuteness</i>	The capacity to continuously appropriate ICT and e-skills into personal work, education, business, social and family contexts in order to take personal advantage of the use of ICT and information.	NeSPA, 2013; Mitrovic et, al., 2013; NCCFCG, 2013;

The diagram (Figure2) to position OGD provision considerations and citizen usage considerations are adapted from Venkatraman's Process-information continuum model (Venkatraman, 1998).

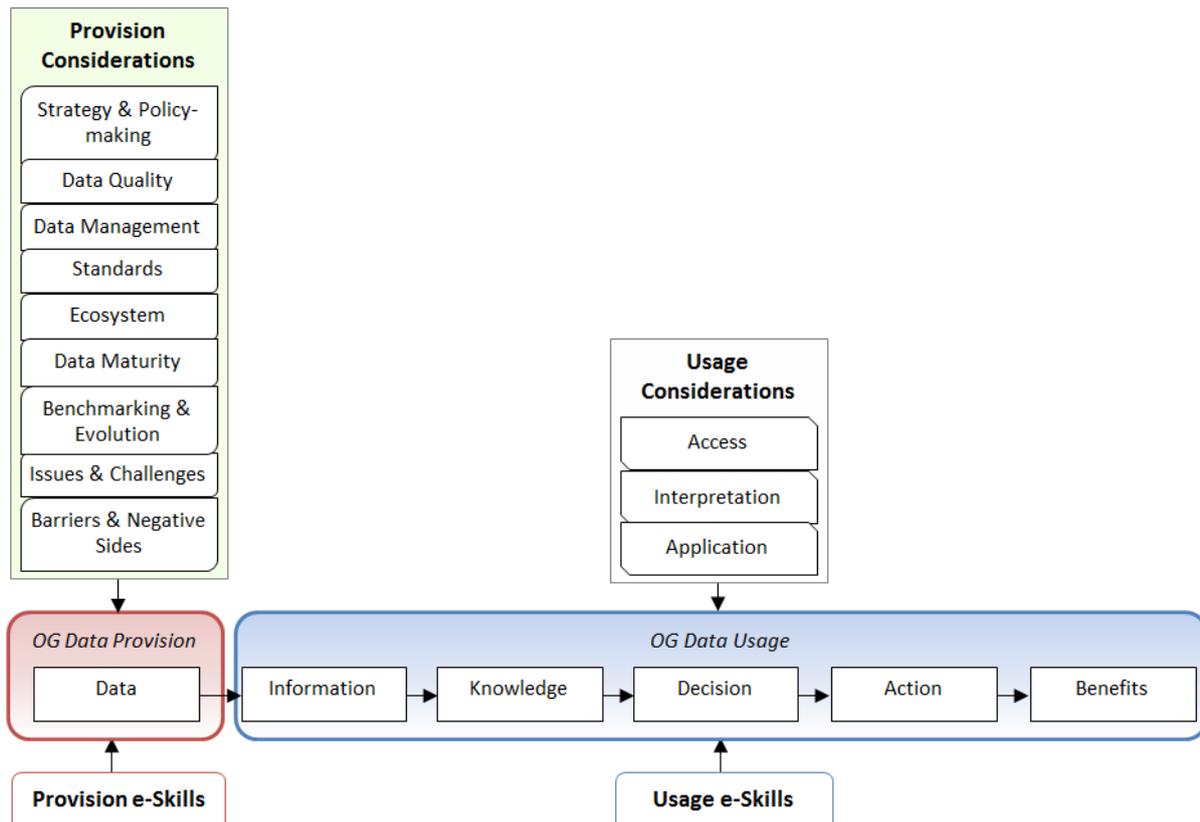


Figure 2: Position of e-Skills in the OGD Provision-Usage Consideration Model (Source: Author based in Venkatraman, 1998)

Venkatraman's model was used to position data in the context of information and knowledge potentially derived from open data for the benefit of decision making. This can then lead to an informed action aimed at achieving various (e.g. social, economic or political) benefits. This differentiation between data, information and knowledge was also necessary since many people use these terms interchangeably, which can be misleading as even big data is not knowledge and wisdom (Ohlhausen, 2014).

The next steps in this study included empirical validation of the above model. In that regard, we first interviewed South African and Namibian government officials who were also asked about the applicability of the conceptual model in Figure 2 as well as to give us their views of what e-skills are needed for an effective provision of OGD. We then have interviewed South African and Namibian citizens to determine their view regarding e-skills for an effective use of OGD. This was followed by the focus group interviews in South Africa, which had a purpose of verifying our findings to that point.

