# THE E-GOVERNMENT DEVELOPMENT DISCOURSE

## Analysing Contemporary and Future Growth Prospects in Developing and Emerging Economies

Kelvin J. Bwalya

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# THE E-GOVERNMENT DEVELOPMENT DISCOURSE

## Analysing Contemporary and Future Growth Prospects in Developing and Emerging Economies

KELVIN J. BWALYA

AOSIS

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## Peer review declaration

# Research Justification

E-Government is a multidimensional phenomenon that has undergone various evolutions, culminating in its increased complexity. Most of this complexity has been brought about by technologies that have a relatively short lifecycle. With the rapidly evolving conceptualisation of technologies and managerial tactics utilised in the realm of e-Government, it follows that the way e-Government is perceived, designed, deployed and employed in different contextual settings becomes difficult. A quick scan through literature, especially of articles dating back not more than three years in journals of high repute, demonstrates how much academic research is lagging behind industry in advancement of knowledge or ground-breaking innovations. There is, therefore, need for academia to up the game and explore contemporary applied topics in e-Government so as to be relevant to actual e-Government implementation. This book brings out current research and practice concepts, thereby articulating the research agenda for e-Government. When e-Government was first conceived, it was designed upon basic technologies where the emphasis was only on simple display of government information for citizens to read. Nowadays, e-Government design comprises many complicated modules such as upload and download consoles, two-way interaction consoles between citizens and government agents, integrated government business processes presenting the whole of government, and it does not solely depend on technology. The complexity of e-Government has now evolved to include political, cultural, economic, social and technical dimensions. Bringing all these difficult aspects together is so complicated that it needs carefully planned strategies informed by local contextual characteristics. Rapid evolution of technology demands that e-Government designs and implementation have to evolve to remain relevant. Although there is rapid evolution of e-Government design and implementation, many publications have not adequately delved into the contemporary and future trends of e-Government. The lack of adequate text on contemporary e-Government advancements has culminated in a serious dearth of appropriate information which could be used in the actual design and implementation of e-Government. For example, there has been an active advocacy on the need to open up government data to inculcate the culture of transparency, yet there are few basic publications on this topic which do not go into the details and contextual nuances of this topic. Unlike giving formulaic definitions and conceptual standpoints on many aspects of e-Government as is the case in many e-Government publications, this book will explore the frontiers of global knowledge value chains by discussing current and future dimensions of e-Government. For example, the book discusses the concept of data governance by exploring how actual opening up of government data can be achieved, especially in a developing world context. Further, the book posits that opening government data should be followed by the opening up of government business processes in order to peddle the concept of accountability and responsiveness. Much text on data governance has concentrated on articulating the basic definitions surrounding this concept. Another very important topic explored in this book is regarding how the concept of decolonisation can be extended to e-Government by providing practical examples as to how researchers in the developing world can contribute to the advancement of e-Government as a scientific field of enquiry and guide its implementation, thereof. Decolonisation is advocated for in e-Government research so that there is a balance in the inclusion of the Afrocentric knowledge into e-Government advancement other than over-reliance on the Euro-, Asia- and America-centric knowledge value chains (Mbembe 2015). As e-Government is a very expensive undertaking, the issue of funding has excluded African countries and a majority of the developing world from implementing e-Government. Despite funding being a critical cornerstone of e-Government development, there is a dearth of information on this topic. This book provides a chapter which discusses traditional and innovative ways of funding e-Government design and implementation which can go a long way in improving e-Government penetration into the developing world. Further, the book explores how intelligent e-Government applications can be designed, especially in resource-constrained countries. A couple of emerging technology innovations such as fog computing and intelligent information technology are explored within the realm of e-Government design. The book is intended to be used by specialist researchers in the field of, among others, information management, applied information systems, computer science, and by organisations and institutions engaged in research and consultancy in e-Government, freedom of information, big data analytics and data governance who will find this book worthwhile. Information officers, system designers and decision-makers or policymakers in government organs and departments who may use this scholarly book as a key reference source to guide their decisions. This book uses some content which has been tested for scholarly rigour in academic journals and conferences. No material has been reproduced in this book verbatim, and if part of it is used in any form, it has been rephrased or embedded in the discussions in this book giving it contextual relevance and due reference has been provided in each case. Therefore, the book generally presents content that has not been presented, published or plagiarised from any source(s). Mainly, the book is conceptualised using systematic literature review, empirical research done in Zambia in 2012 and author's experience in researching and consulting in this field. All the figures in the book have been conceptualised by the author or adapted from other sources to suit the context.

**Prof. Kelvin J. Bwalya**, School of Consumer Intelligence and Information Systems, Department of Information and Knowledge Management, APK Campus, University of Johannesburg, South Africa.

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**List of Abbreviations**

| | |
|---|---|
| 4IR | Fourth Industrial Revolution |
| ABCA | Activity-Based Costing Analysis |
| ACE | Audit Control Environment |
| ADB | Asian Development Bank |
| ADMS | Asset Description Metadata Schema |
| AFDB | African Development Bank |
| AGA | Australian Government Architecture |
| AGIMO | Australian Government Information Management Office |
| APDIP | Asia-Pacific Development Information Programme |
| ARIS | Architecture of Integrated Information Systems |
| ATIA | Access to Information Act |
| BAS | Basic Accounting System |
| BI | Business Intelligence |
| BMP | Benefits Management Plan |
| BOLD | Big and Open Linked Data |
| BPA | Business Process Automation |
| BPEL | Business Process Modelling Execution Language |
| BPI | Business Process Improvement |
| BPIF | Business Process Interoperability Framework |
| BPM | Business Process Modelling |
| BPMI | Business Process Management Initiative |
| BPML/N | Business Process Modelling Language/Notation |

| BPMN | Business Process Modelling Notation |
| BPMS | Business Process Management System |
| BPR | Business Process Re-engineering |
| CaaS | Communications as a Service |
| CAMSS | Common Assessment Method for Standards and Specifications |
| CBA | Cost–Benefit Analysis |
| CCL | Core Component Library |
| CM | Consultative Model |
| CODATA | Committee on Data for Science and Technology |
| CPU | Central Processing Unit |
| CSS | Closed Source Software |
| DCAT | Data Catalogue |
| DEG | Digital Era Governance |
| DFD | Data Flow Diagrams |
| DOI | Digital Opportunity Index |
| DRE | Direct Recording Electronic |
| EA | Enterprise Architecture |
| EAF | E-Governance Assessment Framework |
| EBRD | European Bank for Reconstruction and Development |
| ECIS | European Conference on Information Systems |
| EDA | Event-Driven Architecture |
| EDGE | Essentially Digital Governance |
| EDI | Electronic Data Interchange |
| E-GIF | E-Government Interoperability Framework |
| E-GMS | E-Government Metadata Standard |
| EGDI | E-Government Development Index |
| EGPA | European Group of Public Administration |
| EIA | Enterprise Interoperability Assessment |
| EIB | European Investment Bank |
| EIF | European Interoperability Framework |
| EJEG | Electronic Journal of e-Government |
| EPCs | Event-Driven Process Chains |
| EPI | E-Participation Index |

| ERP | Enterprise Resource Planning |
| ESPD | European Single Procurement Document |
| ETL | Extraction, Transformation and Loading |
| EU | European Union |
| FDI | Foreign Direct Investment |
| FEA | Federal Enterprise Architecture |
| FOI | Freedom of Information |
| FOIA | Freedom of Information Act |
| FOSS | Free and Open-Source Software |
| GA | Government Architecture |
| GCL | Government Category List |
| GDP | Gross Domestic Product |
| GDSC | Government Data Standard Catalogue |
| GITR | Global Information Technology Report |
| GODI | Ghana Open Data Initiative |
| GOGP | Global Open Government Partnership |
| GPL | General Public License |
| GPR | Government Process Re-engineering |
| HCI | Human Capital Index |
| HDFS | Hadoop Distributed File System |
| HDI | Human Development Index |
| HICSS | Hawaii International Conference on Systems Sciences |
| HKIF | Hong Kong Interoperability Framework |
| IaaS | Infrastructure as a Service |
| IADB | Inter-American Development Bank |
| ICRIIS | International Conference on Research and Innovation in Information Systems |
| ICT | Information and Communication Technology |
| IDEF | Integration DEFinition |
| IDRC | International Development Research Centre |
| IFIP | International Federation for Information Process |
| IFMIS | Integrated Financials Management Information System |

| IF-POSH | Infrastructural, Financial, Political, Organisational, Socio-economic and Human |
| IIS | Intelligent Information Society |
| IKS | Indigenous Knowledge Systems |
| IMF | International Monetary Fund |
| IOSN | International Open-Source Network |
| IoT | Internet of Things |
| IPIS | Interoperability Practical Implementation Support |
| IRR | Internal Rate of Return |
| ISA | Interoperability Solutions for European Public Administrations |
| ISCU | International Science Council |
| IT | Information Technology |
| KBE | Knowledge-based Economy |
| KODI | Kenya Open Data Initiative |
| LAN | Local Area Network |
| LNCS | Lecture Notes in Computer Science Book Series |
| LOGIS | Logistical Information Systems |
| LonLUTI | London Land-use and Transport Interaction Model |
| LTS | London Transportation Studies |
| MDGs | Millennium Development Goals |
| MENAP | Middle East, North Africa and Pakistan |
| MIIF | Municipal Infrastructure Investment Framework |
| MUST | Mosi-o-Tunya University of Science and Technology |
| MyGIF | Malaysian Government Interoperability Framework |
| NeGP | National e-Governance Plan |
| NESB | Non-English-Speaking Background |
| NGDII | Next Generation of Digital Information Infrastructure |
| NGO | Non-governmental Organisations |
| NPM | New Public Management |
| NPMMM | NPM Management Model |

| | |
|---|---|
| NPV | Net Present Value |
| NRI | Networked Readiness Index |
| NTA | National Tax Agency |
| NTF | Non-traditional Funding |
| OC | Opportunity Cost |
| ODA | Official Development Assistance |
| OECD | Organisation for Economic Co-operation and Development |
| OG | Open Governance |
| OGD | Open Government Data |
| OLTP | Online Transaction Processing |
| OMG | Object Management Group |
| OSI | Online Services Index |
| OSS | Open-Source Software/Solutions/Systems |
| OWL | Web Ontology Language |
| P3M3 | Portfolio, Programme and Project Management Maturity Model |
| PaaS | Platform as a Service |
| PAYE | Pay as You Earn |
| PMP | Project Management Plan |
| PPA | Progressive-era Public Administration |
| PPPs | Public–Private Partnerships |
| PRM | Performance Reference Model |
| PSP | Public Service Platforms |
| RDA | Research Data Alliance |
| RFP | Request for Proposals |
| ROI | Return on Investment |
| SaaS | Software as a Service |
| SADC | Southern African Development Community |
| SAGA | Standards and Architectures for e-Government Applications |
| SAPs | Structural Adjustment Programmes |
| SARS | South African Revenue Services |
| SDA | Sustainable Development Agenda |
| SDBIP | Service Delivery and Budget Implementation Plan |

| | |
|---|---|
| SDGs | Sustainable Development Goals |
| SGML | Standard Generalised Markup Language |
| SI | Semantic Interoperability |
| SLAs | Service-level Agreements |
| SMME | Small, Medium and Micro-enterprises |
| SOA | Service-oriented Architecture |
| SOAP | Simple Object Access Protocol |
| SOUR | Statement of User Requirements |
| SPL | Semantic Process Language |
| SRS | Software Requirements Elicitation and Specification |
| SSA | Sub-Saharan Africa |
| SSM | Soft Systems Methodology |
| STERP | Short-term Emergency Recovery Plan |
| TAM | Technology Acceptance Model |
| TDFDI | Technology-driven Foreign Direct Investments |
| TEECE | Transition Economies of Central and Eastern Europe |
| TEF | Technology Enactment Framework |
| TESTA | Trans European Services for Telematics between Administrations |
| TET | Technology Enactment Theory |
| TFDI | Technology-driven Foreign Direct Investments |
| TFL | Transport for London |
| TH | Thailand |
| TII | Telecommunications Infrastructure Index |
| TOE | Technology Organisation Environment |
| TP | Test Plan |
| TQM | Total Quality Management |
| UAE | United Arab Emirates |
| UDDI | Universal Description Discovery and Integration Standard |
| UIDAI | Unique Identification Authority of India |
| UKLGA | UK Local Government Authority |
| UM | User Manual |

| UML | Unified Modelling Language |
| UMM | UN/CEFACT's Modelling Methodology |
| UN/CEFACT | United Nations Centre for Trade Facilitation and Electronic Business |
| UNDESA | United Nations Secretariat Department of Economic and Social Affairs |
| UNDP | United Nations Development Programme |
| US | United States |
| UTAUT | Unified Theory of Adoption and Use of Technology |
| VAT | Value-added Tax |
| WAN | Wide Area Network |
| WISER | Wits Institute for Social and Economic Research |
| WoG | Whole-of-government |
| WRM | Workflow Re-engineering Methodology |
| WSDL | Web Services Description Language |
| WSIS | World Summit on the Information Society |
| XML | Extensible Markup Language |
| YETI | Yesser Framework for Interoperability |

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# Biographical Note

Kelvin Joseph Bwalya is an associate professor at the School of Consumer Intelligence and Information Systems, Department for Information and Knowledge Management, University of Johannesburg. He has a PhD in Information Management (University of Johannesburg), Master of Computer Science (Korea Advanced Institute of Science and Technology – KAIST) and Bachelors in Electronics and Electrical Engineering (Moscow Power Engineering Technical University). He is also a member of the Board of Directors – Mosi-o-Tunya University of Science and Technology (MUST). Kelvin is also a PhD supervisor and member of the Board of Exams at various universities around the world. He has supervised five PhDs to completion, and several masters and undergraduate projects. Kelvin has examined 24 PhD Dissertations from nine universities in Africa and abroad and several master's theses. By the end of 2017, he had already published seven academic and research books and over 100 pieces of peer-reviewed articles, and he has also managed numerous research funds. He is also a member of various professional bodies and editorial teams. He is busy researching on big data and predictive analytics, data genomics, cloud and fog computing, spatial-temporal data modelling, competitive intelligence, database design, m-Government, open data, etc. Kelvin is actively pushing for establishing himself as a quality assurance expert on higher education and is currently a member of several higher education authorities in the SADC region. Email: kbwalya@uj.ac.za; ORCID: https://orcid.org/0000-0003-0509-5515

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Last but not least, I thank God for the gift of life, including the privilege to engage in this book project on e-Government, and I hope this work will lessen the burden of someone researching, designing, implementing and monitoring the progress of e-Government (*to the glory of God*).

## Disclaimer

Although care was taken not to include any information which is not factual and to only include information at the very end of the knowledge frontiers, there may be something that could change before this book makes it to print owing to the short lifecycle of this field which is hinged on technology. Therefore, I would like to acknowledge that any inconsistencies, non-factual information and mistakes are mine. I therefore regret any inconvenience that the use of this book may cause.

# Foreword

**Prof. Christopher G. Reddick**
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The use of technologies in public service delivery is changing the efficiency and effectiveness levels of e-Government. Instead of being only a public service platform, e-Government is presenting itself as a key transformation platform of public administration, culminating in presenting itself as an enabler of contemporary interactive governance. From the era of traditional government to new public management to now semantic governance models capable of big data and predictive analytics, e-Government is slowly adapting to the emerging technologies so as to remain relevant and move in tandem with users' and stakeholders' expectations. Given this transformation, there is a need for the different dimensions of e-Government to be continuously redesigned and repositioned. The different dimensions present opportunities for multidimensional research perspectives. No wonder there is heightened interest from different researchers on different aspects of e-Government.

In many parts of the developed world, such as the United States, Canada and the United Kingdom, as well as in emerging economies such as South Korea, South Africa and Brazil, e-Government has developed to the extent of having the potential to contribute to socio-economic development agendas and overall public service competitiveness. However, in many other parts of the developing world, e-Government has not developed to any appreciable extent owing to, among others, resistance to reforming corrupt public business processes and

lack of adequate infrastructure to support emerging forms of e-Government given the emerging technologies, namely, fog computing, business intelligence and other unknown contextual challenges. Understanding the contextual challenges and the different attributes of e-Government, especially from the lens of the developing world context, is essential given the need to collate different voices to form global voices on the different aspects of e-Government development.

This book conquers the global knowledge frontiers by presenting chapters that explore the lacunae of e-Government research worldwide. The topics discussed in this book are uncompromisingly current and are at the very end of the contemporary global knowledge value chains. The innovative nature of this book lies in the fact that contemporary e-Government topics are presented with a flavour of the developing world contextual settings. The book digs deeper into the issues that have made e-Government projects fail, unlike common texts on this topic which are based on surveys presenting the status of e-Government development, adoption or effectiveness of models used in investigating technology use in public services delivery frameworks. Further, the book explores the current innovations in technology platforms and provides a prognosis or a logical direction on how the emerging technologies will influence future e-Government evolution.

This book is subdivided into three parts. Part A has four chapters and intends to present the current status and future key themes in both research and practice. This section generally argues that there is a need to 'decolonise' knowledge from that of Global North to include perspectives and experiences from the Global South so that the end result is a comprehensive knowledge inventory not solely based on a single knowledge value system. The first chapter in this section discusses the different components of generic business case models which can be used to accentuate the need for e-Government implementation before strategic boundaries and documents are set. In other words, this chapter articulates how to put together the statement

of need that has to be presented to various stakeholders to justify why e-Government is desired and essential. The second chapter explores the contextual 'DNA' of the Global South and Global North with special focus on current level of e-Government development and capability in each case. The chapter concludes by presenting detailed scenario discussions of what needs to be done to bridge the divide. The third chapter discusses the approaches and methodologies of e-Government assessments in developing world contexts and highlights the glaring limitations in the generation of new knowledge by the Global South researchers and practitioners, especially regarding contributing to the body of knowledge on e-Government. Continuing the discourse introduced in Chapter 3, Chapter 4 is devoted to recommending practical and viable strategies for Africa's contribution to the decolonisation agenda of e-Government research and practice.

Part B aims to discuss the practical issues of design and implementation of e-Government. As funding the costly establishment of e-Government infrastructure is one of the cardinal pillars for the success of e-Government, Chapter 5 explores the different funding frameworks and models. Chapter 6 discusses the modelling and re-engineering of public business processes which are generally in constant need of transformation in the e-Government environment given the evolving technologies and overall expectations. With a need for creating 'whole-of-government' where traditionally disparate systems need to be integrated so that there is seamless flow of information and service decisions, Chapter 7 discusses the different principles of integration paradigms. In order to keep the costs of designing and scaling up of e-Government systems minimal, Chapter 8 promulgates the use of open-source systems for designing contemporary e-Government solutions. Part C discusses emerging and future dimensions of competitive e-Government solutions. Chapter 9 discusses open governance data and other initiatives depending on the need to open up e-Government data in a spirit to promote accountability. The last chapter of this book

discusses the possibilities of integrating big data analytics into the design of e-Government platforms so as to encourage open and evidence-based decision-making at different levels of the e-Government hierarchy.

I consider this as an apropos resource which has the potential to be used as an authoritative text on e-Government, especially looking at it from a developing world context. As its focus is mainly Africa with a dearth of information on e-Government development, many researchers, e-Government practitioners and academics will benefit by understanding the current e-Government development projectile articulated in this book and further exploring the gaps that have been clearly highlighted in the text.

# PART A

## E-Government Research and Practice

# Mapping the e-Government Agenda: Business Case Modelling

## ■ Overview

In the early stages of e-Government conceptualisation and design – especially in resource-constrained countries – there is a need to justify its implementation in a given contextual setting. This chapter aims to discuss the different dimensions involved in the conceptualisation and designing of business cases that can justify the implementation of e-Government in different contextual settings to different stakeholders. In this context, principles that need to be considered in the design of the business cases are presented and discussed. In so doing, the basic principles that need to go into justifying e-Government projects are presented. The chapter further discusses the benefits of

e-Government as a 'public good' in different contextual settings and provides scenarios demonstrating as to why ignoring the implementation of e-Government in any government business value chain is a huge opportunity cost, especially in as far as harnessing benefits towards efficient and effective business processes are concerned.

# ■ Setting the Scene

Many countries around the world 'have jumped onto the bandwagon with regards to implementing different aspects of e-Government' (Bwalya 2017b). Most of these implementation endeavours have been done without carefully providing a business case as to why it is needed at a particular point in time. By ignoring the articulation of a contextual business case, the actual resources that need to be available in the implementation of e-Government is not known beforehand. Such a scenario is like setting out to build a very large house without knowing the *bill-of-quantities* beforehand. As expected, such e-Government implementation is poised to fail.

The concept of business case modelling is mainly implemented in the private sector as the said sector is very stringent on how it uses its money because of the expected high levels of accountability and project monitoring. In this regard, money is not allocated to a project with substantial probability of failure. Ultimately, most of the projects in the private sector are successful unlike in the public sector. As a result, there are many instances where the public sector aims to emulate the success of the private sector in project conceptualisation and implementation. Although public sector business planning is not necessarily new, literature on business case modelling of public sector innovations is surprisingly rare.

This chapter intends to discuss the bedrock for the motivation of e-Government conceptualisation 'regardless of the context in which it is implemented' (Das, Singh & Joseph 2017). As the

concept of business case modelling is hinged on concepts in the private sector, it is not surprising that there is a dearth of information on business case modelling in the public sector, especially in e-Government environments. In order to clearly understand the fundamental concepts in the discussions presented in this chapter and ultimately in this book, this chapter begins by presenting the key concepts of e-Government.

# ■ Conceptualisation of e-Government

Understanding what e-Government entails and its multidimensional characteristics begins from the understanding of the word 'government' which has its roots in the Greek word κυβερνᾶν (*kybernan*) meaning 'to steer'. The gamut of e-Government outlines the locus and focus of e-Government in the overall governance agenda. It cannot be denied that understanding the gamut of e-Government is an important ingredient to one's understanding of the development and evolution projectile of e-Government applications in any given context. Although there are varying definitions of e-Government, all of them emphasise that e-Government involves the utilisation of Information and Communications Technology (ICT) to provide meaningful public services to citizens and businesses so that individuals, regardless of their status, participate in governance value chains and platforms (Abu-Shanab & Khasawneh 2014; Alomari, Sandhu & Woods 2014). OECD (2016) posits that e-Government presents a set of technology innovations in the public sector that can be potentially utilised for the transformation of government structures, business processes and culture towards transforming public services into more transparent, user-oriented and generally efficient offerings. Because of its multidimensional nature, e-Government principally sits at the perimeter of public administration and information systems (Bwalya 2011; Das, Singh & Joseph 2017).

Contemporary adaptive e-Government focuses on three main arenas: adaptive and improved service provision (e-Service delivery), e-Democracy (digital democracy) and participation of citizens/businesses in the governance processes (e-Participation) (Abu-Shanab & Khasawneh 2014; Schwester 2009). Wherever it is implemented, e-Government continues evolving and when it is adequately developed, it has multi-modal access platforms and displays content in different formats exploring the best that contemporary multimedia has to offer (Das, Singh & Joseph 2017). Further, fully developed e-Government solutions provide bi-directional flow of information to the extent that there is synchronous interaction between government agents and e-Government consumers (citizens and businesses). Such communication capabilities allow citizens to solicit for information from government agents and thereby effectively access government services, namely, online application for drivers' licences, passports, etc.

E-Government is complex as interests of each of the stakeholders represent individual instance and form of what e-Government has to achieve and take (Máchová & Lněnička 2015). There may not be perfectly designed e-Government solutions as this would entail developing many variants of e-Government to take care of each of the many individual instances. Therefore, a good approach is to obtain the common denominator of those interests and ensure that strategies or interventions put in place are able to accommodate a majority of each of those interests. The modelling of the different interests/factors influencing e-Government development can be mathematically represented by a multidimensional array with different scalars. For example, public managers are interested in ensuring that e-Government solutions make their work less demanding and much easier; citizens and businesses generally look for 'custom-made' public services that satisfy their aspirations and service levels and reduce corruption in the government business value chains; politicians are expectant that e-Government will massively reduce the cost of public service delivery; and businesses are expectant that

e-Government will open up channels for them to easily engage the government and influence policy so that the business playing field and environment is levelled. Satisfying the demands of each of these different stakeholders is a mammoth task (Gil-Garcia & Martinez-Moyano 2007). Therefore, the starting point in the design of e-Government is the understanding of the different mental models of the potential (or would be) users and stakeholders and to keep in point that these models keep changing over time. In this regard, it is important to come up with flexible e-Government designs. This study proposes that as these interests change, the development trajectory of e-Government also needs to change to accommodate the changing interests. Therefore, an agile development approach where e-Government is designed upon open interfaces and platforms which are highly scalable is desired. Momentous understanding of the factors influencing e-Government in any area (as shown in this study) is important but more important is the understanding of the evolving individual or institutional interests which call for ongoing exploration of these factors using adaptive models (Gil-Garcia & Martinez-Moyano 2007; Yusuf, Adams & Dingley 2016).

E-Government is better understood by first comprehending its key implications (benefits and negative effects). Driven by massive informatisation and infocracy where traditional government processes are replaced by innovative public service delivery facilitated by ICTs, e-Government shows many forms of positives that need to be explored regardless of the context/ environment in which it is implemented (Das, Singh & Joseph 2017). The key motivation of using ICTs in the public sector delivery platforms was that e-Government would be a vehicle for streamlining workflows and processes for the integration of data and information into the public service delivery platforms. The desired outcome of this streamlining was an improvement in the communication channels for effective engagement of government organs and individuals or businesses (Máchová & Lněnička 2015). E-Government ensures the reduction of inefficiencies in the public service business processes, reduces the cost of public

services and helps in the mitigation of corruption among others (Cloete 2012; Dang & Pekkola 2017; Ndou 2004; Rokhman 2011) (Business process is the set of logically connected sets of activities that are carried out in tandem or in succession to produce a specific output). For example, in the Kingdom of Jordan, e-Government focusses on the nation's transformation into a knowledge-based economy driving competitiveness and dynamism in all corners of the economy, whereas in India the focus is on mitigating corruption in the public sector (Dang & Pekkola 2017; Fakhouri 2014). In the case of the Kingdom of Jordan, e-Government is meant to achieve improved government performance and efficiency by streamlining information and public administration processes, enhancing overall governance competitiveness, increasing transparency and accountability, reducing cost of overall public service delivery and improving skill base and innovation in the public sectors (Fakhouri 2014).

In many instances where e-Government is implemented for the sake of jumping on the bandwagon, there is usually no careful design for the integration of the technology and the actual public service business processes, resulting in misalignment between e-Government technology and organisational processes, which in turn results in missing out on many e-Government benefits (Pederson 2016). Recognising the benefits of e-Government, the Government of Indonesia has put in place policies such as the 2003 Presidential Instruction Number 3 that promotes the proliferation of e-Government at all levels of the economy (Rokhman 2011).

Despite the many perceived benefits of e-Government as far as public service improvement is concerned, there are also negatives that need to be considered during the design of e-Government applications. When not carefully designed to dovetail into the contextual characteristics of the area in which it is implemented, e-Government shows many negative effects. Some negative implications of e-Government are:

- unmonitored external linkages on e-Government sites may provide a gateway for minors to restricted content which can

be accessed freely online such as pornographic sites or possible bullying opportunities
- there are potentially huge socio-economic costs as financial resources dedicated to the design and implementation of e-Government may be used for building social infrastructure such as schools and hospitals
- it may translate into citizens' exclusion from the governance and decision-making value chains
- it may translate into massive retrenchments of public service employees, among others (Ndou 2004; Zhan-qi, Xue & Zhang 2009).

The gravity of the aforementioned negative implications of e-Government may vary given the context in which e-Government is implemented. Many e-Government stakeholders have posited that within the ambit of contemporary public service, e-Government is perceived to add more technological and organisational sophistication to the already congested public sector arena given institutional isomorphism and the conflicting interests of politics and pure public management as a public good (Gil-Garcia & Martinez-Moyano 2007). Further, there is concern that e-Government projects are not designed to follow unison objectives or agendas and development projectiles.

# ■ State of e-Government Development

There is generally low penetration of e-Government in the developing countries' contexts mostly owing to limited understanding of the benefits linked to e-Government implementation (McDermott 2010 in Bwalya 2017a):

> Since the precedence penned by Obama on the need to change the way public administration is done towards more openness, transparency and responsiveness, many governments around the world have done or are doing the same. This has [*culminated into*] e-Government not to be looked at as government-as-usual [*practice*] only enabled by the use of ICTs but as [*a*] participatory governance [*platform*] where all information and decisions are in the public domain. The current understanding is that e-Government will usher in resumes where governance is done on public platforms where all

> citizens regardless of socio-economic status can participate. This is being facilitated by the many FOIs being propagated in many countries the world over. (n.p.)

Because of a thin line between success or failure of e-Government (Dang & Pekkola 2017; Heeks 2003), efforts to understand factors limiting meaningful development of e-Government in different contexts have in the past decade taken centre stage in e-Government research. The thinking of researchers and practitioners has been that designing innovative ideas, solutions and interventions emanates from adequately understanding the key factors that influence e-Government adoption, usage and the general integration of ICTs into the different public service business processes. Although it cannot be denied that e-Government offers a cornucopia of research domains, research focussing on e-Government design in developing countries is generally scarce (Wirtz et al. 2014). Only a few countries such as South Africa, Mauritius and Seychelles have shown a keen interest in researching the different dimensions of e-Government and implementing the findings. Since 1998, South Africa has been implementing e-Government through a dedicated government department (State Information Technology Agency [SITA]) to spearhead integration of ICTs in different government business processes. However, e-Government advancement is slow owing to structural and operational deficiencies, a leadership hiatus in the designing of requisite policies to support responsive e-Government, lack of monitoring and evaluation of e-Government activities, etc. Therefore, e-Government in South Africa has not evolved substantially in spite of the changing environment and stakeholders' preferences (Cloete 2012). This situation is likely to change as there is a serious effort to put in place dedicated e-Government leadership infrastructure at different levels of governance in South Africa. For example, the e-Government office in the Gauteng Province is a dedicated unit mandated to drive the e-Government and knowledge management agenda in Gauteng. In any given e-Government implementation landscape, Bergquist et al. (2017) posit that there should be clear definition of the role of all public officers.

Many e-Government initiatives have either focussed on the supply or demand side of e-Government but not on both (Verdegem & Verleye 2009):

> In order to understand the general factors that influence the success of e-Government, many researchers have investigated factors that influence user adoption and usage (attitudinal determinants) of e-Government. It is these factors that should be at the centre of e-Government design. (n.p.)

There are very few studies that have attempted to integrate studies from the two extremes. Therefore, there is a general lack of adequate understanding in the relationships that exist between the technological dimensions and the different social structures in different places (Elsheikh & Azzeh 2014). One of the very first steps in the designing of dynamic e-Government solutions is the understanding of the kind of adaptive ICT and management infrastructures needed to support the desired e-Government applications. Prior to designing any e-Government solutions, in-depth studies need to be conducted to understand what types or aspects of ICT infrastructure will facilitate faster e-Government growth and be able to adapt to the changing contextual changes over time. Understanding what ICT infrastructure is needed right at the beginning of e-Government design is important because it informs the designers where they need to allocate their resources (Das, Singh & Joseph 2017). Although still lacking, other e-Government enthusiasts have focussed on enterprise architecture (EA) investigations and the broader spectrum of EA investigation other than mere case studies of e-Government (Dang & Pekkola 2017). Yet others have focussed on business process re-engineering of e-Government applications (Alghamdi, Goodwin & Rampersad 2014).

## ■ Understanding e-Government Development

In many parts of the world, interventions towards e-Government development have been informed by studies measuring the

status of adoption and usage of e-Government applications (Urbina & Abe 2017). Most of these studies have been hinged on the assumption that as technology is a key enabler of e-Government, its acceptance and adoption automatically translates into e-Government adoption. However, a key flaw in this approach is that most of these studies have neglected the effect of other factors 'given the multidimensional nature of e-Government' (Bwalya 2017c). Further, it is worth mentioning that technology has a shorter lifecycle, meaning that its changes may have an effect on the degree of e-Government adoption and synthesis down the line. Therefore, studies that have used e-Government development models (stage models), namely, Gartner, World Bank, Howard, Deloitte and Touche, Asia Pacific, Moon, Hiller and Blanger, West, United Nations, Gartner, Chandler and Emanuel, Layne and Lee, among others, capture the snapshot status of e-Government given the status of technology at that particular point in time and may miss out on changing modules of technology and what their effect is on the overall e-Government agenda (Karokola & Yngström 2009).

Although technology has been peddled as the most important attribute in e-Government development and adoption, it is worth noting that e-Government does not solely depend on the computer power but also requires the willingness of the general citizenry and businesses to adopt it (Alomari, Woods & Sandhu 2012). The other factors influencing e-Government need to be considered in any endeavour of e-Government design and implementation. Given the short lifecycle of technology and the fact that e-Government uses technology as its key enabler, it is worth commenting that the evolution of the nature of e-Government is rapid because technology has a short lifecycle. There is evidence that e-Government evolves rapidly and therefore there is a need to understand the forces at play for e-Government evolution (Gil-Garcia & Martinez-Moyano 2007). Unfortunately, these forces are not global and therefore each environment in which e-Government is to be implemented needs empirical studies to be conducted to understand the key forces

that can influence e-Government development in that particular context. In order to maintain relevance of e-Government solutions, it is important that e-Government keeps evolving to adapt to the ever-changing environment.

As an enabler and main gateway to e-Government applications, technology has taken the centre stage of e-Government design and implementation (Alomari, Sandhu & Woods 2014; Ebrahim & Irani 2005; Schwester 2009). Because of using snapshot models like Technology Acceptance Model (TAM), Digital Opportunity Index (DOI) and Unified Theory of Adoption and Use of Technology (UTAUT), many developing countries have been left out of the bandwagon of countries implementing dynamic e-Government as the key context-aware (based on a given context) factors are not known. Dynamic e-Government entails that e-Government revolves according to technology evolution and citizens' preferences. Further, many other developing countries have failed to effectively implement e-Government owing to the high setup costs involved and because its design requires high expertise given the heterogeneity of technology environments in public sector organisations (Heeks 2004; Pederson 2016). Requisite expertise may be required at the design stage to also overcome the different structural and organisational incompatibilities brought about by different contextual outlays within the public sector (Angelopoulos, Papadopoulos & Kitsios 2009; Cloete 2012). Thus, the complexity of successful e-Government implementation and development lies in its different facets of conceptualisation, design, implementation, adoption and usage. This complexity changes rapidly over a period of time (Alomari, Sandhu & Woods 2014; Elsheikh & Azzeh 2014). Appropriate measurement of e-Government needs to consider the evolving aspects of each of the different facets of e-Government and not only the technology. What many models have been doing is measuring the likelihood of e-Government adoption by checking the level of acceptance and usage of technology. This approach for measuring e-Government assimilation is wrong.

The metamorphosis of public administration to include evolving public service delivery models culminated in the conceptualisation of the 'New Public Management' model, which is hinged on concepts based on agility of technology innovation with key emphasis on service efficiency (Abu-Shanab & Khasawneh 2014). As many e-Government models are being influenced by evolving technology innovations with short life cycles, it is thus important to delve towards the development of agile adoption and assessment models. This study defines agile or adaptive e-Government adoption and assessment models which are highly flexible and which may be used to measure e-Government adoption over a period of time not solely based on technology but encompassing all other known 'factors influencing e-Government development in a given area' (Bwalya 2017a).

Although there are many factors that influence e-Government development, Ashaye (2014) posits that the key enablers for e-Government remain technology, people and processes. In the same line of thinking with Ashaye (2014), Al-Khouri (2015) posited that the key enablers for e-Government include citizens, technology, value and economy. Designing collaborative e-Government systems entails considering the following:

1. Citizen-driven – where transparency, participation and shared governance models are considered.
2. Value-driven – where e-Government presents itself as a better decision-making and better service provision platform.
3. Economics-driven – where cost reduction is considered focussing on process efficiency.
4. Technology-driven – where different collaboration tools and platforms are considered. The impact and effect of each of these factors is 'different depending on the context in which it is implemented' (Gray 2017).

# ■ E-Government as a 'Public Good'

Any public administration endeavour should benefit the public in the spirit of 'public good'. 'The concept of "value" can be looked

at from several contextual standpoints as the word has multiple meanings and ambiguity' (Bannister & Connolly 2014). Furthermore (McDermott 2010 in Bwalya 2017a), we could consider that:

> Public value is a relative abstractive phenomenon because it depends on the individual/entity perceiving public interest and that the notion of value may force actors in the public ecosystem to compete for legitimisation, acceptance and hegemony. [...] The over-emphasis for a need to re-think public administration throughout the world, especially in light of massive adaptive ICTs, has not sprung *ex nihilo* from without a careful consideration of a need for responsible public service governance. There is urgent need to combat corruption in both the private and public business value chains, need for responsive governments who are able to respond to citizens' needs, need for participatory and collaborative governance, and need to have transparent/open governance value chains. (pp. 3-4, *emphasis in original*)

As highlighted above, e-Government presents itself as a promising tool to respond to the different needs of contemporary government.

With a view to encourage e-Inclusion of citizens in governance and decision-making platforms and to ensure that e-Government takes its rightful place as a public good, there is a need to ensure that much of the government information is placed in the public domain. With rapid development of newer technologies and conceptualisations such as blockchain, open data and Open Governance, the possibility of putting government information into the public domains can be realised. The direct impact on governance emanating from opening up government data is that there is an eventual reduction in the cost in public service delivery and that there is an overall improvement in the quality of services delivered (Gonzalez-Zapata & Heeks 2015).

E-Government should not be designed strictly from a public good perspective but should clearly establish a business case whence all the e-Government solutions are going to be designed. Appropriate e-Government discourses are evaluated by analysing the public value obtained by the implementation of technologies

in the public sector value chains (Yıldız & Saylam 2013). Because of its nature, e-Government need not be perceived as a technical and non-ideological issue but should be considered as a multidimensional undertaking defined by the technical, political and governance landscape (Bwalya 2017a).

Given the multidimensional nature of e-Government, Alhomod and Shafi (2012) posit that in the implementation of e-Government, there should be separation of duties between the front and the back-end offices given the expertise and focus.

# ■ Business Side of e-Government

Although e-Government is generally perceived as a public good, it cannot be denied that it is a huge business undertaking which requires convincing justification and alignment to the existing and future public service business processes. Further, because of huge sums of money that are required in its setting up (ICT infrastructure – components procurement, design and implementation, aligning to business processes, human resources, etc.), e-Government cannot be only looked at as a service. E-Government is a big investment that requires a great deal of capital to materialise, and it therefore needs careful justification if public resources are to be diverted towards e-Government design and implementation.

# ■ Business Case Modelling of e-Government

The business case presents the justification of the implementation of e-Government in a given area. It gives a fair assessment of what monetary and non-monetary resources are needed in the implementation of e-Government. By doing so, a business case presents opportunities for the government and other interested parties to assess whether engaging in e-Government design and implementation is worth the while. The start-point for any requisite justification of a business case for e-Government

involves the clear articulation of the anticipated benefits that are to be gotten from the business intervention suggested. The business case is readied before all the stakeholders agree on the go-ahead to implement e-Government in any given setup. Further, the business case accentuates the opportunity cost paid if e-Government in a particular context is not implemented at that period in time. The business case is the marketing document that is used to sell the idea of e-Government which clearly articulates what e-Government is, why it is needed to be implemented, what are foreseen and possible hidden costs in the implementation and what resources are generally needed to realise the dream for massive integration of technologies in the different public service business processes. As the business case is the first point in e-Government implementation, even before the design is done, it is not the same as strategy. Strategy is conceived after a business case has been discussed and agreed upon, whereas business case articulates how to execute e-Government given the context of the area in which it needs to be implemented.

A layman explanation of what business case is can be demonstrated by the case of a private company engaging in some business and is not equated to business strategy. Business case aims to articulate why the company wants to delve into a business venture by aiming to articulate a watertight case outlining the anticipated gains and risks involved with the business. Strategy articulates the roadmap of implementing a given plan. A business case sets up the business transactional architecture articulating the different transactional aspects of implementing a business plan and how value is to be obtained from the proposed business undertaking.

In any given setup, a business case is the selling point of e-Government. A carefully thought business plan is cardinal to make a *prima facie* case for potential funders to invest in the setting up and implementation of e-Government. There are many cases where e-Government budget has been proposed, but it is ultimately rejected owing to a weaker business case presented

or the business case not being very convincing. In the USA, around 2002, the Bush Administration had asked for US$100 million over three years. Ultimately, only US$16m was approved by Congress. The same happened around 2005 when US$45m was sought from different funding sources and ultimately only US$3m was approved. Some of the reasons why each of these projects was denied adequate funding are:

1. Lack of a clear business plan that could have provided extensive justification for the information technology (IT) project in technical and economic terms.
2. Inability to differentiate the business plan and the budget.
3. Failure to clearly articulate risks involved in the project implementation with regards to integration of technology into the different portfolios of the public sector business channels.

Articulation of a business case involves articulation of tangible cases where e-Government has culminated into improved overall benefits on the socio-economic scale. For example, in the Australian context, assessment of a five-year period of implementing e-Government revealed that there was generally improvement in public service delivery as posited by 80% of surveyed users, with 45% saying that they had saved money from their engagement in e-Government (Australia Government 2003). In another context, in the implementation of e-Government in Australia, the cost–benefit ratio on the part of the government programmes on all 38 e-Government programmes was 92.5% and the citizens managed to collect AUS$1.1 billion from savings obtained out of the direct and indirect public service cost avoidance (Australia Government 2003). In an attempt to articulate non-financial benefits of e-Government implementation, Davidrajuh (2004) analysed the benefits of the e-Sri Lanka programme for citizens, business and the government departments as part of the business case for implementation of e-Government. In any business case being designed, it is important to articulate with examples how e-Government has revitalised public service delivery and what the socio-economic benefits are in that regard. These benefits

can be extrapolated and mapped to the context in which e-Government is supposed to be implemented.

A business case is used to justify a programme and is used as the basis for decision-making with regard to implementing e-Government. Any meaningful business case is going to have a list of programmes with information presented from multiple perspectives to adequately inform decisions regarding where to go with suggested interventions. The New Zealand Government (2014) articulates that some of the key characteristics for a robust business case are the following attributes:

- A concise, clear and compelling justification as to why there is a need to invest in the proposed change or intervention.
- A detailed plan on how the anticipated benefits are going to be realised, and there will be a clear resolve on how the costs and the risks are going to be managed.
- Clearly defined communication plan to be used at each stage of the implementation cycle to engage stakeholders in order to optimise value for money invested.
- Explicit and transparent basis for decision-making.

Wassenaar (2000) defined a business model as the overall architecture topology defining the core business of an organisation. A business model needs to be included in the business case and should form the core of business case modelling as shown in Figure 1.1. A business case has basic constructs as shown in Figure 1.1. Each of the e-Government options needs to be considered in terms of the constructs shown below so as to form a holistic picture of what it entails to engage in e-Government in any given setting.

As aforementioned, the constructs are the building blocks of a business case. Each of these constructs is articulated in the next section as being constructs used in the criteria for business case modelling. Business case modelling presents the different possible scenarios (scenario planning) that emanate from the implementation of a business in a given environment. The importance of business case modelling is that it accords the
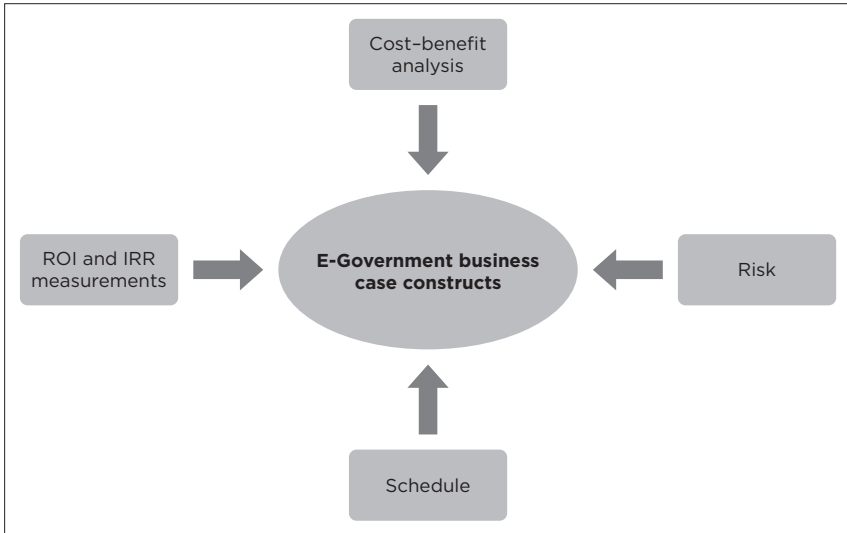
**FIGURE 1.1:** E-Government business case constructs.

interested parties and stakeholders an opportunity to judge whether a business is viable or not.

# ■ Criteria for Business Case Modelling

There are generally several models that are used in establishing a business case for e-Government implementation. As aforementioned, the point of departure in the articulation of a business case is to clearly accentuate the anticipated benefits in any given context. The following are some of the pointers that need to be explored in the articulation of a business case – it is worth noting that the more pointers are included in the business case, the stronger it presents itself to be.

# □ Risk

Each of the identified e-Government options needs to be appraised against the overall risk it possesses. Risk of an

e-Government programme measures the probability that the suggested programmes will not provide the anticipated service levels and the overall benefits. A solution with high risk entails that it is more likely to fail given the context in which the e-Government solution is proposed. Each risk is assessed using overall complexity and overall internal and external interdependencies among the different e-Government options.

In quantifying the risk involved in any proposed e-Government option, the following are some of the necessary documents in the required thorough description of the risk involved. The nature of these documents depends on the context in which the programme is executed:

- Project Management Plan (PMP) – approved formal list of plans used to manage a project. Includes how the list of activities will be defined, prepared, executed and monitored in the framework of the project.
- Risk Log – a master document used to define the different known and anticipated risks that may occur during the e-Government project implementation and is cardinal in monitoring the risks involved.
- Benefits Management Plan (BMP) – articulates how and when 'the anticipated benefits of e-Government' implementation will be delivered and to whom. Also involves monitoring of the impact of e-Government (Ebrahim 2011).
- Architecture Design – a document detailing the analysis of the threats and vulnerabilities, description of the risk mitigation plans and risk implementation which involves the units of risk measurement and risk management.
- Portfolio, Programme, and Project Management Maturity Model (P3M3®) – utilising the self-assessment of project management capabilities and therefore detailing the perceived risk in the proposed e-Government project.
- Procurement Plan – detailing the different technology platforms and expertise needed in the requisite implementation of e-Government.
- Statement of User Requirements (SOUR) – a formal document detailing the anticipated system functional requirements,

requirement specifications and the business process model for the user. The different e-Government system components are connected using standard business process models. The design and presentation of business models shows the risk that may be involved in the implementation of e-Government.

- Governance Plan – includes a detailed list of management activities planned for both foreseen and unforeseen occurrences during the implementation of e-Government.

## ☐ Cost–Benefit Analysis

Cost–benefit analysis (CBA) involves a systematic comparison of the costs and benefits of a system being proposed. A robust business case needs to have at least more than two alternate cases with clear CBA. The CBA considers the cost of each e-Government option compared with the anticipated benefit that is expected to be gotten from engaging in that e-Government option. Each of the options needs to be assessed in terms of volume, cost and time frame. For each of the identified options, it is important to provide the net present value (NPV) and the internal rate of return (IRR) for each of the options where possible and make informed comparisons between the given options. By considering the IRR, we are able to assess the anticipated returns of the e-Government project and device plans on how the proceeds are going to be shared.

## ☐ Benefits

The benefits constructs assess what the society aims to achieve by engaging in e-Government. Archiving adequate justification in the business case on this construct entails striking a balance between what government departments (supply side) achieve from e-Government implementation and what is achieved at the individual and the societal level (demand side) from using technology platforms to access public services. E-Government benefit analysis is relatively a huge analysis which involves articulating minute details about

the benefits of engaging in e-Government for each of the elements in the supply and demand sides.

## ☐ Schedule

The schedule shows what element of e-Government will be implemented at what period in the design and implementation cycle pegged against the cost elements that are needed at each stage. A detailed schedule is going to include any internal or external attributes that may positively or negatively influence the schedule and what impact that has with regard to the costing schedule (a transparent and realistic prognosis of the effect of each factor and whether it may escalate or reduce the actual suggested costing needs to be given). It is also important to explain the logic and reasoning behind all the assumptions in the scheduling decisions for each of the e-Government options and that due reference is given for the origins of such reasoning. A detailed schedule needs to be provided for each time frame proposed including the list of activities. For example, if a period of two months is proposed in scheduling for the designing of an e-Government user interface, then each of the activities listed needs to be explained, clearly indicating the time devoted to each of them. The following list of activities in Figure 1.2 could act as a guideline.
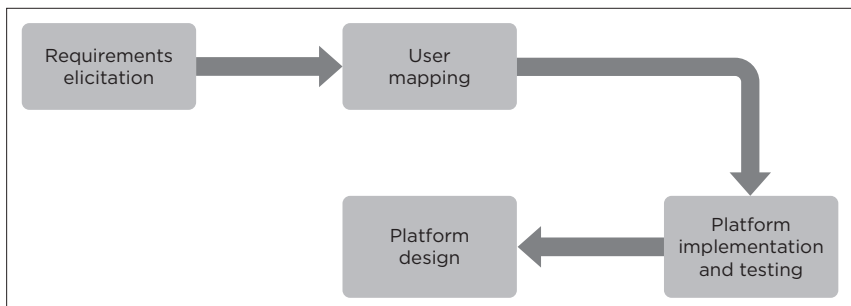


**FIGURE 1.2:** E-Government platform design schedule guidelines.

The decomposition of each of the activities involved in any one milestone brings clarity in the business case and may also help stakeholders understand the risk involved before the risk dimensions are articulated to them. In this case, platform design for e-Government may include four disparate but logically connected sets of activities where each of them needs to be explained regarding what is involved and what time it takes to accomplish one activity.

## ☐ Return on Investment

The return on investment (ROI) is generally the overall benefits that are harnessed after investing in a business. Although the ROI is generally considered in terms of the financial benefits that can be amassed from investing into something, researchers are continuously conceptualising ROI in terms of non-monetary benefits. For example, Hovis (2012) articulates two conceptualisations that can be used to define contemporary ROI: one of them is the common trend of looking at the benefits attributed to the balance sheet and the other one is where you look at benefits beyond formulaic definition of benefits beyond the balance sheet. The two approaches are defined below.

The 'beyond the balance sheet' approach brings to the fore the need to rethink the definition of ROI by basing the business case on assumptions conceptualised using the conservative financing model, which emphasises the traditional conceptualisations of finance. E-Government return using this model entails the invisible financial return, such as 'public good' discussed above, which has an overall impact on the life of the citizens and well-being of businesses in a community. Counting the many intangible benefits of e-Government application in a given area may culminate in overall equivalent benefits that may normally be gotten if the returns were monetary. Put differently, non-financial benefits can be mapped onto equivalent financial benefits. For a government department, benefits may include increased service reachability to community members, increased participation in

the decision-making and policy-making processes by majority of citizens and business entities using technology platforms. For a community setting, the 'public good' dimension represents the overall benefits that may be obtained in a community such as reduction of crime given better reporting platforms provided by e-Government, citizens' access of government information such as job adverts anywhere anytime and better treatment of endemic outbreaks through access to information on how to prevent the spread of a disease, among others. Such non-financial gains, when appropriately mapped onto the financial balance sheets, may translate into substantial overall financial value.

On the balance sheet ROI, the business case focuses on the financial returns that are going to be realised upon implementation of e-Government. The business case presented in this model articulates what financial gains are there for each e-Government option. This involves articulation of citizen and government benefits over a period of time. For example, a government department may save a huge amount of money by providing their services online and citizens may save some money as they need not travel to a physical government department. Further, there can be information services that can be charged per access by the citizens and businesses, especially in mature markets. Contemporary e-Government implementations involve having a common information systems network where all government departments share information seamlessly. In this configuration, a business case would be articulated by comparing what governments spend in leasing and using information networks owned by the private companies against what it costs to build an own integrated system. Then, on the balance sheet, one can easily estimate how much will be saved over a period of time, and this may give the government and other parties interested in e-Government an indication on quantifiable NPV and the anticipated financial gains from such an approach, thereby informing their investment decisions. In short, the cost savings can be clearly articulated for the present and the future to accentuate the business case for e-Government implementation.

Articulating the ROI can be done by giving scenarios of how the implementation of e-Government systems may eventually translate into revenue collection and lessen the strain on the central budget, especially in a developing country's context. In the case of South Africa, the toll road and e-toll road management systems allow motorists to pay small amounts of money for using the roads which have direct benefits to both the government and the citizens. A business case in this scenario may contain articulating the cost of setting up the system and the anticipated revenue that is going to be generated given the average traffic on the roads every day. As aforementioned, the government obtains the much-needed revenue – part of which goes to repaying the loan for procuring and setting up the road management system and another part may go towards constant repairs on the roads directly benefiting the community in the form of increased safety on the roads.

In conclusion, it is worth noting that in any given scenario, when e-Government is being funded, stakeholders need to evaluate the anticipated value of e-Government applications by considering the following pointers:

1. Understanding the CBA and discounting it to the present net value of the anticipated benefits.
2. Understanding the cost-effectiveness with regard to investing in a given project with reference to careful analysis of the likelihood that a given project will produce the anticipated outputs, and these will in no way be less effective than the present state of affairs.
3. Evaluating the likelihood that a given e-Government project will culminate in long-term socio-economic development.
4. Evaluating the importance of the project in terms of providing universal access to e-Government applications and government information.
5. Understanding the social and cultural dimensions and benefits of proposed e-Government projects in terms of its evaluation as a general social good.
6. Understanding the likelihood that the proposed e-Government project will stand the test of time in terms of relevance and

not become obsolete owing to changing governance needs, citizens' tastes and rapidly evolving technology platforms. This assessment looks at the agility of e-Government designs and the likelihood that proposed solutions can adopt emerging governance principles such as open data.

# ■ Financing e-Government Projects

One of the most explicit parts desired in the business case is the articulation of how financing e-Government is going to be achieved. A business case needs to clearly articulate the type of financing to be used in the e-Government project. There are basically three options for financing projects in the e-Government arena. Although this topic is comprehensively covered in Chapter 5, there is a need to mention in passing the different financing models for e-Government applications at this stage. Public finance is mostly financed through loans or budgetary sources (national budgets – financed by tax payers' money and donations from the international community in the case of African countries). Apart from the anticipated impact on government, the return can be obtained from user and service fees for a selected set of e-Government services. In projects financed through the private sector, the private entity enters into a concession agreement with government detailing the different rights and responsibilities for the use of public assets. In many cases, such projects obtain money through user charges.

When bringing private sector participation into e-Government programmes, the following models are considered:

1. Conventional – this is a type of e-Government implementation where the government mans the design, implementation and monitoring of e-Government programmes including ownership of the programmes. The government is responsible for funding the capital equipment required for the project as well as providing the operational budget during the course of project implementation. All the different risks regarding the project are accrued to the government.
2. Outsource – complete control of project creation and implementation, including ownership of assets by the government.

The government leverages private sector know-how on certain competences devoid of the public sector. The risk of the project is shared between the public and private sectors based on their responsibilities on the project.

3. Public and private partnerships (PPPs) – mostly, this is a joint funding model between the public and private sectors, with some concessions. The government is responsible for articulating the scope, time frame and political capital. Using this model, the government does not need to own a substantial amount of delivery services.

4. BOO(T) – the private sector is given concession from the government to design, implement and monitor e-Government. The returns obtained as service charges are used to remunerate the private sector, and the project assets are returned to the government at the end of the concession period.

5. Privatise – in this model, the government only regulates the functioning of the e-Government project. All the rights to design and implement e-Government including the risks thereof are transferred to the private sector.

The business case analysis aims to justify the need for the implementation of the project. A robust business case should include clear cases of technical and financial feasibility. A financial feasibility statement articulates the anticipated financial sources for design and/or purchase of capital equipment for the implementation of e-Government and also articulates at what point in the e-Government implementation cycle can profits and returns be expected to be realised. In the business case, financial feasibility is performed to explicitly show the necessary budget locations mapped against the project item costs and other relevant factors. Establishing financial feasibility of the project is one of the key attributes for a watertight proposal that stands a higher chance of being funded. The NPV should always be less than the budget cost of the project. The suggested budget for the project should be justified by carefully considering the context and including in the business case the equivalent budget cost for similar projects done in contextually similar situations. A competitive business case for requisite e-Government design should contain a detailed funding plan that is going to stand the test of time.

# ■ E-Government Development Cycle

Stakeholders of e-Government need to know that there are different stages involved before e-Government can develop into a completely mature system that can harness all the anticipated benefits. A robust business case needs to show the different stages of e-Government development and articulate the different resource needs at each stage. The articulation of the e-Government development cycle will give an indication to all the different stakeholders that e-Government is a huge undertaking which requires a lot of resources to thrive. The e-Government lifecycle articulates the different stages of e-Government from the time it is conceptualised to the time it is fully implemented and monitored. The e-Government development cycle is shown in Figure 1.3.

At each stage of the e-Government development cycle, the resources are clearly articulated given the context in which
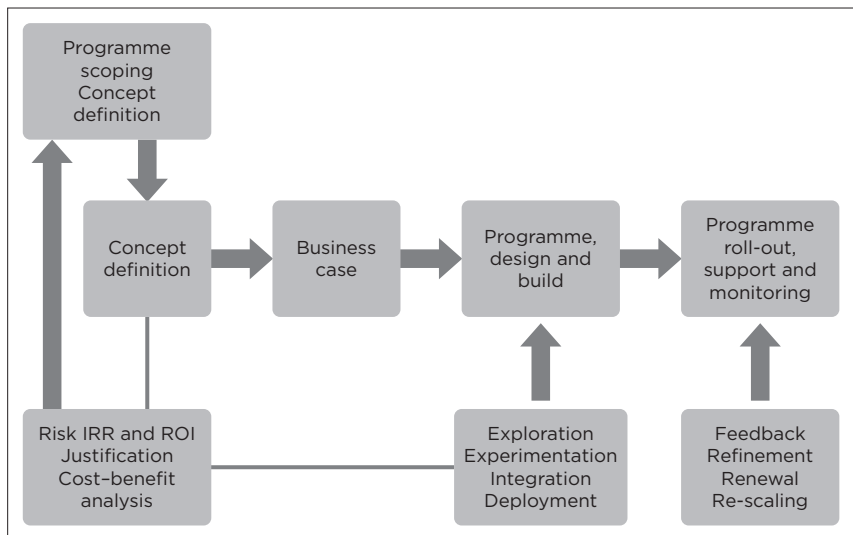
*Source:* Adapted from Wassenaar 2000.
**FIGURE 1.3:** E-Government development cycle.

e-Government is designed and implemented. The following are some of the critical stages involved:

1. Conceptualisation – e-Government vision and strategy development, process re-engineering, change management and capacity-building.
2. Design – development of process models, process study (from the AS-IS model to the TO-BE model). The AS-IS model is the current state of the e-Government and the TO-BE model is the anticipated and the desired state of e-Government.
3. Project Operations – service-level agreement (SLA), monitoring and evaluation, capacity-building and change management.
4. Systems Development – project and programme management, software and data quality assurance and capacity-building.
5. Anticipated Costs – the anticipated costs need to be grouped into one-time or recurrent costs and justification given for each of them.
6. Cost Grouping – recurring costs could include software maintenance and support, training and capacity-building, and software licences, among others, whereas one-time costs may include procurement of the data centre and network infrastructure, such as buying of LAN and WAN; procurement of equipment such as switches and modems; and procurement of database servers, application software, enterprise resource planning (ERP) solutions, etc.

Many governments around the world are now coming up with decision support systems that can be used to judge business case models presented by e-Government champions. An example is the Five Case Model used in New Zealand and the United Kingdom. The Five Case Model is a best practice model extensively used in the United Kingdom for preparing business cases (New Zealand Government 2014). This model aims to ensure that a step-by-step process is followed in the analysis of the different contours of the decision-making process which should be explicitly presented ensuring that aspects of the investment proposal are not undervalued or overvalued.

# ■ Conclusion

Although not commonly used in e-Government conceptualisations, business case modelling is now slowly taking the centre stage in the justification of e-Government projects around the world. Although the concept of public good needs to be considered when justifying the need for e-Government projects, the different constructs of business case modelling also need to be equally considered so that a balanced project is proposed. In any given case, therefore, a business case should give dimensions of the current (AS-IS) and future state (TO-BE) of government implementation. The context in which e-Government is being implemented is going to shape the depth of the business case desired. It is also worth mentioning that business case modelling should strictly form the basis and point of departure upon which e-Government is designed.

## ■ Directions for Research and Practice

Conceptual design and practice of e-Government should logically dovetail with one another so as to make sense of e-Government implementation in any contextual setting. Governments which have hinged their designs of e-Government on context-aware models have seen most of their e-Government initiatives meeting the initial project objectives. For example, the Indian government has placed overemphasis on the need to have business models and cases defined by the local contextual setting. In order to encourage the use of business case modelling during the justification of e-Government projects, a lot of grey areas that exist on the research front need to be explored. Some of these include the following:

1. Exploring and designing the measurement constructs to understand the fit of the proposed e-Government solutions to the overall agenda of public administration and social goodness.

2.  Designing of comprehensive financial models for funding e-Government projects.
3.  Designing of self-evaluation and monitoring mechanisms during the implementation cycle of e-Government.
4.  Understanding how the proposed e-Government solution is going to fit into the contemporary and emerging disruptive technologies. The importance of disruptive technologies such as Internet of Things (IoT), cloud and fog computing, and sensors is able to extend the offering for improved user experiences of technology (EU 2015a). For example, the unique opportunities offered by mobile devices unlock exciting usage realities in the realm of mobile government (m-Government), especially in developing countries' contexts where mobile penetration seems to be growing by the day.

# E-Government Development – Global South Versus Global North

## ■ Overview

This chapter aims to explore the level of development of e-Government in the Global South and Global North and identify the key reasons as to why there is a difference in the level of development. Previous research has found that there is a significant impact of the level of socio-economic development with regard to capacity for implementing e-Government in the public service delivery value chains. The chapter explores the contribution of research and innovation in the developed countries with regard to the development of e-Government,

thereby justifying why research and innovation is one of the cardinal components for competitive e-Government development. Further, comparison between certain countries in Asia and their African counterparts is presented to ascertain the contextual nuances influencing e-Government development in these areas.

# ■ The Need for Comparisons

Comparing e-Government penetration among countries in the Global South and Global North is important because it contributes to the understanding of the differences with regard to e-Government development among the different countries in the world. The comparisons should motivate other countries that are significantly lagging behind as far as e-Government development is concerned to put in strategic interventions that should propel their own e-Government development. Because e-Government is an expensive undertaking, it has been posited in many lines-of-thought that countries which are economically sound are more likely to put in place far-reaching interventions in as far as e-Government development is concerned. In order to contribute to this debate, this chapter explores the contextual dimensions of the Global South and the Global North countries in a bid to understand what really influences the differences in the levels of e-Government developments in these different contextual settings. The comparisons are to be taken as a benchmark practice, with levels of development shown by the known e-Government development indices from United Nations Secretariat Department of Economic and Social Affairs (UNDESA).

The Global South is a group of countries that are predominantly found in less developed countries' contexts such as major parts of Asia, Latin America and Africa. Countries in the Global South are generally resource-constrained. On the contrary, the Global North represents countries from environments endowed with adequate resources and is mainly found around the Americas

and Europe. Comparing the level of e-Government development in these two extremes presents a good ground for understanding the factors at the centre of e-Government development at a global level, assuming all other factors are constant. Many studies have been performed worldwide focussing on the contextual differences between the Global North and the Global South. The studies have brought out different understandings of different aspects of socio-economic development. For example, with a view to understand the differences in the quality of life between the Global South and the Global North, Dick and Duchêne-Lacroix (2016) did a comparative study on multi-living in both Global South and Global North countries. The results of the study showed that because of the relatively higher public access to critical socio-economic opportunities and resources, people living in the Global North had a more fulfilling life, especially in the contemporary technological and innovation age. This chapter intends to articulate whether the same can be said of e-Government development.

In order to clearly understand the contemporary trends in e-Government, it is important to track the history in the development of e-Government applications as technology evolves by exploring e-Government evolution over the years. The next section articulates the different stages of evolution that e-Government has undergone given the rapid technological advancements brought about by the short lifecycle of technology, changing governance models in public administrations and the ever-changing expectations of the customers (citizens and businesses).

# ■ E-Government Evolution

Although e-Government is highly multidimensional, it should be posited that public administration and technology (enabler platforms) take centre stage in as far as its success and development is concerned. E-Government transformation is brought about by the changing forces which are mainly around

technology, governance models and customers' preferences (Bannister & Connolly 2014):

> Transformation is about change and when looked at through the lens of public administration may mean an improvement in the service and a perceivable change which brings about significant difference in the ex-ante [*before*] and ex-post [*after*] of the transformed entity. (n.p.)

The expectation of public service transformation in the realm of e-Government is that there will be improved and efficient public service offerings operating at above the minimal expected service quality levels as espoused in the SLAs (Navarra & Cornford 2012):

> Public administration has been passing through different phases over the years from traditional administration styles where individuals need to visit physical offices to access public services through technology platforms (e-Government). E-Government was ushered into being with the emergence of New Public Management (NPM) whose key auspices are based on promoting accountability, effectiveness and efficiency of public administration. The key attributes of NPM were hinged on promoting efficiency, marketization, accountability, decentralization, and reinventing government so that it is more responsive to the needs of the citizens. (n.p.)

The conceptualisation of New Public Management (NPM) saw the aforementioned principles being integrated and implemented in e-Government projects in different contextual settings. Further, NPM has seen a growth in governance innovations and has opened up integration of new conceptualisations such as open data, open government and information integration analysis out of consideration of the concept of big data in the design of e-Government solutions (see Chapter 9).

Incorporation of the principles espoused in the NPM conceptualisation into public service delivery options such as e-Government can be achieved by the utilisation of two management models: These are the NPM Management Model (NPMMM) and the Consultative Model (CM). The NPMMM posits that the role of the state is to provide information and focuses on transactional activities such as tax filing, drivers' licences and for accessing government information. The CM promotes a

limited degree of citizen- and business-state interaction where e-Government is seen as an attempt to link various legacy systems in the governance hierarchy. Further, the CM promotes a limited degree of citizen- and business-state interaction where e-Government is seen as an attempt to link various legacy systems in the governance hierarchy (Bwalya 2017a):

> The type of e-Government design envisaged in this chapter is the Participatory Governance Model which aims to ensure that all citizens/businesses regardless of their social standing participate in the design and implementation of e-Government thereby increasing the representative base in the decision-making processes. (p. 5)

Of late, there has been a feeling that despite the huge contribution of NPM in the transformation agenda of e-Government, NPM is seen as having outlived its usefulness owing to its diminished anticipated impact on overall e-Government. This has been attributed to the changing times in the information environments and landscapes worldwide. 'Therefore, it is important to have adaptive e-Government solutions designed collaboratively which aim to ensure that managerial policies, technology and people are strongly bound together' (Bwalya 2017a). As Dawes, Vidiasova and Parkhimovich stated (2016):

> [*Of*] late, there has been a push towards open government data (OGD) which argues that government information and decision-making processes should be put in the public domain where individuals regardless of their status can access them. The concept of OGD opines that there should be accountability and transparency in public administration. The OGD movement has been faced with considerable technical and social barriers that threaten its wider adoption [*the world over*] towards being a hallmark for open and responsive government enshrined onto the FOI conceptualisation. (n.p.)

Ohemeng and Ofosu-Adarkwa (2015) also stated that:

> [*The open data*] movement is swiping across the world with no reservations to developing world contexts with Ghana joining the bandwagon with the Ghana Open Data Initiative (GODI). At the global level, the Global Open Government Partnership (GOGP) aims to encourage the development and proliferation of multi-stakeholder governance frameworks. On the other hand, national initiatives such as

the GODI aim to advance the principles propagated by GOGP at national level. The GODI aims to re-connect the supply and demand sides of e-Government in Ghana so that they exchange public information. (n.p.)

The rapid growth of e-Government has seen a swiftly increasing use of mobile technologies in e-Government (called mobile government [m-Government]), especially in many of the developing countries' contexts where the mobile penetration rate is higher (Serra et al. 2015). 'With a bid to further link citizens and government and transform their interactions, the concept of Big and Open Linked Data (BOLD) has been conceived' (Janssen & Van den Hoven 2015). Further to big data is the emergence of the IoT and its integration into the different e-Government designs. IoT is increasingly being utilised to design pervasive information systems everywhere and this presents itself as an opportunity that e-Government can explore. The emergence of IoT has enabled new innovations to appear to make our society safer and secure, but at the same time threatening individual privacy (Janssen & Van den Hoven 2015). Owing to increased interaction models in the Web 2.0 environments, e-Government is slowly utilising Web 2.0 platforms as interaction platforms, especially for activities ranging from open policy-making, customer service to collaborative platforms given the new thinking where citizens are included as partners in the governance value chains in the realm of e-Government 2.0 (Sivarajah, Irani & Weerakkody 2015). E-Government 2.0 entails the use of Web 2.0 technologies into the e-Government arena. E-Government 2.0 is more than just a concept, as it has recently been used in the UK Local Government Authority (UKLGA).

Embedding the emerging technology platforms in the e-Government design frameworks and encouraging wider usage among the government workers and citizens requires huge financial investments, expertise and commitments. Other than that, the environment needs to be ready to adopt emerging governance innovations (Joseph 2014):

The first point of call for e-Government implementation is e-Readiness which is the ability of an economy to utilise ICTs in

order to tap into the different opportunities brought about by the new economy. (n.p.)

Talking about more advanced e-Government settings, Eom, Choi and Sung (2016) stated that:

> In advanced e-Government environments, such as South Korea, smart government is now gaining ground. Smartness in the public administration domains entails the enshrinement of creative mix of emerging technologies and the cultivation of an innovation culture which allows timely response to service demands. (n.p.)

The core precedents of smart government are to utilise environmentally-friendly ICT, enhance work productivity, improve employees' work–life balance and to boost the general efficiency of work processes (Eom, Choi & Sung 2016).

In advancing e-Government research, there is a continued call for e-Government researchers and practitioners to collaborate and continue exchanging notes. E-Government 'research has concentrated on two dimensions – technological (inherent features of technology that determine the impacts of introducing it) and social (human choices within different social structures) determinism' (Heeks & Bailur 2007). Given the emerging e-Government platforms, it is important to carefully consider how the emerging dimensions may be embedded into the e-Government innovations. An example of such emerging dimensions is Public Service Platforms (PSPs). Based on NPM, PSPs are a new form of technology platform that support service provision to citizens in an e-Government framework (Ranerup, Henriksen & Hedman 2016).

Given the above, especially with the transformation of e-Government in order to adapt to changing information paradigms and considering the many benefits that come with e-Government implementation, it is important to ensure that ICTs are rightly integrated into the different public service delivery processes. Not doing so does not help the aspiration of many governments' vision for transforming their public sectors so that they become competitive and innovative in this era of the

fourth industrial age. An innovative public service will be better placed to harness the key benefits of an innovative public sector given the Fourth Industrial Revolution (4IR).

# ◼ Global South Versus Global North

Depending on the focus, there are many definitions that have been attributed to the differences between Global North and Global South. Odeh (2010) opines that the Global North comprises basically wealthy countries with appreciable degree of technological advancements and politically, socially and economically stable economies, whereas the Global South is the exact opposite of the Global North and is mostly agrarian-based. A majority of Global South countries have underdeveloped economies, lagging behind in most aspects of human and social development and are mostly dependent on the Global North. With over 58% of the population engaged in agriculture coupled with lower technological capability to produce finished goods, the Global South produces a lot of raw primary goods that have less value until a point they are processed into finished goods. Further, there are low levels of productivity in Global South countries which have been sustained by continued low-quality levels of living and low human development. While considering the human development index (HDI) as the yardstick for measuring levels of poverty, it is found that the Global South in general has higher levels of poverty.

The Global South includes many of the countries in Asia, Africa, Oceania and South America, whereas many of the countries in Europe, North America and Austrasia are considered Global North countries. It is worth mentioning that there are many countries in South America like Chile and Uruguay which belong to the Global South bracket. The current global trend with regard to e-Government shows that there are significant orientations and measures taken by the Global South countries to position themselves towards achieving improved e-Government

implementation. Many stakeholders and countries in this bracket have recognised the fact that positioning themselves towards a stronger digital agenda is important, especially with regard to improving efficiency in the global public service business value chains. The Global North countries are highly networked and are better placed to harness the different global opportunities such as technology and governance innovations other than their counterparts. The next section discusses the concept of network readiness as a tool for measuring the preparedness of a country to harness the different opportunities offered in the global network value chains.

# ◼ The Network Readiness

Network readiness is one of the precursors to any entity's effective participation in the emerging 4IR. As network readiness is associated with the 4IR, a country highly connected in different networks will be able to harness the advantages that come with the 4IR. Understanding the overall degree of development with regard to network readiness is important because it allows a country to assess how connected it is to the global information and knowledge value chains using digital networking channels. The more a country is connected, the more it is ready to access the different digital opportunities that are a fuel to overall national competitiveness.

Since 2001, the Networked Readiness Index (NRI) has been measuring the level of technological revolution globally. Evolving every year, the index now measures ICT penetration into the different socio-economic establishments using 53 indicators. The NRI posits that unique innovations are driven by four pillars:

1. The level of development of digital technologies and business models.
2. The level of adoption of ICTs by businesses to the effect of integrating them into business processes is a lever for competitiveness.

3. The participation of both the private and public sectors in delving and investing into digital technologies can be a driver for social impact.

4. Sustainable digital economies will be shaped by evolving governance frameworks and the ability of the citizens to react and quickly adopt the emerging digital innovations.

In the contemporary governance and information management environments, the level of connectivity has a direct implication on the capability to harness the different opportunities made available by information technologies. In measuring potential for a country to implement e-Government, UNDESA measures network readiness using the NRI model. Each country being assessed for potential e-Government has its NRI computed. The NRI model measures the NRI using three components, each dedicated to measure one aspect of network readiness:

- Environment readiness – checks the different aspects that can influence the degree of readiness in the area in which it is implemented. This aspect revolves around the conduciveness of the economy and/or the organisation which is at the centre in the utilisation of ICTs.
- ICT access readiness – generally assesses how ready an economy and/or organisation is with regard to accessing and using ICTs. This assessment focusses on the availability of requisite ICT infrastructure to support access to relevant information and innovation, and the general readiness of the individuals to use ICT applications.
- Network usage – this is the component of the NRI that assesses the overall capacity of an economy or institution to constructively utilise different forms of ICTs in their day-to-day activities.

The NRI is a comprehensive model that has seen its usage in many studies measuring different aspects of e-readiness and network readiness (Addom 2004; Kashorda et al. 2007; Olatokun & Opesade 2007; Tarvid 2008). Further, the NRI is a hybrid model which utilises both attributes and variables of the qualitative and quantitative research allowing better measurement of the different attributes from different individuals and contextual

settings (Bridges Organization 2005; Dutta & Jain 2004; EIU 2007; Keoduangsine & Robert 2007; Ranjbarzadeh et al. 2013; Saekow & Samson 2011). The NRI further measures the policy attributes analysing the policy stature that can facilitate the integration of ICTs into the different domains of the socio-economic establishment (Kashorda et al. 2007).

There is a strong push by the leading Asian economies, namely, Singapore, Malaysia, South Korea, and Japan, to improve and develop the overall utilisation of ICTs in governance business processes. For example, Malaysia has moved up to the 31st position overall on the UNDESA e-Government assessment list owing to the commitment of the government to the overall digital agenda. Since the 2015 assessment, China, Malaysia, Mongolia, Sri Lanka and Thailand have shown higher levels of e-readiness. It is worth mentioning that the individual usage in the region is generally the lowest in the world, but there are strong signs of improvement in the recent years.

In the Latin American and the Caribbean regions, half of the countries have shown serious commitment to and improvement in the implementation of e-Government. The leader of e-Government development in this region is Chile (38th) and the least developed is Haiti (137th). With regard to network readiness, the absolute NRI score has a continued improvement trend. This means that most countries in this region are transcending towards being connected to the digital and information superhighway, thereby harnessing the different opportunities that come with the digital age. The region has further shown improvements with levels of innovation as a key requirement to the emerging 4IR. A scan of the region further shows that there are deliberate manoeuvres to improve the innovation, legal and regulatory environment so that the countries in the region are ready to be key knowledge and socio-economic players in the digital environment.

The 2016 network readiness shows that in the Arab world, the United Arab Emirates (26th) and Qatar (27th) have continued to

be model leaders in as far as network readiness is concerned (UNDESA 2016). It is worth noting that the MENAP region is home to two of the biggest movers in the 2016 UNDESA rankings – Kuwait, which moved from 72nd to 61st, and Lebanon, which moved 11 places to 88th. The vibrant business environment and willingness to participate in the knowledge economy is putting pressure on the government to up its game in as far as digital adoption in the public services is concerned and generally improves the regulatory environment (Burma 2016):

> The 2016 NRI report anticipates that there will be over 26 billion Internet-connected devices which are Internet-enabled manned by over 4 billion global Internet users and global Internet IP traffic will reach 2.3 zettabytes. (p. 23)

Digital revolution is changing innovation capabilities given the upsurge in registration of patents, and business model innovations show that there is overemphasis on innovation as a source for competitiveness. Despite the push for technology-led innovation, there is evidence that some businesses and many government departments worldwide are still missing out on digital opportunities. That being the case, there is a huge gap between public sector engagement and individual ICT usage.

## ■ Global Technology Projectile

Understanding the development projectile of technologies is important so as to correctly ascertain what potential innovations need to be considered in the design of the different technology platforms. Further, as technology is one of the key enablers of technology, it is important to understand what technology innovations are currently being pursued throughout the world in different contexts. Because of the emerging technology innovations such as big data and fog computing, there is active research worldwide on how these emerging technology platforms can be embedded into the e-Government designs. Many research institutions in the Global North are pursuing high-end technology innovations such as 3-D printing, energy storage and fog and

quantum computing, and are exploring ways as to how these will revitalise the information and knowledge landscapes.

One of the central technology innovations is the emergence of the concept of technology disruption. Disruption is happening across all establishments in the socio-economic hierarchy, and entities that stand a chance to thrive will be those that can easily adopt emerging technology innovations. The potential of disruptive technologies on human lives cannot be overemphasised. It is possible that human beings will continue adjusting to the emerging technologies by acquiring new skills and repositioning themselves so as to remain relevant in the emerging digital age and to take advantage of the best that technologies have to offer. Disruptive technologies open up opportunities for a more inclusive society where citizens are more connected with one another, small and medium enterprises are better able to compete with huge multinationals given their enhanced capabilities owing to their access to and use of emerging technology platforms and solutions, and engagement and interaction capabilities on the part of citizens and businesses are further improved. Another potential and most promising game changer in e-Government platform design and implementation is the 4IR. The fourth industrial age is much more based on knowledge excellence where ubiquitous access to dynamic knowledge bases and processing capabilities is enhanced (Baller, Dutta & Lanvin 2016). Because of the changing needs with regard to technological and managerial competencies, e-Government projects will need careful human resource strategies to attract competent individuals who are able to continuously integrate evolving technology platforms into e-Government designs. Contemporary competencies are going to be the need for agile government systems that are optimistic of impending constant technological revolutions and flexibility in re-engineering business processes to accommodate change.

Manyika et al. (2013) articulate the different advances in technologies that have revitalised the life experiences of humans.