## 6 E-Skills for Effective Provision and Usage of Open Government Data

Awareness as the primary consideration for sense-making of e-skills in OGD appeared early in this study as an overarching theme. This theme is, in fact, characterised by a vast majority of interviewed citizens in South Africa and Namibia regarding either conceptual ignorance or usefulness of OGD or both. For example, a number of interviewed citizens confuse open

data and the mobile phone data. *“I understand that data is what I get to use for all the social networks on my phone...”* responded an interviewed student in South Africa. Struggling to understand a concept of OGD and e-skills, a number of Namibian and South African interviewees quickly became disinterested and demotivated for further discussion on the topic. Hence, many interviewed citizens could not answer questions about e-skills needed for beneficial use of OGD. However, upon a deeper explanation of OGD, a more knowledgeable interviewed citizens remarked that *“...somebody should make me aware of my skills level as well as where I can upgrade my skills so that I can take full advantage of open data”*. An interviewed software developer also agreed that awareness aids usage as one of the key pre-requisite for beneficial usage of OGD since *“...the issue about OD for me is how people will know what to use it for... as it can encourage learning new skills...”* while the interviewed Namibian citizen believed that the whole continent of Africa needs *“better understanding of open government data and more of e-education”*.

Even some interviewed government officials were not well informed regarding potential benefits of OGD. However, the reviewed literature reveals that OGD related awareness problem is also found to exist in developed countries (e.g. Jaakkola et al., 2014). This strongly emphasizes the need for spreading OGD awareness, particularly among the citizenry. This can be done, for example, through promoting agencies, relevant mailing lists or directly contacting potential users (Open Knowledge Foundation, 2012) or OGD advocacy (Davies, 2014).

From the perspective of this study, e-Awareness as a sense-making skill is needed as it relates to users’ awareness of the relevance of OGD and their capability to understand a need for adopting particular skills that can facilitate the beneficial use of OGD. Hence, e-Awareness requires activities analogous to marketing (Manyika et al., 2013). As such e-Awareness can also be used for making users aware of a need to adopt a lifelong-learning paradigm as the nature and structure of open data will increasingly change. This is also applicable to the government officials as OGD providers in order to increase the openness of the government and also stimulate citizens to use the provided data (APC, 2012).

In order to heighten the awareness of OGD-related e-skills, some of the interviewed well-educated citizens, once they got to understand the potential value of OGD, pointed out that there should be a move toward ‘open data mindedness’. This denotes a process of developing the ability of citizens to be self-aware, to know, ‘feel’ and assess open data as well as to recognise a need to acquire skills and capability needed for beneficial use of OGD. The term ‘mindedness’ is a recognised psychological term (e.g. Appelbaum, 1973) but is not recognised as an e-skill. However, the description of OGD mindedness by some interviewees fits into the category of e-skills that relates to e-Astuteness. Hence, e-Astuteness should be considered as useful for beneficial use of OGD. Other e-skills identified by this study that are relevant to either provision or usage of OGD or both are given in the following table (Table 3).

Table 3: Mapping e-Skills to OGD Considerations (Source: Author)

OGD Area of Consideration	Needed e-Skills
<b>Open Government Data Provision</b>	
<i>Strategy and</i>	<i>e-Awareness</i>
<i>Policy-making</i>	<i>e-Leadership skills</i>

	<i>e-User Skills</i>
Data management	<i>e-Practitioners Skills</i> <i>Data Literacy</i> <i>e-Business Skills</i>
Quality aspect of data	<i>e-Practitioners Skills</i> <i>Data Literacy</i>
Standards	<i>e-Leadership skills</i> <i>Data Literacy</i>
Ecosystem	<i>e-Leadership skills</i> <i>e-Practitioners Skills</i> <i>Data Literacy</i> <i>e-User Skills</i>
Data Maturity	<i>e-Practitioners Skills</i> <i>Data Literacy</i>
Benchmarking and evaluation	<i>Data Literacy</i> <i>e-User Skills</i>
Issues and Challenges	<i>e-Leadership skills</i> <i>e-Practitioners Skills</i> <i>Data Literacy</i>
Barriers and negative sides	<i>e-Leadership skills</i> <i>e-Practitioners Skills</i> <i>Data Literacy</i>
Legal issues	<i>e-Leadership skills</i>
<b>Open Government Data Usage</b>	
Search and Access	<i>e-Awareness</i> <i>e-Literacy Requisites</i>
Interpretation	<i>e-Literacy Requisites</i> <i>Data Literacy</i>
Application	<i>e-User Skills</i> <i>e-Astuteness</i>

The mapping of e-skills to the OGD provision and usage considerations is in more details elaborated in the next section.

### 6.1 E-Skills for Effective Provision of Open Government Data

The interviews with the higher level government technical managers and particularly with the executive level government officials confirmed the importance of **e-Leadership**, which is also very much linked to the **awareness** and **advocacy** championing (e-Awareness) as well as the internal championing and the strategic internal guidance: “...we cannot do much if our executives don’t understand value of technology, data and information... and are not able to give a direction...” (SA government official). This was also the opinion of the interviewed e-skills specialists who believed that spreading awareness inside and outside government, highlighting potential benefits, must also be accompanied with advocating the adoption of lifelong e-skilling (skilling, re-skilling or up-skilling). Having **e-Users skills** will help these levels government officials to use ICT effectively in their everyday work.