Some of these disruptive technologies have a huge potential to be used in e-Government settings. A few of these technology revolutions are the following:

- Reduction in the cost of acquiring Internet-enabled technologies from a supercomputer costing US$5m in 1975 to about US$400 for a mobile phone which has even better functionalities than the supercomputer had in 1975.
- Increase in autonomous vehicles demonstrating the advances in artificial intelligence.
- Projected 2–3 billion people having access to the Internet increasing the potential of e-Government success.
- Tangible advancement in sequencing of human genomes with a significantly reduced cost and increased efficiency. The advancement of data genomics will enable the analysis of synthetic data patterns as it does in synthetic (DNA) biology in enabling big data and predictive analytics.
- Cloud and fog technology enables the use of dispersed resources over heterogeneous networks as a service.
- Advanced robotics engineering which will culminate in service automation. Robotic machines and programmes can be used at the back-end of e-Government to provide human-like responses, thereby improving the experience of access of services by individual citizens.
- IoT utilising low-cost sensors including actuators for process optimisation to enable informed decision-making.
- Interesting technologies in the pipeline such as wireless charging, once commercialised, will have a huge impact on e-Government given the increasing number of individuals accessing e-Government applications using mobile devices which require sustainable power.
- Increased economic impact in the range of 5–7 trillion US dollars for the automation of knowledge work and more.

## ■ Information and Digital Divides

Digital divide measurements have been used in many developing countries' contexts to measure the level of development of ICT infrastructure, including their access and usage, to understand

the level of access to different digital opportunities. Guttal (2016) posits that although the demarcation between Global North and Global South countries has been drawn using the measurement of the levels of socio-economic, industrial, scientific and political maturity, there have been efforts to measure the differences using the digital and information divide. Many countries in the Global South have generally scored low points on the digital divide and standards of living. Despite this being the case, it can be posited that there have been remarkable positive shifts. Many of the Global South countries, especially Asian and Latin American countries, contribute a great deal of competent manpower to the global workforce, have significantly reduced hunger and poverty, and have improved education systems. Although this is the case, there are still significant divides in the different aspects between the Global South and Global North countries.

Karlsson (2002) has argued that there is a knowledge divide between the Global South and Global North owing to unequal capabilities with regard to generating knowledge from scientific or non-scientific enquiry. Owing to capacity issues, the global knowledge and power gradient are tilted towards the Global North owing to their continued and sustained investment and funding in scientific enquiry. This has generally culminated in visible digital divide which is brought about by the lack of sustained access to technologies and ultimately information ecosystems that may be at the centre of human advancement.

## ■ E-Government Development

Nkohkwo and Islam (2013) investigated the development of e-Government in 49 African countries coming up with a more holistic picture of the penetration of e-Government in sub-Saharan Africa. Their study posited that the recurring themes of factors negatively influencing the growth of e-Government include undeveloped ICT infrastructure, inadequate and incompetent human resources who could be developing context-aware e-Government solutions and strategic frameworks,

underdeveloped legal and regulatory frameworks, and the digital divide and lower levels of connectivity. These factors are further generally classified into IF-POSH (Infrastructural, financial, political, organisational, socio-economic and human).

Some studies have been performed in the Global South, especially in the Asian context, where countries such as South Korea and Singapore have vowed to be among the world leaders in e-Government development. For example, Seo and Mehedi (2016) conducted a study in four Asian countries (Bangladesh, India, Korea and Pakistan) investigating the use of e-Government as an information-sharing platform and a public service delivery platform. The study posited that e-Government is failing to appropriately penetrate the socio-economic establishments owing to lack of adequate and appropriate infrastructure, expensive technology and a limited and generally weak private sector. Among the four countries surveyed, South Korea had a relatively advanced e-Government development having already started the implementation of transformational and connected services.

Comparisons of e-Government development are mostly performed using reference to the UNDESA e-Government studies, especially with special reference to the e-Government development index (EGDI) and the e-Participation index (EPI). The EGDI is a composite weighted index which is based on the normalised values obtained from the measurement of the telecommunications infrastructure index (TII), human capital index (HCI) and the online services index (OSI). The availability of competent human resources who are able to design e-Government solutions given the context is a critical measure of the likelihood for e-Government success. The HCI measures the number of people available in a given organisation and societal context who can be deployed to advance the different aspects of e-Government. The EPI is a supplement index to the EGDI which measures the percentage of the citizens and businesses that are able to access e-Government services and therefore participate in the governance value chains (e.g. policy and decision-making). The EPI is intended to understand the level of

inclusiveness of the citizenry into the available governance platforms. In other words, the EPI measures the level of utilisation of e-Government platforms and solutions by the individual users and businesses and ultimately their level of participation in the governance business value chains. To add value to the comparison performed in the study by Seo and Mehedi (2016), the comparison here is performed using the same measurement metrics but using different years, that is, 2012, 2014 and 2016 to observe the development trend trajectory as shown in Table 2.1.

Table 2.1 and Table 2.3 show that EPI assessment was not performed in 2012, as the EPI was not yet calculated at a global level. Table 2.1 shows that in the Asian context, South Korea has shown a very high level of e-Government development as evinced by having the highest EGDI with a participation index of 1.000 in 2014 and 0.9661 in 2016. The level of e-Government development and competitiveness attained by South Korea is the best in the world, as evidenced in the first five-year global e-Government leadership in the UNDESA e-Government development surveys. Further to the metrics shown in the international surveys, South Korea has a higher DOI which is among the highest in the world. The DOI uses a set of 15 indicators to measure the impact of the efforts towards reducing the digital divide and the achievement of the recommendations of the World Summit on the Information Society (WSIS). Singapore also shows very high levels of e-Government development. Pakistan and Bangladesh are the countries with the least developed e-Government owing to, among others, sustained political and socio-economic instability.

**TABLE 2.1:** E-Government development and e-Participation comparison in the Asian context.

| No. | Country | 2012 | | 2014 | | 2016 | |
|-----|---------|------|-----|------|-----|------|-----|
| | | EGDI | EPI | EGDI | EPI | EGDI | EPI |
| 1 | Pakistan | 0.2823 | – | 0.2580 | 0.3333 | 0.8915 | 0.3729 |
| 2 | Bangladesh | 0.2991 | – | 0.2757 | 0.3922 | 0.3799 | 0.5254 |
| 3 | Korea (South) | 0.9283 | – | 0.9462 | 1.0000 | 0.8915 | 0.9661 |
| 4 | Singapore | 0.8474 | – | 0.9076 | 0.9020 | 0.8828 | 0.9153 |

EPI, e-Participation Index; EGDI, e-Government Development Index.

Another important metric in e-Government measurement is the OSI and the TII which measures the degree of public service implementation at the national level. The OSI measures the number and depth of government services that can be accessed using online platforms. The OSI is a four-stage model which is based on measuring the online presence of government business process according to the stages of '(1) emerging presence, (2) enhanced presence, (3) transactional presence, and (4) connected presence' (Krishnan 2014:16).

As in Table 2.1, Table 2.2 shows that South Korea and Singapore have shown a mature level of e-Government by having scored very high OSI and TII. The scenario in Bangladesh and Pakistan is known. The above statistics are compared with the development of e-Government in four other global contexts in Africa as shown in Table 2.3.

Although e-Government advancement is still relatively very low compared with other regions, some level of development is being witnessed in this regard in the African context. Mauritius is undoubtedly the leader of e-Government development in Africa

**TABLE 2.2:** E-Government online service comparison in the Asian context.

| No. | Country | 2014 | | 2016 | |
|---|---|---|---|---|---|
| | | OSI | TII | OSI | TII |
| 1 | Pakistan | 0.3228 | 0.1174 | 0.3261 | 0.1299 |
| 2 | Bangladesh | 0.3465 | 0.0941 | 0.6232 | 0.1193 |
| 3 | Korea (South) | 0.9764 | 0.9350 | 0.9420 | 0.8530 |
| 4 | Singapore | 0.9921 | 0.9710 | 0.9710 | 0.8414 |

OSI, Online Services Index; TII, Telecommunications Infrastructure Index.

**TABLE 2.3:** E-Government development comparison in the African context.

| No. | Country | 2012 | | 2014 | | 2016 | |
|---|---|---|---|---|---|---|---|
| | | EGDI | EPI | EGDI | EPI | EGDI | EPI |
| 1 | South Africa | 0.4869 | – | 0.4869 | 0.3333 | 0.5546 | 0.5593 |
| 2 | Ghana | 0.3159 | – | 0.3735 | 0.3922 | 0.4181 | 0.4576 |
| 3 | Mauritius | 0.5066 | – | 0.5338 | 0.5294 | 0.6231 | 0.6610 |
| 4 | Uganda | 0.3185 | – | 0.2593 | 0.1373 | 0.3599 | 0.4915 |

EPI, e-Participation Index; EGDI, e-Government Development Index.

having massively invested in competent and appropriate technology platforms and infrastructure. Further, Mauritius enjoys a relatively mature democracy with strong leadership dedicated to empowering the country with a competitive edge. South Africa has also a relatively developed e-Government institution with many of its government services enjoying considerable presence online. Other countries such as Ghana and Uganda are upcoming on the e-Government ladder.

In general, countries in the Global South have many contextual challenges that have delayed the penetration of e-Government. It can thus be posited that because of the sustained problems in the different socio-economic and political culture contours, it is very difficult for most of the Global South countries to engage in meaningful e-Government. Further, many of the Global South countries have deep-rooted leadership problems with pronounced unwillingness to promote the migration of government processes onto the e-Government domain. The Bretton Woods institutions, particularly the World Bank, have understood the need for efficient leadership and robust public administration to lead the socio-economic agenda in the Global South countries. This orientation was to be enshrined into the socio-economic setups emanating from accountable and efficient public services. In order to achieve this goal, the World Bank in cahoots with the International Monetary Fund (IMF) recommended the implementation of structural adjustment programmes (SAPs) in the developing countries. The SAPs were the genesis of change which was perceived to have unwavering potential to transcend and replicate into the other domains of the socio-economic establishments.

# ■ Overcoming e-Government Discrepancies

The potential of the Global South countries in catching up with the Global North countries in terms of e-Government development lies in their ability to heavily invest in different e-Government

strategies and their capacity to overcome the inherent challenges characteristic of e-Government development in the Global North countries. A competent and dynamic innovative culture is one of the key pillars for meaningful and successful e-Government development. Therefore, in this era of digital Darwinism, it is important that government departments keep reinventing their public services in order to remain relevant to the changing expectations and ever-evolving technologies. In order for this to be achieved, there is a need for sound leadership to drive the ever-changing needs for public service transformation.

Another conceptual underpinning that needs to be considered in this context is that Global North countries need to realise that solutions for many challenges they face towards encouraging e-Government lie within themselves. Therefore, instead of over-reliance on technology-driven foreign direct investments (TFDI), the Global South countries should rely on south–south TFDI as a viable source of income to reduce the divide between the Global South and the Global North (Chaminade & Gómez 2016).

# ■ Conclusion

This chapter has articulated the different measurement dimensions that can be considered when investigating the differences between the Global South and Global North countries, 'especially with regards to e-Government' (Bwalya 2013). As e-Government is a multidimensional phenomenon which is especially hinged on technology and the different governance models, this chapter focussed on discussing the evolution of e-Government given the ever-evolving technology platforms. The chapter articulates the different emerging technology dimensions with a view to understand the potential development projectile of e-Government.

The divide between the Global South and Global North will keep on reducing given the emergence of affordable yet very effective and portable technology solutions such as cloud and fog computing. Global North countries need to improve their

overall capacity in taking advantage of the different opportunities offered by the emerging affordable innovative solutions.

## ■ Directions for Research and Practice

With regard to practice, anecdotal evidence suggests that there has been resistance in the integration of technology solutions in the different public service business processes owing to varying reasons, the most striking among them being the unwillingness of the governments to facilitate this change. In many developing countries, governments may go out of their way to make pronouncements of the need to implement e-Government while doing nothing to ensure that the leadership, institutional and legal frameworks are in place to facilitate the implementation of e-Government. In many cases, the fear is that once technology (ICT) is used in the governance business processes, it will be a hindrance for government officials to pursue under-hand deals or that it might jeopardise their jobs.

There are a lot of grey areas that exist as far as e-Government development in the Global South countries is concerned. One of the clear-cut directions should be to delve into the understanding of contemporary and emerging technology platforms and e-Government designs. Such studies could explore the evolution and advancements of different technology platforms and find ways as to how these emerging technologies can be adopted and utilised in the design of e-Government platforms. Another direction would be to examine the funding models that exist for e-Government implementation in the environment in which it is implemented. An example could be exploring the known and unknown crowdfunding models as source of resource capital for the design and implementation of e-Government. Further, another direction could be taking inventory of competencies of the workforce responsible for the design and implementation of e-Government. The outcome of such a research would be the proposal for future human resource competencies in designing future dynamic e-Government models. In short, there are many

research directions that can be explored in e-Government given its multidimensional nature in any context in which it is implemented. In many instances, context is going to define the focus and direction of research.

Given the aforementioned scenario, and considering the continued reduction of cost in acquiring e-Government infrastructure owing to the emergence of affordable options such as cloud computing, it can be posited that e-Government development in the Global South will improve significantly. Therefore, it is okay to posit that by 2050, the Global South would have significantly caught up with the Global North given the many innovations that are being pursued currently in the developing countries (Weber & Bussell 2005).

# Discourse of e-Government Research and Practice in Developing Countries

## ◼ Overview

In order to effectively discuss and debate the different contours of e-Government, it is important that the status of e-Government design and implementation in developing countries be thoroughly understood. This chapter presents a bibliometric study of the leading research and publications in e-Government globally with the key focus on the developing world. The chapter tracks active researchers and innovators focussing on the development of e-Government in Africa and ascertains how their efforts have contributed to the overall body of knowledge and practice of e-Government in Africa. The crux of this chapter is that it is not encouraging that content on

e-Government penetration would be principally generated by researchers outside the continent, with indigenous researchers not doing much. Further, the chapter explores the opportunities brought about by the changing models of e-Government, especially with the emergence of mobile e-Government platforms providing increased adoption and usage opportunities for e-Government given higher mobile penetration rates in Africa.

# ■ Introduction

Although e-Government is relatively nascent in terms of scientific maturity and methodology, a lot of research on its different aspects has been performed. Many researchers from both the developed and developing countries' contexts have been researching extensively on the design and implementation agenda of e-Government. As posited in Chapter 2, many of the Global South countries are lagging behind the Global North in as far as e-Government development is concerned. Although this is the case, the United Nations Development Programme (UNDP) (2012) posits that although developing countries have encountered numerous challenges in implementing e-Government, Ghana, Nigeria and Côte d' Ivoire have made significant progress owing to the robust planning that has been put in place. Further, South Africa and Mauritius have made significant strides in e-Government development.

Using the unconventional bibliometric study approach, this chapter is the result of a systematic review of 82 journal articles, 14 book chapters, and policy documents at national or supranational level, among others. Famous databases such as Emerald,[1] Springer,[2] Elsevier,[3] Ebsco host,[4] ScienceDirect[5] and

1. See http://www.emerald.com.

2. See http://www.springer.com.

3. See https://www.elsevier.com/en-xm.

4. See http://www.ebscohost.com.

5. See http://www.sciencedirect.com.

journals of high repute, specifically focussing on information systems, e-Government and public administration were explored. Some of these journals include Elsevier's *Government Information Quarterly*, Wiley's *International Journal of Information Systems in Developing Countries*, *European Journal of Information Systems* and *Journal of Information Management*. The sources chosen publish research at the frontiers of the knowledge value chains on e-Government and other closely related themes.

The inclusion criteria were based on the methodology (qualitative *v* quantitative) used, focus of the paper, research approach (use of established theory, model or framework), time-dimension (cross-sectional or longitudinal) and potential to contribute to the body of knowledge.

The chapter specifically focusses on the research approaches that have been followed in the period from 1997 to date (2018), bringing out the key research approaches and themes and charting a prognosis of the likely future e-Government research development projectile. The understanding of future research and practice models is important so as to enable governments and co-operating partners to design contemporary e-Government and put in place interventions that will remain relevant in the future. The accomplishment of such a milestone enables saving a lot of money that could have been used for re-engineering e-Government processes. Further, this enables the researchers in the developing countries' contexts to understand the pertinent issues in e-Government design and use them in their different research endeavours and interventions.

# ■ African e-Government Research Development Discourse

As e-Government keeps gaining ground as a scientific field and as one of the key levers for transformation of the public sector towards responsiveness, competitiveness, transparency and accountability, many researchers and practitioners have shown

unwavering interest in e-Government. The result of this heightened interest is that there are many conceptualisations that have been linked to e-Government. In developing e-Government conceptualisations, many researchers have relied on case studies from developed countries' contexts without taking into consideration the fact that contexts differ, and therefore a design that worked in the developed countries' context will not necessarily work in a developing country's context (Sæbø 2012). It is worth mentioning that a majority of research efforts in developing countries is dominated by case studies and conceptual studies that investigate what has already been done and therefore do not necessarily bring out new design concepts to guide future e-Government development in the developing countries (Sæbø 2012).

The current status of e-Government research in Africa can be articulated by exploring the different research studies that have been performed, while simultaneously keeping an eye on research done by indigenous African researchers. Aladwani (2016) investigated the impact of corruption on e-Government development. It is evident that corruption in the procurement processes of e-Government contributes to 'ultimate failure of e-Government projects' (Bwalya & Mutula 2015) as presence of massive corruption culminates in compromised designs. In another study, Kettani and Mahidi (2009) analysed e-Government development in North Africa and articulated the transformational trajectory that e-Government has attained. This research aimed to investigate the status of penetration of e-Government and its prospects. The results of the study showed that there is no national or supranational entity guiding e-Government development in Morocco. Using a systematic literature search, Wahid (2012) provided an inventory of e-Government research in developing countries between 2005 and 2010, thereby articulating the gaps in e-Government research and future research gaps. Understanding the current landscape in research and practice is important to articulate the emerging themes in e-Government research. In an attempt to collectively understand the different concepts used in

e-Government circles, Shahin and Finger (2008) investigated the differences between democratic governance and institutional governance and found that the two are strikingly different and that they use different principles and conceptual underpinnings. Sæbø (2012) investigated the current status of e-Government development in Tanzania and formed perspectives on the future e-Government development projectile. Using a multi-stage data collection exercise, data were collected from the ministries, departments and agencies of the Tanzanian government regarding the initiatives and status of ICT integration 'into the different government business processes' (Sæbø 2012). Despite the promise of Sæbø's study, the analysis criteria were neither discussed nor presented rendering it very difficult to judge the quality of the research that was performed. Ifinedo and Singh (2011) investigated e-Government maturity in transition economies of Central and Eastern Europe (TEECE) with a focus on comparing e-Government development in the European Union (EU) context with that in the developing countries' context.

Other than the above studies, there are yet more studies focussing on different aspects of 'e-Government design and implementation in Africa' (Mkude & Wimmer 2015). Using content and link analysis, Onyancha (2007) investigated the presence of African e-Government websites online. The overall conclusion of the study was that although Africa was lagging behind the developed countries in e-Government development, there were indications that this was going to change in the long-term as most of them had shown major improvements. Wheeler (2003) investigated the penetration of the information society in Egypt analysing interventions that were put in place and found out that most of the attempts benefited only the well off. In another study, Goldkuhl (2012) conducted an exploratory study that came up with a conceptual framework aimed at guiding e-Government research. Vissser and Twinomurinzi (2009) using an interpretive approach investigated the e-Government penetration in South African public service and found that e-Government was not generally linked to the public service delivery mandate.

Many other e-Government studies have used the UNDESA global e-Government survey to understand the level of e-Government in a given context. For example, Adeyemo (2011) investigated the development of e-Government in Nigeria with the key focus on the UNDESA e-Government surveys. In another study, Nkohkwo and Islam (2013) investigated the inherent challenges impacting on e-Government development in sub-Saharan Africa. This study was done using comprehensive review and analysis of 75 articles and documents from 49 sub-Saharan African countries concentrating on 'infrastructural, financial, political, [organisational], socio-economic and human (IF-POSH)' (Nkohkwo & Islam 2013). Using a transcendental theory, the grounded theory methodology, Matavire et al. (2010:n.p.) investigated the challenges influencing 'slow development of e-Government in the [flagship Western Cape] e-Government [implementation]'. The challenges unearthed went a long way in repositioning e-Government implementation in South Africa. Heeks (2003) posits that the failure of many of the e-Government programmes can be attributed to design–reality gaps emanating from lack of careful consideration of the local contextual characteristics.

The above research studies have principally focussed on the opportunities and positive aspects of e-Government development. Other researchers in the developing countries have focussed on the negative implications of e-Government implementation. Such research has exposed the downsides of e-Government which are rarely pursued in traditional e-Government research. For example, the aphorism of 'competitive e-Government' has also culminated in many negativities such as growth of cybercrime in large cities, namely, Johannesburg, Cairo, Nairobi, Lagos, etc. For example, cybercrime accounted for the looting of more than US$4m from some commercial banks in Zambia in 2013. Among the two extreme approaches in e-Government enquiry, there are also many key similarities. For example, the factors influencing adoption are one and the same. A bibliometric analysis of a majority of e-Government research shows the following as the key areas in

e-Government enquiry: policy studies focussing on 'policy design [and] effects, design studies [focussing on] design [policies and] effects, [effect] evaluation, [e-Government design and effects, etc.]' (Goldkuhl 2012:7). Goldkuhl (2012) recognises the three key areas of e-Government research as policy, design and effects. Effects comprise implementation, monitoring and evaluation of e-Government interventions and projects. The different research themes that have been perceived by different researchers emanate from the three key areas articulated above.

Judging by the number of articles published in e-Government research in the developing countries, India was found to be the leading country in e-Government research (Wahid 2013). The research showed that a lot of progress has been made in as far as e-Government is concerned in the developing countries. Although this is the case, it is evident that many of the papers in e-Government have been found to have limited or no theoretical and conceptual grounding. Many of the papers reported used the interpretive research paradigm in their study design.

## ■ African e-Government Development Cases

This section intends to critically present the different cases of e-Government development in Africa. These cases enable us to delve right into the contextual nuances and contours of e-Government development.

Using thematic and critical narrative analysis, Ruhode (2016) investigated the evolution of e-Government in Zimbabwe. Zimbabwe presented a good case of e-Government development in a politically polarised environment where the economy had almost come to a veritable meltdown, and governance institutions and processes were in a state of disarray. In Zimbabwe, e-Government was a good challenge to implement because of limited competent human resources owing to human capital flight resulting from massive emigration to greener pastures. The policy framework was not developed to any appreciable extent owing to political instability. Ruhode (2016) has provided a

critical analysis of e-Government development from the analysis of the policy infrastructure in Zimbabwe geared towards encouragement of effective e-Government development. Zimbabwe's e-Government backbone was the 'Visionary Strategic Plan of the Ministry of ICT' (Ruhode 2016:4) which was implemented in conjunction with the 2006 National ICT Policy Framework. The strategic plan was hinged onto the Ministry of ICT so that the encouragement of ICT penetration into the different government business processes and the society in general is spearheaded by the ministry. The ICT policy framework recognised the potential of technology as one of the key enablers of national development. With the implementation of the Short-term Emergency Recovery Plan (STERP) penned by the inclusive government of 2015, e-Government was recognised as one of the key vehicles for achieving increased efficiencies and accountability in the public sector. One of the perceived weaknesses in Zimbabwe's e-Government approach is the over-reliance on technology as a key factor for e-Government implementation.

With the advancement of mobile phones as not only voice and SMS communication devices (Mtingwi & Van Belle 2012) but as full-fledged mobile computation and information processing devices, mobile phones present themselves as excellent e-Government platforms. In order to take full advantage of e-Government service applications, the Malawi health sector has developed requisite applications such as VillageReach, RapidSMS and the FrontlineSMS (Mtingwi & Van Belle 2012). SMS has been used extensively in providing up-to-date market information pertaining to different aspects of agriculture throughout the world (Islam & Grönlund 2007). For example, Esoko is an SMS application extensively used in Ghana and Tanzania to obtain market information on agriculture. Further, the banking sector has developed requisite mobile applications for citizens and businesses to pervasively access banking services. Some of these applications include *Banki Mmanja* [banking at your fingertips], *Bank Ponseponse* [ubiquitous banking] and M0626. The mobile applications in the banking sector are in the pilot phase.

Many e-Government practitioners have posited the need to have open data and open government (see Chapter 9) as the contemporary key pillars of progressive e-Government. The implementation of e-Government culminates in the posting of critical information online towards opening up of government data (UNPAN 2002). The making available of government data on public platforms through open government data unleashes a lot of opportunities on the governance front. Opening up data involves re-orientation of information production, with a view to wipe away public bureaucracy. However, Weinstein and Goldstein (2012) have argued that bringing open data and open government together under the same banner can impede the overall progress of e-Government projects. There has been a lot of interest in open data and open government research emanating from successful implementation of these concepts by the Obama administration. The Kenya Open Data Initiative (KODI) is one of the African pioneers in promoting global access of public data by the general citizens. On the contrary, the Kenya Open Government Partnership places the government at the centre of efforts promoting accountability and transparency of government resources. Within this establishment, open data is considered as a partner and precursor to open government. The KODI was launched by Mwai Kibaki in 2011 and was driven by the desire to harness public service innovation, ingenuity, creativity and government modernisation. The initiative is spearheaded by a multi-spectra approach where the private sector and local citizen empowerment organisations have been integrated into the design and implementation of the initiative. Some of these organisations include Uwezo and Twaweza and 'Code for Kenya'.

In many parts of Africa, most of the e-Government projects have failed to live up to expectations. Lupilya and Jung (2015) investigated the challenges and opportunities of e-Government as a lever for government transformation in Tanzania. The study found that although there is undeniably higher commitment to e-Government from government leaders, there are still glaring challenges that need to be addressed. Some of these challenges include reluctance towards accountability and transparency by a

majority of government workers, an avalanche of technology solutions with no careful strategic orientation on how to appropriately and logically integrate them into the different public service business processes, and an illusion of innovation and technological misadventure yielding increased corruption in government and a reluctance to accept the desired rapid government transformation agenda. In the case of Tanzania, it was evident that there is a need for e-Government leadership to embrace the planning, coordination, optimisation and integration of IT/ICT infrastructure projects to achieve the desired levels of government transformation spearheaded by e-Government implementation. Using the qualitative and quantitative methodologies as complementary to each other, Lupilya and Jung (2015) examined the current status of e-Government development in Tanzania. The understanding of the current status is provided by analysing the different indices mostly from the UNDESA surveys. Understanding the status is also made possible by utilising the Technology Enactment Theory (TET). The use of TET enables Lupilya and Jung (2015) to identify three factors that are cardinal to the advancement of e-Government in the Tanzanian context. These factors revolve around institutional, technological and individual competencies.

In order to avert the challenges and implementation roadblocks, it is important to have clear strategic frameworks that are going to guide e-Government development informed by the context. Many researchers have investigated the planning aspects of e-Government implementation and have posited that e-Government implementation involves many aspects which in most cases are not foreseen. These unforeseen aspects can be dealt with by having a clearly defined strategy conceptualised right at the design stage of e-Government. Realising the importance of e-Government strategy in integrating technologies into the different public business processes, Mugambi (2011) investigated the role of e-Government strategy in Kenya. The study found that strategy is important in providing the right direction in the implementation of e-Government given the

unique contextual settings. E-Government implementation in Uganda has shown that it is important to think big but start small with regard to e-Government development. Using a phased approach, e-Government in Uganda was started using the DistrictNet e-Governance programme as a pilot programme, and it was understood that this programme was going to dovetail into the national e-Governance programme.

Mtingwi and Van Bellee (2012) investigated m-Government readiness in Malawi and found that Malawi is generally ready to embrace mobile technologies in its public business processes so as to leapfrog e-Government. The implementation of e-Government in Malawi was to advance the socio-economic development which has been espoused within nine themes: agriculture, tourism, transport and communications infrastructure, health, postal services, banking, education and e-Commerce. In investigating the readiness for implementing mobile government in Malawi, Mtingwi and Van Belle (2012) utilised a post-positivist philosophical approach hinged on qualitative research orientation. The research was organised using the technology, organisation and environment (TOE) theoretical underpinning. Thakur and Singh (2013) utilised the Prossler–Krimmer model to examine the technological, political, legislative and societal perspectives of e-Government development in South Africa. Although there are some challenges with regard to the different perspectives of e-Government, there are clear indications that there are glaring opportunities to explore with regard to e-Government development.

In assessing the level of development of e-Government in any African environment, it is important to ask the 10 key questions that e-Government leaders need to ask. Analysing these questions may enable the identification of key research themes that need to be pursued in contemporary e-Government design:

1. Why is e-Government being pursued? – There is a need to understand the key purpose of e-Government in the space of public service transformation where technology is used as a key enabler.

2. Why is realising its full potential not easy? – Harnessing the full potential of e-Government enables a coordinated approach in the different efforts in the implementation of e-Government. The cost incurred in realising e-Government growth is substantial and therefore a careful and not-rushed design is needed to avert the cost mistakes of design mismatch. Warning: computer reform – introducing computers and technologies to existing public service business processes (i.e. simply automating old business processes) is not e-Government. E-Government entails re-engineering business processes to accommodate new SLA requirements and to be as scalable as possible to continuously accommodate rapidly evolving technologies.

3. Is there a need for the definition of a clear vision and priorities for e-Government? – Depending on the context in which it is implemented, e-Government may mean different things. In any e-Government implementation, there is a need to define the vision and priority areas and to articulate how e-Government fits into the overall public service delivery framework, as societies have different needs.

4. Why consider political will as a force for e-Government success? – Successful e-Government needs to have well-established political will and leadership to enable the overall support and guidance in the development projectile of e-Government projects. This may include finding locations where e-Leaders are emerging and giving them a platform to showcase their competencies. These e-Leaders also need to be competent enough to integrate evolving technology themes into e-Government.

5. Why question the selection criteria or process of e-Government projects? – When considering e-Government projects, it is important to pick the right projects according to the need at a particular point in time. If a small project is successful at the early stages of e-Government implementation, it may act as a very authoritative example for other e-Government projects to come. Appropriate selection processes may involve identification of those parts of the public sector which are struggling a lot and then implementing e-Government to showcase its power in revitalising and transforming public

sector delivery. The selection criteria of e-Government involve ensuring that the goals of e-Government match the available technology, and vice versa.

6. What should go into the planning and management of e-Government projects? – This involves rigorous planning and establishing of management controls when designing and implementing e-Government. This may involve establishing of teams to monitor different aspects of e-Government and ensuring quality control measures and work plans throughout the design and implementation stages of e-Government.

7. What measures will be put in place to overcome resistance from within or outside the government? – In many environments where e-Government has failed, government employees have tended to resist the introduction of technology. In any 'context where e-Government is implemented' (Bwalya 2011:5), there is a need to understand what factors are likely to influence resistance. One of the key factors cited is their fear of being obsolete in the public sector value chains. In overcoming resistance, employee anxiety and ensuring that there is 'buy-in', there is a need to come up with interventions that promote inclusion in the e-Government value chains. These measures are not prescriptive but vary from place to place.

8. What are the different ways of measuring progress towards successful e-Government implementation? – Because of the significant amount of resources involved (human resources, financial, information, etc.), accountability is very important. Setting the overall criteria for measuring performance of e-Government against the SLAs and referring to benchmarks is important to check the progress of e-Government implementation. In order to promote confidence in e-Government, it is important to plan and publicise any gains of e-Government.

9. Why enshrine e-Government development onto stronger partnerships with different stakeholders, especially the private sector? – The private sector brings in different attributes such as expertise and financial support for competitive e-Government design and development. It is a requirement that the different stakeholders be treated as partners in the advancement of e-Government.

10. What are the different ways in which e-Government can improve citizen participation and inclusiveness in public affairs? – During any e-Government implementation agenda, encouraging, organising and managing participation is critical for development. Thus, before the actual design and implementation, it is important to ensure that the factors that are likely to stifle participation are dealt with right at the outset.

Although the developing countries have not significantly contributed to the development of e-Government knowledge, there are indications that this situation may change in the future. Promising contributions are being made by researchers from developing countries towards the body of knowledge on e-Government. Wahid (2012) reviewed 108 papers published during the period from 2005 to 2010 and found an increased push towards investigating different e-Government phenomena using the interpretive paradigm and increased use of theories. Further, there is an increased use of action research and longitudinal studies.

# ■ Global Advancement in e-Government Design and Implementation

Of late, there have been numerous advancements in e-Government design and implementation in different contextual settings (Hussein et al. 2007; Islam & Grönlund 2010; Kahani 2005; Kettani et al. 2008). For example, e-Government has been designed to support the electronic data interchange (EDI), 'Web service delivery, virtual reality, [voice recognition], and key public infrastructure' (Anjoga, Nyeko & Kituyi 2017:2). For example, e-Government is used in many socio-economic avenues including the health sector. La Placa, McNaught and Knight (2013) considered the different contours surrounding the concepts of well-being and health in social science which is vital to understanding the behavioural aspects in e-Government research.

Health is a state of well-being and should not be considered merely as the absence of disease. Well-being can be extended to e-Government to refer to the different intergenerational and interpersonal relationships, access to information on economic and social resources, and ubiquitous access to e-Government resources. When appropriately conceptualised and designed, e-Government can be used in many different aspects of the socio-economic infrastructure.

Global e-Government models have now embraced the emerging dynamic and pervasive information management models. In exploring dynamic and robust e-Government applications, researchers need to explore responsive measurement approaches for the different metrics used in the assessment of e-Government development. Contextual challenges which usually delay e-Government development, such as limited 'ICT infrastructure, human resources', underdeveloped legal frameworks, connectivity and 'Internet access, digital divide, etc.' (Scholl et al. 2016:253), need to be carefully considered (Rakhmanov 2009).

# ■ Methodological Grounding of Africa's e-Government Research

Although e-Government is not a mature scientific field, Wahid (2012) opined that there has been sustained growth in the number of publications and interest from researchers in this field. This has culminated in several publication outlets dedicated to e-Government research and practice. Because of its nature, e-Government falls under multiple fields, namely, 'information systems, public administration, political science, [social sciences, etc.]' (Ruhode 2016:2; Heeks & Bailur 2007).

Although the methodological nuances of a true case study have not been followed in many instances, many e-Government researchers have utilised the case study approach (Wahid 2012). The survey approach has also been extensively utilised in e-Government research. In terms of data collection, interviews

and questionnaires were the most common tools utilised in gathering e-Government data. Other methods such as reflections on project experiences, document analysis of baseline data and web content analysis were famous data collection methods. Of late, methodological triangulation is gaining ground in data collection methodologies.

In terms of topical focus of the papers surveyed, a majority of them have explored e-Service research, and the second popular topic has been investigating issues surrounding the success or failure of e-Government applications (Wahid 2012). Among the papers surveyed, e-Society was found to be the least researched area. The papers reviewed showed that only 2.8% applied the critical approach and action research methodology which would be critical for the deeper understanding of the different characteristics and contextual settings of e-Government. Many African countries are busy overcoming the inefficiencies produced in the public governance business processes brought about by the fragmentation of policy and socio-economic establishment.

A key finding from Wahid's (2012) work is that many of the e-Government researchers have not paid attention to research epistemology or philosophies grounding their research. The limited philosophical grounding in e-Government research has contributed a great deal to e-Government not developing at a faster rate in as far as positioning itself as a science is concerned. The limited theory in e-Government has made it very difficult for e-Government researchers to talk with one voice and use similar approaches in investigating e-Government from multiple vantage points. Lack of well-defined theory culminates in reduced chances for the accumulation of knowledge and is therefore translated into a delay in development and recognition of e-Government as a field of scientific enquiry. Wahid (2013) posits that future e-Government researchers need to concentrate on solidifying the research paradigm and methodology, integrating more of longitudinal studies and

utilising more theory given the part of e-Government being investigated.

Many of the research studies explored above have shown that e-Government basically lacks theory or clear methodological paradigms. It is important for e-Government research to consider the different basic theories and paradigms in the design of their research studies. For example, researchers need to understand the basic research paradigms as follows: In the positivist research paradigm, the researcher objectively measures phenomena generating tangible evidence of formal prepositions and hypothesis testing in a bid to increase the predictive capacity of a phenomenon. The interpretative research is geared towards understanding phenomena by analysing meanings assigned to them by people. Critical research aims to provide critiques of the social phenomena which have been constituted by history and by people. Critical research aims to explore the oppositions and contradictions in the contemporary economy. Understanding these paradigms and integrating them in their research projects is critical towards the advancement of e-Government as a scientific field of study.

## ◼ E-Government Research Domains

It is evident that e-Government research has mostly focussed on meso- and micro-levels when pursuing research, namely, impact of e-Government, e-Government development (design and implementation), forms of public management and others. At the macro-level, e-Government research should concentrate on investigating the role of e-Government in facilitating government reform and ICT-enabled institutions.

Many e-Government studies have focussed on investigating the optimistic and pessimistic views of e-Government and understanding the impact of e-Government by focussing on institutional factors, organisational re-arrangements and user reactions, among others (Kanat & Özkan 2009; Kunstelj &

Vintar 2004). Further, a lot of e-Government researchers have carried out exploratory studies investigating the progress made in the implementation of e-Government. For example, using document and thematic analysis, Munyoka and Maharaj (2016) have examined Zambia's progress in e-Government implementation.

A sizeable amount of research has been dedicated to understanding the platforms utilised in the display and access of e-Government projects. For example, many studies have focussed on usability aspect of e-Government platforms. Anjoga et al. (2017) investigated e-Government from the usability point-of-view and developed a framework that can be used for managing usability aspects of e-Government in developing countries. Usability is the overall degree of satisfaction that a user experiences upon using e-Government platforms. The overemphasis on e-Government usability is to ensure that citizens and businesses do not find it a problem to access e-Government applications and information content culminating in improved efficiencies in the government business processes. In the case of Africa, only a few studies have investigated actual e-Government implementation, especially with regard to achieving higher usability; as a result, there are no authoritative frameworks or models that can be used to guide the design and implementation of e-Government usability. Questions on usability demand that e-Government must be designed in such a way that it accommodates people who would normally not access available e-Government applications. This can be achieved by having alternative delivery channels and processes for e-Government.

Any research into e-Government usability should consider aspects of one of the following user requirement directions:

1. Functionality – the matching of the services to particular user groups.
2. Technical dimensions of the e-Government access platform, for example, security – any information of the users should not in any way disadvantage the e-Government user.

3. Reliability – the user needs to be convinced that a given e-Government system will work as expected, meet the anticipated functional requirements, remain available and also satisfy the time requirements. One of the key characteristics of a good system is its predictable behaviour to such an extent that the 'user should not be surprised by the way the system reacts' (Anjoga et al. 2017:4).

4. Multilingualism – users, as they are engaging with e-Government platforms, should be given an opportunity to choose the language they are more comfortable with, by ensuring that e-Government content is presented in all the major languages spoken in a given location.

Exploratory e-Government research brings out indicators of the aspect of e-Government being studied. Such studies are indicative and are not meant to be generalised. Exploratory studies in e-Government have mostly concentrated on understanding the status of e-Government implementation and a few on the reasons why there is usually low penetration and 'adoption of e-Government in [many] government [business processes]' (Ebrahim 2011). Yıldız (2013) followed an exploratory study approach to answer the big questions surrounding the research directions in e-Government. This was done so as to understand the current status of the field and as to where it is headed. The answering of the big questions also enabled the understanding of the emergent topics and issues in e-Government. Yildiz (2013) posits that the analysis of e-Government takes off from the public administration perspective. The answering of the big questions in any given situation is cardinal with regard to its definition as a scientific field unlike only considering the available data generated from the empirical research and the methodologies employed. Yildiz (2013) considers that exploring the big questions of e-Government research is a way for opening up the research agenda of the field.

Answering the big questions unlocks embedded research questions in any given context. Any scientific enquiry needs to delve deeper into the understanding of the origin of reasoning

given the subject matter under enquiry. For example, while investigating e-Government from the academic periphery of a public administration perspective, it is important to explore the fundamental focus of public administration literature, namely, PPPs, politics–administration dichotomy, political economy, transparency and accountability, public financing, citizen inclusiveness, outsourcing, etc.; an e-Government researcher will then extrapolate the issues in public administration to e-Government.

Yildiz (2013) articulates the factual limitations of the explanatory power of most of e-Government research. Some of the limitations include:

1. Definitional vagueness and the propensity of e-Government research to focus on outcomes rather than processes pertaining to e-Government processes.
2. Many of the e-Government studies and outcomes have view-blurring myths which are under-theorised. For example, many of the e-Government studies are exploratory in nature, focussing on understanding interventions put in place for improving e-Government and thus significantly lacking adequate explanatory power.
3. Most e-Government research has normative stance on many instances being investigated.
4. In its multidisciplinary nature, e-Government research is a quasi-autonomous field emanating from public administration and information systems.