**Managing data** effectively at the OGD providing side inevitably requires **e-Practitioners skills**. The interviewed e-skills specialists, as well as the government based ICT professionals, firmly believe that very high level of ICT skills are needed for this task: “... we need wide technical knowledge and skills if we are to use servers and the database tools effectively...” (The interviewed government official). “Without having high technical skills we cannot use

*technology properly but without knowing the structure of data and what is required, we cannot publish quality data*", added another interviewee, pointing to the need for e-Practitioners skills but also **Data Literacy** skills. These skills are equally important for managing OGD and publishing data of a high quality. In addition, it was pointed out by some interviewed middle-level government technical managers that *"...publishing data can be very costly if it is not done efficiently...after a few months or a year, we will stop publishing..."*. This suggested that **e-Business skills**, which are described as skills aimed at increasing organizational efficiency and productivity, can be useful in achieving the OGD provision efficiency.

There are still no generally agreed upon Open Data **standards** at either international or national levels. Hence, many authors agree that there is a clear need for such standards (e.g. Martin et al, 2013) as open data policies can be regarded as comprehensive only when certain data standards are in place (Halonen, 2012). According to this study, two types of e-skills will be helpful in that regard: **e-Leadership** skills for giving directions to the standard developing process, and **Data Literacy** for *"...really understanding what data or open data really are and what standards are needed..."* firmly believed an interviewed statistician, data specialist.

In determining e-skills needed to build an OGD-related **ecosystem** was not a straightforward task due to the complexity of such a system, which includes data, policies, developers, capital, and products (Goldstein & Dyson, 2013: 12) as well as multi-disciplinary knowledge and skills (e.g. organisational, technical or political) needed for addressing that complexity. However, the interviewed government officials, e-skills specialists and ICT professionals agreed that **e-Leadership** can play a crucial role in championing the scope and direction of an OGD ecosystem as *"...somebody has to lead the initiative"* (Interviewed middle-level government official). An interviewed ICT professional also expressed the importance of communication between different stakeholders should be of *"very high quality"* as it will help *"different components (e.g. matching demand for data to used technology and data formats) of ecosystem to interact successfully to secure long life of the system"* This statement suggests that matching technology to data requires, not only **e-Practitioners** skills and expertise in **Data literacy** but also an astute approach (**e-Astuteness**) in bringing the right stakeholders together in this process which inter alia includes data managers, data controllers, data creators and data specialists (RIDLS, 2013). This 'technical' set of skills is needed in every country, region or local community based upon their own unique technological circumstances (O'Neil, 2013), hence requiring a contextual solution for the ecosystem. Interoperability and effective communication among stakeholders (UNDESA, 2013; Nugroho, 2013; Open Knowledge Foundation, 2012) are also very important for building and sustaining an OGD ecosystem (Zoomers, 2005) that includes the involvement of technology savvy OGD leaders as well as citizens engagement on participatory related **e-User Skills**.

According to the interviewed government officials and e-skills specialists, understanding and managing **Data Maturity**, which is achieved through continuous supply of comprehensive data (Susha et al., 2014), data integration (Kalampokis et al., 2011), data transparency (Lee & Kwak, 2012) and publishing through the open data portals (Sayogo et al., 2014), requires at least **Data Literacy** and **e-Practitioners Skills**. **Data Literacy** is, for example, needed for

understanding data structure and formats while **e-Practitioners Skills** are indispensable for managing data servers, the databases containing OGD datasets as well as the belonging applications (e.g. the Internet-based data manipulation tools). *“This cannot be done by anybody but only by people with a very high understanding of data and how it is supplied to the public...”* remarked one of the interviewed government ICT professionals.

Governments will either rely on their own evaluators or use outsiders to benchmark and evaluate their OGD initiatives. **Benchmarking** and **evaluation** of open data includes assessments such as quality aspects of open data such as accessibility, availability, completeness, error-free, or security (Ren & Glissman, 2012); accuracy of implementation of open government principles such as accuracy, consistency, timeliness, machine processability, non-proprietary nature, existence and quality of public input, or interagency coordination (Work Group on OD, 2007; Tauber, 2012); or open data output represented by number of open data sets available, data formats, reuse conditions, pricing, or number of applications developed (European Commission, 2011). The interviewed government officials and e-skills specialists agreed that, first of all, the evaluators must possess **e-Users Skills** in order to access OGD portals and *“use applications like a spreadsheet for tabulating criteria...”* (Interviewed government official). They further agree that it is not possible to assess any data without possessing *“...Data Literacy, at least but even better to engage a data scientist...”* (Interviewed e-skills expert).

In order to establish the right set of e-skills to address the identified issues, challenges, barriers and negative sides related to OGD, an additional analysis was conducted on other important considerations that can influence the success of OGD-related e-skills initiatives. That analysis revealed that these considerations can be classified as follows:

- **Social:** Data Divide; Little attention for public value and solving societal problems; Need for technical skills and extensive knowledge of the context of data that are beyond the reach of a large part of the population; Citizens are not benefiting from OGD. The interviews analysis revealed that **e-Leadership** skills can help in dealing with these social considerations.
- **Economic:** Maintain publishing of OGD with limited resources - related to **e-Business skills**; Wasting resources to publish invaluable data - related to **Data Literacy**.
- **Political & Legal:** Biased OGD publishing; Governance of restricted data; Risk of violating legislation by opening data; Unintentionally violence of privacy; Negative consequences for governments; Timeliness related to embargo period prohibits the publication of recent data; Opening data as an afterthought; No priority is given to data publication; Deciding what OGD to make open - related to **e-Leadership skills**.
- **Organisational:** Institutional setting; Task complexity; Difficulties with data ownership; Unclear responsibility and accountability - related to **e-Business skills**.
- **Technological:** Supporting data redundancy - related to **E-Practitioners skills** and **Data Literacy**; Integration of obsolete systems still in use and new web-based applications needed for opening-up government data; Technical readiness; Preventing users from finding datasets on the websites of public agencies - related to **E-Practitioners skills**.
- **Data-related:** Data quality mismatch - related to **Data Literacy**; Linking and combining a large number of datasets from a large number of different sources and limitations in the data formats; Providing right tools for managing and exploring

OGD; Decisions made on poor information/data quality - related to **E-Practitioners skills and Data Literacy**).

The interviewees reiterated the role of **e-Leadership** skills in terms of OGD **Legal considerations**, identifying clearly the role of high ranking government officials to support and influence national OGD-related laws and regulations. However, it is important to emphasise that this study focused only on e-skills, not other skills and knowledge needed for addressing these complex OGD-related considerations.

## 6.2 E-Skills for Beneficial Usage of Open Government Data

The analysis of the interviews with citizens and e-skills specialists revealed that for **searching** OGD, the potential users must be aware of the existence of these data (**e-Awareness**). The prospective users should also be aware of potential benefits of these data in order to stimulate them to search for OGD. **Accessing** OGD from relevant data portals inevitably requires some familiarity with ICT devices (hardware) and relevant applications (the Internet-based software), thus requiring **e-Literacy Requisite** skills. However, **interpreting** OGD also requires **Data Literacy** skills in order to 'translate' these data into useful information. Effectively using the extracted information for decision-making, aimed at the socio-economic or political actions, requires additional e-skills. For example, using UI-based OGD applications requires familiarity with **e-User Skills** and deciding what information to use (and how) for an informed decision-making requires an astute approach (**e-Astuteness**). The same astute approach is needed when the potential OGD users decide about what device would be the best suited for accessing certain data (e.g. simple meteorological data vs. complex maps).

At some point of this study, a query arose whether there would be typical user of OGD in developing countries or typical users in a certain country, in the case, in South Africa and Namibia. This could be potentially helpful in typifying e-skills needed by these users. The support to this search was found in the reviewed literature: *"In my experience, there are no "typical" users. There are users who just want backdoor access to data and have no interest in the user interface (UI). For those users, we can have application programming interfaces (APIs) and pre-extracted bulk downloads. There are those who wish to peruse the data and analyze it in the environment of the site itself. For them, we need an intuitive UI, good search and query features, and data visualization and extraction capabilities (Farivari, 2014).*

The above citation sums up most of the responses from the interviewed citizens in this study, emphasising that there are no 'typical users' either in South Africa or Namibia. It must be stated, though, that the majority of potential OGD users in these two countries have a lower degree of education and are less socio-economically fortunate. The interviewed citizens who are to a certain extent familiar with the concept of open data and already e-literate (having **e-Literacy Requisite skills**) "feel" more 'comfortable' in the 'UI category' than in the 'API category'. This suggests that they will not be able to process OGD on their own and extract the beneficial information. Instead, they will need help from those possessing **Data Literacy** and **e-Practitioners** having the database related expertise.

A vast majority of the interviewed citizens in South Africa and Namibia are not likely to acquire a high level of e-skills such as Data Literacy or e-Practitioners skills, which can be

also labelled as 'interpretations and sense-making skills' (Johnson, 2014). This absence of the e-skills related capacity can severely impact on what people are able to do (Sen, 1980); hence, it will inevitably contribute to a widening of the Data Divide chasm. This is already stressed by a number of authors such as Frydman (2010) who was certain that *"...the empowered will have access to [this data] and will act upon it, while many of the people...won't"*. Even the interviewed students from a number of Cape Town universities were not certain that they already possess the required skills needed to access and beneficially use OGD. In fact, insufficient awareness of either concept of open data or OGD-related e-skills (or both) was a predominant response from the academic communities in South Africa and Namibia.

An almost identical response was from the interviewed academics, except for a few of them who possess e-Practitioners Skills or Data Literacy (e.g. computer science or information systems specialists). However, after the concepts of OGD and e-skills were explained to them, they agreed that e-Requisite Literacy is a precondition for use of OGD through the user interface ('UI category') and a prerequisite to acquiring Data Literacy skills that will allow them to independently use OGD.

A number of interviewees, particularly students and younger participants, stated that they will prefer to access OGD through mobile applications, which corresponds with Farivari's (2014) suggestion that *"...we must cater to them [mobile users] as well"*. Many developing countries, including South Africa and Namibia, have a very high penetration rate of mobile phones. Furthermore, 'smartphones' are becoming increasingly more affordable but also more convenient for accessing OGD. For example, only in 2014, one of the biggest retail chains in South Africa has sold about 600,000 entry-level smartphones. This finding suggested that 'mobile e-skills' will be also important for access and beneficial use of OGD.