Analysing 74 research papers focussing on e-Government, Yildiz (2013) found that a significant portion of e-Government research has been in the form of empirical, multidisciplinary and collaborative studies investigating an aspect of e-Government. Papers focussing on the EU showed that many of the studies focussed on collaboration models among different stakeholders, namely, between government and the research community, evaluation models for e-Government services, design and implementation of cross-border interoperability, the need for designing citizen-centric e-Government services, and demand-

based e-Government services. Other themes emanating from the research papers surveyed include e-Participation, trust in e-Government, democratic processes, intersectional relationships, value of ICT investments and interoperability of government services (Joia 2006).

This chapter uses the top-down and deductive approach where the widely investigated themes and largely explored questions are presented as a list for the research community and practitioners to provide input. In the empirical research conducted, the following are some of the big questions that contemporary e-Government research has to explore:

1. What are the different ways to better connect and ground e-Government studies in mainstream public administration research and practice? – the genesis and motivation of e-Government is public administration, specifically the desire to have improved and efficient administration in the public business processes. Given that this is the case, the intellectual base of e-Government should be the administrative core of governance. It is thus worth mentioning that e-Government should be connected and grounded in public administration values and research. The consideration of technology as a key enabler of e-Government demonstrates the fact that technology is simply a component of the wider public administration. Therefore, e-Government is a lever for achieving the desired public administration in any given context. The understanding of the key motivation for the design of e-Government lies in the desire for improved public business processes and services. It therefore goes without saying that contemporary e-Government design and implementation should shift the focus from the 'e' to the 'government' which is anchored by e-Government.
2. How can e-Government be positioned so that it is more oriented towards multidisciplinary nature and comparative studies? – fragmentation of e-Government research has culminated in duplicated and low-quality research owing to lack of communication among researchers. Contemporary e-Government needs to encompass higher levels of

coordination among researchers and between researchers and practitioners culminating in high levels of multidisciplinary orientation. The European Group of Public Administration (EGPA) has been advocating for multidisciplinary, empirical and comparative research on e-Government to articulate the advances in e-Government research.

3. What are the best ways of measuring and evaluating e-Government performance and results? – many researchers have evaluated the performance of different e-Government projects. A multiplicity of methods are utilised, with varying orientations. The evaluation of organisational, social and financial benefits and risks, and technical aspects (functional and non-functional characteristics) is cardinal to articulating the anticipated performance and benefits of e-Government to stakeholders. There is an urgent need to develop robust evaluation ways and metrics in measuring e-Government success and public value using multidisciplinary and multi-method approaches. Previous research in e-Government has shown that there is little empirical research aiming at testing key claims of e-Government. Further, there is generally lack of indicators that would be used for measuring transformation towards integrated and networked government. Most e-Government measurements are basically benchmarks which may not necessarily measure the actual status of e-Government development. The general lack of metrics makes e-Government evaluation subjective and therefore it is subject to human interpretation.

4. What are the correct ways of producing 'novel and more usable concepts, models and theories in e-Government' (Bwalya & Mutula 2015)? – there is abundant criticism of e-Government research as being intellectually immature to produce its own usable concepts, models and theories. Much of the central literature in e-Government has been produced in the form of 'grey literature' by consultancy firms, international organisations such as UNDESA, think tanks and government benchmark studies, leaving the academia out of the knowledge value systems. It is therefore vitally important that e-Government researchers jumped on the bandwagon as e-Government knowledge producers. The e-Government research is generally susceptible to limited theory which presents itself as a multifaceted problem

limiting effective communication between e-Government researchers and practitioners.

Investigating the different e-Government models, Goldkuhl (2012) posited that e-Government research comprises three notions of policy, design and effects, and these emphasise the need for a comprehensive framework for e-Government research. Wahid (2013) posits that e-Government research is basically focussed on three key research categories, as shown in Figure 3.1.

In order to understand the constructs espoused in Figure 3.1, it is important to explore each of them in the realm of e-Government design. It is worth noting from the onset that there are no clear-cut boundaries between these categories and that any category is not mutually exclusive. A description of the three research directions is given below:

1. Technocentric or online service delivery – the design is informed by the technology dimension to achieve the desired e-Government benefits. This category focusses on e-Services and online information provision together with full electronic case handling.
2. Government-centric/organisational change – the design strongly focusses on achieving the goals of the government and/or the organisational unit implementing e-Government. This category recognises the fact that technology on its own cannot provide a conducive environment for large-scale
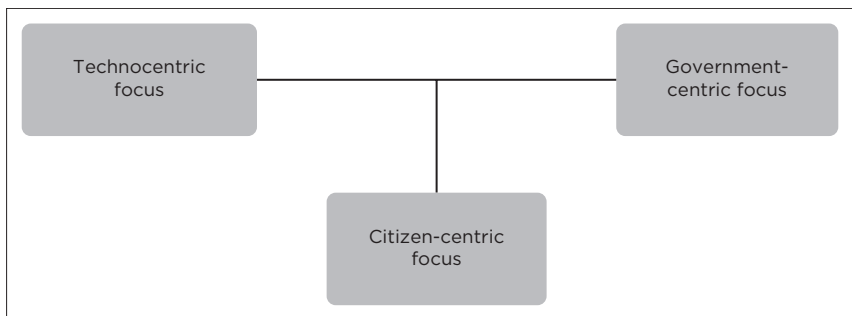


**FIGURE 3.1:** E-Government research focus.

amassing of e-Government benefits if there is no dedicated organisational change.

3. Citizen-centric/better government – the design focusses on the aspiration of the citizens towards ubiquitous access of government information and services. In this category, for instance, e-Government design is focussed on putting in place appropriate policies, rules and regulations that will help go a long way in protecting citizens' information by providing requisite privacy domains.

Knowledge frameworks are the intellectual and scholarly foundation of any robust e-Government research which links research to the overall scientific community. Frameworks present themselves as a test bed and act as a knowledge genesis for a scientific study. Frameworks articulate logical thinking in a research (Hedström & Grönlund 2008). In understanding the different knowledge frameworks commonly used in e-Government, Heeks and Bailur (2007) categorise the following as the most common ones:

1. Theory-based – in this category, research design and execution is hinged on an explicit, well-established theory such as innovation theory, structuration theory or institutional theory (Heeks & Stanforth 2007; Jones & Karsten 2008).
2. Schema-based – at the centre of schema-based research is the use of schemas of techniques or a technical architecture of e-Government.
3. Concept-based – driven by an established concept such as usability or governance as a key reference in the design of e-Government research and practice.
4. Framework-based – a known framework from an established theoretical work such as technology enactment framework (TEF) is used as the reference for the design of the e-Government research.
5. Model-based – the research is informed by a known model from a deep knowledge framework such as TAM to establish the measurement constructs that the study is interested in (Hamner & Qazi 2009). In some cases, the model may be adapted to suit the local contextual characteristics.
6. Category-based – research studies are informed by a set of categories or list of factors.

Many researchers have identified the different research themes that are commonly pursued in e-Government research (Nishantha et al. 2009; Orlikowski & Baroudi 1991; Ouyang 2005; Peters, Janssen & Van Engers 2004; Wahid 2013). According to Wahid (2013), the following are some of the research themes actively pursued in e-Government:

1. Design and implementation – these studies focus on the different design principles for the e-Government applications and solutions. They also use the technology development frameworks and IT artefacts as enablers of e-Government such as e-Health, e-Voting, e-Government interoperability framework, knowledge-based decision support system, e-Participation framework and the different strategies and principles for successful design and implementation of e-Government.
2. Adoption – studies in this domain have focussed on determinants and processes of adoption of technology in the provision and access of public services and information. Studies focussing on determinants looked at internal (government) and external (citizen) perspectives so as to ultimately understand the factors that influence e-Government adoption. Some of these factors include trust and citizen technical readiness (such as computer self-efficacy, ease of use and perceived usefulness). Adoption happens at both the institutional level and individual level. Adoption at institutional level is studied using e-Government stage models, institutional theory, TET, etc. At the individual level, adoption is examined using TAMs, for example, the 'technology acceptance model (TAM), [the] unified theory of acceptance and use of [a] technology (UTAUT), [etc.]' (Kabir et al. 2015:117).
3. Impact – these studies focus on understanding the overall and specific impact of e-Government in the different socio-economic establishments. Most papers in this category on developing frameworks or instruments for assessing impact and others assess impact of e-Government in real contextual settings using longitudinal research designs. Other papers have focussed on assessing the level of impact of e-Government in a defined context. For example, studies have been designed in such a way that they investigate the impact of e-Government

from different perspectives such as economic, stakeholders, social, educational, taxpayers, and government agencies (on transparency, accountability, efficiency, etc.).

4. Evaluation – many e-Government researchers have focussed on investigating the success or failure of e-Government initiatives. Different perspectives such as organisational, technical and social aspects have been used to evaluate the design and implementation of e-Government. An example of technical evaluation includes analysis of website design or level of interoperability and integration of e-Government systems.

5. Context – research in this group has concentrated on understanding the contextual issues that impact on e-Government development. The key thesis obtained from the papers in this group accentuates the need to consider contextual outlay when designing e-Government solutions. Any place in which e-Government is being implemented may have unique technical capabilities given current IT infrastructure, organisation context (political leadership, citizens' computer self-efficacy, IT skills, etc.) and social context.

In understanding the gaps in e-Government research, Wahid (2013) categorised the papers analysed under the themes of (1) design/implementation, (2) adoption, (3) impact, (4) evaluation and (5) context (organisational and social). The research themes were mapped against their research paradigms (methodological standpoints). Further, the research focus was mapped against the research paradigm (interpretivist, positivist and critical). The empirical domains articulate the main themes of e-Government research. Table 3.1 shows some of the key themes of contemporary e-Government research.

Understanding what e-Government entails is very important in order to have the correct design modules of e-Government and thereby avoid its ultimate failure. Heeks (2001) has presented the following three domain modules of e-Government, namely, e-Administration (public administration done on online platforms), e-Services (public service provision

**TABLE 3.1:** Themes in e-Government research.

| Main theme | Sub-theme | Description |
| --- | --- | --- |
| Design and implementation | IT artefacts | Tangible developments in the e-Government domain such as the development of technology platforms for e-Voting and e-Health |
| | IT development frameworks | Development of conceptual frameworks that are cardinal for design and development of effective e-Government solutions, for example, interoperability and e-Participation frameworks |
| Adoption | Processes | Investigating level of adoption using various concepts/models (e.g. stage models) |
| | Determinants | Aim to identify key factors influencing adoption of e-Government (trust, technical readiness of the citizens, ease of use, perceived usefulness) |
| | Problems | Examining organisational readiness and citizen participation as antecedents to effective adoption |
| Impact | Assessments | Come up with correct ways of measuring impact in a real contextual setting |
| | Constructs | There is an urgent need to come up with constructs that should be used to measure impact |
| | Frameworks | Develop a robust instrument that can be used to measure impact |
| Evaluation | Success/failure factors | In any given context, identify factors negatively impacting on e-Government development |
| | Technical | Evaluate the technical dimensions of e-Government (e.g. assess website design and usability) |
| | Social | Evaluate deployment of e-Government in a social contextual setting (e.g. in agricultural sector) |
| | Organisation | Evaluate the integration of e-Government at an organisational level |
| Context | Challenges/barriers | Identification of the challenges or barriers connected 'to the contextual [setup] in which e-Government [is] implemented' (Ashaye 2014). These can include limited human resources, underdeveloped ICT infrastructure, low ICT skills, etc. |
| | Opportunities and prospects | Identification of contextual promises related to e-Government implementation |
| | Technical issues and resources | Understanding the technical and resource requirements for e-Government implementation |
| | Organisational and institutional issues | Identifying key organisational issues that may impact on e-Government development (e.g. inter-organisational collaboration and political leadership) |

*Source:* Adapted from Wahid 2013.

using online interaction platforms) and e-Society (using technologies towards sustainable connections and interactions within the city).

Given the above, there is an urgent need to carry out studies to understand how e-Government infrastructure can be leveraged to narrow the gap between the rich and the poor. The leveraging of e-Government as a tool for narrowing the said gap is important in the case of South Africa as it is considered as one of the most unequal societies in the world (Thakur & Singh 2013).

# ■ Participation in the Global Information Value Chains

Because of the many e-Government projects that have failed or tended to fail, a lot of e-Government researchers have tried to understand what factors are at the centre of success or failure of e-Government implementation. Van Reijswoud and de Jager (2009) posit that the success of e-Government depends on the degree to which technology has been embedded into the different existing government business processes. In this regard, Uganda implemented the DistrictNet e-Governance programme to ensure that e-Government was firmly embedded into the government business processes at the local level. The failure of e-Government projects culminates in citizens and businesses in a given context not participating in the information society and thereby missing out on harnessing the different opportunities brought about by the information society. As posited above, in order to avert failure of e-Government projects, there is a need to 'understand the contextual and [general] challenges that may impact on e-Government [development]' (Bwalya 2011:213). Nkohkwo and Islam (2013) grouped e-Government challenges into:

• socio-economic aspects (corruption, poverty, illiteracy and culture)
• political aspects (leadership, administrative reforms, legal frameworks, data privacy and standards, and regulatory issues)

- organisational aspects (top management support, recruitment of personnel, change management, organisational information management, transparency and internal efficiency)
- financial aspects (Internet cost, financial constraints and cost infrastructure).

These challenges in different aspects of e-Government need to be addressed if e-Government is to succeed and not miss out on harnessing the anticipated benefits of the global information value chains.

Avgerou and Madon (2005) examined the upcoming information society and its obvious threat – the digital divide. Meaningful achievement towards effective e-Government can be realised by first addressing the needs of the information society. Many countries in the developing countries have been left out from the information society principally because of underdeveloped ICT infrastructure and low ICT skills.

# ■ Conclusion

It is clear from the foregoing that there are a lot of grey areas that need to be explored in e-Government research. In the context of developing countries, e-Service delivery has been dominating e-Government research. In the developed countries, there are focussed and specific themes such as intelligent IT, data privacy, trust and information quality which aid in pursuing advanced variants of e-Government. On the contrary, the developing countries are still grappling with basic issues in the design and implementation of e-Government. The focus of e-Government in the developing and developed countries' contexts is different given the different contextual setting, where the former is geared towards putting in place interactive e-Government designs and the latter is preoccupied with designing basic e-Government applications whose impact is geared towards reducing corruption, poverty, etc.

Although there has been increasing focus on public administration principles on e-Government, the role of technology in the development of e-Government as a whole cannot

be ignored. Meyaki (2010) looks at technology as an excellent enabler for e-Government and further posits that the composition of a successful e-Government is 20% technology and 80% people. Getao (2012) postulates that the key issues that define access to e-Government implementation dwell on the agency's separation of powers between the front and back offices, and the SLAs, such as levels of quality and standardisation, especially with reference to the use of e-Government. As a *quid pro quo* for e-Government development, governments expect that citizens will effectively utilise ICTs in their interactions with government entities, and citizens in return expect that utilisation of e-Government platforms will culminate in a more accountable, transparent and efficient public service.

## ■ Directions for Research and Practice

There are a lot of issues that still need dedicated research enquiry for e-Government to appropriately develop in the context of the developing countries. Some of the key directions are articulated below.

In the future, e-Government will take diverse research directions given the ever-evolving technology platforms and requirements of the consumers. With regard to the design and implementation, there are clear indications that the future will demand the incorporation of context as one of the key determinants of the form of e-Government design. The contextual characteristics can be made known by involving end-users and stakeholders to determine local readiness. Pertaining to the implementation, e-Government needs to focus on the evaluation of the design in achieving the anticipated implementation aspirations. Wahid (2013) reports that future research agenda of e-Government should be hinged onto requisite conceptual, methodological and empirical domains. With the conceptual domain, most previous e-Government studies were not adequately theoretically grounded (Heeks & Bailur 2007). There is a need for e-Government to explore theories utilised in different

fields that have been constantly utilised in research. With regard to the methodological domain, there is a need for e-Government researchers to pay more attention to the different research paradigms. Given the multidisciplinary nature of e-Government, researchers need to consider other methodological perspectives and research paradigms from other fields.

Adoption is one of the key research themes of e-Government which will continue to take centre stage in e-Government for some time. Given the context in which e-Government is implemented, investigating the adoption process (decision-making, resource mobilisation, strategy formation, etc.) is a very good indicator for the penetration and usage of e-Government. Future e-Government research needs to encourage the use of interpretive research paradigms to address the how, why and what questions with regard to adoption of e-Government solutions in different patterns around the developing countries' contexts. Further, there is a need to synthesise studies on adoption so as to collate the different lessons from different contextual settings on adoption.

Because of the emerging popularity of e-Government in the developing countries' contexts, it becomes very difficult for one to explore issues surrounding citizen participation, citizen-oriented-ness, government service quality and democracy without bringing into the equation the question of technology or e-Government. Therefore, future research needs to delve into the technology nuances of e-Government, especially looking at suitability and adaptability to the developing countries' contexts. E-Government research needs to propel proactive design and implementation by further investigating the different cost models that need to be explored to develop sustainable e-Government applications.

In the near future, there will be increased attention on contextual nuances surrounding organisational and social contextual issues. Studies will focus on determining the conditions that make some contextual issues more important in the realm of

e-Government design and implementation than the others. Impact studies in e-Government will concentrate on theorising the impact of e-Government implementation by considering tangibility, measurability and magnitude. As many of the contemporary e-Government evaluation techniques are reliant on a technocentric approach, future research will focus on designing comprehensive evaluation techniques and aim to integrate evaluation with the design and implementation phase.

# Decolonisation of e-Government in Africa

## ■ Overview

Of late, there have been dedicated efforts from both the public and private sector for African researchers to develop content informed by the local contextual settings to contribute to the global afro-indigenous knowledge value chains. Just as territories were ruled by colonial powers bringing with them their way of thinking, afro-knowledge systems have been colonised and largely ignored in the human development agendas. Knowledge colonialisation has led to ignoring Africa's rich knowledge which has been collated from contextual experiences over the years. As a result, many interventions intended to solve several problems on the African continent have been informed by solutions from the Global North and therefore can't appropriately solve the different problems. This chapter discusses how knowledge decolonisation can be achieved in the realm of e-Government research.

# ■ Introduction

The author's experience in leading consultancies and research on e-Government for over a decade has shown that there is generally a dearth of information and knowledge with regard to e-Government design, implementation, adoption and usage in resource-constrained countries generated from developing countries' contexts such as those in Africa, Asia and Latin America. Researchers and practitioners find it very difficult to find up-to-date information on different dimensions of e-Government design and implementation generated from a developing country's context. Many research efforts and publications have been performed by international organisations or researchers from outside Africa focussing on developing countries' contexts. Further, a majority of e-Government research or studies conducted on Africa have been led by researchers and experts who may not be well-versed with the contextual nuances of Africa. As a result, many of the publications emanating from such studies and research reports generally lack depth and mostly suffer from contextual mismatches.

This chapter aims to provide content that will ignite interest in e-Government researchers and practitioners to pursue evidence-based research and practice in e-Government in Africa. The main thesis of this chapter is that there are a lot of research opportunities for researchers and practitioners interested in e-Government design and implementation to explore in Africa and take advantage of in as far as positioning themselves as pioneers of e-Government knowledge generation in Africa is concerned.

# ■ Knowledge Disruption

From time immemorial, human beings from different parts of the world have deliberately advocated for agendas bordering on domination of the human being towards given ways of thinking and cultural and socio-economic domains. This thinking orientation has led to limited indigenous knowledge models at

the centre of innovation agendas. Within the confines of systemic orientation and manoeuvres by a majority of world powers affecting the quotidian dimension of life of the global population, coloniality of power, Euro-centrism and capitalism were greatly pursued and encouraged. The deliberate obstruction of indigenous knowledge development has deprived local communities of opportunities to develop their own thinking styles, knowledge and solutions to their everyday problems informed by the local contextual characteristics. Using the aforesaid deliberate policies biased towards dominating other human beings, the colonial powers ensured that the thinking models of the local people were tailored towards only approved models. The suppressing of local knowledge models was one of the powerful weapons used worldwide to advance social, cultural, political and economic colonisation. The said endogenous agendas of mankind are now seriously being contested using the movement 'decolonial turn' motivated by the resolve to fight the social ills, namely, imperialism, racism, colonialism and apartheid. Grosfoguel (2007:211) posits that the epistemic decolonial turn aims to 'epistemologically transcend, decolonise the western canon and epistemology [sic]'.

Efforts to contest the minority but widely referenced knowledge value chains and methodologies have been on the agenda of researchers and practitioners for a very long time (over four decades). The motivation to contest the colonial value systems in human behaviour, democracy, socio-cultural dispensation, economic models and thinking models, among others, was accentuated by liberation stalwarts in Africa, namely, Thomas Sankara, Steve Biko Kwame Nkrumah and Anta Diop, who had desired to put an end to African cultural dilution. This group of individuals understood that colonialism was used as a reprieve to socially and economically differentiate the Global South from the Global North countries (see Chapter 2). The contestation of the monopolistic knowledge orientation is termed knowledge decolonisation. Within the realm of research, decolonisation is poised to discourage over-reliance on Western

and Eurocentric knowledge value chains. Chapter 3 has shown that e-Government researchers have continued relying on the west for knowledge on e-Government conceptualisations, design heuristics and principles, and implementation lessons. The problem with this approach is that the contexts significantly differ, and therefore, the knowledge domains and lessons generated in the Global North may be significantly different from the one generated in the Global South. With most research delving towards the need to consider context, decolonisation of e-Government research is more than desired so as to design e-Government solutions informed by the local contextual settings.

For a long time, there has been over-belief that western knowledge and methodologies (qualitative, quantitative and triangulation) are the most authoritative ways upon which research should be hinged. Contemporary thinking demands that there is a need to disrupt this universalism by pursuing alternative knowledge value chains as the basis for effective research. In the e-Government domain, these alternatives may include participatory action research and feminist research methodologies. The movement towards decolonisation of research approach is not geared towards ignoring or replacing the western and Eurocentric knowledge value chains; instead, they should be used as basis and reference for the consolidation of indigenous knowledge value systems and methodologies to inform the design and conducting of research (Mbembe 2015). Knowledge disruption, in this regard, demands that there should be a shift from the status-quo where thinking and knowledge models are only those from the Western world.

Recognising that there is no epistemic tradition which has the absolute correct way of obtaining the truth or conducting research, it is important to encourage alternative knowledge value chains and thinking models so as to promote and facilitate conducive environment in which innovation in the realm of e-Government can thrive. African e-Government researchers need to encourage the reference of Africanity as a start-point of

objectivity unlike the current over-reliance on Western and Eurocentric knowledge value chains which should not be considered as absolute universalism given the contextual uniqueness of the African technology and governance landscape. Agreeing with Adesina (2008), who postulates the idea of endogeneity according to Archie Mafeje, knowledge generation grounded in African governance experiences and African contextual setup should drive the knowledge generation agenda in the realm of e-Government.

Over-reliance on Western and Eurocentric knowledge domains which are hegemonic translates into subjecting African researchers' thinking and level of innovation to the mercy of western knowledge and way of life and subjecting the reasoning trends to one possible rationality. In the highly dynamic world in which we live, contemporary knowledge systems should not be mutually exclusive but collectively exhaustive encompassing all the possible knowledge conceptualisations and thinking models. E-Government researchers are strongly advised to design their research studies using the African standpoint informed by the contextual outlay of the African intellectual landscape. Inclusion of endogenic knowledge systems is a kaleidoscope for future competitiveness.

# ■ Conceptualising Decolonisation

Decolonisation is a reflective, intentional and carefully crafted self-examination by previously colonised people in a bid to claim back what was taken away from them as a result of colonialisation so that the future post-colonialism is informed by indigenous culture and knowledge systems (Gone 2011). Further, decolonisation has simply been defined as the process of re-establishing that which was eroded from a given socio-economic and cultural civilisation as a result of colonisation (Williams & Mumtaz 2007). Decolonisation promotes the proliferation of exogenous knowledge rather than indigenous knowledge systems (IKS). Many researchers have defined indigenous knowledge differently; therefore, there is no

global definition or conceptualisation of what indigenous knowledge entails. Many of the different definitions concur that indigenous knowledge is local knowledge that has been generated or conceptualised from a given location and is unique to a given contextual setting. Knowledge colonisation ignores local knowledge and thinking models while promoting knowledge developed in a foreign contextual setting.

In the last five years, there has been serious debate within South African universities on the topic of decolonisation which was ignited by students' desire to have the university curriculum decolonised to include more local content. The desired decolonisation in Africa should focus on methodology (design and implementation), approaches and processes for conducting research, and the making available of e-Government information and knowledge generated from African contextual setting(s). Shizha (2013) posits that colonial education was problematic, disruptive and hegemonic in that it did not integrate African thinking models, cultural practices or IKS into the education systems. The ultimate result of the colonial education system was that local knowledge value systems were not developed substantially. Realising this void, African researchers and knowledge practitioners are now busy devising strategies and ways in which IKS can be developed and included into the different learning value chains.

Recognition and reference of African knowledge value chains in contemporary fields of enquiry is desired so as to come up with scientific innovation hinged on historical and contemporary socio-economic and cultural fibre of the African continent. African knowledge systems date back to 1440 AD when the Oyo kingdom in Yoruba nation (Nigeria) and the Benin kingdom existed in tandem with:

- Chinese Huángdinate (in existence since 200 BC)
- Islamic Caliphate (6th century)
- Holy Roman Empire (1500 AD)

- Ottoman Sultanate in Anatoli
- Tsardom of Russia and the like, which were the centre(s) of great history and civilisation.

The existence of African knowledge frameworks way back in the 14th century, when all major regions were developing their knowledge systems, and the present disappearance of African knowledge systems is a cause for concern. It is evident that colonial powers had propelled the development of their own knowledge systems and way of life towards integration and adoption into the regions that they conquered. Coloniality brought with it an invisible hand that ensured that the desired power structure articulating norms and locus operandi kept revolving around the countries that were colonised way after colonialism had ended (Maldonado-Torres 2005). It is worth mentioning that colonial power structures were designed in such a way that the Global North maintained their superiority over the Global South and that colonised countries entirely depended on the former colonial masters. Such strategic orientations ensured that African knowledge systems could not be developed to a much appreciable extent. The existence of African knowledge systems and civilisation demonstrates the fact that Africa knowledge systems need to be integrated into contemporary scientific enquiry on projects focussing on Africa.

In any given setup, decolonisation of knowledge is a double-edged process which considers two steps informed by the following overall conceptual underpinning:

1. De-construction of the existing popular methodologies and methods that are at the forefront of producing and facilitating the coloniality of knowledge (Ndlovu-Gatsheni 2013b). De-construction involves careful analysis of the existing research approaches, processes and methodologies and careful consideration of the geo-politics of knowledge production (methodologies are the theoretical or conceptual principles that underpin a research, whereas methods entail the actual conduct or execution of a research study).

2. Reconstruction and/or reinvention of the research process. Given the identified knowledge value chains informed by the local contextual settings, reconstruction of knowledge entails utilisation of alternative knowledge or methodologies in the execution of a research study.

# ■ Coloniality

The understanding of the concept of coloniality is the first step towards the understanding of decolonisation. There are basically two types of colonialism: the first one involved conquering of the physical spaces where colonial masters would physically be present in a given geographical site to take control of the socio-economic resources of the area and be in command of the political culture; the second one is a contemporary trend which involves the colonisation of the mind using different disciplines, namely, science, education and law (Le Grange 2016). Coloniality exposes the African population to Eurocentric indoctrination which is poised to patronise knowledge stereotypes and values emanating from the continent and universalise Eurocentric knowledge value chains.

In many instances, coloniality has been referred to as the dark side of modernity (Mignolo 2007; Ndlovu-Gatsheni 2013a). Further, coloniality is closely associated with making it difficult for the advancement of humanity because it cages human beings in a web of homogeneous knowledge value chains that have been chosen by the colonial masters, thereby stifling innovation and competitiveness. Coloniality allows a single knowledge system to be the basis of reasoning, facilitating single worldviews on majority of issues that can be explored.

# ■ Decolonising Research

It is not a hidden fact that much of the e-Government literature is from the Global North based on the advancement of the implementation of e-Government practice by a majority of

developed countries. Researchers in the Global North have written extensively on the advancement and evolution of e-Government from the many e-Government projects that have been implemented (Bwalya 2011). Although this is the case, this is not to posit that researchers in the developing countries have nothing to write about with regard to e-Government implementation in Africa.

Nkohkwo and Islam (2013) have argued that there is a knowledge divide between the Global South and Global North owing to unequal capabilities with regard to generating knowledge from scientific or non-scientific enquiry. Because of capacity issues, the global knowledge and power gradient are tilted towards the Global North owing to their continued and sustained investment and funding in scientific enquiry. This has generally culminated in visible digital divide which is brought about by the lack of sustained access to technologies and ultimately information ecosystems which may be at the centre of human advancement. E-Government researchers in Africa are called upon to tell a story of e-Government implementation from their own environment with reference to the Global North – only then shall the different voices be collated to contribute towards enhanced contribution to the e-Government body of knowledge.

## ■ Decolonisation of Research Methodology

In the case of South Africa, which, through the apartheid system, was bent on the oppression of black people and people of colour, many knowledge value chains and epistemologies are still affected by the oppressive apartheid resume. Most South African universities are still embroidered into the web of western worldviews on many issues surrounding humanity, culminating in suppressed alternative thinking models and innovations (Heleta 2016). This stance on knowledge production and worldview is still dominating the curriculum in institutions of learning throughout South Africa and trickles down to the research methodologies pursued by researchers produced by such a learning system.

Single-world-view research methodologies are more prone to logistical, epistemic, factual and contextual inconsistencies which render research done obsolete. Such single-world-view conceptualised methodologies may culminate in biased research results when utilised in e-Government research which is multidimensional. Heeks and Bailur (2007) posited that e-Government theoretical base and methodological status is thin, and therefore, it is still premature for e-Government to be considered as an established scientific field of enquiry. Therefore, in this regard, there is a need for decolonisation of research methodologies in African e-Government research. Decolonisation of research methodology(ies) and approach(es) allows e-Government researchers in universities to be open-minded and allows progressive ideas on the advancement of e-Government.

A call for decolonisation of the curriculum in African universities started around the 1960s. Decolonisation of the tertiary education system in Kenya was consolidated by Ngugi wa Thiong'o's *Decolonising the Mind: The Politics of Language in African Literature* (Wa Thiong'o 1986; Garuba 2015), focussing on relevance of the education system to the current and future situation of the country and the continent at large. Sustainable decolonisation of the curriculum emanates from the decolonisation of the research and knowledge generation processes informed by local contextual settings.

# ■ Decolonisation and African Knowledge Landscapes

Evans (2012) articulates the efforts that led to decolonisation in Africa, with special focus on Southern Africa. As stated above, decolonisation aims to address the question of western knowledge hegemony and bring parity in terms of reference and utilisation of alternative knowledge value domains (Keane, Khupe & Seehawer 2017). In most research conducted in Africa, there is

an inherent paradox where thinking and design of research projects is hinged on western knowledge systems. The over-dependence on western knowledge, especially on issues of scientific validity, has culminated in diluting the potential to include local and indigenous knowledge research in African setups.

Oelofsen (2015) posits that African philosophy needs to be hinged on fostering the decolonising of the African mind and the way of doing things, as well as enshrining confidence in the citizenry that locally bred knowledge can be competitive and far-reaching. The reasoning is that meaningful decolonisation emanates from the decolonisation of the intellectual landscape to such an extent that philosophies and thinking will be rooted in African culture and socio-economic establishment. Further, African philosophies need to uproot the intellectual inferiority complexes that germinated during the period of colonial oppression which were solidified using strategic and deliberate policies to promote Western knowledge and thinking models. The colonisation of the mind translates into African intellectuals lacking adequate levels of confidence and self-esteem to lead strategic knowledge generation agenda, especially relying on indigenous knowledge value chains. Oelofsen (2015) further contends that for Africa to be an active partner to the rest of the world in knowledge generation, there is the need to overcome the superiority and inferiority paradoxes that have dominated the African intellectual landscape for a long time. Further, African IKS need to be collated and recognised as knowledge assets that will go a long way in repositioning the place of the African content as a knowledge producer at the world stage.

Le Grange (2016) has posited that as universities are one of the biggest entities in the production of knowledge in Africa, any attempt to encourage research in any given context needs to start from the decolonisation of the university curriculum. A decolonised and robust curriculum is going to put in place a breeding ground of knowledge and a conducive environment that facilitates free and open thinking with well-integrated

local knowledge. It can therefore be posited that decolonisation is desired at all levels of the society in order for Africa to be competitive in all spheres of the socio-economic establishment such as education and the society at large (Tuck & Yang 2012).

# ■ Decolonising e-Government Knowledge Value Chains

Decolonisation of knowledge production in e-Government in Africa is desired at the different levels of abstraction. The following represent some of the specific e-Government domains presented in the realm of the type of decolonisation desired at that particular level:

1. E-Government design and assessment methodology – The scarcity of literature on e-Government design and implementation in developing countries' contexts points to the fact that e-Government researchers from the Global South have not generated adequate body of indigenous knowledge to contribute to the wide body of knowledge of e-Government.
2. Theory and models – E-Government has continued its over-dependence on other disciplines with regard to theory. As the majority of e-Government in Africa involves adoption studies which are hinged on technology or human beings, e-Government research has borrowed theories extensively 'from computer science, information systems, public administration, [sociology], and [psychology]' (Ku, Gil-Garcia & Zhang 2016). This state of affairs causes e-Government to be continuously referred to as an emerging field of enquiry. In consideration of the local contextual characteristics, e-Government should aim to conceptualise its own models and theory, and African researchers are well-poised to contribute to this cause. The generation of own theoretical concepts and models by e-Government researchers will have a long-lasting positive impact on knowledge colonisation.
3. E-Government practice – Because of a highly colonised knowledge landscape with regard to Africa's e-Government indigenous knowledge, there is limited home-grown knowledge

which can be used in the design and implementation of e-Government in Africa's contextual setups. The overall impact of such a scenario is that the development of e-Government in Africa is dwarfed.

Further to the above, with the effect of colonialism in implementing the Weberian (traditional) model of governance in many of the cases coupled with the underdeveloped IKS, there is no critical mass of lessons to form a substantial body of literature for e-Government in Africa.

Because of colonialism which did not generally dedicate resources and commitment to the utilisation of technologies in public service delivery platforms, many e-Government efforts in Africa are underdeveloped. The genesis of public administration in Africa can be traced back to the 1900s and spearheaded by the colonial administration and was generally based on the Weberian model (Inyang 2008). The Weberian model employed public officials, mostly on a permanent basis, to enforce the policies given to them by the powers that be, and was associated with bureaucracy and red tape which are rightly recognised as enemies of an efficient and transparent public service delivery. The criticism generated by scholars on the Weberian model led to the NPM conceptualisation.

Many African countries have improved the capacity of their public administration to include e-Government modules owing to the SAPs which were initiated in the 1960s. During the last 30 years, African countries have followed transformation of the public sector after a series of engagements with the Bretton Woods institutions and other cooperating partners. The engagements have emphasised the need to recognise the changing role of public sector given the contemporary information-intensive environments. Many of the African countries have transcended from agrarian to industrial economies and finally positioned themselves towards being knowledge economies. After the SAPs which strategized to enforce cost reduction and containment measures, the second wave of

transformation was geared to address underdeveloped institutional capacity and weak human resource capacity which were identified as the root-cause of inefficient public service delivery (Burke 2012). The third wave was the NPM-induced reform which was hinged on aggressive improvement towards a competitive public service delivery.

The transformational phases articulated above have generally culminated in informatisation of the public service delivery which is a basis for rapid adoption of heterogeneous technology platforms. The use of technologies in public service delivery has culminated in easier access, storage and communication of the different positions of government.

# ■ E-Government Research in Africa

In general, e-Government research was introduced by practitioners who wanted to understand the different contextual and global issues attributed to 'e-Government design and implementation' (Mkude & Wimmer 2015). The research community and academia in general jumped onto the bandwagon once the shape of the field started showing. In the contemporary research environment and setup, researchers and academics are expected to be at the forefront of knowledge generation. Further, as early as 2007, Heeks and Bailur (2007:258) had already observed that e-Government research was 'playing fast and loose with generalisations' and peddled ideas of the need to pursue research informed by the contextual setting in which e-Government is earmarked to be implemented. Burke (2012) has indicated that the need for exploring e-Government given the local contextual setting cannot be overemphasised, especially in the African context where there is generally very low knowledge production on e-Government.

As it is a multidisciplinary phenomenon, e-Government has attracted research interest from a variety of researchers, principally from information systems, computer science, political

science and public administration. Scholl (2007:29) has posited that 'class of integrative interdisciplinary sciences addressing evolving clusters of research problems systematically underserved and understudied within the boundaries of established disciplines' (Scholl 2007:29).

Khan et al. (2011) posited that there is a need for e-Government researchers to come to the party and pursue a lot of research done from peripheral regional local contexts so as to further e-Government discourses from the developing countries' contexts. African researchers cannot be left out from this party. Failure to generate e-Government body of knowledge from the developing countries' contexts may culminate in a dichotomy of centre-periphery logic ignoring the potential knowledge that could have been generated had different aspects of e-Government been investigated in different locations. The analysis of e-Government development executed in different contextual settings may lead to pointers on how unique contextual settings may influence the development of e-Government.

From the mid-1990s, when terms such as electronic government, digital government, government online started appearing in literature, there has so far been increased body of knowledge that is being produced every year on e-Government design and implementation. Given its interdisciplinary nature, many researchers are encouraged to investigate one aspect or another of e-Government. With the constant maturing of the field, there are now a variety of avenues and outlets where e-Government research can be disseminated. On the journal front, the *Government Information Quarterly*, the *Electronic Journal of Information Systems in Developing Countries*, the *Electronic Library*, the *Electronic Journal of e-Government (EJEG)*, *Records Management Journal* and the *Information Systems Journal* produce a lot of e-Government research in Africa. Authoritative international conference journals include the *International Federation for Information Process* (IFIP EGOV conference, ICEGOV conference, a dedicated e-Government

track which is normally included in the Hawaii International Conference on Systems Sciences [HICSS e-Gov]) among others. The existence of diverse fields of research dissemination avenues and outlets points to the fact that there is an extensive amount of research on e-Government being generated around the world.

In this study, in order to understand the status of e-Government research in Africa, an extensive literature review was conducted. The focus of this review was to identify researchers contributing knowledge on issues surrounding e-Government development in Africa. The search was also aimed at identifying analytical studies that have examined the status of e-Government development in Africa. The search focus was peer-reviewed journal outlets, especially those with established databases such as Elsevier, Emerald and Scorpus, and peer-reviewed conference proceedings. This search did not specifically consider any timeframe to the search so that as many search results as possible are extracted. In order to leave out any research, online publications and published documents were explored. Unfortunately, this extensive search yielded no significant results accentuating the fact that there is a dearth of information on the status of e-Government development in Africa. The key limitation of this search is that papers published in languages other than English were excluded from this research. The exclusion of papers in other languages other than English may have culminated in leaving out important research on e-Government development in Africa.

Khan et al. (2011) posited that African research is poorly represented online. Much of the e-Government research focussing on Africa and found in international databases and in other retrieval systems may be a tip of the proverbial iceberg. The dearth of information on e-Government research in Africa has been substantiated in various scientometric and bibliometric studies that have been conducted. For example, out of 450 relevant e-Government papers that were published between 2000 and 2009, less than 1% focussed on e-Government

development in Africa (Schlichter & Kraemmergaard 2010). In another study, out of 145 articles published in mainstream e-Government journals, only 11% were found to contain content on e-Government development in Africa (Khan et al. 2011). Much of e-Government research on Africa has used the meso unit of analysis, focussing on changes and transformation of the public service brought about by e-Government implementation and how this transformation is impacting on the public service agenda. On the contrary, research at the macro-level which focusses on investigating the impact of the implementation of e-Government on the economy in African setups is almost non-existent.

Realising that there was a dearth of information on e-Government development in Africa, Misuraca (2007) did a study in different countries of Africa to understand the status of development and the contextual characteristics in Africa that has generally slowed the penetration of e-Government in the different socio-economic establishments. Burke (2012) analysed the status of e-Government research in Africa performed over a decade. This exploratory research was done through a content analysis of 50 papers from the Scorpus database with analysis focussing on e-Government research and publications on the subject. The analysis gave an indication of the status of scholarly research and generally e-Government knowledge production from the African standpoint. Guma (2013) investigated the e-Government development trajectory articulating the move away from a rusty and inefficient public service machinery known for its unresponsiveness and high operational cost to one that is efficient and cost-effective, using Uganda as a case study.

Within the cadre of e-Government researchers focussing on Africa, many of the active researchers are from outside the continent. For example, Richard Heeks from the University of Manchester, United Kingdom, Christopher Reddick from the University of San Antonio, United States of America, and Gianluca Misuraca who is one of the lead researchers of the EU Data

Governance programme have done a lot of high-impact work on e-Government in Africa. There are still other overseas researchers who have done significant work on e-Government in Africa. This is not to posit that African researchers have not done impactful work – there are a number of researchers on the continent who are doing quite well in as far as generating knowledge on e-Government is concerned. It is worth mentioning that although overseas researchers generate a lot of knowledge on Africa's e-Government development projectile, many of them will always have a bias (consciously or unconsciously) as they engage in this type of research.

Nkohkwo and Islam (2013) did a systematic review of the initiatives and implementation of e-Government projects in Africa from 2001 to 2012. This review was done in all the 49 countries of sub-Saharan Africa (SSA). This research showed that some of the key challenges in e-Government development in Africa included limited appropriate ICT infrastructure, lack of requisite legal frameworks, limited supply of competent human resource base, generally expensive Internet access, higher levels of the digital divide and connectivity difficulties. In most of the SSA countries, lack of appropriate human resources and generally underdeveloped ICT infrastructure are the two main bottlenecks for successful e-Government implementation. To understand the different key dimensions of e-Government development in Africa, Nkohkwo and Islam (2013) mention that the different e-Government themes can be grouped into six well-thought themes, namely, (1) infrastructural, (2) financial, (3) political, (4) organisational, (5) socio-economic and (6) human (IF-POSH).

With reference to the UN global readiness survey, Asogwa (2011) surveyed a list of African countries with regard to their e-Government usage. Many governments in Africa have been implementing e-Government to such an extent that there should be enough practice and experience to generate enough e-Government

knowledge and experience from the African context. The study showed that even though many African governments have shown willingness to actively use ICTs, there is lack of sustainability in the resolve for e-Government implementation as some websites go for long periods of time without being updated. Because of technology and ICT infrastructure which has dominated research in Africa's e-Government discourses, researchers from information systems, computer and information sciences have dominated e-Government research and contribution to the e-Government body of knowledge. In other parts of the world, there has been equally extensive e-Government research done from the lens of public administration, political sciences and development management disciplines (Heeks & Bailur 2007). Contemporary robust research has demanded that e-Government take a multidisciplinary and collaborative research between or among different research domains.

As articulated in Chapter 3, the main themes of e-Government include e-Services, e-Participation, digital democracy, accountability, programme evaluation, policy analysis, technology innovation, e-Government design and e-Government strategy formation. The e-Government field is evolving at a very fast rate requiring the integration of new knowledge value systems as fast as possible. Although e-Government is a relatively new field, there are so many research papers that are produced every year drawing us closer to maturity. Despite this being the case, it is now common knowledge that the theoretical ground of e-Government research is still not significantly developed preventing the growth of e-Government from being a field of enquiry and science. Therefore, e-Government researchers need to actively contribute content given their contextual settings to advance the recognition of e-Government as a field of science.

The placing in the public domain and sharing of experiences in e-Government design and implementation given the local

context is important to advance the e-Government agenda in Africa so that experiences are translated into best practice given the African context. This sharing of experiences will contribute to the formation of the knowledge critical mass which will go a long way in reducing the number of e-Government projects that fail during implementation. It can be stated that the lack of experience and knowledge sharing in e-Government domains is arguably 'one of the key [causes] for failure of [a majority of] e-Government projects [in Africa]' (Kettani & Moulin 2014). Since around the year 2000, the trend in many of the e-Government projects failing in Africa has continued to date, causing a lot of anxiety with regard to e-Government project implementation. Heeks (2003) reported that 35% of e-Government projects are total failures in developing countries, with a further 50% partially failing and only 15% making the cut.

# ■ Conclusion

This chapter has explored the concept of decolonisation of e-Government research in Africa, focussing on the key meanings of the concepts associated with decolonisation. Because of the overemphasis on globalisation and global knowledge citizenship demanded by the research community, it cannot be overemphasised that there is a need for reference to Eurocentric, international inclined knowledge systems and the IKS to come up with balanced research and views. The chapter posits that e-Government researchers in Africa should tone down the ante but up their level of contribution of locally generated knowledge and therefore contribute 'to the [e-Government] body-of-knowledge' (Bwalya 2014). It is worth mentioning that there are acute opportunities for e-Government researchers in Africa to tell their own side of the story with regard to advancement of knowledge contribution towards the maturity of e-Government as a scientific field of enquiry.

# ■ Directions for Research and Practice

In order to collate e-Government knowledge on the African continent, it is desired that there should be a dedicated conference that acts as an avenue where e-Government research in African government could be discussed. E-Government researchers need to pursue research in African contextual settings and contribute to decolonisation of e-Government knowledge in Africa.

# PART B

E-Government Design
and Implementation

# E-Government Funding Frameworks

## ◼ Overview

Many e-Government projects in resource-constrained environments eventually fail because of lack of strategic, sustained and clearly articulated funding models (Bwalya & Mutula 2015). E-Government keeps evolving, and in order to keep pace with the ever-evolving technology platforms, there is a need for continuous supply of monetary resources to drive innovations and re-engineering of business processes. This chapter intends to discuss the funding options that can be explored in the realm of e-Government implementation and highlight the e-Government funding options for the developing countries' contexts (the thinking introduced and exculpated in this chapter is in tandem with the thinking of business case modelling introduced in Chapter 1 of this book). Different funding options are explored given the contextual settings of developing countries in Africa,

and they serve as a framework for designing context-based funding models anywhere on the continent and in environments with similar contextual nuances. Availability of a requisite funding framework is a guarantee for sustainable implementation of e-Government.

# ■ Introduction

At any time when governments start discussing e-Government implementation, one of the key questions asked is concerning funding and whether there will be money throughout for sustainable e-Government implementation. Several different methods have been utilised in the funding of e-Government interventions, and the key principle in funding a majority of interventions has been the involvement of all the possible stakeholders to provide one or more aspects of funding. Generally, many governments understand the higher costs involved in e-Government design and implementation and also appreciate the key benefits associated with e-Government implementation. Striking a balance between the cost and amassing the anticipated benefits is one of the key challenges faced by many governments in the developing countries.

E-Government is one of the most expensive interventions that a government can pursue in a bid to improve public service delivery. From the onset, right at the point of crafting a business case, there are significant costs related to consultancy fees if a watertight case for the implementation of e-Government were to be assembled. E-Government needs the understanding of upfront expenditure needed to achieve the implementation of necessary applications in the government departments. It is worth mentioning that in the design of any e-Government implementation, there are both visible and hidden costs that need to be considered right at the onset of e-Government conceptualisation. These costs are incurred at the different 'stages of the e-Government' implementation and development cycle as posited in Chapter 1 (Muñoz, Laura &

Pedro 2018). Understanding the different costs associated with e-Government in its entirety is the bedrock for designing competitive e-Government models that cannot be disadvantageous at any stage of the implementation cycle. It is also worth noting that funding of e-Government is one of the most critical points in any e-Government project.

The focus of e-Government is slowly positioning itself to be a competitive-edge innovative solution for inclusive and responsive governance. This change is necessitated by the desire for including the citizen as a partner in the governance value chain. In this governance model, the technology platforms utilised in the realm of e-Government should not limit citizens' access to e-Government applications and opportunities to contribute in policy and decision-making, accessing government's information, etc. This means that the changing model of e-Government pronounces technology as a lever for modernising public services towards being an interactive platform for citizens and businesses. In so doing, e-Government is not only a tool for automating existing licence applications, and tax payments, among others, but also a lever for encouraging the private sector to invest in the IT sector so that they can easily do business with government departments using diverse technology platforms.

As the role of technology in emerging e-Government plat forms is pronounced, it is thus logically coherent to posit that technology is one of the most important features for contemporary e-Government development. Acquiring competitive technology solutions costs a fortune and can skyrocket the overall cost of e-Government implementation if not carefully planned and managed. The use of competitive and progressive technology platforms unlocks many innovative e-Government solutions which can be explored by both citizens and businesses. For example, policymakers may be able to obtain a certain balanced single view of a huge quantity of heterogeneous data analysed using big data analytics. In cases where policymakers are not sure as to what choice to make from the analysed big data, using predictive analytics can help them simply choose from the

available choice options. In the case of citizens, advanced technologies may enable them to have a fully supported ubiquitous engagement with government departments where documents can be downloaded or uploaded from government websites with ease. The business sector may be given an opportunity to use electronic platforms in tax filing at their own convenience by taking advantage of the advanced capabilities. In such an environment, Subhajit (2004) posits that e-Government presents itself as an excellent platform for the connection of people, businesses and the government. Acquiring such capable e-Government technology system is costly and may not be affordable to developing countries' contexts. However, there are other emerging options such as cloud computing platforms which come at both a technical (reduced functionality, security concerns) and a financial cost. Therefore, it is important for developing countries to explore other affordable and sustainable funding options.

Owing to the huge technology costs, many of the developing countries have underdeveloped ICT infrastructures. Apart from the underdeveloped ICT infrastructures, developing countries face a plethora of challenges that generally prevent them from developing their own e-Government projects. For example, most of the people do not have access to the Internet and most do not consider Internet access as a necessity owing to the many socio-economic challenges they have to devote their attention and energies to. Their capital markets are less developed and the private sector is still relatively small, presenting huge funding challenges for e-Government projects. Because of the contextual settings, cost–benefit attributes are very different from majority of the developed countries. Further, ICTs and Internet access costs are fundamentally expensive when compared to the developed countries. Apart from the hope from the Monterrey Consensus on financing for development, developing countries find themselves at crossroads as to where to head to for the much-needed financial aid in e-Government development.

In comparison with the developed countries, setting up e-Government in Africa is relatively very expensive. The developed countries' economies have advanced ICT infrastructure owing to the fact that most of their economies depend on a relatively developed ICT infrastructure; government and private institutions with relatively developed ICT maturity levels; matured institutional, legal and regulation frameworks; and a citizenry with higher ICT skills. On the contrary, in most of the developing countries it is the opposite. This means that e-Government implementation will emanate from educating the masses on basic ICT skills and applications, installing of expensive ICT infrastructure commensurate with the desired ICT applications in the different government business processes, carrying out of awareness campaigns, training of government workers to be responsible for developing the requisite technology applications informed by the local context and ensuring that there are appropriate legal, regulatory and institutional frameworks. It is worth noting that each of these requirements costs huge sums of money and can derail e-Government funding if adequate funding is not provided.

This chapter pursues the different dimensions of e-Government funding including project planning, cost overruns, plans for the reduction of transaction costs, etc. (Mimicopoulos 2004). The chapter also explores the different e-Government funding models that have been used in different parts of the world and can be potential funding models in e-Government in the developing countries.

## ■ E-Government Development Projectile

E-Government implementation and its development, thereof, is a complex undertaking that involves many interlinked and logically connected aspects. Bringing all the different aspects and dovetailing them to form a connected and 'whole-of-government' requires coordination of different efforts and innovation. The formation of

the strategic interventions, the coordination (leadership) and the actual development of innovative solutions, so that the different technology solutions tightly hinge into the public service establishment and service solutions, costs a lot of money. In order to clearly understand and appreciate what is involved in the e-Government implementation and development, there is a need 'to understand the' genesis of technology use 'in public service delivery' platforms and what it takes to bring together a contemporary public service establishment (Ashaye 2014).

Understanding what is involved in technology implementation involves appreciating the different forces that determine technology utilisation in the public services. Some of these forces include:

- The 1978 Network Nation using Hiltz and Turoff's approach which posited that socio-organisational changes can be pursued by a massive embarkment on technology utilisation. Further, the ever-evolving technology systems and their utilisation in public service delivery value chains could lead to democratisation and decentralisation which is in tandem with 'structural adjustment programmes (SAPs) advocated [for] by the Bretton Woods institutions' (Batruch et al. 2004).
- Technological determinism puts social and human factors as secondary and technology as the primary determinant of the different changes in society (Drosos 1996).
- Leadership's appreciation of the role of technology in achieving an efficient and transparent public service delivery.
- Adoption and utilisation of the technology may be influenced by the external factors. A public organisation may be forced to implement technology in its delivery platforms owing to the pressure emanating from citizens' expectation of the organisation to use ICTs.
- Consistent need for the re-engineering of bureaucracy which has been posited by the NPM putting the citizens as customers of the public services.

Lau (2003) posits that emerging technology platforms usually promise a lot of good things but eventually fall short of delivering on the promises and therefore do not necessarily satisfy their cost tags.

Understanding the cost of e-Government is important so as to enable the comparison of the cost versus benefits obtained. There are different costs that are attributed to e-Government development: some of the costs are once-off and others are continuous throughout the e-Government development cycle. The financial model that is needed right at the conceptualisation phase of e-Government should rightly demarcate the once-off and continuous costs in e-Government implementation. Therefore, there should be clear articulation of what costs fall under what cost type. E-Government costs include the capital involved in the setting up, such as acquisition of technology infrastructure (including installation of the ICT infrastructure, buying of key software, etc.), and the daily continuous costs that are incurred during the implementation may include budgets for advertising and awareness campaigns and paying for human resources involved in day-to-day implementation, etc. There are many parts of e-Government that need funding from the time it is conceptualised until it has been developed to the point where citizens are able to utilise e-Government applications. Each of the following stages of e-Government implementation needs to be allocated funding 'for e-Government implementation to be a success' (Hamner et al. 2012). A robust e-Government design should be able to articulate the cost structures of each of the main stages for e-Government implementation, as shown in Figure 5.1 (Bwalya & Mutula 2016).
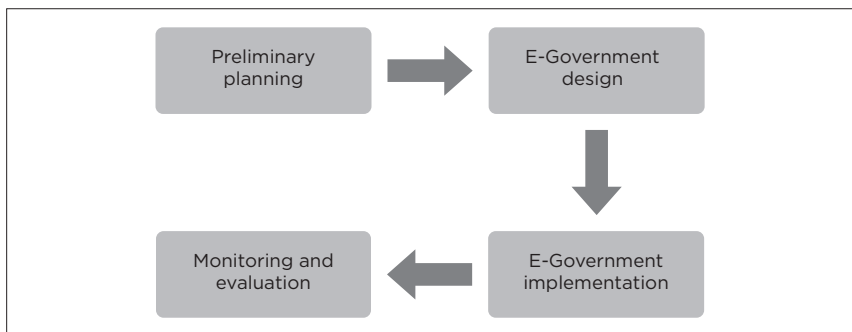


**FIGURE 5.1:** E-Government design cycle – main stages.

The first stage of e-Government implementation is the point where the idea to implement e-Government is conceived. After conception, teams are now put in place to do the planning to realise the conceived idea. In the e-Government planning phase, some costs involved may include payment of consultants to come up with the business case (see Chapter 1) and justify the need for e-Government given the context. In this stage, appraisal of the dimensions of e-Government design and implementation is considered. Once a watertight business case has been presented to all the different stakeholders and there is consensus that there is *prima facie* case for e-Government to be implemented, then the actual design of e-Government is embarked upon. In the design stage, the actual e-Government designs are done. This involves the design and testing of the different technology platforms and solutions. The supporting managerial requirements are also designed so that the different technology platforms dovetail to the general public services. Cost in this stage includes procurement of technology such as servers, database software and general hardware components; paying consultants for redesign of public service models to include the technology component; and retraining of civil servants so that they optimally utilise e-Government applications once they go live. Once the design is complete and all the technology modules and platforms have been integrated into the overall public service value chain, it is time to go live. The third stage is where many of the public services have been migrated onto the technology space. Citizens and businesses are able to access government information and are able to utilise some services, namely, tax returns, paying for business licences and so forth online. Costs in this stage may include paying consultants for designing change management strategies, awareness campaigns for the citizens, etc. After implementing e-Government for some time, it is now time to start monitoring whether its performance is according to the prior perceived level. Stage four checks the performance of the e-Government against the anticipated level of service.

# ■ E-Government Funding Models

There are many strategies for funding technology integration into the diverse public services. The choice of what funding strategy or model to use depends 'on the context in which e-Government is implemented' (Bwalya & Mutula 2015) and should be decided upon case by case. The following list, not mutually exclusive, discusses the commonly used e-Government funding models:

1. PPPs – Principally, PPPs aim to engage the private sector in funding (partially or fully) projects in which the government has a majority stake. The involvement of the private sector enables the government to source capital funding which is used to take care of the capital expenditure of the project. In general, PPPs are a legal contract between the private sector and a government entity where the private sector is expected to provide certain services or finances to the e-Government project and assume all the risks associated with the project. Nowadays, the focus of PPPs is not only to benefit from the finances of the private sector but also to benefit from the know-how and competent skills incumbent of the private sector. Further, the PPP arrangement enables the private sector to bring in insulation against political intervention in e-Government as the private sector will also have a definable interest. Because the private sector has a reputation for zero-tolerance of incompetence, it can be posited that their involvement in e-Government projects will enable it to be more responsive to the needs and preferences of the customers. The involvement of the private sector makes a possibility for transfer of risk to the private sector given its reputation for risk averseness. PPPs are one of the most common repayment methodologies that have been used by most e-Government projects the world over. The advantages of PPPs are that they generate incremental revenue which can later be used to compensate the private partner.
2. Bonds – Issuing bonds in domestic or international capital markets is one of the sustainable ways to fund e-Government as it is a cheaper alternative to bank loans. As partial repayments are not due until bond maturity, there are low

budget risks to the whole project. There are so many choices upon which the bonds can be issued: the general obligation bonds have repayment guaranteed by the 'full faith and credit' where the full taxing authority of the issuer pays back the bonds; project revenue bonds not guaranteed by the issuer but obtained owing to the promise of the expected revenue of the project financed; dedicated revenue bonds whose bond repayments are guaranteed by a particular revenue stream which in most of the cases is not related to the project financed; and sometimes gross domestic product (GDP)-linked bonds are used to pay for e-Government. The repayment coupon of GDP-linked bonds is determined by the nominal real GDP value.

3. Loans – Within this framework, there are so many developmental partners willing to fund e-Government department as long as it is looked at through the lens of ICT for development. Some of the multilateral development banks funding in this area include the World Bank Group, the African Development Bank (AFDB), the Asian Development Bank (ADB), the European Bank for Reconstruction and Development (EBRD), the European Investment Bank (EIB) and the Inter-American Development Bank (IADB).

Despite the traditional e-Government funding models articulated above, there are also emerging funding models and frameworks 'that need to be [explored] in the [context] of e-Government [implementation]' (Mbako et al. 2012). The following are some of the emerging options for e-Government funding and implementation approaches which can be explored:

• Because of the ever-falling prices of hardware, e-Government projects can now leverage the cost of hardware by using more innovative funding models. Over the last two decades, the price of hardware (especially processing power and storage) has been halving every year, but the cost of software and human resource keeps going up. During this period, the technology cycles have significantly halved putting more pressure on companies to regularly replace ageing technology platforms. Instead of technology financing taking a huge chunk of the e-Government budget, it is now in the region of

less than 10% of the budget. The current technology environments allow for software outsourcing companies to pay and install new e-Government systems and possibilities, through software leasing, to use a software for an agreed period of time for a fee.

• Transferring the financial burdens to the vendors of the e-Government systems. In the USA, transactional portals have been implemented for no charge. Different vendors, namely, Microsoft Corporation and NIC, provide free portals in over 18 states. In Bulgaria, Hewlett-Packard has built e-Government systems that link the passport office, police, Ministry of the Interior and the criminal justice system to enable quicker security checks. The company did not get paid in advance for setting up the system but got into an agreement with the government to get a certain percentage of the revenue generated from the use of this system. In some instances, e-Government can be designed in such a way that the government agrees with the outsourced service provider or private sector entity that paying for the services rendered or the system provided will be done from the savings incurred and the rest from the revenues. These financial models, called *Share-in-Revenue* or *Share-in-Savings*, lower the upfront capital expenditure that would have otherwise been incurred and externalise the risk associated with the e-Government project.

In huge ICT projects, especially those implemented in the Global North countries, incremental implementation of the project modules is more risk averse than implementing everything at once. In the case of e-Government, especially in the developing countries' context with limited funding, utilisation of the incremental approach is one of the ways to reduce the risk of project failure and ultimately reduce the need for huge upfront capital expenditures.

1. In most of the developing countries, there is a belief that the government needs to provide public services free-of-charge. This makes it very difficult for citizens to directly pay for e-Government services. Although not tested, one of the probable and feasible ways of funding e-Government in the

developing countries' context is to include a separate dedicated tax in the general tax systems. For example, a government may decide to include 3%–5% tax on the pay as you earn (PAYE) or value-added tax (VAT). In this mode, all the citizens are able to pay for e-Government services collectively consumed by the population. The only thing the government needs to do in this case is to explain to the citizenry what this additional tax is meant for so that they buy into the idea.

2. E-Government portals can be used as advertising spaces for huge companies or any interested organisations to reach a majority of the citizens. The revenue brought in through adverts can be used in many different aspects of e-Government development.

3. Citizens can be made to directly pay for the convenience experienced in accessing government services and information only. The mode in which the direct payments are realised depends on the context in which it is implemented. It is worth noting that such a model will be problematic to implement in a developing country.

In the PPP model, unlike the public entity, the private entity bears the risk of the project and is responsible for the management part. The private sector is not paid for the services rendered by the public entity at the onset of the project but at the end based on performance (reference to the anticipated deliverables). A large percentage of governments around the world passionately promote funding of their complex projects using the PPP model. For example, India approved the 'national e-Governance plan (NeGP) in 2006' (Ojha & Pandey 2017) with specific mention that all the e-Government projects must preferably be financed using the PPP model. The PPP model involves complex arrangements between the public entity and the private party with regard to agreeing how the project will be executed; what is the role of each participant; what kind of resources are needed during the design, implementation and monitoring cycles; management of risks; funding models; etc. In order to understand

the suitability of the funding model, the following questions have to be answered:

- Does the funding model help in the execution of e-Government project? Whether a government or a PPP model is used in the form of traditional or structured financing model, and will the financing be adequate at all phases or levels of the implementation cycle.
- How are the project risks managed? This involves analysing adequate methods for managing risks – such as whether the risk will be on the part of the government or will be transferred to private parties.
- How will the allocation of available or future project resources be approached? Ensuring that there is an optimum structure for managing the heterogeneous aspects of e-Government so that there is adequate funding throughout the project cycle.

In understanding the feasible methods that can realistically be utilised in funding e-Government applications, it is important to do benchmark studies on how funding is done around the world. Many countries have used different methods for funding e-Government projects depending on their contextual settings. Serikbayev (2010) considers different funding models utilised in e-Government implementation around the world. Basic e-Government funding has been from the following sources: voluntary contributions, fund-raising (donors, grants and foundations), assessed contributions, borrowings, taxation and service charges. Grout and Stevens (2003) explore the different funding options for e-Government. PPP has proved to be a viable funding mode in the UK context, while it cannot be appropriate for other contextual settings with less developed economies. Walsh (2008) discusses the municipal infrastructure investment framework (MIIF) which is a financial model used to determine the amount of money needed to finance capital projects. In Ukraine, public service accountability and transparency has been greatly improved by the 'utilisation of ICTs in the different business processes' (Bwalya & Mutula 2014; Hladchenko 2016).

The difficulty in gaining support for e-Government implementation is the high cost of implementation against the backdrop of uncertain returns. Other than the funding provided, the USA has a dedicated institutional establishment and political will with a dedicated office (Office of E-Government & Information Technology) for e-Government at the White House. In the context of South Africa, the service delivery and budget implementation plan (SDBIP) handles the financing of the municipal government to implement e-Government. There is generally limited budgeting for e-Government development at the municipal level.

As aforementioned, the funding of e-Government when approached as ICT for development has many international actors providing funding in this area. Some of these actors include the following: the WSIS Task Force on Financial Mechanisms spearheaded by UNDESA and the UNDP; UNESCO, ITU, UNCTAD; the donor countries via Official Development Assistance (ODA) and the private sector via foreign direct investment (FDI); and other initiatives led by the private sector. In the EU, the EU Structural funds are used to fund e-Government (Haffner et al. 2016). In the WSIS context, the Tunis leg affirmed that the financing of ICTs is a key aspect for meeting the Millennium Development Goals (MDGs). In light of this affirmation, a plan was devised for improving the existing ICT financing mechanisms (Capati-Caruso 2007). In the case of African countries, although there are many funding options for e-Government projects, most are funded through budgetary allocations from the national treasuries and managed by a government agency. In most of the cases, this funding is provided for the entire duration of the project. However, with the financial stress on the limited public monetary resources, it is important to start considering alternative sources for funding e-Government.

# ◼ Cost Structure of e-Government

As aforementioned, in order to clearly understand how much is involved in the design and implementation of e-Government, it is important to benchmark how much is being spent by governments

around the world in the implementation of e-Government. E-Government implementation contains both visible and invisible costs, which means that it is important to have budgets catering to both types of costs. The certain or visible costs account for approximately 60% of the total cost structure, whereas intangible costs account for around 40%. These tangible costs include procurement of both hardware and software, development of the e-Government solutions and maintenance, lease or establishment of telecommunication networks, quality control and performance measurement, research and development into emerging trends, recruitment of a competent human resource base, training of public service employees and awareness campaigns of the citizens and businesses, among others. The intangible costs are mainly used for re-organisation of the governance structures, that is, re-organisation of the internal public service business processes, inter-institutional integration designs and platforms, etc. Other costs include change management programmes that entail the strategic initiatives put in place to reorganise the organisational structures and the way business is done. An example demonstrating the e-Government cost structure can be seen in the implementation of e-Government by the Italian Tax Agency which spent a total of 93 million Euros. Out of this amount, about 55% was used for hardware and software development and maintenance, telecommunications, call centres, etc. About 18% was used for re-organising the business processes and the organisational structure, 15% for labour costs and 12% for hiring key human resources.

According to the 2009–2010 global information technology report (GITR) and the 2010–2011 world economic forum report, there is an undeniable link between global competitiveness and digital readiness and correspondingly GDP per capita with ICT readiness of the country. Countries that have shown good levels of competitiveness have extensively adopted ICTs and are utilising them in the different socio-economic value chains. Thus, in order to jump onto the competitiveness ladder, many countries have massively reduced the digital divide and are aggressively integrating technologies in their different socio-economic value

chains. According to Mimicopoulos (2004), many countries have invested huge sums of money to advance their technology integration into the different socio-economic setups. For example, Singapore invested over US$1.3bn to implement its e-Government development Action Plans 1 and 2. The e-Russia project gobbled over 1.43 billion Rubles and the e-Taiwan project spent over US$1.04bn. Other countries such as South Korea, USA and Canada have equally spent huge sums of money to set up their e-Government projects.

As e-Government demands top-of-the-range technologies in order to stand a good chance of being adopted by individuals and businesses, huge investments in the procurement of technologies at the start of any e-Government project are a huge risk. Because e-Government projects are known for delays, the risk of obsolescence in IT asset investment is extremely high as this can easily culminate in sunk costs which cannot be easily recovered. In an African landscape where the ownership and risk of the project lies with the government department, this can culminate in a huge cost to the taxpayers if not properly timed. Within the contemporary debate, evaluation of the value of e-Government can be done using India's e-Governance Assessment Framework (EAF) which measures e-Government value using five attribute classes: 'service orientation, technology, sustainability, cost-effectiveness, and replicability' (Ojha & Pandey 2017).

Most of the investments in e-Government setup discussed above are upfront costs at the setup stage. Despite these huge initial costs, many of the e-Government projects fail, resulting in significant loss of investment (Heeks 2004). Most of the failures are as a result of misalignment of the technology to the traditional public services and financial risks characteristic of e-Government projects. In order to mitigate the failure rates and therefore loss incurred after initial investments (upfront capital expenditure) in e-Government, there is a need to carefully and strategically plan the design and implementation projectile of e-Government. Although there have been significant improvements in e-Government development in Africa, the continent is still

significantly lagging behind most of the regions in the world (Mawela, Ochara & Twinomurinzi 2017).

In their study, Ojha and Pandey (2017) found that any e-Government project requires a carefully crafted structuring strategy coupled with innovative financing model to facilitate agility in e-Government implementation. Agility entails flexibility and responsiveness while reacting to impending changes, enshrining a paradigm where there is flexible decision-making, commitment to building core competencies, innovative methods of managing and sharing risks, customising or tailor-making e-Government solutions and creating an environment where innovation is carefully nurtured to fuel sustainable growth.

# ■ Strategies for Reducing Costs

Because of the huge costs involved in e-Government, it is important that innovative ideas be designed in order to contain the higher costs. The following are some of the strategies that can be considered case by case to determine which one is the most suitable in any given context:

1. Although not to be used as a magic bullet to achieve cost reductions, the use of outsourced service providers as and when the need arises can culminate in the saving of huge sums of money unlike when permanent people are employed to provide the same service for e-Government. There is a need to mention that a wrong approach to outsourcing may also culminate in significant cost consequences.
2. Avoidance of engaging in the utilisation of emerging technologies which have not been thoroughly tested as such technologies stand a higher chance of failure. In other instances, not a total avoidance but a cautious approach to emerging technologies may also save the e-Government effort a great deal of money. On the contrary, utilising a technology that has stood the test of time is better because chances of rendering the e-Government design to fail are minimal.
3. As the implementation of e-Government involves many stages of funding cycles whose services are provided by different

service providers and consultants, there are many pathways for corruption in the service procurement processes. Contemporary e-Government implementation involves the utilisation of e-Procurement systems so as to mitigate the level of corruption in the procurement processes.

4. Daily transaction costs can present as a huge cost dimension of e-Government if not properly controlled.
5. Treating e-Government expenditure as a long-term expenditure will enable the government to view capital expenditure as long-term funding.

The strategies mentioned above can be applied to e-Government funding strategies depending on the context and financial needs. Choosing which strategy to use in an African environment is going to be informed by the economic structure of the country and the different political and social factors.

# ■ Future e-Government Funding Models

Funding is one of the critical elements of competitive e-Government. The need for appropriate, adequate and sustainable funding is more pronounced given the need for increased innovation, agility and responsiveness demanded by future e-Government applications. Future funding of e-Government applications will be more robust and dynamic, with the traditional PPPs which are at the centre of most developing countries' funding of traditional and contemporary e-Government pushed to a less dominant role. Figure 5.2 shows the different funding elements of e-Government and demonstrates that the need for sustained funding cannot be overemphasised given the continuous need for e-Government design, implementation and monitoring.

Figure 5.2 shows the main contemporary and future funding models of e-Government. The key funding sources are the PPPs (co-operation between the public and private sector), donor aid or assistance from developmental partners, funding from government (e.g. raised through tax), and crowdsourcing
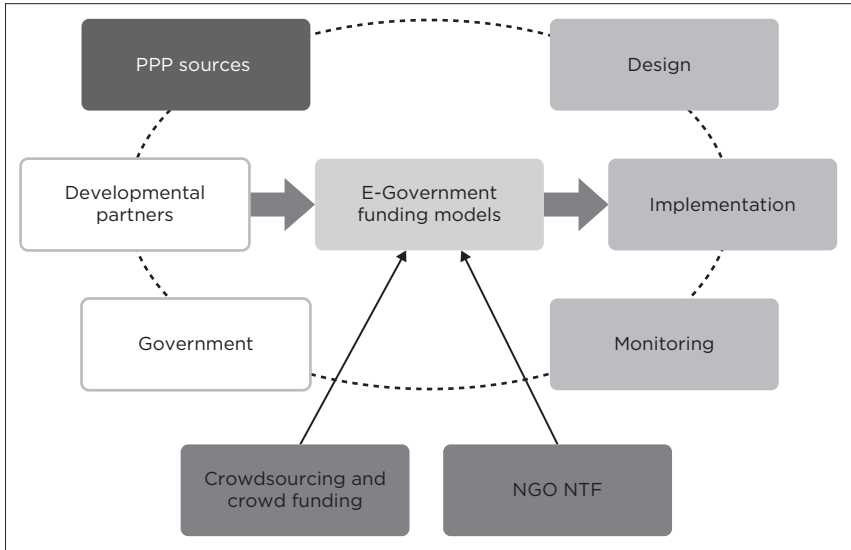
**FIGURE 5.2:** Funding models for e-Government.

or crowdfunding. The emerging model is the partnership between governments and non-government organisations (NGOs) and non-traditional funding (NTF). This kind of partnership is hugely beneficial because it brings not only finances but also competencies and capabilities on the e-Government scene which the government departments would not normally possess. These funds are needed in the design, implementation and monitoring of e-Government.

# ∎ Conclusion

The question of funding is one of the first ones posed by many a stakeholder in e-Government conceptualisation and design. Many stakeholders are interested in seeing continuity and sustainability of the project once it is kick-started. Funding has made many countries in the developing world sphere not to 'jump onto the bandwagon of countries implementing e-Government' (Bwalya 2011:30). Therefore, discussing the

different strategies and principles in e-Government funding, especially by countries in the developing countries' contexts, is a current and very important e-Government topic. This chapter has explored the different issues surrounding e-Government funding in both developed and developing countries' contexts. The chapter concludes by exploring both the contemporary and emerging e-Government funding models which can be explored in the developing countries' contexts. The funding strategy of any e-Government implementation should be accompanied by a business case articulating the different contextual nuances as discussed in Chapter 1.

## ■ Directions for Research and Practice

As funding of e-Government research is a new and emerging research area with roots in the private sector, there are a whole lot of contemporary issues that need to be explored. Literature shows that there are many e-Government funding models that have been conceptualised in the developed countries' contexts. What is lacking are models conceptualised with reference to the developing countries' contexts. E-Government researchers and practitioners are implored to take advantage of the opportunity to contribute endogenous knowledge from Africa's local contextual settings in the spirit of e-Government knowledge decolonisation.

# Process Modelling and Re-Engineering of Government Systems

## ■ Overview

As customers' and stakeholders' preferences with regard to their needs for government services and information keep changing, it is important that e-Government systems need to keep on evolving as well so that the different e-Government solutions fulfil expectations. This chapter discusses evolving models upon which e-Government can be designed and introduces the concept of open interoperable interface for dynamic e-Government applications. The chapter further discusses the evolving dimensions of e-Government which need to be explored using longitudinal studies instead of cross-sectional ones. Understanding the factors influencing e-Government needs to

be measured over a period of time as customers' and stakeholders' preferences keep changing. The last part of the chapter explores the managerial dimensions of e-Government bringing out the need for not only over-emphasising technological dimensions of e-Government but also considering the managerial dimensions in the different contextual settings.

# ◼ Introduction

As e-Government is a highly dynamic field, it is important to ensure that any meaningful frequent changes in ICTs are integrated into the e-Government design. Design of e-Government is not a one-off thing at the start of an e-Government project but continues throughout the implementation cycle at frequent intervals when there is a change in the users' requirements or changing technologies. Therefore, e-Government solutions are designed to be open and scalable as much as possible. Open and scalable applications would not require e-Government projects to be redesigned entirely when there is a change in the requirements. Contemporary e-Government solutions are designed in such a way that they can easily be re-engineered and remodelled based on current and future requirements.

There is no doubt that the introduction of ICTs and the Internet in different parts of the socio-economic establishment, especially in the realm of e-Government, has culminated in transformation of the delivery of public services. For example, among the older people, implementation of e-Government enables care to be delivered using virtual means (Maniatopoulos et al. 2009). Because of the ever-evolving e-Government models, it is important to understand the current status of e-Government given the constantly changing expectations from e-Government. In a bid to understand the current status of e-Government development in Romania in relation to other countries, Stoica and Ilas (2009) did a comprehensive study in Romania and found that there was a need for e-Government modernisation. The quest for modernisation was motivated by

the desire for e-Government to remain current, relevant and useful to a majority of the users. This modernisation was to be driven by transforming some parts of e-Government to incorporate the anticipated changes. The Romania case presents a perfect scenario for the need of e-Government transformation in the realm of re-engineering.

The quest for continuous improvement of e-Government designs to accommodate both internally and externally influenced change is one of the key characteristics for contemporary dynamic e-Government designs. Such kind of designs is intended to be dynamic and agile to the point that they can undergo metamorphosis in their designs in structure, functional pose or platform design without hugely compromising their availability or reliability. As e-Government systems are huge government information and service consoles spread across many government departments which realistically will be geographically dispersed, it becomes very difficult to achieve anticipated agility in contemporary service and information environments. This is because any small changes will consequently culminate into the need to implement changes in many parts of the systems to cope with the small changes. Assuming that agility can be realistically achieved, e-Government can be a good candidate platform to use in an information-intensive and dynamic government department which has evolving rules and regulations that need to be constantly enforced. An example of a government department that would normally have to change its rules is the revenue department which presents scenarios where the use of e-Government is needed in administering or enforcing rules such as tax requirements on both individuals and companies (Collins 2009).

Re-engineering of business processes entails that the current business processes (AS-IS) need to be modified to include the emerging functional and non-functional requirements given the changing business and individual needs to come up with new systems which will be more functionally relevant (TO-BE). Process modelling and re-engineering of public business

processes is one of the cardinal actions that need to be executed if e-Government were to continue being current and retain its relevance. In many cases, the needs of the individuals and businesses change rapidly culminating in changing expectations on the part of the e-Government system. Although process re-engineering is generally rare in the public sector, the private sector has been implementing different types of re-engineering in order to remain competitive and obtain the necessary value for their business engagements. Although this is the case, the public sector is now pressured to implement process re-engineering to sustainably provide public services expectant and desired by the general population.

The genesis of process re-engineering, just like many other e-Government conceptualisations, emanates from the private sector. Leonard and Pretorius (1996) opined that it is important for public enterprises to adopt strategic corporate and business culture for massive integration of ICTs into its business processes in order to improve competitiveness. Thomson (2009) investigated how e-Procurement is done in Australia and found that the system design has to change regularly to accommodate new procurement rules. In such an environment, a strong process re-engineering approach is desired. Therefore, it can be opined that government process re-engineering (GPR) involves repositioning or redesigning of business processes to conform to the current needs by the customers and the emerging technology platforms.

# ■ E-Government Business Processes

Appreciating process re-engineering emanates from a clear understanding of what a business process entails, thereby appreciating what is involved in the actual business processes. In a business process, there are sets of activities that are logically interconnected towards achieving a defined goal. The activities are defined by an event which is acted upon (e.g. event trigger and service request), information transformation in the process and production of an output (e.g. access to information and delivery

to information). A careful analysis of a business process enables the improvement of the level of efficiency of public services.

The understanding of what a business process entails is the point of departure in the understanding of e-Government business processes and ultimately the concept of process re-engineering. Sensuse and Ramadhan (2012) define a business process as having a clear beginning and end, articulating a set of logically and functionally linked sets of activities which aim to achieve a desired business goal. Business processes are designed in such a way that the activities create value in achieving given strategic objectives. A business process may be defined using activities from the same functional area or from different functional areas (or swim lanes). Further, a thorough understanding of process re-engineering involves a clear understanding of the different entities used in business processes. Inputs to a business system are data that can be customer enquiries or materials that can be used to ignite process execution. An outcome is the output that comes out from the execution of a process. 'A process is [considered] a structured, measured set of activities [which is meant] to produce a [desired outcome]' (Weldemariam 2010:13).

Business process models exist in two types, namely, dynamic and static models. Dynamic models are time-dependent and show information at the process level which can be put into a chronological order. Examples of dynamic models are event-driven process chains (EPCs) or value-added chain diagrams. Static models are models which do not depend on time. An example of such a model can be modelling of organisational structure.

Understanding the conceptualisation of process re-engineering starts from a clear understanding of what a business process entails. Figure 6.1 shows an example of a business process.