As there is still debate within the South African e-skills community whether mobile e-skills are distinctively separate skills or only a kind of e-User Skills, at this point, it would be safer to classify them as e-User Skills that are specifically designed for an effective use of mobile devices such as smartphones or tablet computers. In order to acquire e-Users Skills related to mobile ICT devices, users first must be e-literate (e- Literacy Requisites), which means that 'up-skilling' of the majority of citizens in South Africa and Namibia must take place if they are to be able to effectively use their mobile devices. However, regardless of ICT devices used, the beneficial use of OGD by citizens will require Data Literacy.

## **7 Open Government Data e-Skills Related Gap and Role of Intermediaries**

The vast majority of interviewed citizens in South Africa and Namibia stated that they will not be able to use OGD independently since they do not possess skills to do so: *"...I know how to use a computer but don't know how to use it [OGD]...I will need help..."* (interviewed citizen in South Africa) echoed many other citizens' responses in both South Africa and Namibia. Even well-educated interviewed citizens stated that OGD related skills will prevent them to use OGD: *"Yes, I would need OGD for possible innovation... but I see that I don't have these skill for manipulating and interpreting data...I will not have time to learn them...it would be great if somebody can help..."* (Interviewed entrepreneur with degree in economics).

The finding that vast majority of citizens in South Africa and Namibia (most likely in many other developing countries) will not be able to beneficially use OGD on their own, implies that they fall within the 'Data Divide' chasm (Figure 3). Hence, from the e-skills perspective, to bridge this divide and make OGD available and useful to the majority of citizens, a third party involvement is needed. That third party by this study is identified as the OGD intermediaries as *"...most open data initiatives are designed in a way that end-users either need technical skills or need to rely on an intermediary, in order to extract information from datasets"* (Davies, 2014). However, it should be noted that OGD intermediaries are not necessarily individuals but, in many cases, the multidisciplinary teams within an organisation such as NPO or a research institute (Bakici, Almirall & Wareham, 2013; Puron-Cid et al., 2012).

According to Network Science applied in the social field the role of intermediaries is best suited since they are able to connect "two worlds" (e.g. Diani, 2013). The OGD related intermediaries can, for example, connect the open data providers and users by helping in articulating citizens' needs for particular open data (Davies, 2014; Nugroho, 2013) or for disseminating OGD related information to the greater public (Halonen, 2012). However, in order to perform their task successfully, these intermediaries must be appropriately skilled, i.e. must possess either Data Literacy skills or database and programming related e-Practitioners skills (e.g. Telikicherla & Choppella, 2014) or both. E-skilling of OGD intermediaries can be done through self-learning, short courses or more formal education. Although the first two methods were recognised as acceptable, the latter is selected by many interviewees as a preferred way of skilling OGD intermediaries as the formal education and training *"give broader and more valuable skills"* (interviewed e-skills specialist).

An example of e-skilling potential OGD intermediaries comes from the University of Western Cape (South Africa), which offers the post-graduate diploma in ICT application development, to non-IT graduates (e.g. sociology, nursing, law or political studies graduates). These students live in various communities with different levels of socio-economic development and are well informed about their communities burning issues and problems. At the end of their postgraduate studies, by combining their undergraduate training in their field of specialisations with an understanding of the community issues and newly acquired e-Practitioners programming skills, they are well positioned to utilise OGD for useful ICT applications aimed at addressing these community issues.

Yet another example is regular 'code jam' sessions organised by the Western Cape e-Skills CoLab (Ikamva National e-Skills Institute - INeSI, South Africa) where students from all disciplines learn how to make applications for mobile phones. These students also come from various communities and are well positioned to identify community needs and translate it into useful ICT applications. One of relevant example is the use of open transport real-time data from one of the Westerns Cape universities to create an application, which helps users to considerably reduce a waiting time at the bus stations. Unfortunately, similar examples are not found in the Namibian context.

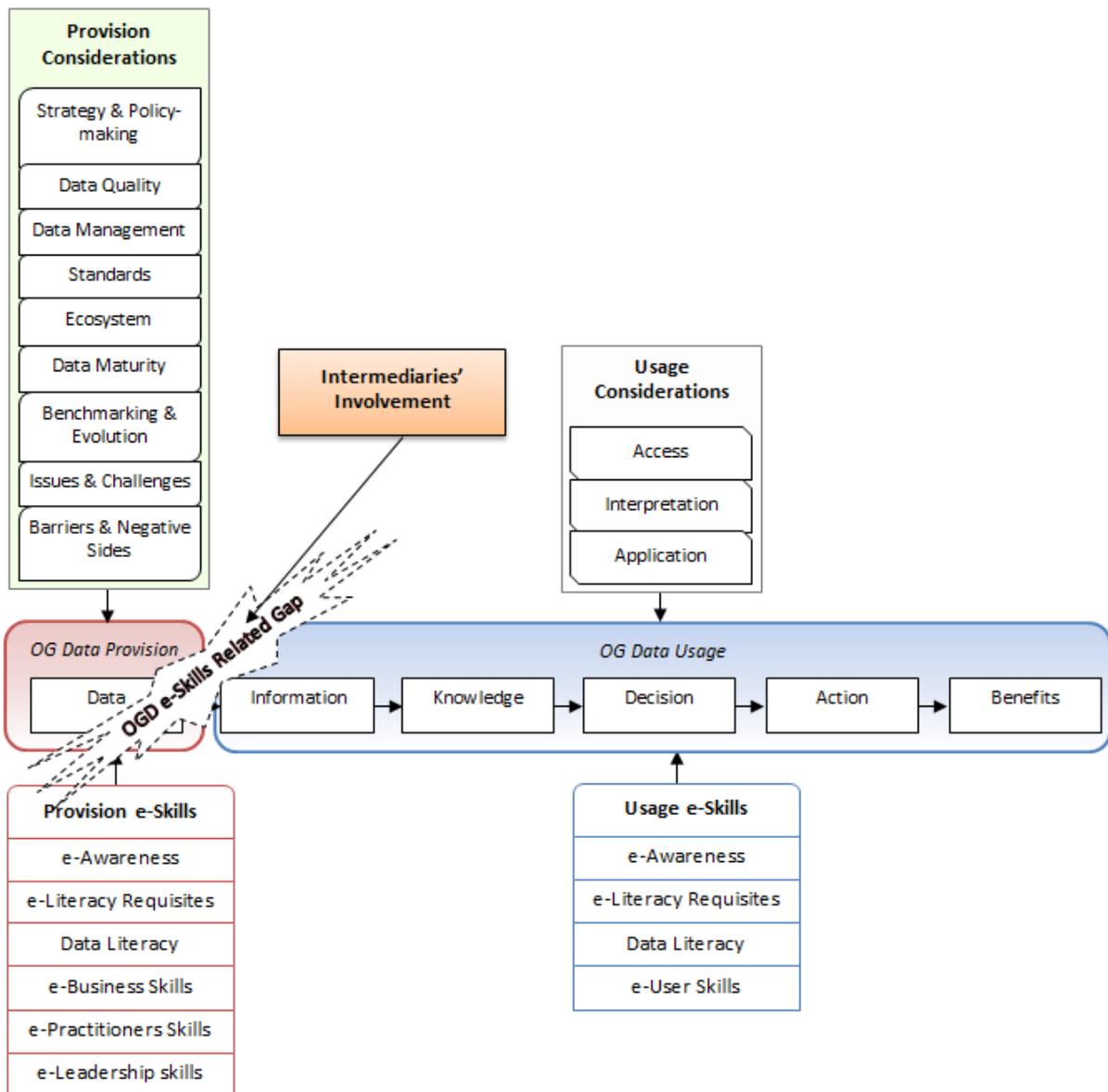


Figure 3: Place of Intermediaries in Bridging OGD e-Skills Related Gap (Source: Author)

The role of intermediaries is not only to use their skills for producing useful applications for citizens but also to help citizens to acquire OGD related e-skills. In fact, this study disclosed that in countries such as South Africa and Namibia, the role of various training and educational organisation in e-skilling citizens is crucial. Currently, various organisations offer mainly different e-Literacy Requisites courses (e.g. information literacy, technological literacy) but Data Literacy is not readily offered. An exception is the School of Data, an international organisation that offers free online courses “... a nice gentle introduction to working with data” - as stated with an interviewee involved in this initiative. Unfortunately, this kind, of course, is only suited for citizens that already possess e-Literacy Requisite skills and are sufficiently educated (at least completed secondary education) to understand various data concepts.

In order to provide data skills to a very large number of citizens in South Africa and Namibia, an effective approach is needed if OGD is to benefit the majority. Obviously, this task cannot

be accomplished either by the government or other organisations (non-profit, for-profit) in isolation: *"I do think that organisations with the technology skills can play a role and assist us in open data... but not only on their own... and especially as we have a large population where there is a low skills problem"* (interviewed South African financial professional). Hence, a kind of multi-stakeholders collaboration is needed. This partnership can include governments (as OGD providers), civil society organisations, educational and training institutions and also for-profit businesses – an approach similar to that one described in the South African National e-Skills Plan of Action. This complimentary, coordinated method (Tanriverdi & Ruefli, 2004) is likely to yield higher returns (Kuk & Davies, 2011), i.e. produce a large number of data literate citizens than any 'in-silo' approach.

Summarising the role of OGD intermediaries in developing countries such as South Africa and Namibia, intermediaries can, using their skills (including e-skills) create a symbiosis, (a kind of 'specified complexity') between the data providers, provided data and data users. This can create a useful amalgamation of OGD stakeholders, which is likely to effectively support the socio-economic or political impact coming from the use of OGD. It is also important to state that OGD intermediaries should not be a substitute for e-skilling citizens for beneficial use of open data. They should be considered as only temporal aid as there is always the risk that intermediaries end up doing the work for the end users, rather than helping the end users to do it by their own (Twidale, Blake & Gant, 2013). There is also concern about possible bias or unintentionally inaccurate interpretation of data by intermediaries. Hence, e-skilling of citizens should be long-term government strategies in the developing countries such as South Africa and Namibia. The main purpose of this skilling is to help citizens to understand how the data world functions and how it influences their lives. Learning how to interact with such a world, the basic programming and data skills is what the future generation should possess if the citizens' participation threshold is to be as low as possible (Halonen, 2012).