Figure 6.1 has accentuated the fact that an e-Government business process may involve many different tasks that may be housed in different government units or departments.
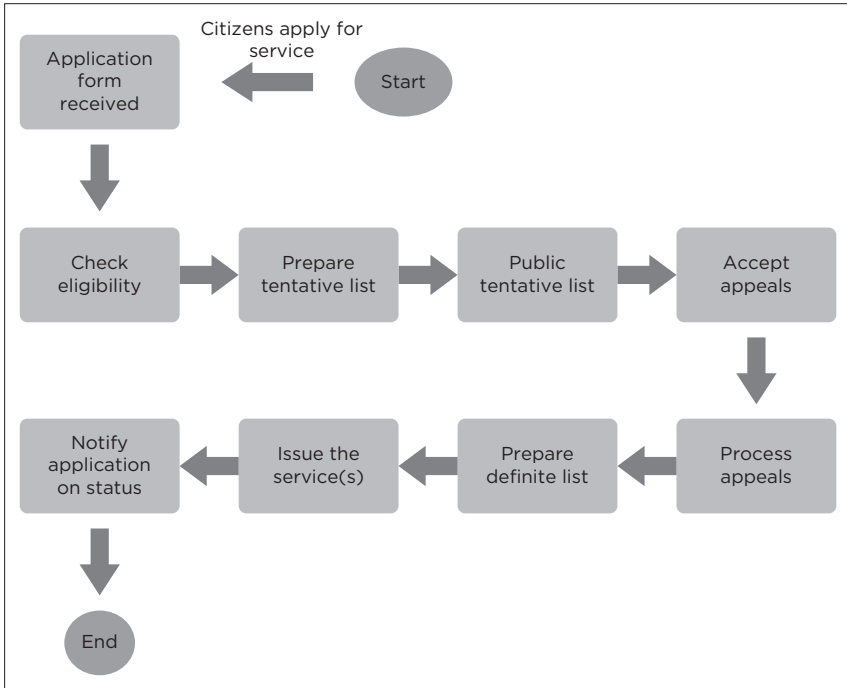
**FIGURE 6.1:** E-Government business process.

For example, there can be an office receiving applications for a service, such as applications for driver's licences, another one for checking eligibility of the applicants, and yet another for processing appeals. For these different government departments to make informed decisions, they need to be integrated so that they can seamlessly share information. In general, a scenario for a business process may involve the following:

1. A citizen logs an online application for a licence through an online government platform.
2. The application is functionally assigned to one government unit and processed through a business process.
3. A business process involves a series of interconnected business activities and modules. These activities and modules are sub-divided into several tasks.

4.  The tasks can be executed in tandem and in co-operation with other government units. Examples of these tasks may include validating the name and birth date, verification of citizenship and marital status, etc. The results from the different tasks are then collated together and transmitted through a communications network to the dispatching department to make a final decision on the application.

# ■ Motivation for Process Re-Engineering

Scaling of e-Government to accommodate emerging technology platforms into the design happens frequently and therefore calls for informed process re-engineering of the different public services. O'Hara and Stevens (2006) opine that in order to continuously harness the key benefits of e-Government, there is a need to continuously re-engineer the governmental business processes.

Scenarios that warrant process re-engineering are articulated as follows: During the implementation cycle, there could be increases in the demand of certain e-Government solutions or the platforms upon which e-Government was designed may change prompting change in the design. There are limited options that can be followed if there is absolute and urgent change in e-Government change. A government may decide to ignore the need for change. One of the options is erecting new e-Government infrastructure or modifying the existing one which is very expensive and many governments around the world cannot simply afford the cost and ultimately decide to let go of the e-Government mission when that happens. An example of the need for re-engineering occurred in the failure of the Transport for London (TFL) real-time tracking system in 2010. Because of unforeseen popularity of the app, the system crashed because it could not handle the amount of data it had to process per day. In order to address this problem, it was apparent that TFL be moved from its original server to Microsoft Azure Cloud

infrastructure allowing it to be able to handle more data from its use. In another context where redesign of the e-Government was desired was in Nepal. Using action research, Joshi, Islam and Islam (2017) investigated the implementation of e-Government in the drivers' licensing department of Nepal. The study showed that the common problems faced could easily be avoided by migrating the data and application execution component to the cloud unlike constant re-engineering of the business processes. The case of doing this in Nepal brings into perspective the reality that not all genuine-looking cases of re-engineering need to culminate in re-engineering but that there could be alternative solutions to the problem at hand.

E-Government process re-engineering (eGPR) allows the public services to be redesigned so that the services are leveraged and better placed to harness the key benefits of e-Government. The transformation of traditional e-Government practices into modern public services utilising technology as a key platform requires carefully planned business processes with technology enablement which might culminate in the following processes:

1. Reducing the workforce needed in the e-Government environment by automating existing business processes through the integration of technologies.
2. Ensuring that government information and public services are accessible online. This may include platforms where citizens and businesses can download forms, fill them in and upload them back to the government portals, applying for services such as tax returns.

It is important to note that e-GPR has evolved from the concept of business process re-engineering (BPR) which follows a radical approach in redesigning 'business processes to achieve dramatic improvements in critical, contemporary measures of performance such as quality, service [levels] and speed' (Champy & Hammer 1993:32), which are ultimately better results for the stakeholders. There are standard processes or steps which need to be followed in the re-engineering processes (Figure 6.2).
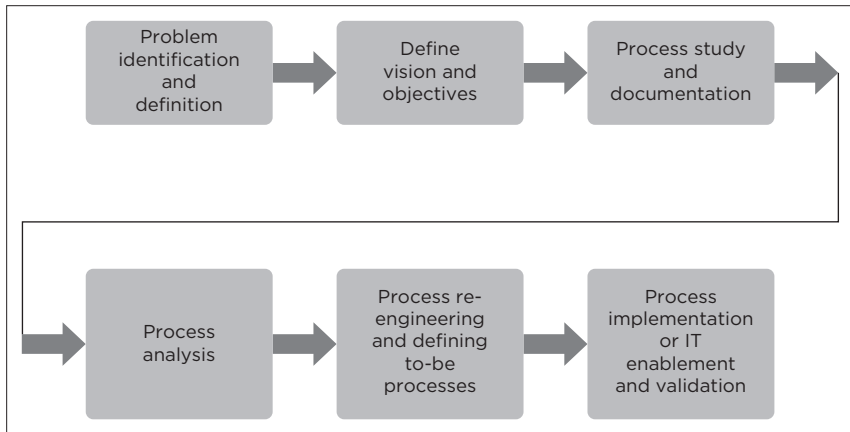
**FIGURE 6.2:** The business process re-engineering process.

Figure 6.2 shows the basic steps in the BPR process. The following is the articulation of each of these steps:

1. Process identification and definition – this entails choosing a process that needs to be analysed, clearly defining it and locating its role within the overall service delivery desired.
2. Definition of the vision and objectives – this is the articulation of the overall vision of the service being provided and locating the position of the business process being analysed.
3. Process study and documentation – this involves a detailed study of the current processes analysing the key tenets of the current business processes. By so doing, the weaknesses in the current process are articulated and documented in a 'AS-IS' document which will later be utilised as reference in the process re-engineering activity.
4. Process analysis – the documented processes from the step above are analysed with various tools to understand their logical link to one another and establish how each aspect contributes to the overall goal of the business process. The analysis done in this process brings out the improvement opportunities in a given situation. The decision as to which processes need to be improved is based on the anticipated

value brought by the given business process to the overall service, the complexity in offering the service and the metrics involved in the business process. This step is done to clearly understand the baseline metrics that need to be considered in the analysis.

5. Process re-engineering and defining TO-BE processes – in this phase, new processes that have addressed the inefficiencies identified in the analysis phase are designed. The new processes may involve reworking, redesigning, outsourcing or replacing the main or sub-processes. The new processes are documented in the 'TO-BE' documentation so as to record the motivation of the changes done in the business processes.

6. Process implementation or IT enablement and validation – this involves the actual implementation of the suggested changes in the business processes or e-Government platforms so as to accommodate the changes. Some of these changes may culminate in a change in the legal framework or retraining of the key staff in order to manage the change.

Process re-engineering is cardinal in the development of new systems because it offers opportunities for the current processes to be revamped or redesigned given the emerging technology platforms. The motivation for process re-engineering is mainly pushed by a variety of reasons. For example, Van der Vyver and Rajapakse (2012) posit that social pressures forced the Singaporean authorities to utilise BPR and re-engineer most of the public service business processes, and backlogs in pensions and tax processing prompted Sri Lankan and South African authorities to re-engineer their business processes using BPR. At the moment, for example, the South African Revenue Services (SARS) has re-engineered tax payment systems bringing most of them into a comprehensive online system and has come up with a robust e-filing system. In Sri Lanka, the e-SriLanka initiative is an ambitious project aiming to transform most of the public services online.

Not only BPR is used to redesign and re-position business processes in many different contexts as there are other methods and approaches that have been employed in redesigning

business processes. In order to appreciate the merits of the re-engineering method, Bogdănoiu (n.d.) compared the BPR with the Kaizen method. Whereas the BPR method entails redesigning or scaling up of business processes at one point in time, the Kaizen is an incremental (step-by-step) method used in the redesigning of the business processes. The BPR is harder to implement, is technology-oriented and proposes radical changes in the business processes, whereas the Kaizen method is easier to implement because it is people-oriented and focusses more on processes. Kaizen is an established methodology that proposes continuous improvement to the business processes. The Kaizen enables the setting of standards given a context and then continuously strives to improve on those quality standards. It is conceptualised upon the inclusion of known quality standards, namely just-in-time delivery, total quality management (TQM), 5S, Kanban and six sigma.

El-Khadiri and El-Fazziki (2012) investigated the information systems architecture in the public service and found that workflow systems are the basis for BPR, especially in information-intensive dynamic business processes. In many cases, organisations use many different approaches in improving their business processes. Some of these approaches include business process automation (BPA), BPR and business process improvement (BPI). BPA aims to positively revitalise the work outputs in the organisation by focussing on the automation of the existing business processes. Automation, from an information management perspective, entails that data are no longer stored in paper files but are integrated in electronic databases endowed with location and access transparencies in a distributed networked environment. The implication of automation in this regard is that information can (easily) be accessed from anywhere at any time using electronic platforms. BPI aims at retouching (improving) business processes by executing incremental changes to the existing business processes without necessarily introducing new tasks or processes. BPR focusses on redesigning existing business processes after a critical analysis to improve

overall performance in terms of service delivery, quality, costs, etc. The genesis of the conceptualisation of BPR was TQM which was dedicated towards incremental improvement in work processes and outputs.

Understanding the key step used in BPR allows any e-Government researcher to tailor-make a BPR according to the 'contextual characteristics of the [area] in which e-Government is implemented' (Bwalya & Mutula 2014). A typical BPR configuration has four steps:

1. Planning – involves the gathering of information on the process and further giving a detailed request description of the process. A description of the process is contained in the AS-IS document which articulates the snapshot characteristic(s) of the process under consideration.
2. Analysis – involves a careful and critical rethinking of the process with reference to its functional and non-functional requirements. This process is done in order to analyse the existing business process with regard to its logical and technical configuration and characteristics and how it executes its intended functional characteristics. By so doing, serious dysfunctionalities are identified which is the basis for the reconstruction of a new process. Analysis of the current processes involves examining the information flows in the business processes.
3. Reconfiguration – involves the actual reconstruction of the new process carefully considering the needs of the customers, actors, stakeholders, process providers and businesses. The functional and non-functional characteristics of the desired system and the improvements upon the existing processes are documented in the TO-BE document.
4. Accompanying – entails articulating and unpacking the changes to the various users of the system and stakeholders so that they appreciate and take advantage of the improved system. Accompanying is done by training the users and taking them through the different change management processes.

In general, the BPR methodology involves envisioning new processes with improved quality attributes, initiating of change,

rigorous process diagnosis, process redesign and reconstruction, and process monitoring after re-engineering. BPR basically involves fundamental rethinking of the existing business processes translating into 'radical redesign of the processes to achieve [unmatched] improvements in' the business processes with reference to critical contemporary quality measures (Champy & Hammer 1993:n.p.). An organisation that focusses on continuous process improvements is process-oriented and has each and every business process identified and coded, where every individual employee and stakeholder is aware of the existing business processes in the organisation, especially those in their swim lanes (their area of operation), and each process has a clear measurement criteria. Contemporary and classical BPR further advocates for cross-functional business processes and radical redesign. As posited above, it is clear that BPR advocates for continuous radical transformation agenda rather than incremental changes. As e-Government also advocates for drastic changes every time, it is thus appropriate that the conceptualisations of BPR be adopted in the public service delivery platforms.

BPR is not only geared towards utilisation of ICTs in the public business processes and the encouragement of service innovation but also the understanding of how the different technology platforms in the public business processes dovetail to the overall governance value chains (Kovačič 2000). In order to understand the technical and logical dovetailing of e-Government processes, there is a need to design models and frameworks based on the concept of work flow processes. Bitzer and Kamel (1997) proposed the Workflow Re-engineering Methodology (WRM):

> [*T*]hat uses workflow management automation to enable [*the realisation of*] BPR. [...] The WRM uses the more accurate, real-time process measurements, gathered by the workflow tool, to improve the efficiency, effectiveness and flexibility of the workflow process. (p. 1)

The semantic process language (SPL) gives opportunities to the designers of e-Government processes to integrate language semantics into the design of executive workflow models.

Olbrich and Simon (2008) posit that the SPL enables the different business rules of the public services to be included into the models which can be visualised to create the actual e-Government design. Other BPR tools and platforms include activity-based costing analysis, TQM, functional decomposition modelling, data flow diagrams (DFDs), data modelling, function modelling (data flow diagramming), petri nets – dynamic flow modelling, etc. (Indihar-Stemberger & Popovic 2003).

Gayialis et al. (2016) posit that business process modelling (BPM) is a potential tool for public service transformation. Aydinli, Brinkkemper and Ravesteyn (2009) aver that BPM involves outlining business practice, processes, information flows, data stores (databases) and information systems. Further, BPM shows how work processes are executed in an organisation and what information is needed at any stage of the business process. Examples of BPM tools include petri nets, unified modelling language (UML), business process modelling notation (BPMN), workflow nets and EPCs. When used within the e-Government domain, BPM activities are geared towards the optimisation of the different public services so that they are as efficient as possible.

The business process management system (BPMS) allows the modelling, monitoring, simulation and re-engineering of the business processes. The BPMS can be integrated to e-Government systems in order to virtually monitor the efficiency at each stage of the process. The BPMS can be integrated into the existing system in order to optimally perform according to expectations and the context in which it is implemented. The BPMS comprises six core modules: process designer – process modelling and performance analysis of simulation scenarios, process engine for executing the different simulation scenarios, data dictionary for managing user accounts, big data analytics report console to generate process performance reports, process monitoring handler for the provision of real-time information regarding process execution, the query and process optimiser serves to manage the different system-level queries and processes that
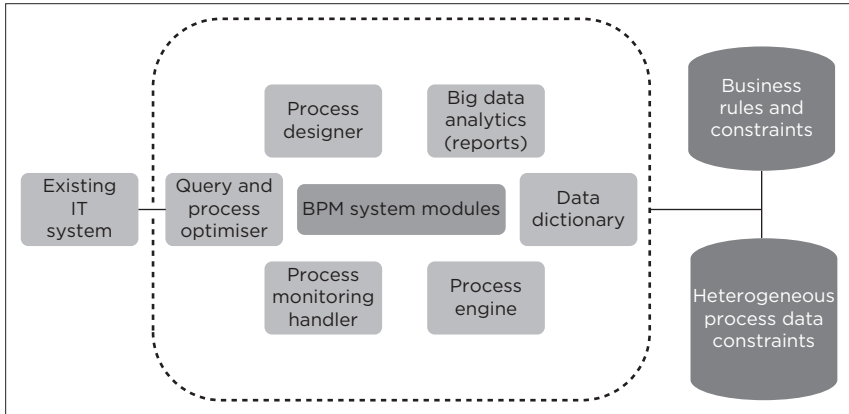
**FIGURE 6.3:** Business process management system.

may be generated from the existing integrated IT system. The system architecture of the BPMS is shown in Figure 6.3.

The components of the BPMS may be conceptualised with reference to the local contextual characteristics.

# ■ Modelling and Simulation of e-Government Business Processes

As aforementioned, process modelling was mostly practised in the private sector but has now found its way in e-Government design and implementation. E-Government modelling has borrowed from modelling of other types of business processes in the private sector (Liegl & Schuster 2007). Process modelling helps to understand the hidden characteristics of a business process. The in-depth informational analysis of each of the processes enables authorities to know where the process is weak, who is not doing their work, where in the process chain is there a likelihood of negligence or corruption, among other issues. The massive implementation of ICTs in public delivery platforms meant robust re-engineering which also meant redesigning the legal frameworks so as to accommodate the new changes.

This also involves the re-orientation and repositioning of the internal workflows to accommodate the new changes. There are different types of process models – some of them are used for demonstrative purposes only, especially for showing the logical arrangement of activities in a business process and others are used as executable workflows. The executable workflows can be used in designing the actual business processes. The emergence of executable workflows has enabled the possibility of having automatic business processes taking precision and service efficiency to another level. Within the process management domain, the introduction of automatic BPR is a paradigm shift which enables business re-orientation without having the input of a human being (Indihar-Stemberger & Popovic 2003). In the last century, process re-engineering was done with the introduction of technology using manual procedures.

In order to model business processes in the re-engineering effort, BPM is used. BPM offers standard syntax and semantics to further describe a business process in an electronic environment by using the BPMN. There are many advantages of using BPM – it is used as a tool for understanding and improving business processes and therefore provides a common platform for understanding business processes (Kasemsap 2016). Modelling business processes enables the description of relationships between e-Government activities and therefore can be used to describe the linkage and collaboration between government departments in a bid to exchange information, businesses, citizens and other governments across nations. Modelling government business processes allows the understanding of the levels of integration of business processes within government departments which is a direct indication of the seamless flow of information among departments. Lastly, BPM is an excellent way of analysing process-based activities in the realm of e-Government.

There are many methods that have been used for simulating business processes, namely Integration DEFinition (IDEF) (0/3), petri nets, activity-based costing, system dynamics,

discrete-event simulation and knowledge-based techniques (Jaklič, Groznik & Kovačič 2003). Simulation modelling is important in process modelling because it helps in the modelling of the following aspects of business processes: dynamic – the behaviour of a business process changes over time; interactive – processes may comprise many components which interact with one another so that there is a need to capture the interactive behaviour; and complicated – in that a process may consist of many interacting and dynamic objects. In the real world, many software are used in modelling government business processes. Examples are Rockwell Arena software, BEA AquaLogic BPM, Microsoft Excel and Microsoft Visio (Neubauer & Stewart 2015). Other than these, there are other methods which can be used in the process modelling agenda. For example, regarding modelling inter-organisational B2B business processes in the B2B domain (Liegl & Schuster 2007):

> United Nation's Centre for Trade Facilitation and Electronic Business (UN/CEFACT) which is a standardization body known for its work on UN/EDIFACT and ebXML. One of its most recent developments is UN/CEFACT's Modeling Methodology (UMM). (p. 407)

Sensuse and Ramadhan (2012) used the soft systems methodology (SSM), BPMN and the UML to model dynamic business processes.

Palkovits and Wimmer (2003) articulate the need for utilisation of a carefully defined meta-modelling technique in e-Government redesign processes. Meta-models define formalism upon which the actual modelling takes place. Modelling platforms need to be adaptable, open and flexible to integrate the different modelling paradigms that can exist. Metal model can support the modelling of diverse aspects of e-Government process modelling as they are endowed with the following characteristics:

1. Able to model the engineering of the business models and their web services.
2. Able to design and realise the corresponding technology.
3. Able to evaluate the resources and assets directly linked to the different business processes.

Liegl et al. (2007) posit that around the world, many e-Government designs have been informed by the United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT) Modeling Methodology (UMM). Mostly, UN/CEFACT has been used to model inter-organisational business processes in the business-to-business domains. 'UMM is a UML based methodology' (Liegl et al. 2007:2) used to mostly capture functional requirements in the business process. In conceptualising the design of e-Government business models, requirements elicitation is one of the most cardinal processes that need to be done. Wimmer and Truanmuller (2004) have articulated the different requirements that public service modelling demands. Some of these requirements are discussed below:

1. The different legal environments and functional/non-functional requirements of e-Government demand that the modelling is accustomed to the unique e-Government characteristics. Therefore, each public service model should have the necessary objects, subjects, events, activities, constraints and business rules commensurate with the public sector.
2. Simple easy-to-read models unlike complex ones are desired so that all the stakeholders are able to understand what is being conveyed.
3. Need for the synchronisation of the e-Government business processes using standard operations so as to form one-stop e-Government access points.
4. As e-Government operates in carefully monitored environment with defined legal frameworks, the business processes and models should be made in such a way that restrictions imposed by the legal frameworks on the re-engineering of the processes need to be considered when re-engineering the processes.

In order to create a highly integrated business process in the public service, e-Government designs have been continuously conceptualised upon the Business Process Modelling Execution Language (BPEL). BPEL gives a description to the flow of a business at a semantic level so that a series of interactions between given web services are clearly defined using the BPEL

for Web Services (BPEL4WS). The configuration at the conceptual and semantic level allows different public service partners to invoke or provide services to the overall e-Government processes or other services within the government information infrastructure. The overall conceptual integration model for e-Government using BPEL4WS is shown in Figure 6.4.

The description of the services, interaction consoles and the web services allows seamless execution and therefore semi-automation of public business processes in the realm of e-Government. Therefore, processes that are allowed to be executed in the e-Government environment are those that are adequately described by the BPEL. In tandem with the BPEL, the BPMN was developed by the Object Management Group (OMG) in order to achieve standardised modelling notation. As a communication tool for the business analysts, the BPMN is a relatively easy language to understand and comprehend by the users. The business analysts are mandated to check whether e-Government still observes its desired functional requirements over the years and therefore remains relevant to its users. As technology and user needs keep changing all the time with regard to e-Government, the business analysts are continuously mandated to monitor the e-Government requirements to dynamically capture the changing business requirements by the citizens and businesses.
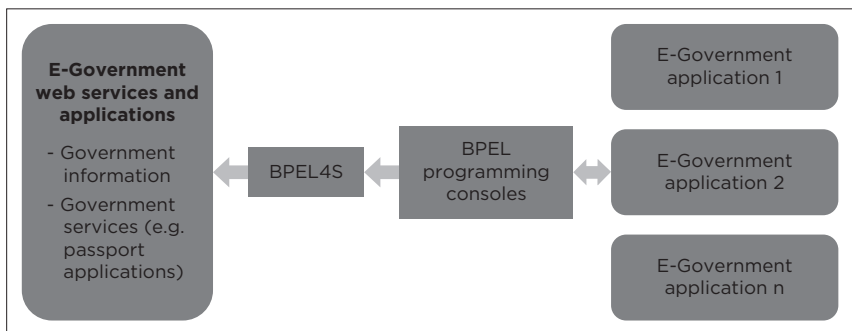


**FIGURE 6.4:** Web services and business process execution language in e-Government environments.

In the real e-Government applications design environment, the captured requirements from the process models done by the business analysis using BPMN (relying on De Morgana symbols and already existing UML activity diagrams, IDEF, etc.) are now interpreted by the technical developers who rely on the OMG's Business Process Management Initiative (BPMI) to map BPMN onto XML-based executables such as BPEL. Apart from the BPMN, the EPC is a business process modelling language that can be used to model highly dependent processes in a business process. The EPCs were used in the ARchitecture of Integrated Information Systems (ARIS) (Gingele, Childe & Miles 2002), which is a method for conceptual integration of functional, organisational data and output in the information systems design endeavours.

E-Government researchers need to come up with business process modelling tools specifically meant for the public sector. This is because most of the modelling tools do not take care of the contextual environment in e-Government setups (Alpar & Olbrich 2005). The lack of field-specific process modelling tools has negatively impacted on systematic business process modelling of public services. Process modelling is important in e-Government so as to understand the different entities defining the desired service levels in e-Government.

# ■ Modelling Real-Life Situations

Although process re-engineering is desired for competitive e-Government, it has faced a lot of challenges in real public sector environments. Martín and Montagna (2006) opine that some of the key problems experienced include:

1. attitude (unwillingness on the part of the public sector employees to apply the radical process transformation advocated for by BPR)
2. scope and extension (lack of clearly defined scope targeting the change and clear articulation of the functional areas included in the change)

3. knowledge and leadership (existence of leaders and BPR champions who can drive the change and encourage public sector innovation as advocated for by the BPR)
4. resources (usually lack of adequate financial and human resources to push the change)
5. techno-centrism (overemphasis on technological aspects of the change and ignoring the organisational and individual perspectives)
6. legislations (as e-Government is highly reliant on public sector policies, rules and regulations, it may be very difficult to explore extant innovative options in service offerings as everything done has to be within the confines of the law).

Tak (2013) provides a practical scenario on the importance of process re-engineering in a real-world environment, especially in a dynamic setup. The Unique Identification Authority of India (UIDAI) is implementing the AADHAAR unique identification project which aims to allocate a 12-digit unique identifier for all citizens in India. This number will be stored in a central relational database system which will be connected to the different e-Government services across India. The database will be able to store biometric information, namely fingerprints, iris scans and photographs. As personal information such as birth, death and marriage change over time, an e-Government automatically modifies itself so that new relational instances are created during the lifecycle of the individuals. The change in the non-permanent data may culminate in re-engineering of public business processes.

Boughzala, Assar and Romano (2010) analysed the use of the application MAIN+ in the e-Procurement aspect of e-Government in France. The analysis included the understanding of each of the minute aspects of the business processes at each stage of the current processes (AS-IS) and the anticipated (TO-BE) process. Analysing the business processes explores the following concerns:

1. Thorough process description focussing on tasks and activities, resources and actors, and inputs and outputs.
2. Identification of the task (at the micro level) and activity (at the macro level), the role and interaction models of each actor

(coordinator or user) with whom the user interacts and what information is shared during the interaction processes.

3. In each of the activity and process, understand what documentation resources are utilised during each input and output.

4. Understand what average time it takes for each activity or task to be accomplished (in terms of minutes, hours, days, etc.). This is not a mandatory step but helps in the coordination of the different activities in the process chains.

Chatfield (2009) investigated the 'e-Tax' systems of the Japan National Tax Agency (NTA) that provides a platform for integrated online income tax, tax returns filing and other tax payment services. This study found that for the e-Tax system to make a lot of sense in contemporary information management environments, it was important that it be integrated with other existing government information systems. Subramoniam and Twinky (2014) examined vehicle registration process in India which was becoming very complex given the large number of vehicles newly acquired every year and recommended that the cause for process re-engineering was more than justified.

# ■ Conclusion

E-Government research has developed to such a point that it is now borrowing a lot of concepts from the private sector in order to accentuate its competitiveness and appeal to the different stakeholders. Within this line of thinking, e-Government designs are now expected to be agile to the point where they are able to instantaneously change given the changing dimensions in its internal and external environments. Although there are many forces that generally influence the state of e-Government at each stage of the implementation cycle, customers' and stakeholders' expectations and their changing preferences and the rapidly evolving technology platforms given the short technology cycles determine the path e-Government is going to take. Therefore, given a highly volatile environment, e-Government applications

need to keep reinventing themselves so as to remain relevant, acceptable and useful among its many stakeholders.

This chapter has articulated the key principles of BPR both from the private and public sector perspective. At the end of the chapter, emerging themes and conceptualisations in e-Government development have been explored. The chapter has further presented the key principles that need to be considered in the design of simulation models mimicking the implementation of e-Government in real environments.

## ■ Directions for Research and Practice

Process re-engineering presents opportunities for e-Government systems and programmes to be redesigned to match with the current expectations in the environment in which it is implemented. Research opportunities in this area involve articulating the different re-engineering models that can be conceptualised with key focus on the developing countries' context. This may contribute towards the design of global re-engineering model(s) that can be used in practice. As process re-engineering is fairly a new area in e-Government, another research direction may be exploring the current experiences that have been garnered in different developing countries' contexts with a view to contributing to the best practice in this regard. Future research directions are going to concentrate on how to design automatic process re-engineering models that can practically be included in the actual e-Government designs. Further, research can be explored in the line of attempting to find more realistic modelling notation that will stand a better chance of competing with established business process modelling techniques such as BPMN and BPEL. Further still, research can further pursue emerging technology conceptualisations such as web services and BPEL in coming up with executable models that can be run in online environments to mimic the experience of actual e-Government designs.

# Semantic Governance Ecosystems and Integration Paradigms

## ■ Overview

Many government departments in Africa have jumped onto the bandwagon of institutions using technologies in their business processes; however, most of these technologies are implemented as disparate systems. Disparate systems do not have channels or platforms through which they can seamlessly share information, let alone make information flow through the systems, thereby reducing the essence of e-Government in decision-making. E-Government is based on the understanding that government systems need to be integrated together so that they can share information. Requisite sharing of information enables improved public service delivery and provides a platform for facilitating evidence-based decision-making in governance value chains. This chapter discusses semantic integration of e-Government

systems both from the technological (such as e-Government integration frameworks) and managerial standpoints. The chapter specifically explores the different interoperability frameworks which are at the centre of e-Government process and system integration. The integration models discussed in this chapter will act as guiding reference(s) for the design of integrated e-Government systems in Africa and in contextually similar environments.

# ■ Contemporary e-Government Designs

Although e-Government is a multidimensional phenomenon depending on many factors to succeed, interoperability of government systems is one of the most critical requirements that needs to be achieved if the benefits of e-Government were to be harnessed. With regard to contemporary information management environments where there is an increased need for ubiquitous access and management of information resources, interoperability of government information systems provides a glimpse of hope for e-Government systems to realise the benefits of adaptive e-Government systems. The concept of information system integration and interoperability presents a departure from the traditional governance systems. In traditional government setups, there are a great variety of legacy systems deployed in different business processes of the public service delivery frameworks (Bwalya & Du Plessis 2015), and these are not integrated in any case.

Interoperability of systems is cardinal in the implementation of e-Government because it accords government departments opportunities to overcome information roadblocks, namely, differences in data; differences in information and system standards; differences in organisational culture among government departments and units; legal and political issues, security issues, usability issues, managerial and jurisdictional issues; etc. (Cestari et al. 2014). Such an environment provides opportunities for service coordination which ultimately improves

the value of e-Government implementation. Information systems in different organisations can achieve interoperability if only they communicate, collaborate and interact, and this can be achieved by overall system integration. The implementation of interoperability mechanisms allows the sharing of orchestrated procedures by multiple government agencies (Saekow & Boonmee 2009).

In any e-Government design and implementation, it is important to consider the different aspects of interoperability which are critical to both managerial and technical aspects of e-Government. This is because context differs in any area where e-Government is implemented, and therefore, it is logical to posit that contextual characteristics are also unique and therefore differently impact on the overall likelihood of success of e-Government (Bwalya & Healy 2010).

# ■ Semantic Business Models and Interoperability

Although semantic models are predominantly concepts hinged on business disciplines, contemporary e-Government solutions are now being designed based on semantic models as the basis for data and process integration. This is done with a view of creating one logical e-Government space with standard system syntax and semantics. Rahman (2010) articulated the need to incorporate the 'integration of different e-Government systems [in] different government departments' (Bwalya 2016) and 'proposed a semantically enhanced architecture to address the issues of interoperability and service integration in e-Government web information systems' (Roberto 2005:1). Understanding interoperability can be achieved by first understanding the concept of 'co-operating systems' – systems which work in tandem using the same resources and procedures to achieve the same goal. In the case of interoperability for e-Government systems, two or more systems exchange data or simply have the shared interface (or middleware) to enable seamless flow of

information to aid decisions and enable the provision of a reliable and efficient e-Government service (Cestari et al. 2014).

Interoperability has been loosely defined as the coupling of characteristics of association of different attributes of two or more systems rather than a single system. System interoperability is contextual as it depends on the given characteristics of systems under consideration. The contextual outlay of interoperability defines 'both functional and non-functional requirements' that a system needs to satisfy in order to logically and technically dovetail to other systems within the same information space. In many e-Government design modules, this is defined by designing solutions based on open systems architecture defined by a common middleware (Novakouski & Lewis 2012). Interoperability is not exactly the same as terms closely linked with it such as integration and collaboration. For example, integration involves strong links of tightly coupled systems. On the contrary, interoperability entails loosely coupled information systems which are basically compatible with one another. When considering interoperability, context articulates the set of circumstances in which events, entities, processes, etc., are situated and provided with opportunities as well as constraints (Griffin 2007; Malinauskienė 2013). According to European Communities (2008):

> Interoperability is the ability of disparate and diverse organizations to interact towards mutually beneficial and agreed common goals, involving the sharing of information and knowledge between the organizations via the business processes they support, by means of the exchange of data between their respective information and communication technology (ICT) systems. (p. 5)

Interoperability is not only a technical concern but also traverses across many different domains of the socio-economic establishment. 'Interoperability means the ability of ICT systems and of the business processes they support to exchange data and to enable the sharing of information and knowledge' (IDABC 2004:5). Generally, interoperability allows two or more e-Government systems to seamlessly exchange information virtually or using connected interfaces built on open standards.

Further, interoperability is a multifaceted concept that revolves not only on technical attributes of systems for information and process flow (process standardisation, data semantics, etc.) but also on political issues, legal and regulatory issues, social issues and other contextual factors that impact on government systems to be connected to the point that they exchange data and information. This interconnection will allow information to easily permeate and flow through public organisations' boundaries aiding informed decisions and an improvement in the time it takes to offer public services (Novakouski & Lewis 2012). Interoperability allows disparate and diverse entities of the information systems to communicate in a mutually accepted manner sharing information and integrating processes among them (Novakouski & Lewis 2012).

It is worth noting that any interoperability configuration is aimed at basically three different goals in a wider conceptual underpinning: data exchange – data flow from one entity in a system to the next, involves the specification of the data exchange protocols and the data marshalling requirements; meaning exchange – assigning of the same meaning to the information being exchanged; process agreement – details the actions on the information received by each of the entities that received the information (Novakouski & Lewis 2012). For interoperability to make sense, it needs to be standardised in four dimensions – syntax, semantics, technology and pragmatics. Standardisation enables information systems to be designed using identical strategies and implemented using known identical design platforms. Novakouski and Lewis (2012) have posited that interoperability is one of the key aspects of successful e-Government implementation. Interoperability is desired in any system to achieve the following:

- Data exchange – transfer of data from one device or data terminal to the other, namely, a mobile phone connecting to a mobile terminal to access GSM signal, automated data exchange in computer-readable back-end processes, e-mail, etc.

- Meaning exchange – the conceptual underpinning which allows the same or closely similar meaning to be attached to the information that is being interchanged between two or mobile information agents/nodes. Meaning exchange avoids misinterpretation of data in a given context.
- Process agreement – focusses on the action to be taken on the information obtained through data exchange and accords attention to the actions taken by the information agents/nodes in a bid to further process or utilise the given information. Process agreement is achieved when the information agents/nodes agree prior to sending or receiving the information as to what to do with that information. In the realm of e-Government, process agreement enables e-Government users to provide one set of information which can be interpreted and utilised in a similar manner by the different government organs. Lack of process agreement allows users to provide the same information to multiple government departments responding to a single event (Suchaiya & Keretho 2014).

The development of e-Government usually follows two approaches: standards (mainly based on the national interoperability framework) and architecture (national EA) (Lallana 2008). Realisation of the goals of interoperability standards and EA as reference for design and implementation of e-Government generally faces a host of challenges and needs carefully thought strategies to appropriately achieve the desired goals (Malinauskienė 2013).

# ■ Forms and Types of Interoperability

It is worth noting that achieving the entirety of interoperability (technical, semantic, organisational) is very difficult in the face of e-Government. Several researchers and practitioners have proposed variety of methods that can be used to achieve interoperability in different contexts (Novakouski & Lewis 2012). In reference to other researchers, Laskaridis et al. (2007) articulated the different types of interoperability which can be

considered in the different attempts to 'join-up' public administration for sharing information and applications. Three different types of interoperability have to be considered:

1. Organisational interoperability – concerned with the definition of business goals, the modelling of business processes and understanding of the interaction and collaboration aspects of public service administrators with a view to exchange information. Further, organisational interoperability is concerned with addressing user and stakeholder requirements. Organisational interoperability articulates the ability of different disparate organisational systems to dovetail to one another for process agreement. Organisational interoperability is concerned with intra- and inter-organisational process alignment.
2. Semantic interoperability (IS) – ensures that e-Government users at different ends of the business process have the same understanding of the information sent through e-Government channels. SI focusses on the meaning of data exchange in a given context. SI checks to ensure that the exchanged information has precise meaning of what it intends. In the big data analytics era, this type of interoperability is cardinal as it facilitates the combination of 'received information with other information resources [so that] it [is processed] in a meaningful manner' (Mecca et al. 2016:n.p.). Hreňo et al. (2011:144) assert that 'semantic interoperability [(SI)], i.e., technical capability of interoperation of provided services', is one of the key pre-conditions for a successful e-Government. SI 'enables the modelling and representation of knowledge within a [given] domain by' explicitly formalising key domain concepts, workflow sequences and structures (Mohammad 2013:120). Implemented basically using service-oriented architecture (SOA) and web services, the utilisation of SI within e-Government enables the services to be interoperable within the wider e-Government infrastructure and therefore more transparent to the end-users.
3. Technical interoperability – focusses on technical issues concerned with the linking of e-Government computer systems and services and includes the investigation and

design of open interfaces using open technologies, 'interconnection services, data integration, [specification of the] middleware, [accessibility,] presentation and exchange and security [dimensions of data]' (IDABC 2004:16). According to Novakouski and Lewis (2012), technical interoperability allows the specification of technical solutions that dovetail to each other with open interfaces providing the much-needed communication layer for data interchange. Further, according to Lallana (2008), apart from communication, technical interoperability covers interconnection (networks and systems development standards), data integration (data description standards for data interchange), information access and presentation (data presentation format to the user) and content management and metadata (description, management and retrieval of public information). In achieving technical interoperability, the focus is on the characteristics of the different technologies such as the consideration of XML for the integration of e-Government information and application services using a certain set of explicit rules. This may also include the articulation of web services in the design of e-Government applications. Web services are defined as software systems which are defined by a URL endowed with XML defining the web service public interfaces and bindings. The loosely coupled architecture of web services is service-oriented and relies on web service description language (WSDL), universal description discovery and integration standard (UDDI), and the simple object access protocol (SOAP) to fully define itself as a meaningful technology innovation. (For a detailed description of UDDI, SOAP, WSDL, etc., see Laskaridis et al. [2007].)

4. Legal interoperability – this concerns the design, implementation and maintenance of e-Government solutions within the existing legal, regulatory and institutional frameworks in the area in which it is implemented. E-Government needs to comply with the laws, rules and regulations in the line of intellectual property rights, administrative laws (secure, religious or traditional law) and privacy and data protection rules. The lack of understanding of the legal framework culminates in likely failure of e-Government efforts.

Data integration involves technologies that allow multiple access to heterogeneous data spread over multiple databases. In order for appropriate data integration to be achieved in an e-Government 2.0 environment, it is necessary to consider 'the three approaches (application integration – mediation; database federation; data warehousing)' to be achieved (Al-Sudairy & Vasista 2011:3). Using the concepts of SOA and event-driven architecture (EDA), Widodo et al. (2013) designed an e-Government interoperability architecture to connect disparate e-Government systems at the national, provincial and district level. In general, therefore, interoperability generally entails that different systems can be executed or run.

# ■ E-Government Interoperability

'[E-]Government interoperability framework ([e]-GIF) is a set of standards and policies that a government uses to specify [how] its different agencies, citizens and [businesses] interact with each other' (UNDP 2007:2). Cestari et al. (2014) posit that the importance of e-Government interoperability lies in enabling of systems for improved, evidence-based decision-making, improved accuracy in the coordination of government programmes and the general provision of improved government programmes. E-Government interoperability covers policy, management and technology dimensions of e-Government design and implementation (Malinauskienė 2013 cited in Pardo et al. 2012). The e-GIF articulates a set of guidelines, policies and managerial and technical standards including protocols that need to be observed and implemented to achieve meaningful e-Government (Tucker & Miller 2005). Design of e-Government interoperability starts from a clear understanding and consideration of the government's strategic focus, vision and goals and not necessarily from the design of the technology platforms (Lallana 2008). It is worth mentioning that achieving meaningful e-Government interoperability is done over a period of time using incremental steps and cannot be done instantaneously. Implementation of interoperability in the

e-Government environment involves more than understanding the technical attributes or standards or using XML for integrating two or more applications or simply the integration of e-GIFs (Guijarro 2007; Saekow & Boonmee 2009).