## **8 Policy Implications**

Understanding public policy as a purposeful plan for guiding decision-making related to achieving an intended outcome or preventing undesired developments in society (Bovens, Hart & Van Twist, 2007), this section describes the policy implications of OGD related capacity building through the acquisition of e-skills. These policy implications, which bear upon government and the citizens, are classified in the following levels: (i) Strategic, (ii) Operational, (iii) Technical, (iv) Social.

### **8.1 Strategic Policy Implications**

This study has shown the relevance of OGD related awareness among government officials, which includes awareness of e-skills required for the effective and efficient provision of OGD. Governments, particularly in developing countries, should embark upon strategies focusing on OGD related e-skills policies and programmes that include awareness campaigns within government departments and agencies. Developing e-Leadership skills at the strategic government level is also crucial for the success of the OGD initiatives as improved quality in public management requires *"a certain amount of leadership and vision"* (Halonen, 2012). These skills are indispensable for building and supporting interoperability of OGD ecosystem (Open Knowledge Foundation, 2012) and should be an essential part of such a system. Open data is not an apolitical initiative (Halonen, 2012), however, e-skills

policies should become a prerequisite to optimally support and build the capacity of all political leaders since data skills training is correlated with higher political impact (Open Data Barometer, 2015). The role governments play in maximizing their e-leadership influence will increase as more pressure will be placed upon policymakers to manage the disruptive challenges brought about by renewed changes in technology.

A citizen-centric approach in the provision and usage of OGD should be of primary importance to governments if the notion of OGD as being usable for all (G8 Charter, 2013) is to be fully utilised. Capacitating citizens through the acquisition of e-skills in countries with a large portion of ICT illiterate population should not happen in isolation if we are to effectively proceed from a technologically excluded to an e-inclusive society (Sharif, 2013). Responsive governments must consider the methods by which citizens can be fully engaged in making use of OGD (Beyond Access, 2012). Hence, it would be important to utilize multi-stakeholders e-skills initiatives and embed the Data Literacy training in such initiatives. An example of such a systemic initiative is described in the South African e-Skills Plans of Actions (210 and 2013), which promote inclusion of governments, educational and training institutions, for-profit businesses and civil society organisations. Providing more education on the 'data society' (Halonen, 2012) can equally help government officials (OGD providers) and citizens (OGD users) to develop e-skills that are indispensable for getting the most out of OGD (UK Government, 2012). Such capacitating initiatives aimed at promoting Data Literacy, which is based on long-term planning and sound, sustained investments (Open Data Barometer, 2015), will be supported by and in support to the United Nations' **Data Revolution for Sustainable Development** programme (UN, 2014).

Regarding international strategic policy implications, this study advises the inclusion of e-skills preparedness as an OGD readiness indicator or variable (Alonso, 2011; Open Data Barometer, 2015) in assessment apparatuses such as Open Data Barometer. This is substantiated on the fact that such particular e-skills are indispensable for effective and efficient provision and beneficial usage of OGD.

## **8.2 Operational Policy Implications**

Developing countries suffer from a limited availability of relevant training and technical capacity in open data (Open Data Barometer, 2015). Hence, governments in these countries should initiate strategies and policy objectives aimed at achieving certain levels of Open Data Readiness targets. Although developments in the OGD field is still slow in these countries, capacity building can start from existing information and data practices within organisations and communities, and make gains by adopting step-by-step data-driven approach (Davies, 2014). The aim of the policies in this area is to empower citizens and equipping them with necessary e-skills (and other skills) to successfully engage with government agencies collaboratively (UNDESA, 2013), especially in the developmental related projects.

This study has shown that vast majority of citizens use mobile phones, but upon further enquiry, citizens show a lack of knowledge about OGD. It was also found that it is not the lack of interest to OGD that is the obstacle, but the lack of e-skills needed to access and manipulate open data. This study clearly shows that mobile technology, especially in developing countries provides more accessible means for citizen engagement, and should

compel government and other stakeholders to understand the world from the perspective of the mobile citizen. Though using data in a mobile environment is complex, teaching these skills should be the focus of OGD skilling policies to enable people to interact with such complexities in a user-friendly and practical manner.