The need for streamlining public services to achieve a seamless flow of information within the different government departments cannot be overemphasised. For streamlining to take place, there is a need for integration of the different technology platforms and systems in the different government departments. Bringing together the different public service platform layers – processes, asset position and path dependence – are key attributes for a robust e-Government interoperability framework (Malinauskienė 2013). Some of the different types of interoperability are articulated below:

- E-Government interoperability, in its broad sense, is the ability of constituencies to work together. At a technical level, it is the ability of two or more diverse government information systems or components to meaningfully and seamlessly exchange information and use the information that has been exchanged (UNDP 2007). Interoperability in the realm of e-Government is considered in the following six dimensions: technical, semantics (data semantics and standardisation), organisational, legal, political and socio-cultural aspects (Novakouski & Lewis 2012). The EU and the UNDP e-Government interoperability studies have posited that there are three different dimensions that need to be carefully considered if meaningful interoperability were to be achieved.
- Technological interoperability focuses mostly on the technical aspects in the realm of hardware and software domains. Hardware focusses on networking and connectivity protocols (e.g. POPs, IMAP, TCP/IP and UDP). Software focusses on semantics and syntax for data (e.g. DDL and XML) and for facilitating effective business and web services (e.g. WSDL and SOAP).
- SI is a recognition that data are represented in different structure and organisation but the meanings that the data convey should be the same with no varying interpretations for collective expected actions on the data set.

- Organisational interoperability: for two different organisations operating on the same data domain, it is important that they are able to cooperate and perform a collective task exchanging information and services. Such kind of interoperability is achieved by adopting the same data and business process standards or frameworks, namely, the e-GIF, TOGAF, ebXML, etc.

There are so many benefits of implementing highly interoperable systems in e-Government. For example, the cost of implementing e-Government in a new government department is significantly reduced by leveraging and reusing existing e-Government systems; as systems are interconnected, e-Government culminates in improved data gathering and parsing which makes information with a high degree of integrity available to government workers for decision-making. This is because interoperability ushers in a paradigm where there is a requisite record and transaction trail in the decision-making processes allowing a possibility of facilitating increased transparency and accountability. Interoperability frameworks would enable connecting government departments and organs to such a point that it will be possible to access almost all the different data sets generated from public business processes in one point. This scenario enables technocrats or data specialists to analyse the trends in huge data sets at once, thereby presenting context-generated perspectives upon which policymakers can make informed decisions. Interoperability of e-Government services allows seamless flow of data within the government departments allowing provision of better public services (Lallana 2008).

The e-GIF is important in e-Government design because it defines the technical specifications and basic specifications that are at the centre of managing government information across government departments. The understanding of e-GIFs promotes seamless exchange of information (Saekow & Boonmee 2009). In its entirety, e-GIF architecture contains:

- The framework covering high-level policy statements, and technical statements including management and compliance resumes. The framework also contains the technical guidelines

on how e-Government needs to be implemented by articulating baseline functional and non-functional requirements.
• The e-GIF registry is concerned with the managerial attributes of the technology, especially the e-Government metadata standard (e-GMS), the government data standards catalogue (GDSC), government category list (GCL), technical standards catalogue (TSC), XML Schemas, etc.

Figure 7.1 presents the different components of the e-GIF.

The implementation of the e-GIF in the case of New Zealand is spearheaded by the e-Government Unit (Tucker & Miller 2005). The use of e-GIF accentuates the need of standards in the design of the architecture configurations for e-Government solutions. Jonkers et al. (2006:63) consider that the IEEE Standard 1471–2000 posits that 'Architecture is the fundamental organisation of a system embodied in its components, their relationships to each other, and to the environment, and the principle guiding its design and evolution.'
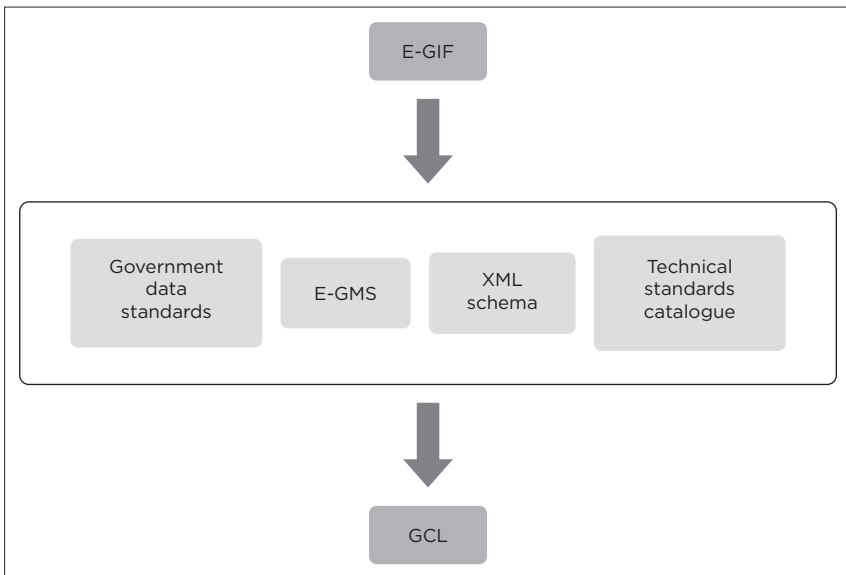


**FIGURE 7.1:** E-Government interoperability framework high-level architecture.

Because of limited integration and interoperability of systems which culminate in reduced informational and functional collaboration between government departments, there is a need to explore many interoperability frameworks in a bid to develop context-aware e-GIFs.

Appropriate integration and interoperability can be achieved by the implementation of e-Government solutions using the government architecture (GA). The GA supports a wide range of conceptualisation with regard to interoperability and goes beyond to present itself as a conceptual framework upon which designs of collaborative e-Government systems and interoperability frameworks (such as e-Government interoperability frameworks and e-GIF) are hinged. The GA allows the abstract prescription of the elements and the relationships of the government architectural configuration geared towards achieving an integrated service (Janssen et al. 2011). The contemporary age of e-Government design and implementation demands that government organisations and departments can no longer operate in isolation and thus have to be integrated in order to collaborate with one another.

# ■ E-Government Interoperability Frameworks Around the World

Many governments in the world have attempted to implement interoperability of applications at different levels of service abstraction. Some of the examples are briefly discussed below (Cestari et al. 2014):

1. Government Interoperability Maturity Matrix (GIMM) – provides a framework for different government systems information exchange protocols and presents itself as a framework for public administrations to evaluate their e-Government status. These evaluations enable different government departments to understand the maturity levels of their e-Government implementations.

2. e-PING – this is one of the most famous e-Government interoperability frameworks. The e-PING is the official Brazilian e-Government framework which defined the minimal level of technical, policy and managerial specifications 'that need to be put in place for [any level of] e-Government implementation' (Bwalya 2011:325). Specifically, e-PING provided a list of conditions that need to be achieved establishing system integrations, levels of interactions, conditions for interconnection, security and data dimensions.
3. The German government included both the architecture and standards in 'Germany and Architecture for e-Government applications (SAGA)' – as a common guideline for developing robust e-Government applications.
4. The ISO 15005-5 Core Component Technical Specification (CCTS) (UN/CEFACT 2003), Core Component Library (CCL) and UN/CEFACT standards are applied in Greece (Greek e-GIF) and Thailand (TH e-GIF).

In Brazil (e-Ping 2006), Australia, Malaysia and the United Kingdom, among others, the standards are hinged on technical attributes such as data integration, presentation, interconnection, metadata and security. Federal enterprise architecture (FEA) framework brings together a set of interrelated 'reference models' to come up with a comprehensive model with six sub-domains: strategy, business, applications, data, infrastructure and security. Enterprise interoperability assessment (EIA) enables an organisation to do self-assessment so as to know its strengths and weakness in light of its maturity agenda (Cestari et al. 2014). Just as in BPR (see Chapter 6), the different levels of interoperability readiness allow an organisation to know its 'AS-IS' stage and come up with a strategy to achieve higher readiness in its 'TO BE' stage.

# ■ European Union

In order to facilitate the evolving technologies and emerging e-Government platforms, the EU is in the process of revising its interoperability framework (EIF) in order to ensure that the

different government departments throughout the union use the same open platforms and are integrated as much as possible. It is anticipated that this will contribute to facilitating the operationalisation of the cross-border digital services infrastructure. The EIF has undergone several revisions in order to conform to changing needs of e-Government at the EU level. The EU also aims to facilitate requisite interaction between the government and citizens/businesses (Bwalya & Mutula 2014) further involving them in the design and implementation of e-Government solutions and services.

The Interoperability Solutions for European Public Administrations (ISA) programme is mandated to develop progressive e-Government solutions in the EU that are able to take advantage of the envisaged cross-agency and cross-border e-Government services. The ISA programme has so far developed the following solutions (tools, services and frameworks) towards an integrated data and process environment in the EU e-Government drive. These are cardinal in the EU goal towards a fully integrated and connected Europe (EU 2015b).

- A metadata standard, the Asset Description Metadata Schema (ADMS), for people aiming to reuse semantic assets (metadata or reference data) to understand SI requirements. Gives guidelines on how people can share their own semantic assets. Also in this line is another innovation, the Data Catalogue (DCAT) Application profile used for data portals.
- Designed the Trans European Services for Telematics between Administrations (TESTA) as data communication service to be used at the EU level allowing data interchange between different e-Government entities.
- As e-Government is being designed, there is a need for designers to check the level of interoperability of their design with the different EU e-Government platforms. The Interoperability Test Bed allows distributed e-Government applications to dovetail to each other so that one seamless cross-border e-Government network is achieved.
- Open Project Management (OP2) to provide domain-specific project management methodology in the realm of e-Government.

- Registry designed as a tool for managing and sharing reference codes which is cardinal for cross-border data exchange.
- Developed the 'common assessment method for standards and specifications' (CAMSS) (Council of the European Union 2016) useful in guiding procuring of ICT services for e-Government implementation.
- Designed the 'European Interoperability Reference Architecture and European Interoperability Cartography' (EIRA and EICart) (Council of the European Union 2016) which may go a long in promoting reuse.
- Given the many languages in the EU, the ISA developed the VocBench3, which is a multilingual platform promoting collaborative thesaurus management.
- Designed the European Single Procurement Document (ESPD) for facilitating universal participation of individuals and businesses across the EU.
- Developed Core Vocabularies which is a set of metadata standards critical for reusing semantic assets and metadata management.

The new ISA[2] aims to achieve SI of all government systems in Europe. The ISA[2] is a predecessor of the ISA programme which developed the EIF.

The contemporary e-Government development agenda of the EU is espoused upon the need to have an integrated and interoperable government as shown in Figure 7.2. This type of e-Government is hinged upon the achievement of open government (see Chapter 9) and joint-up government which goes a long way in achieving the envisaged integrated cross-agency and cross-border e-Government systems enabling EU citizens to access the same e-Government services in their countries. The main entities in this e-Government establishment are citizens, businesses, civil society, social partners, private sector and the government employees (users).

The envisaged EU integrated and interoperable government is realised by the design of open data governance systems, open processes and open service. This stems from the widely held
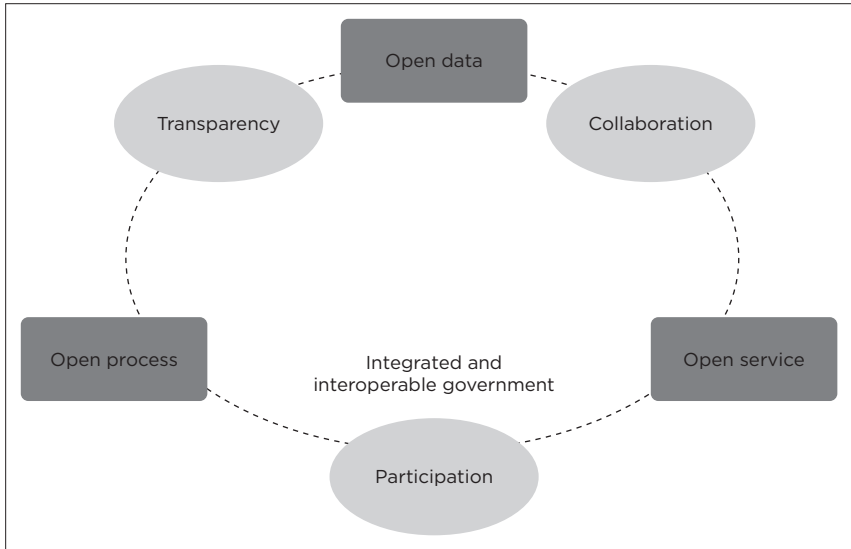
*Source:* Adapted from Tröbele, Leosk and Trechsel 2017.
**FIGURE 7.2:** The X-Road constructs for e-Government interoperability framework.

conviction that opening up data may significantly culminate in improved efficiencies and transparency. In this regard, accountability is but a fallacy, and enhanced accountability in governance value chains cannot be truly achieved. Therefore, it is important to open not only data but also government processes and systems.

Although there has been active pursuing of 'Digital by default' in the EU articulating mandatory online services, it is worth mentioning that digital is not yet the DNA of many governments in the regional grouping (European Commission 2016). With regard to 'Cross-border by default', about a quarter 'of the services required [for] foreign entrepreneurs to [do] business in [other countries] is [either] offline [or does not exist at all]' (European Commission 2016:10). This means there is work to be done in this regard. Another obvious challenge in cross-border e-Government in the EU is the language barrier (European Commission 2016). In order to understand the current level of

development of integration and interoperability of government systems in the EU, individual countries are surveyed as articulated below. The surveys basically bring out the individual country e-GIFs which have been developed with reference to the EIF:

- Malaysian government interoperability framework (MyGIF) – focusses on interconnection, information access, data integration, security and metadata, and adopts internationally recognised open standards (vendor and product neutral). The MyGIF (2003) is anchored by the Electronic Government Information Technology Policy and Standards of 1997, the Malaysian Public Sector ICT Management Security Handbook of 2002 and the *Digital Signature Act of 1997* coupled with the *Digital Signature Regulations 1998*.
- Yesser framework for interoperability (YETI) – the interoperability guiding framework of the Kingdom of Saudi Arabia which articulates information exchange and service-sharing strategies among the government institutions. The framework defines data types and schemas; metadata elements and dictionaries; and technical policies on integration, security, connectivity and information delivery standards. The policies formed within YETI are guided by interoperability, market support, openness, international standards, integration approach (e.g. topologies such as hub-to-spoke and bus, and point-to-point), integration layer (data and application), specification of semantics, technology standards, etc.
- Germany's standards and architecture for interoperability – the standards and architectures for e-Government applications (SAGA) focusses on the identification of the necessary standards, specifications and formats and sets conformity rules given the context (Bwalya & Mutula 2014). The SAGA specifically focusses on four development projectiles: process modelling, definition of normative technical references, data modelling and the development of basic components.
- Indian e-Governance Framework – unlike many interoperability frameworks that focus on technological integration, the Indian framework focusses on facilitating interactions among different stakeholders of the government. The understanding is that requisite policies are made by exploring full interaction with and participation of citizens.

The Indian e-Governance Framework mentioned above has the following attributes:

1. Design guidelines and specifications for websites.
2. PPP and different revenue models for funding e-Government design and implementation.
3. Record management principles and guidelines based on the international standards ISO 15489-1 and ISO 16175-1:2010.
4. Documents related to programme management activities, namely, software requirements elicitation and specification (SRS), project management plan (PMP), test plan (TP), user manual (UM), etc.
5. Guidelines for the design and implementation of e-Government, namely, request for proposals (RFP), that is, functional, non-functional, technical, commercial specifications, and SLAs (Bwalya & Mutula 2014), etc.

In contrasting the level of development of the EIF, the following paragraphs cover some of the interoperability frameworks implemented throughout the world.

The e-PING architecture in Brazil has different assumptions, technical specifications and policies that define the interoperability of services and processes for e-Government. The e-PING provides the building blocks for e-Government interoperability.

New Zealand's e-Government Interoperability Framework comprises mainly three documents that define integration of public service business processes and services – policy, standards and resources. The New Zealand e-GIF promotes the use of open standards to provide design guidelines, technical characteristics and principles that aim to achieve universal access of e-Government applications at no cost, devoid of discrimination of users, and for all e-Government processes and interactions to be documented. The actual e-GIF for New Zealand has the following modules:

1. Network – articulates the details of the transport, namely, protocols, networking standards, Internet protocol suite, network channels, network security, etc.

2. Access and presentation – articulates how users access and present business systems with most standards defining this portfolio obtained from Government Web Standard and Recommendations.
3. Data integration – standards for facilitating data, process and service interchange between disparate systems.
4. Business services – supports seamless flow of business data and information by integrating processes. For example, using SI, the data integration standard (XML) defines the meaning of data in a particular business information context.

FEA is a framework used in the USA which has five reference models – performance, business, service, technical and data reference models. The FEA provides a common framework and vocabulary to enable better management of the IT portfolios across the federal government. In this regard, interoperability is defined as the capability to discover and share data and service.

Australian e-Government Interoperability Framework – the Australian e-GIF (Ae-GIF) focusses on addressing the information, business processes and technical attributes of e-Government design and implementation setting the standards and methodologies for integrated and seamless services. The Ae-GIF uses the business process interoperability framework (BPIF) to assist governments by providing a set of tools for transitioning to connected and shared modes of service applications which is central to the transformation of the whole of government. The BPIF has the following modules:

1. List of support sources in guiding the collaborative agenda of e-Government systems in different departments.
2. Roadmap detailing key steps towards interoperability.
3. Capability maturity that government departments can use to identify their level of process interoperability maturity.
4. Documentation of case studies of business process interoperability initiative of the different agencies of the Australian government.

The BPIF is referenced together with the Australian Government Architecture (AGA) Reference Model which is used to guide the integration of government systems in Australia and also to assist in mitigating gaps and service redundancies, principally in the public sector. The AGA has the following modules:

1. Data reference model – considers how data are to be integrated into the government business processes using XML and SI to enable seamless flow of information.
2. Business reference model (BRM) – considers a functional view of the different business processes in the Australian government segmented around common business areas rather than the structures of the government agencies and departments.
3. Performance reference model (PRM) – this is the reference model which is used to measure performance of governance management systems across the Australian government.
4. Technical reference model (TRM) – a framework that gives the technical standards and technologies that need to be considered in the Australian polity in order to enable the delivery of competitive public services.
5. Service reference model (SRM) – a framework that specifically focusses on the classification of services and sub-services by considering their functional attributes to support expected performance objectives.

Hong Kong Interoperability Framework (HKIF) – focusses on providing client-centric public services by articulating the technical interoperability of government systems at both the back-end and front-end consoles. Just like all frameworks, the HKIF brings together different interoperability specifications under one umbrella. The HKIF specifically focusses on providing a set of technical and data standards for defining system interfaces across different departments, providing guidelines on defining technology infrastructure architectures and procedures and providing business-oriented specifications for the realisation of integrated e-Government services.

The implementation of integrated government information systems connected by a common middleware and jointly working together is cardinal for contemporary e-Government systems that are expected to share information by way of exchanging electronic records and documents. This raises the question of how interoperability is being designed in the ambit of the current e-Government system and metadata standard for procedural and process integration. Some leading countries in e-Government such as the United Kingdom have designed the UK e-Government Metadata Framework (e-GMF) and the UK Government Metadata Standard (e-GMS). It is desirable that metadata frameworks and standards be included in the design of the interoperability frameworks.

The African continent and other resource-constrained environments slowly jumping onto the bandwagon for designing e-GIFs are bedrocks upon which e-Government integration is based. Box 7.1 shows the different procurement systems used in the public sector of South Africa, especially at the municipal level. Box 7.1 aims to showcase the level of integration among the different systems used in the public sector. Note that these systems are highly integrated using different technology solutions.

# ■ Challenges in Integrating e-Government Applications

UNDP (2007) posits that there are specific challenges that need to be overcome during the implementation of integrated applications. Some of these challenges include addressing issues concerning capacity development, especially on the availability of requisite human resources that are going to be responsible for pushing the integration agenda. Another issue is the difficulty attributed to the compliance and enforcement of the adoption of integration standards. In the implementation of e-Government, it is difficult to measure the success of each of the key constructs

**BOX 7.1: Heterogeneous information systems: South Africa.**

- The logistical information systems (LOGIS) are implemented at the national and provincial departments for procuring, controlling and regulating optimal stock levels.
- LOGIS is integrated with the basic accounting system (BAS) to enable efficient processing and financial control.
- LOGIS is used for asset procurement, requisition and provisioning, contracting and supplying, disposal infrastructure, reporting and security management, etc.
- Notable organisations using LOGIS include the national security arms, namely, South African National Defence Force, National Treasury which runs the integrated financial management information system (IFMIS), Procurement Management Module as the lead site, state security agency, etc.
- Other than LOGIS, the district and local municipalities use 13 different financial and procurement systems. Some of these systems include Hardcat, Procure to Pay, Intenda, ISP, SAP, etc. Other vendors include Bytes, SAP, Oracle, SEBATA, BCX, VESTA, UFEZELE, Quil, None, RDATA, FUJITSU, CICS, etc.
- Connectivity between provincial and national government departments is facilitated by a requisite ICT infrastructure base that has already been put in place in South Africa. Although some progress has been made towards integrating government processes, it is still difficult to create inter-database correlations and verifications with organisations such as SARS, CIPC and the Department of Labour.
- The IFMIS will eventually replace the LOGIS and other systems such as PERSAL and BAS. The IFMIS is an integrated system with the following key functional models: supply chain management (includes management of general ledger and payroll) and business intelligence. The introduction of the IFMIS will further improve public service delivery in South Africa.

espoused in the e-GIF (Zhang, Guo & Chen 2007). There is also basically limited accountability on the part of the implementing agencies and the general bureaucratic challenges.

# ■ Smart Government

Smart government involves the requisite streamlining of internal and external business processes of public services underpinned by law or regulations, defined processes and information channels within citizen-centric conceptualisations (Al-jenaibi 2015). With all the advancements in technology spheres, such as the emergence of blockchain and smart cities, e-Government will be part of the ambient intelligence movement where technology will be deployed all over the environment(s) in which people generate information (Pankowska 2008).

Advancements in international standards (such as the Dublin Core model, ISO 15836, adoption of XML) for process and data integration have motivated many governments to offer connected government through technology systems. One of the key requirements for smart governance is that the different identifiers used in the governance value chains need to conform to ANSI/NISO Z30.84-2005 (NISO 2010) standard. Therefore, it can be posited that smart governance has strict guidelines on the content metadata management. Examples of these guidelines include the guidelines on the schema management – for example, the W3C's recommendation for XML configuration can be used to have XML-based products and services.

Contemporary smart government entails the integration of various e-Government systems in order to have a truly connected governance hinged on the provision of ubiquitous information resources. In some instances, in order to provide higher integration levels of e-Government with other known platforms and applications, e-Government is implemented using the cloud computing principles. The implementation of e-Government on cloud computing infrastructure allows the unlocking of opportunities that could not be perceived using the traditional

ICT infrastructure. Any cloud architecture is built in such a way that it is highly flexible and modular and can easily integrate with other information systems, thereby offering a 24×7 access platform for the e-Government services. There are many advantages of implementing e-Government on cloud platforms – for example, cloud computing allows scaling to better accommodate new technology innovations, provides efficient management and disaster recovery opportunities, and offers unlimited central processing unit (CPU) supply, storage and bandwidth, etc.; moreover, cloud architecture is very dynamic because it is built on SOA.

Cloud architecture in contemporary e-Government applications offers many advantages in as far as overcoming intermittent challenges that were common in traditional e-Government applications. Traditional e-Government applications are those considered to have been designed on common technology platforms which do not offer any dynamic capabilities in as far as data and service management are concerned. Competitive design of e-Government should have the following characteristics given the ever-changing dimensions of e-Government aspects:

- Auditing and logging of actions in e-Government environment – contemporary e-Government implementation demands that there is accurate tracking of the different actions executed in e-Government environments by leaving logs of all interactions that may further act as an audit trail during the audit processes. Process and security audits enable period monitoring of the interactions and give an opportunity for the cloud to organise and analyse huge volumes of e-Government data to detect signs of fraud. The use of cloud computing architecture to design e-Government enables guaranteed reliability and availability of public services implemented on the cloud.
- Disaster recovery – both natural and artificial disasters such as floods, wars, earthquakes and human error can cause e-Government data to be lost and e-Government systems to become dysfunctional. This may culminate in

overall unavailability of e-Government services. A robust e-Government should therefore consider appropriate and reasonable backup and recovery systems. Cloud architecture allows data and applications to be redundant so that in case of disasters, the e-Government system is able to automatically switch from one data centre to the next. Cloud computing architecture further allows location and access transparency with regard to distributed resources in the e-Government environment.

- Adequate scalability of the data – as the scale and meaning of e-Government data keep changing over the years, it is important for e-Government applications and data stores to be able to handle any type of data that may emerge. Although relational databases have the capability to handle data at the lowest levels of abstraction, cloud databases have enhanced capability to handle dynamic data at any level of abstraction and scaling without any negative impact whatsoever on performance. Designing e-Government on cloud databases enables appropriate handling of both static and distributed scaled data in the public service business processes.
- Managing new instances, replication and migration of e-Government services – cloud architecture enables the replication and migration of services at a municipal level so as to avoid lost time and effort, resources and financial cost during implementation of similar services that may be implemented in another department. Cloud architecture brings capabilities to replicate applications by having many instances of the same application so as to extend the service offered. Therefore, significant resources such as time and money are saved from the need to deploy new application instances in a new department each time the service is desired.
- Smooth migration to new and emerging technologies – in the e-Government design practice, the migration to new technologies is one of the serious challenges that need to be overcome. In many cases, when a new technology emerges, e-Government needs to be redesigned altogether. Designing e-Government on cloud architecture enables easy and smooth integration of new and emerging technology innovations into the e-Government design without having to redesign the whole thing.

# ■ Research Domains

Given the evolution of e-Government design platforms, there are a lot of research opportunities and angles that can be pursued. Janssen et al. (2011) articulate the four key research challenges that define collaboration and integration in e-Government environments. These challenges define the key research areas that need to be explored in different contextual setups. The following are some of the typical research domains:

- Pragmatic layer – research in this domain focusses on process flexibility and agility, SLAs, the monitoring of system performance, checking compliance, relationship governance within the different stakeholders, lifecycle approaches and shared services.
- Semantic layer – research focusses on semantic web services, ontology definition and integration, model-driven architectures and service composition.
- Syntactic layer – focusses on message and data exchange standards, definition and harmonisation of terms, metadata definition and integration, etc.
- Technical layer – technical research directions include security aspects of e-Government implementation, identification, reliability, scalability, cloud infrastructures, etc.

The research themes and approaches in this field can be understood by exploring the different research already done in different contextual environments. Al-Khouri (2011) proposed an adaptive framework to support the development of e-Government in the UAE. The frameworks accentuate the need to have an ever-evolving e-Government design based on interoperable conceptualisation. The CIVIC IDEA core platform is built around the SOA. Mecca et al. (2016) proposed a digital identities handling solution within e-Government based on SOA. Gatautis and Vitkauskaite (2010) discussed e-Government interoperability in Lithuania as a system for integrating government business processes rather than reinventing the wheel. They further went on to provide a comparison of the best practices in e-Government interoperability design and practice in the EU. At the regional

level, the European Interoperability Framework (EIF) acts as the guideline for interoperability designs, and at the national level within the EU there are some interoperability designs benchmarked against the regional interoperability guideline. Some of the examples at the national level include the United Kingdom's e-Government Interoperability Framework, Germany's 'Standards and Architectures for e-Government Applications [(SAGA)] and [the Greek] e-Government [Service Provision and] Interoperability Framework' (Othman and Razali 2013:n.p.). On analysing the country-specific frameworks, the United Kingdom's EIF seems to be the most advanced and mature framework having undergone various revisions during its implementation cycle. In another study, Dias (2014) did a bibliometric study to understand the growth of e-Government research and practice, especially with reference to Portugal. Al-Khanjari, Al-Hosni and Kraiem (2014) enabled many computers owned by different government departments to interact and exchange information across ministerial boundaries. Malinauskienė (2013) used dynamic organisational capabilities theory in a research dedicated to understanding context-based e-Government interoperability research.

Ray, Gulla and Dash (2011) have studied the institutional framework for India's interoperability initiatives (National e-Governance Plan [NeGP]) and found that the initiatives were well-poised to succeed as there was proper support from the government, with defined institutionalised initiatives within the ambit of e-Government. Shvaiko et al. (2009) discussed the e-Government Interoperability Framework for Mozambique (eGIF4M) which was developed using a holistic approach by referring to the existing interoperability frameworks. In order to take care of the different dimensions of e-Government, Sarantis, Charalabidis and Askounis (2010) proposed a strong project management approach to e-Government through the e-Government Transformation Project Management (eGTPM). The project management approach mitigates the risk of e-Government failing on its promise by ensuring that the different attributes, domains and processes of e-Government are dovetailed together in one information management space (Sarantis, Charalabidis & Askounis 2010).

# ■ Conclusion

The question of interoperability in contemporary e-Government systems is undoubtedly cardinal in progressive public service and information dispatches to the general public and businesses. As posited by Ray, Gulla and Dash (2007), interoperability is a major enabler for 'one-stop' government services. This chapter has discussed the different characteristics and types of interoperability frameworks as utilised in different contextual setups throughout the world. Issues of system integration and interoperability have also been carefully explored. Interoperability is a key requirement that is needed in the emerging information-intensive e-Government designs. As the SADC region aggressively pursues the regional integration agenda, it is important to consider a regional e-Government strategy that is going to facilitate business process mobility wherein entities in one country can easily access business opportunities and registration in another country.

## ■ Directions for Research and Practice

With regard to practice, it cannot be overemphasised that interoperability frameworks and strategies are very important in order to realise the 'whole-of-government' where e-Government systems seamlessly exchange information and services. As has been articulated in this chapter, a lot of models and frameworks exist to design and implement e-GIFs throughout the world. Some of the most prominent e-GIFs have been implemented in Brazil (e-PING), Germany (SAGA), Malaysia (MyGIF) and the EU (EIF), and it is expected that each of the areas in which e-Government is to be implemented must come up with unique e-GIFs informed by the local context. '[Research opportunities exist] in the [design] of [different e-GIFs given the different] contextual characteristics in the [areas] where e-Government is implemented' (Bwalya & Mutula 2014).

# Open-Source Solutions for Design of Pervasive Government Systems

## ■ Overview

Because e-Government is prohibitively costly to design using conventional technologies and traditional approaches, new technology and implementation models have to be found in order to reduce the high costs associated with e-Government implementation (Al-Rashidi 2012). The developing countries are mostly left out from e-Government owing to lack of adequate financial resources to procure appropriate technology that presents wide-ranging functional capabilities. One of the candidate technology solution models is the use of Open-Source Systems/Software/ Solutions (OSS) for e-Government implementation (Tella & Tella 2014). In this chapter, OSS refers to Open-Source Solutions.

Because e-Government uses technology as one of its key enablers, it is important to explore what software systems or platforms can be used in designing the heterogeneous e-Government platforms which may be needed in any given 'context in which e-Government is to be implemented' (Scholl et al. 2016:n.p.). This chapter explores how the principles of non-proprietary software platforms can be explored and utilised in designing e-Government solutions. The chapter also discusses different hardware configurations that can be used in e-Government systems.

# ■ Emerging Technology Models

As technology is one of the key enablers for e-Government development, it is acceptable to refer to it as a key determinant for e-Government success (Pardo, Nam & Burke 2012). Being a determinant, it is not surprising that technology is one of the most expensive components of e-Government (Ebrahim 2011). Therefore, there is a need to understand the different technology options that may exist. Open-source solutions have presented themselves as the beacon of hope for the global penetration of e-Government in different governance systems. Usage of OSS has gained precedence in back-office applications, namely, in web servers, mail, integration systems, etc. It is worth mentioning that e-mail clients, content management systems and desktop applications wired using OSS are also gaining momentum.

There are currently many established industry players and tech giants that are busy implementing open-source systems and software guaranteeing the sustainability of OSS in the future. These different OSS enthusiasts are further advancing the open standards agenda so as to increase the OSS footprint on the world stage. The ever-increasing maturity of OSS has made it possible for many e-Government applications to be designed upon open standards. The two key motivations for OSS penetration into the different communities have been primarily driven by the lucrative products that have been developed using the open-source code, and the opportunities, processes and

productive units that emanate from the utilisation of OSS (Scacchi 2002). Birk et al. (2002) further posit that OSS presents opportunities to attain independence from software producers. Baguma (2006) posits that OSS is loyalty- and licence-free, making it possible for the user to move away from using a named OSS once they deem that it may not be necessary going forward. Given the foregoing, it can be posited that OSS usage is a potential game changer in the design and implementation of e-Government, especially in the developing world context.

# ■ Open-Source Software Platforms

As e-Government implementation is very costly and has prevented most of the developing countries from integrating it into their governance platforms, the use of OSS presents a source of hope as the cost of e-Government is significantly reduced. From the Netherlands to the US navy, OSS has been used a great deal to facilitate management and access to critical information (Ward & Tao 2009). Many governments around the world are now considering adopting OSS as platforms upon which e-Government can be designed. It is worth mentioning that, especially at municipal governments with limited resources, adoption of OSS presents itself as a viable solution upon which e-Government can be designed. Utilised within the confines of the general public license (GPL), open-source software provides a high degree of flexibility with the code provided in the public domains. Anyone can read, adapt and fork (adopt an existing project and modify it to include their own attributes for their own use) or modify any source code. The development projectile of OSS is promising. Nordfors et al. (2009) posit that by 2020 many governments around the world will have comprehensive public services online and most of the e-Government designs will be fuelled by the OSS platforms.

Open-source software has dawned with many government departments adopting it to achieve more innovative e-Government solutions, agility and cost-effectiveness. Many governments around the world have formalised the use of OSS by forming

policies specifically targeting the use of software solutions in government business processes (Tella & Tella 2014). Because of the fact that OSS is designed using open-source standards, in many instances, OSS is more cost-effective than proprietary software and can be easily integrated into the different government business processes.

There are basically two types of software: proprietary and non-proprietary. The OSS falls under the non-proprietary category, where it is available to the general public to use at their own risk. The other alternative to OSS is the proprietary or closed source software (CSS) where the users do not have the freedom to modify and use the software as they like because the source code is proprietary commercial software which is ultimately a source of competitive advantage. Maluleka (2014) mentions that OSS is a software registered with the open-source initiation and correspondingly issues a licence. Therefore, OSS is not entirely free and so does not address the issue of saving. The issue of 'free' is concerned with the freedom to access and modify OSS within the confines of further developing it.

The key characteristics of OSS are espoused in the five open-source freedoms: 'you can get it, you can use it, you can see it, and you can change it, but those changes belong to everyone'. These characteristics are articulated below:

1. The development projectile of the OSS follows the process of public collaboration where individuals regardless of status are given the opportunity to play with the available code and embed their innovations for the enrichment of the code.
2. In most cases, OSS options are available free of charge, although there are certain software which can only be accessed upon payment of a certain amount. In situations where a small charge is attached for one to access the code, it means the software is extremely valuable and the initial developers would like to preserve the innovation in the code.
3. There are no licensing fees or any restrictive licensing schedules that are entertained in OSS. The advantage this offers to the adopters is that the software can be used

without any extra cost. The downside is that no patches are administered during the use-cycle of the software and therefore innovations are not coordinated and immediately integrated into the software modules. Further, there is no maintenance and support during the implementation cycle.

4. Access to source code of the software and inner-workings of the technology is unreservedly granted to enable individuals to modify, customise and further improve the code. In such an environment, innovation is rightly encouraged to flourish. This is a characteristic of technology transparency.

5. There are restrictions to the sharing or redistribution of the customised, improved or modified code so that individuals in different contexts keep adding their knowledge to the enhancement of the code. The OSS is often built on open standards which do not pose any restrictions to further development of the code.

## ■ Benefits of Open-Source Solutions

There are many advantages or benefits that can be realised from the use of OSS from technical, managerial and cost standpoints. In general, OSS play a big role in reducing the technology divide globally. In considering the benefits and value that is brought by the utilisation of free and open-source software (FOSS) in e-Government environments, there is a need to look beyond the conventional benefits in terms of the convenience brought to the users and government workers and the financial positives brought to the government itself because of the savings realised. The benefits should be considered in the broader socio-economic context both from the social good perspective and the economic and technical dimension. Looking at FOSS in this regard will help developing countries broadly understand the absolute value of FOSS as appropriate platforms in the e-Government establishment. Depending on the context in which it is implemented, the following are some of the benefits of OSS in designing e-Government applications:

• OSS supports the growth of the indigenous IT industry providing home-grown innovative solutions and ultimately

culminates in digital self-sufficiency. Encouraging locally grown IT industries will ultimately contribute to nurturing employable skill base, provide much-needed employment to the youth, keep financial resources 'onshore' and discourage highly skilled human resource base from migrating to other greener pastures where they can ply their trade and showcase their talents.

- The use of FOSS allows innovation to thrive among individuals in the local community and facilitates the advancement of local solutions and hands-on, self-directed and experiential learning. The innovations on OSS platforms allow multiple validation and feedback as many people will have access to the innovations sharing knowledge commensurate in an information society.
- Open-source provides opportunities for rigorous and dynamic standards which can be used in collaboration and seamless distribution of technology innovations (Vrabie & Antonie 2013). This involves the nurturing of products commensurate with the information society. Further, OSS supports the creation and consumption of content adopted for local languages enabling the penetration of technology innovations in remote/unique contexts and cultural setups.
- Because OSS code and platforms are accessible mostly at no extra cost, the implementation of OSS promotes entrepreneurship at the individual level in line with software development. Individuals are given a chance to showcase their skills with regard to customisation of software to local contextual settings and the design of ways to appropriately integrate the innovations into the existing software platforms. The use of software allows the proliferation and flourishing of small, medium and micro-enterprises (SMMEs) so as to directly contribute towards job creation and participation of minor players in the global socio-economic value chains (Bwalya & Mutula 2014).
- The existence of OSS provides opportunities for smaller firms to participate in and access global markets overcoming the competition barriers which would normally happen in environments where access to technology is not guaranteed.
- The use of open-source eliminates the possibility of vendor lock-in and reduces the psychological dependence of developing

countries on developed ones by unlocking technology innovations relevant to their local contextual settings.

- The knowledge and competitive profile of the developing countries is uplifted given the utilisation of OSS, which gives them the knuckle to participate in the global economy. Massive utilisation of the OSS in different socio-economic contexts increases the desire of the developing countries to be technology-savvy and progressive nations that are at the forefront of conquering the knowledge frontiers.
- When used in the government value chains, OSS goes a long way in opening up government data (see Chapter 9) towards openness, transparency and accountability. As most of the OSS innovations are based on open standards, this may lead to universal access of e-Government applications. There is freedom in the use of OSS in e-Government as there is no lock-in into the proprietary software from profit-making organisations. This positions the OSS technology platforms as bespoke technology innovation platforms.

Liu and Luo (2010) have proposed a data warehouse solution (eGovMon DW) for e-Government with a detailed architecture solely based on open-source software and systems. For example, the Data Source 3XL is the main data source with specialised schema based on Web Ontology Language (OWL), uses Extraction, Transformation and Loading (ETL) (RiTE) in the extraction of the data from different sources and converts it into a uniform format. The use of OSS significantly reduces the cost of e-Government.

Another advantage of OSS is that the existence of code publicly encourages innovations as anyone can modify it and then later integrate it into the main code of e-Government (Rahman 2010). This brings us to the conceptualisation of not using proprietary standard as a development platform for e-Government. The implementation of e-Government on OSS platforms enables integration with other technologies developed on similar platforms as open software/systems is highly interoperable (Boyer & Robert 2006). In addition, FOSS is usually evolving owing to innovation which can be advanced by anyone

at any time. It is worth mentioning that FOSS is highly flexible and modular, giving it a higher chance of adaptability to emerging software platforms.