### **8.3 Technological Policy Implications**

The review of the literature revealed that many governments struggle with access to and usability of data. This study showed that the South African and Namibian governments are no exceptions. The usability of OGD is related to the quality of the provided data, which often causes reluctance from governments to publish OGD. This is, according to this study, attributed to the lack of capacity in data management or having no idea of the kinds of data needed in the marketplace. Thus, policy-makers should ensure that government officials, as OGD providers, are equipped with appropriate e-skills, hence ensuring data users will obtain usable, high-quality data. Even the best, most accurate data are useless if they are not accessible to governments, policymakers, civil society, and other users in a usable format (Center for Global Development, 2014). In this respect, the e-skills related policies will be influential in creating efficient and effective OGD providers. According to this study efficiency and effectiveness does not apply to only having mastered bureaucratic skills but also in adopting a locally grounded approach upon which development of skills related to OGD capturing and quality management are derived from understanding the local contexts. On the other hand, the technology-related OGD policies should focus on e-skilling users to effectively use various technologies such as wired (e.g. PCs) or wireless (mobile phones, tablets or laptops) devices for accessing and manipulating OGD.

### **8.4 Societal Policy Implications**

For effective streamlining of a government's legislative regime and policies to support an Open Data governance framework, governments will need to create a more co-operative ecosystem, which also includes e-skilling, across spheres of government, related agencies and stakeholders. The global interest in both Data Science and Data Literacy requires governments to review educational policies and to invest in developing skills in this area. Doing this kind of e-skilling in a systemic way will require governments to overhaul their educational systems to equip - if not all - at least a majority of citizens with the appropriate levels of e-skills needed to beneficially engage in opportunities offered by open data. Governments should adopt accelerated strategies to introduce modules at schools that are related to data and statistical literacy and in data management.

Contemporary society is increasingly dependent on data and citizens with data processing skills are essential in order to fully capitalise on all the potential that lies within public data (Halonen, 2012). The results of this study show a growing Data Divide among e-literate users and others without these skills. The dearth of data literacy skills that is prevalent across the studied participants forces the demand for greater inclusion of opportunities to develop citizens' data literacy skills through, for example, introducing such courses at various levels at schools and training institutions. In this respect, e-User Skills should go beyond the access to and use of technology, and more toward the ability to use and manipulate data for greater advantage. From the societal viewpoint, the OGD e-skills related policies should aim at closing the Data Divide, targeting particularly low-income communities as arenas for

building 'information justice' and developing capabilities that include both skills and technology (Johnson, 2014).

### **8.5 Intermediaries related Policy Implications**

This study has shown that the OGD intermediaries are a necessity if we are to overcome not only the resource disparity between those more affluent and disadvantaged communities, but also being able to help and equip such community members with e-skills that will help them to make sense of OGD and, hopefully, positively affects their life. With the support of intermediaries that are able to develop new skills and tools, aimed at translating raw data into information for a broader constituency (UN, 2014), citizens will become better informed about the value, influence and latent power of data. This will also help in raising the awareness of citizens about OGD and motivate them to become involve in and support advocacy initiatives related to OGD.

Intermediaries, however, should be the initial go-between bringing communities into knowing and learning about the OGD agenda. In this relationship, intermediaries' role is to equip communities (citizens) with the capacity to use and extract value from OGD by their own. In other words, OGD intermediaries should not be a substitute for e-skilling citizens but rather a party that help them to become independent in accessing, adopting and appropriating open data of any kind.

## **9 Concluding Remarks**

This study, using the case study methodology, utilised the Ensemble View of the IT Artefacts approach to situate this research in the context of developing countries, South Africa and Namibia, with a task to explore the relevance of the OGD related e-skills to government and citizens, which were the main stakeholders in this study. The other theoretical lens used in this study, the Genre System of Organisational Communication, helped to determine that opening government data can have huge potential benefits including transparency, efficacy and efficiency within government and also innovation through services that deliver social and commercial value. However, it was clearly established that no benefits from OGD can be achieved if the government officials (OGD providers) and citizens (OGD users) do not possess a requisite e-skills. While government officials must possess a wider range of e-skills, including the highest level of e-Practitioners skills, citizens should be at least equipped with Data Literacy skills if benefits from OGD are to be achieved independently. The fact that majority of citizens in South Africa and Namibia (probably in many other developing countries) still do not possess a requisite e-skills, suggests the existence of a Data Divide. This requires an immediate action from governments on the strategic, operational, technological and societal policy levels. Since the OGD intermediaries are the important party that can help in bridging the identified Data Divide, their role in e-skilling should also be the focus of OGD related policies.

The model produced by this study, containing the OGD provision and usage considerations and e-skills needed for addressing these considerations, can be useful for several stakeholders. Researchers can use this study as a base for further research in the field while practitioners in governmental departments and agencies can benefit from understanding OGD related e-skilling issues. This study can also be used as a framework for strengthening the evidence-based policies for open government in developing countries. However, this

study should be seen as embryonic as it only opened up exploration of e-skills as an important facet of OGD related capacity building. Hence, further relevant research is needed, for example, exploration of the most effective ways to open up data literacy opportunities to a large number of citizens, optimal way of e-skilling government officials, the role of intermediaries in Data Literacy initiatives or to identify policy frameworks for the establishment of an OGD related e-skills ecosystem. Given the importance of e-skills for successful interaction with OGD, it should be equally important that future research should be dedicated to the inclusion of e-skills preparedness as an OGD readiness indicator.

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