Although there is a worldwide crusade for the utilisation of OSS in e-Government and similar government-led applications, it is important to consider the caveats involved in the utilisation of OSS as key design platforms. Some of these caveats include:

- Possibility of security vulnerabilities that may be found in open-source code.
- A lot of work and expertise may be needed in the development of the OSS code to bring it to a point where it can be seamlessly integrated into the existing e-Government programmes and platforms.
- Possibility of lack of ready expertise to develop context-aware e-Government solutions and applications that may be relevant to the local contextual setting.
- It is not a given that the available OSS platforms are commensurate with all the e-Government needs, and therefore there exist some contexts and situations that demand the functionalities exhibited in proprietary software (this observation may be served as cautionary to mainly resource-constrained countries that may ultimately see OSS as the messiah for their software needs).

Jahangir Alam (2012) articulated some of the disadvantages of OSS as (1) lack of opportunities where the users of the OSS can claim for the damage caused by bugs – the use of OSS is at owners' risk, and (2) because anyone can lead the development process of OSS code, there is no guarantee of continuity of innovations.

## ■ Technical Dimensions of Open-Source Solutions

There are many practitioners and researchers that have done work in OSS applications and technology platforms. The AOSIS Forum is a leading grouping of experts that have provided technology

guidelines that can be redesigned and integrated into the different e-Government designs. Further, some governments around the world have encouraged the use of OSS (and cloud computing) in the design and implementation of e-Government. For example, the USA '"Digital Services Playbook" encourages [government departments] to [use] open-source, cloud-based and [other available] commodity solutions across the [entire] technology stack' upon which public services are designed (NARA 2015:2). Open standards such as HTML (ISO/IEC 15445:2000), Open Document Format (ISO/IEC 26300:2006) and proprietary standards (e.g. ISO 3200001: 2008 ['PDF'] and ISO/IEC 29500 [Office Open XML format]) can be used in different aspects of e-Government design. Further still, the emergence of many viable sources of software such as SourceForge. net and http://www.opensource.org provides opportunities where code can be adapted to suite the e-Government needs.

The prospects for OSS integration, adoption and use are high as almost 95% of IT organisations have leveraged different aspects of OSS directly or indirectly in their mainstream IT solutions. The Gartner Hype Cycle for OSS posits that this is already possible now. The penetration of OSS is so promising that even the Microsoft Corporation uses Linux in Azure cloud to deliver its core service applications. As of the end of 2015, over 97% of supercomputers run on Linux which is a commanding OSS operating system according to Google research.

NARA (2015) has explored the different open-source technology solutions that can be explored in records management even in the realm of e-Government. Some of the tools include the following:

1. ACE (Audit Control Environment), developed by the University of Maryland, aims to establish the file integrity of long-term archival material and document using cryptographic techniques.
2. Alfresco software allows organisations to manage information content from scanned images, photographs, video files, engineering drawings, etc.; APACHE™ OODT from NASA is a data grid framework used for metadata management which can be used for transparent access to distributed resources and allows distributed information processing.

## ■ Utilisation of Open-Source Solutions Around the World

Realising the benefits of OSS, many countries around the world have adopted OSS in their e-Government solutions, culminating in significant improvement of the overall public service provisions capabilities. The following are some of the countries that have aggressively adopted OSS in their governance value chains:

- SMS blackbox, an SMS helpdesk application which is delivered using open-source platforms, was customised to the local contextual characteristics and is vastly used in Nigeria.
- South Africa has recognised the importance of OSS in governance value chains sanctioning policies that promote equal chances in the utilisation of both proprietary and open-source software. Specifically, the use of OSS is encouraged owing to the elimination of licensing and predatory maintenance arrangements culminating in expensive long-term exorbitant contracts. Just like South Africa, Venezuela has adopted and is promoting OSS in all aspects of e-Government and proprietary software only in cases where OSS is not feasible. The idea was arrived at owing to the fact that over 75% of the money for software licences were remitted to foreign nations (Tella & Tella 2014).
- Developed upon Linux, the Delixus e-Governance Platform was developed in India to address the needs of rural poor citizens receiving widow pension or pension services from the local government authorities. Linux was better placed to be used in this context because it could easily be modified to suit the legal and technical requirements in India. Further, Linux was cost-effective and had a higher level of security. Delixus was accessible from multiple platforms, namely, Linux, Windows, etc.
- In the EU, Germany has adopted OSS (GNU/Linux) to run operating systems of the different software applications running in the German parliament. Linux is also used in France (ministries of culture, defence and education) and in the United Kingdom (British police and intelligence agencies).

Further, the Ministry of Finance in Finland has shown that over 30 million Euros stand to be saved if the Finnish government agencies adopted Linux.

- In an attempt to run away from over-dependence on US firms for software in their information systems, the Chinese government is aggressively promoting the use of OSS, especially GNU/Linux to design their own e-Government systems.

It is therefore evident that open-source technology solutions have been used in different contextual settings throughout the world. For example, Cuba is aggressively implementing OSS in its e-Government drive (Garcia-Perez, Mitra & Somoza-Moreno 2006). The e-Governance programme in India is now actively taking advantage of emerging platforms such as cloud computing and open-source software for developing e-Government applications (Yadav, Rajasthan & Singh 2012). In Canada, the use of FOSS such as Linux, Apache and OpenOffice in designing e-Government solutions is recognised and formalised (Boyer & Robert 2006). The Australian government has a robust policy that articulates the different guidelines on how to integrate OSS into the design of e-Government (AGIMO 2012). The policy also gives clear directions on how to go about the business of procurement of different technology platforms and solutions for the Australian government.

At the global stage, a 'lot of interventions are being put in place to' encourage the utilisation of FOSS as platforms or technology enablers of choice (Bwalya, Sebina & Zulu 2015). For example, the UNDP came up with the Asia Pacific Development Information Programme (APDIP) initiative which coordinates the 'International Open Source Network (IOSN) [as] a centre of excellence for FOSS' integration into the different platforms worldwide (Wikibooks n.d.). In the information management environments, IFLA working group on open-source software coordinates the implementation of FOSS in libraries worldwide.

## ■ Integration of Open-Source Solutions into e-Government Design and Implementation

Many different countries around the world have adopted OSS as the platform upon which e-Government is designed. The possibility for the use of OSS presents itself as a unique opportunity for developing countries to base their e-Government designs on OSS. There is no doubt that the implementation of FOSS is gaining ground in many e-Government implementation contexts. This is because FOSS can be used in diverse contextual settings. The use of OSS is made possible in e-Government given the increasing use of open interfaces which make it easier for similar technologies to be used in different e-Government platforms. In many e-Government contexts, conventional economic establishments often put roadblocks to the proliferation of OSS given its different economic interests (Perens 2006).

An open standards policy to guide the implementation of OSS facilitates the adoption and wider usage of OSS in the different government departments (Bwalya, Du Plessis & Rensleigh 2011a). Open standards are good software alternatives to proprietary software because they allow the avoidance of 'vendor lock-in' where monopolistic technology vendors make their customers slaves as customers become over-dependent on monopolistic technology owing to frequent releases of patches. Further, OSS allows different choices other than having to see prescribed software or systems designed to vendor specifications. E-Government designers have software/system mobility as they can freely switch between alternatives at no cost as high switching costs have been completely eliminated and there is no restrictive licensing anymore. The integration of OSS in e-Government designs is not a given as it requires solid knowledge about the different FOSS business models, anticipated impact, licences and other perspectives which are dependent on the context in which e-Government is being implemented (Bwalya & Mutula 2014).

In many parts of the world, the cost of software in implementing e-Government is significant and it has prevented many countries

from implementing e-Government (Kumar et al. 2014). Therefore, the use of FOSS presents a great opportunity that needs to be explored. Besides being free, FOSS enables the amassing of many benefits such as scalability, precision, security, globalisation and interoperability of systems designed using the same open-source software or systems.

Lakkaé (2014) investigated contextual factors that influence OSS diffusion and sustainability and assessed the impact of OSS usage at socio-economic and socio-political level. The research found that the impact of OSS with regard to open initiatives such as open government and its impact on market structure and competition still remains unexplored to a lesser or greater extent. Open-source systems and platforms are excellent platforms that can be used to design contemporary electronic voting systems owing to their innovation and design flexibility (Kesselman 2014). Contemporary and future voting systems need to be designed upon OSS platforms to bypass the eminent security flaws, bad tabulation and partisan software design evident in many current direct recording electronic (DRE) voting systems.

## ◼ Cost of Open-Source Solutions

Apart from the general maintenance and operating costs, implementing of OSS in portal development may also be linked to capital expenditure in the setup of the portals. In implementing OSS, it is important to consider the costs that are involved as articulated below:

- Infrastructure development costs for building e-Government portals. This may involve costs related to payment of consultancy or competent technical people in developing portal platforms, transfer of both paper and digital records to computerised databases (data digitisation and integration), website design and creation, etc.
- Costs related to management and maintenance of the portal in relation to keeping abreast with evolving open-source software solutions. This may also involve costs involving

training so that they acquire adequate competent and operational skills to run e-Government platforms. Other costs may include remuneration for staff involved in portal management and maintenance ensuring that there is adequate support for trailing (and updating, modernisation and upgrading) the developments in the hardware and software used.

• Costs related to building investment towards shifting to computerised databases and information management. This involves procurement of workstations including network and communications infrastructure. If the software and systems are based strictly on open-source, the costs related to software are negligible.

Given the caveats that need to be considered in the use of OSS in e-Government design and implementation (Al-Rashidi 2012), there is a need to carefully consider the multidimensional aspects of OSS deployment in e-Government value chains. In deciding whether non-proprietary or proprietary software is going to be utilised in any given setup, the following needs to be considered (AGIMO 2012):

1. TOTAL cost of ownership – agencies need to carefully consider both the direct and indirect costs in order to arrive at the total cost of ownership of the OSS innovation into the e-Government value chains. It is important to note that even software which is considered absolutely free of cost may eventually culminate in costs with regard to alignment to the existing software consoles, integration, data conversion, maintenance and unforeseen exit costs. A careful consideration of such costs may be enough to determine whether it is worth the while to consider OSS or CSS. It is worth noting that as proprietary software comes with licences that are valid for a certain period of time, it also comes with maintenance support and in some instances may also include installation and customisation to the local contextual characteristics.

2. Following procurement guidelines – in procuring either type of software or systems, it is important to strictly follow the laid-down procedures and guidelines in selecting software solutions. This may involve subjecting the software against

the set criteria and eventually selecting the one with the highest score which presents good fit-of-purpose.
3. Matching against agency development projectile – the given product innovation or software solution needs to be checked against product maturity and how it fits into the overall agency's development roadmap or needs. Each agency would have clear SLAs in order for it to be efficient and effective. It is these SLA requirements that will be used in order to ascertain the level of maturity of a given software. As stated above, all the different options need to be considered and the one that is most suitable and likely to dovetail into the agency's aspirations is chosen as the most appropriate one.
4. Matching agency capacity to requirements – before a software solution is chosen, it is incumbent upon the agency to ensure that the desired SLA is matched against the required level of maintenance and support for the chosen support.
5. Alignment of strategy and architectures – the agency's service and information strategy and the different architectures may demand for certain principles, standards and technologies, and these will need to be taken into consideration when procuring a new software. Correct alignment may culminate in massive reduction of the perceived costs.

# ■ Open-Source Solutions Implementation in e-Government Applications

In adopting and utilising OSS, Scacchi (2002) articulated the different forces that are at play in the development of OSS. These different forces have different impacts on the development of government information systems. The following are some of the key points that need to be considered in this regard (Ashaye 2014):

• The need to understand the quality of OSS from a socio-technical perspective – the quality of OSS determines the impact of open-source solutions. There is a need to come up with a standard way of measuring the quality of OSS.

As most OSS applications are developed using distributed asynchronous collaboration between researchers dispersed over time and space, it is important to agree upon the quality metrics that should define OSS. The software industry focussing on bugs, errors or issues has recognised Bugzilla and IssueZilla and released reports highlighting hundreds of bugs in common open-source software such as Mozilla web browser. Key research focus in this regard is the understanding of these different issues by software companies on OSS bugs analysing socio-technical patterns of these bugs and their overall well-being on the evolution and adoption of OSS.

- Motivational forces, career contingencies and occupational cultures of OSS developers – there is a need to understand why software experts engage in software development sacrificing their time and skills to develop OSS solutions. Literature mentions that some are motivated to jump onto the 'geek fame' bandwagon so that their reputation is enhanced in software development circles, using OSS for the good of the public, while certain others are motivated to obtain financial benefits that come with OSS development (Birk et al. 2002; Buffett 2014; Scacchi 2002).
- The role of OSS in advancing or inhibiting research in sciences – in many cases, policy mandates that software developed by a named agency be open-source. This may have both positive and negative implications – positive in the sense that knowledge of innovations can be dispersed across the agency and negative in the sense that there can be other researchers who may not want to put their innovations in the public domain, thereby stifling the advancement of OSS.
- Open-source in policy – OSS innovations and solutions may have an impact on the direction of the national and international technology and science policies. The different levels of technology advancements, especially between the Global North and Global South countries, can be done with the analysis of their different policy frameworks. For example, countries in the EU follow the EU policy which stipulates that any innovations out of programmes funded by the union should as much as possible be open-source.
- 'Open Government' emanating from the integration of e-Government and OSS – the emergence of OSS is a potential

game changer in as far as e-Government is perceived and implemented (Bwalya 2016). With louder calls for opening up e-Government data to come up with open government, the use of OSS will eventually culminate in increasing interoperability and accessibility of e-Government applications. The realisation of open government entails that the 'source code' for government business processes is going to be put in the public domain so that citizens and businesses can discuss, review and refine the code for future adoption into the actual government business processes.

- Research needs – in order to advance the implementation and adoption of OSS in e-Government domains (Ebrahim 2011) and other potential government systems, there is a need to explore the different critical issues that may be acting as 'road blocks' of e-Government implementation. Such issues may include the understanding of what aspects of OSS development projects, such as Apache HTTP Server, SendMail, GNU/Linux operating system, may be true of such development efforts but not necessarily true of the indicative characteristics and critical success/failure factors linked with OSS projects (Scacchi 2002). It is worth noting that OSS projects are significantly different in the way they are framed. For example, huge projects such as Apache, GNU/Linux and Mozilla are somewhat exclusive as they are not listed on software open-source community portals such as SourceForge (http://www.sourceforge.net) or freshmeat.org.

Buffett (2014) has articulated the most common factors that influence the adoption of OSS as follows:

- Total cost of ownership – although the initial costs are relatively very low, there is a need to acknowledge that OSS may eventually be equally expensive owing to its requirement of experts to appropriately integrate the technology innovations into the government business processes according to the local contextual settings.
- Concerns regarding continued service and support – as there is no cost involved to obtain OSS, there is no one liable or mandated to provide services and support during the implementation. This means that OSS aptly relies on expertise

that may be resident in a given organisation. Ultimately, the expertise comes at a cost.

- Lack of adequate and appropriate skills among the employees regarding OSS – in many cases, government organisations do not have relevant expertise in their midst. This entails that there are limited innovation capabilities for e-Government applications designed over OSS.
- Product capabilities and maturity – for open-source software and applications, it is very difficult to ascertain the level of development or maturity of OSS code or applications.
- Difficulty of integration – OSS applications are generally designed with reference to a general environment depicting model characteristics. Customising OSS applications during design in order to easily integrate them into existing e-Government applications is a very daunting task (Hutchison et al. 2004).
- Staff knowledge with regard to how OSS differs from proprietary software – many members of staff in the e-Government environment are generally not aware of the differences and implications of OSS and proprietary software in the e-Government systems.
- Viability of the open-source community – OSS advancement depends on constant addition of knowledge to the OSS code or applications by the different individuals. The principle is that when new functionalities have been added to the software code, that particular code needs to be pooled back into the community so that other individuals can modify and benefit from the given innovation or further add their own aspects of innovation to advance the usefulness of the OSS.
- Software enhancement – appropriate innovation of OSS requires a lot of time.
- Security of the OSS – many adopters of OSS are not completely convinced of the security attributes and capabilities of OSS and are therefore not absolutely ready to engage in OSS.
- Fit-for-purpose – OSS relevance is judged with regard to ability to meet the set business goals. In some cases, OSS is taken in a raw form and people expect it to conform to their contextual attributes and completely fit into their business contexts. If this is not achieved, the OSS is deemed a failure.

- Concerns regarding intellectual property – as any individual can contribute to the innovation of OSS code and applications, it then becomes extremely difficult for one to convincingly claim that a given innovation is attributable to him or her. In many cases, if there are intellectual accolades or property for a given OSS innovation, this is claimed by the community.
- Adherence to standards – because OSS provides a lot of freedom in innovation, there are few chances that individuals would ultimately observe the OSS standards and principles espoused in the open-source initiative and other recognised open-source organisations.
- Complexity – generally OSS is very difficult to implement as it demand to be dovetailed to the local contextual characteristics.

Kesselman (2014) articulates the different ways in which vendors can deliberately implement vendor lock-in using several methods such as the following: designing an e-Government system on technology standards and software unique to the other common design platforms. For example, instead of basing their designs on open standards for wider interoperability, the designs are developed using exclusive standards not similar to any others so as not to allow interoperability with other applications; implementing stringent, restrictive and exclusive software licensing resumes; implementing a patch management system where the software buyers depend on the vendors for intermittent release of software updates and security upgrades.

The key challenges for software adoption and usage, especially in government departments, include user resistance (lack of willingness of the citizens to adopt and use OSS), lack of approved standards (as OSS is implemented at the adopter's peril and one cannot claim anything from anyone owing to damage caused by OSS), migration costs (costs related to migrating e-Government services from traditionally proprietary platforms to OSS), compatibility with proprietary software and general lack of support. The appropriate integration of OSS depends on the cadre with expertise available in a given government department.

# ◼ Designing e-Government on Open-Source Solutions Platforms

In many governments around the world, there is a need to come up with strategic innovative interventions to encourage the penetration of OSS in different government departments and business value chains. In taking full advantage of the opportunities that OSS has to offer, the following are some of the initiatives that need to be taken into consideration at the government stage:

1. Train and put in place an adequate and appropriate cadre of employees with requisite human resource base to advance the agenda of OSS integration into the different business processes of the government. Such a cadre of human resource will have competent skills and imaginative capabilities for them to design innovative and context-aware (taking cognisance of the local context characteristics) e-Government solutions and applications that will be relevant to the local context.
2. There is need to ensure that open-source platforms/solutions are given due consideration when procuring software, paying particular attention to both the desired functional and non-functional requirements. In situations where the aggregate advantages and cost surpass its disadvantages, OSS be chosen as appropriate solution for designing e-Government business service channels.
3. There is a need to increase and nurture the culture of sharing of open-source innovative solutions designed within the confines of e-Government (Bwalya & Mutula 2014) and encourage a culture of collaborative development of e-Government solutions through open and interoperable open-source solutions, systems and platforms.
4. The skills and capabilities to use open-source needs to be strengthened throughout the whole public service business value chain encompassing government workers, suppliers, etc. A highly competent public service value chain stands a higher chance of taking full advantage of the different opportunities brought forth by the adoption and use of OSS.

5. In many government setups, there are many procedural and administrative 'roadblocks', such as red tape, that have negatively influenced adoption and usage of OSS in government business processes. In some instances, the different business models and supply chain relationships can make it very difficult for innovative collaborative efforts to be explored using open-source solutions. It is common knowledge that collaboration is very difficult in disparate systems.

6. Ensuring that there is a suitable and appropriate mix of both proprietary and non-proprietary software during the implementation of e-Government so that the best possible innovative service solutions are designed.

The list of good practices in utilisation and adoption of OSS in e-Government environments are articulated below (Buffett 2014; Forrester 2007):

• Need for requisite plans for competitive management of maintenance and support costs. Although perceived free of cost, many researchers and OSS practitioners have rightly posited that there are maintenance and integration costs of OSS in e-Government applications which may be substantial if not handled properly. A requisite e-Government implementation plan should have a detailed and clear plan on how costs attributed to OSS implementation are going to be managed.

• There is a need to put in place 'rules governing OSS development, maintenance, security and support' (Buffett 2014:10). If a government department were to formally adopt OSS, it is important to put in place guidelines and rules regarding OSS development from the perspective of design, implementation, maintenance and monitoring. The rules should guide the behaviour of government employees at any stage of OSS implementation in e-Government.

• Need to ensure that the organisation has an adequate cadre of employees with relevant skills and knowledge in the development of OSS applications. Many government organisations do not have highly skilled workforce in the technical domain who may adapt e-Government applications designed on OSS platforms as OSS evolves. In some instances,

the technical workforce may not even correctly understand the different ways to integrate OSS into e-Government systems.

- Before official adoption and during implementation, it is necessary to rate and rank the OSS risks and come up with ways to mitigate those risks. OSS applications come with many risks which can be transferred onto e-Government designs. It is important to clearly understand these risks in each given situation, rank them and come up with ways to mitigate or eliminate them.

- Guidelines and rules managing the 'approval processes for choosing OSS [innovations] prior to [office] adoption' (Buffett 2014:10). OSS innovations should not be adopted without reference to anything given that many government departments have not established rules and procedures for approval processes. The rules should be guided by the configuration of the current processes in the area in which they are anticipated to be implemented. The rules should be clear and concise, with clear linkages to the local contextual settings and common OSS guidelines and standards.

- Continuous monitoring of the OSS community in order to be in the know of the contemporary innovations and to ensure that there is adequate support and development of innovative solutions to be used by the organisation. A dedicated team needs to be put in place in this regard so as to track the development in the OSS community and take note of all the relevant innovations that can potentially be utilised in e-Government environments.

- There is a need for an OSS strategy that provides the development roadmap of e-Government and generally articulates how OSS should be integrated into the different contours of e-Government.

- Establish OSS licensing standards in order to be able to perform licence due diligence for the organisation. Each department implementing e-Government should develop OSS licensing standards so that only qualified units in utilisation of OSS in implementing e-Government do so.

- Anticipate regular changes in OSS applications being implemented in e-Government circles and establish guidelines for the approval processes for such changes. When there is a

change in OSS platforms upon which e-Government is designed, government departments need to follow laid-down procedures for implementing that change in the e-Government environment (Bwalya & Mutula 2014).

- There is a need to put in place 'internal development, testing and change management processes for OSS' (Buffett 2014:10). Any e-Government environment needs a competent cadre of employees who can implement change management processes as OSS evolves.
- Ensure that there are frequent opportunities where employees in the organisation benefit from 'internal training regarding open-source software and technologies' (Buffett 2014:10). As OSS innovations evolve so fast, there is a need for a competent cadre of employees who can swiftly integrate these changes onto the e-Government design. Such a cadre of employees can be created if current employees are accorded further education and training opportunities in contemporary and emerging dimensions of OSS.
- Establish a support model for the OSS product. Once the innovative OSS solution has been adopted and formally implemented in the e-Government establishment, it is very difficult for it to retain its relevancy given that innovative solutions in OSS keep evolving. If there is no formalised support team to track all these changes, it becomes difficult for the OSS initiative to remain relevant to e-Government.

# ■ Future Prospects

Emerging technology innovations such as business intelligence (BI), cloud and fog computing, and OSS are opportunities for e-Government which need to be explored (Liu & Luo 2010). For example, technologies built upon the Jaspersoft Business Intelligence Suite may be used to create intelligence solutions built upon open-source solutions for e-Government applications. In addition to OSS, Maluleka (2014) articulates the possibilities of using cloud computing in the public sector. The advantages of cloud are that it is flexible and thus can be scaled and positioned according to user requirements, uses metered billing which enables users to pay only for the services rendered and not

based on contract and allows automation which makes it possible to build, deploy and configure the services according to users' specification.

In future, FOSS will take the centre stage in e-Government design and implementation and will be a bespoke e-Government design platform (Bwalya 2016). Kumar et al. (2014) has articulated the different ways in which FOSS can be used. The following are some of the possible uses of open-source software/systems:

- Server operating systems, such as RedHAT and Suse, and database management systems, such as MySQL, PostgreSQL, may be used as dynamic information repositories. E-Government provides opportunities for the evaluation of OSS content management systems within e-Government.
- Portal or collaboration tools, such as Joomla or Plone, and operational tools, such as Zabbix to design collaboration platforms, and communications platforms, such as Openfire or Asterisk, to ensure that e-Government platforms are designed using open standards and platforms for interoperability (ability of different systems to read the same file using similar operations or protocols). For example, there is a huge push for the adoption of Plone as one of the main platforms for stream communication in e-Government environment worldwide.
- Application frameworks such as Java and development tools such as Eclipse and Netbeans.

# ■ Conclusion

The use of OSS is a huge opportunity for developing countries to jump onto the bandwagon in as far as e-Government implementation is concerned. This chapter has explored the different forms of OSS and articulated the benefits and disadvantages of OSS in the realm of e-Government. This was done with a view to present a balanced view of OSS with regard to their potential in integrating them into e-Government designs. Further, examples of how different countries have used software solutions are presented with a view to articulate the different

possibilities with regard to integrating OSS in e-Government applications.

## ■ Directions for Research and Practice

This chapter has identified the different OSS applications in e-Government designs. What remains to be done is further research into the integration of OSS into actual e-Government designs given the varying contextual settings. There are also other possible research questions such as examining the functional capabilities of FOSS in e-Government applications and how this compares with conventional technologies in the same functional domain.

# PART C

## Emerging Dimensions of e-Government

# Data Governance, Open Governance, Freedom of Information and e-Government

## ■ Overview

The concept of NPM has kept evolving to now include the concepts of data governance and freedom of information (FOI). These changes have been necessitated by citizens' increased realisation that government information belongs to them and they have the right to access and use it to their common good. Therefore, there has been increased demand that e-Government be designed in such a way that it recognises these changing dimensions of information management ('International E-Government Development', Chmielarz & Szumski 2018). With

the proliferation of public data generated from multiple public service points, data-driven future, big data and predictive analytics and smart cities, governance systems need to be designed in such a way that they are capable of managing and analysing huge sets of data and are highly scalable to respond to changing trends in governance (Yadav 2015). The need for responsive governance systems facilitates ultimate inclusiveness of individuals into the governance and decision-making value chains regardless of their status. Responsive and open governance (OG) can only be achieved if the principles of data governance and FOI are embedded into the e-Government design. This chapter explores the different dimensions of FOI and discusses the concepts of data and OG in the realm of e-Government. Several research endeavours that have been done in this regard are presented (Rana, Dwivedi & Williams 2013).

# ■ Introduction

There has been a lot of hype around the benefits of e-Government in reducing corruption, increasing efficiencies and promoting accountable and transparent governance. Many improvements to traditional e-Government designs have been accomplished in this regard to ensure that each of them conforms to the desired functional characteristics. E-Government on its own does not translate into massive transparency and accountability because many aspects of its configuration are still hidden from the desired open platforms of e-Government design. Contemporary e-Government design should be implemented in open platforms as much as possible so as to promote the concepts of FOI and should utilise the OG models given a particular context in which e-Government is implemented (Bwalya 2013).

This chapter intends to explore the principles of data governance, OG and articulate the role of FOI in advancing openness in e-Government environments (Bwalya, Sebina & Zulu 2015). As a potential platform for achieving enhanced transparency in public service, e-Government is one of the most promising platforms that

can be explored. Acknowledging that different countries had different information rules (e.g. different FOI rules) including different legal and regulatory frameworks upon which public governance is hinged, open e-Government models cannot be easily globalised.

# ■ Open Data

The conceptualisation of open data demands that there should be opening of government data generated in the different public business processes in order to promote transparency and access to the data by all the concerned stakeholders (businesses and citizens). Opening of government data can be achieved by considerable transformation of the public sector (Janssen et al. 2012). Recent research has shown that there is a direct link between open data and the possibility of bringing citizens to participate more in the decision-making processes and facilitating the encouragement of collaboration within the different governance endeavours (Mkude & Wimmer 2015). The implementation of open data in e-Government does not need structural and organisational elements that are necessary for the full support of citizens' participation in the governance value chains. Lourenço (2015) and Ruijer et al. (2017) have articulated the need for open data to consider the complexity of unique democratic processes that exist in different contextual settings.

Most existing open government models are hinged on three pillars: transparency, participation and collaboration (Veljković, Bogdanović-Dinić & Stoimenov 2014; Maseh and Katuu 2017). It can therefore be posited that opening government data is more likely to culminate in increased transparency in the governance business processes, increased participation in the decision/policy-making platforms of the governance establishment and the encouragement of collaboration between citizens and the different departments. Open data can further be lined with the emerging information management paradigms such as big data, predictive analytics and cloud computing. Therefore, the research areas for open data are diverse. For example, the International

Science Council (ISCU) has posited that open data should be investigated from different dimensions so as to logically link it to big data which is an emerging theme of ubiquitous data science and information management.

## ■ Open Government Data

According to the United Nations, 'honest and responsive government' is desired worldwide so that people should have a say in government matters and that the government should agree and commit to including people on governance value chains. Open government data allow data generated from government's business processes to be put in the public domain so that citizens, businesses and stakeholders can easily access and assess it. For example, the open government data conceptualisation enables governments to put data in the public domain with regard to how public money is spent. In the contemporary digital age, the above can be achieved by opening government data which can correctly be achieved using tailor-made technology solutions. 'Open Government Data [is] an enabler [for] transparent, accountable and effective public administration [which is] in [direct] support of the [UN] 2030 Agenda for Sustainable Development' (UNDESA 2016:21).

There are many advantages of open government data with regard to putting in place an accountable and responsive government. Some of the advantages include support for policy integration and institutional coordination made possible by improving the sharing of data across ministries, enforcing the whole-of-government (WoG) concept which unleashes effectiveness of responses given by the government to complex and multidimensional development challenges, increasing the capacity of public administration in the fight against poverty, hunger and the provision of essential services, thus appropriately responding to the needs of the vulnerable and disadvantaged groups, enhancing collaboration and partnerships among the different business sectors and government so as to promote and

coordinate planning and policy-making in the delivery of public services, making benchmarking of different services possible given the publicly available data, forcing the government to deliver on its promises as information about policies, action plans and actual expenditures are in the public domain using open budgets.

Amassing the different benefits of open government data can only be achieved by designing contextually aware (considering local context) e-Government applications. The design of open government data is made possible through the use of open standards (Hutchison et al. 2010). Open standards are design standards conceptualised and designed through a collaborative process which is meant to facilitate interoperability and data exchange among different service applications and systems. Open government relies on three pillars: 'policy and regulatory framework, organisational framework and channels and modalities' (Abdugaffarovich et al. 2015:134). A requisite e-Government development should ensure that all the three pillars are appropriately considered in the e-Government design. Open government places government information as a public resource which has inherent social and economic value to the citizens and businesses (Gil-Garcia, Pardo & Nam 2016).

The 2030 Sustainable Development Agenda (SDA) is being pursued at the global level to understand how 'public administration institutions can mainstream the Sustainable Development Goals (SDGs) into [the different] national development plans' (UNDESA 2016:21). Open government data bring hope to public institutions with regard to making informed decisions especially within the context of SDGs. The emergence of Government 2.0 has led to collective intelligence and the realisation of more collaborative variants of governance which delve to reduce the hierarchical and control-centred forms of governance (Roy 2014).

Establishing effective open government data follows a series of steps which have been deemed optimal regardless of the context in which implementation is planned. Apart from the steps

articulated here, it is important to reference the different governance models, data governance and data quality processes and the different organisational processes that facilitate effective OG data. Figure 9.1 articulates the seven key steps that need to be considered towards achieving effective data governance.

The steps shown in Figure 9.1 can be articulated in the following narrative:

1. Understanding the meaning of open government data (Chorley 2017) and the different areas that need to be targeted given the context in which open government initiative is to be implemented.
2. Ensuring that there is maximisation of the availability of information assets. Government organisations need to devise innovative ways that promote the making available of data and information.
3. After ensuring that the information is readily available, it is important for the organisation to determine who does what and with what? This involves creating roles, rules
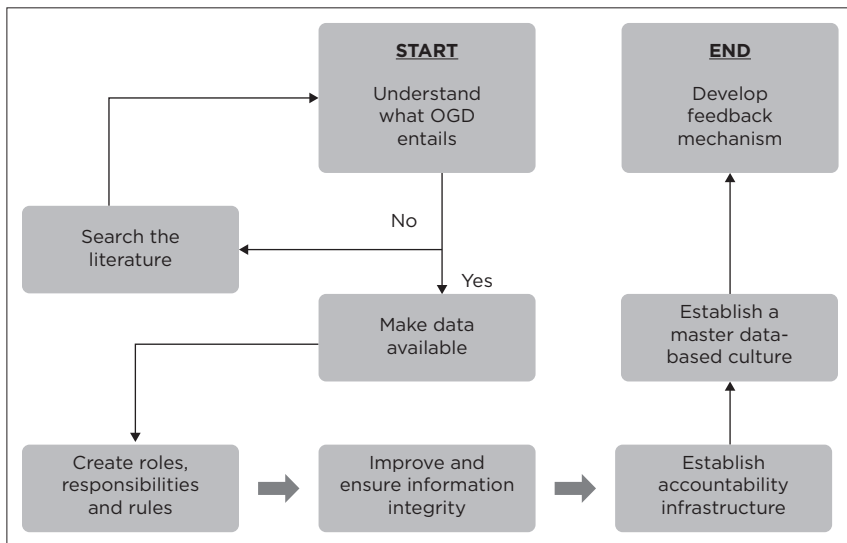
**FIGURE 9.1:** The seven steps to open government data realisation.

and responsibilities. Starting from the different business processes in the organisation, the first step for assigning responsibilities entails the understanding of the data in a given business context. On understanding the meaning of data, you can assign the different responsibilities in the governance data management process.

4. Once roles and responsibilities have been set, it is now time to improve and ensure that there is information asset integrity. This can be done using a four-stage process: creating data profiles using an ongoing process so as to recognise good and bad data, parsing and standardisation of data, data enrichment processes and monitoring the data over time.

5. Need to establish an accountability infrastructure that places people at the centre of information quality to complement the efforts initiated by the existing processes. This will enable people to be accountable for the different information resources at the disposal of the organisation. In this regard, people need to be empowered with the right technology tools and platforms to ensure that they take control of the information resources.

6. Once the processes, the technology and the people are in place to manage data governance, it is important to pursue strategic initiatives focussed on changing the culture of the organisation towards being master data-based rather than transaction data-based.

7. The last step is to put in place a feedback mechanism that is going to trail the attainment of the goals of the process. The feedback mechanism allows a continuous process improvement cycle.

# ■ Data Governance

Data governance is concerned with data management principles, techniques and strategies that are available for managing the different data resources within a given context. There are so many emerging themes in data governance and OG research and practice which have been defined using different strategies in different contextual settings.

In managing the different types of data, one of the key attributes that need to be carefully considered is the data management strategy and the different repositories that are needed in that particular context. Data management needs to explore the best practice in the management of different types of data that may be generated in different governance business processes (Baskerville, De Marco & Spagnoletti 2013). It is worth mentioning that static and dynamic data can be managed with different management strategies revolving around capturing, representation, storage and access. The different strategies in the design and management of data repositories need to be carefully managed in open data public service environments which generate terabytes of data. Therefore, e-Government researchers and practitioners need to ask what the best strategies and approaches are with regard to data management and repository design to facilitate effective and dynamic management of open data (Bwalya & Mutula 2014).

Another important requirement is data legislation governance and policy. A progressive government needs to put in place different data legislation policies that articulate the handling and usage of different types of data in the public service business processes. The policy should also consider the handling of security and privacy option of the different types of governance data. Although an open data environment is desired, it is fair to mention that there will be a very small percentage of governance data that need to remain private, which is only revealed to people with the necessary authority to access such data. Apart from putting in place a vibrant policy regime, open data demands that there should be policy frameworks that directly support the implementation of open data in government business processes. An example is the enactment of the FOI which mandates the government to put their data and information in the public domain so that citizens can easily access them. Another important dimension linked with the promotion of open data access is data legislation governance which works towards ensuring that open data principles are embedded into the different government

business processes. In this regard, researchers and practitioners need to explore the legislation, policy frameworks and governance structures in order to understand what is required to configure and position organisations in such a way that a conducive environment is created for the sharing of governance data and the enshrining of open data principles in the different business processes.

Data innovations and data for development are two prerequisites for a vibrant information environment. Open data environments demand that information environments need to be created so that innovations can thrive. Innovative intensive environments are those that allow free access to different aspects of information. Ensuring that the government data are subjected to open data will ultimately culminate in increased innovations in public services, thereby providing the desired innovative firepower for e-Government. Open data can further open up government data so that they are easily accessible to all citizens and businesses (Traunmüller 2003) and are therefore used as a fuel for socio-economic development. In this regard, questions that need to be explored can be framed around the need to understand the degree of accrued benefits brought about by the open data initiative and how far this pushes an economy towards being a knowledge-based economy (KBE) hinged on aggressive data innovations. Another question that needs to be explored in this regard includes how can open data unlock opportunities for government departments to timeously access data to be used in the planning of the developmental roadmap which can be biased towards addressing rural unemployment and underdevelopment realities, facilitate employment creation and more.

Availability of requisite data and technology infrastructure may go a long way in ensuring that the appropriate data governance is achieved. The existence of coordinated research data cyber infrastructure enables the true opening up of government data. This is because a networked and coordinated ICT infrastructure will ensure that once data are generated in any business process, it is easy for such data to be replicated in

different government departments that have docked to the ICT network. Such a scenario will enable data to be used in different public business processes and innovation agendas. Questions surrounding the need for requisite ICT infrastructure include understanding what type of infrastructure is needed to promote the enshrinement of open data in the governance business processes – this may include putting in place high-speed data networks in the education and research networks, data centres, high computing information environments, etc.

Given the above requirements for data governance, another important aspect for truly opening up data is the need for data awareness and capacity-building. When implementing open data initiatives in the government business processes, it is important to ensure that all the citizens and business entities understand the different open data initiatives being implemented. This approach will make it possible for everyone to actively participate in the implementation of open data initiatives (Safarov 2018). As most of the citizens in the developing world do not have adequate ICT skills and have low information literacy, it is important that deliberate training programmes be designed so that a majority of people participate in taking advantage of the opportunities brought about by open data. Questions surrounding awareness can include investigating the best awareness skills relevant to any institution, the best placed campaigns to reach a majority of the people, etc.

In order to gain from the main benefits that come with opening up of government data, there are several contextual and general challenges that need to be addressed in any given contextual setting. A recent UNDESA project identified 'eight key factors as necessary for a successful Open Government Data implementation plan' (UNDESA 2016:36). These include:

- Government commitment – the commitment to continue providing a conducive legal and regulatory environment for the proliferation of open government data is of cardinal importance. The government also needs to show commitment

with regard to ensuring that the requisite ICT infrastructure is in place to facilitate the management of open government data. Government commitment may include ensuring that there are key human resources in the government departments who are mandated for the management of open government data such as the chief data officers, information (privacy) commissioners, etc.

- Appropriate policy regime or legal frameworks – the existence of appropriate legal frameworks and policies specially targeted to address different aspects of open government data is important for its success. Each government needs to come up with policies and/or frameworks that can address the dynamic challenges that are generally faced in open government data implementation.

- Institutional structures – in order for the policies and frameworks to be integrated into the open government data implementation, there is a need for requisite government institutional structures which should drive the agenda of the integration of open government data into the different socio-economic structures (Bwalya & Mutula 2014). Some of the policies and/or frameworks may include legislation of access to information facilitated by the enactment of the freedom of information acts (FOIA) (Sandoval-Almazan & Gil-Garcia 2016), provision in the constitution on data privacy and corresponding legislation, 'legislation on Open [Government] Data, Ratification of [key] International Treaties on Access to Information [and] Data Privacy, [etc.]' (UNDESA 2016:39).

- Government data management policies and procedures – each government department needs to have contextual data management policies and procedures which are at the centre of the day-to-day operations. The procedures show pointers on how to deal with the different aspects of open government data.

- Responsibilities and capabilities within government – an empowered workforce with appropriate skills and competencies is cardinal for the designing of innovative solutions towards dealing with open government data in a given context. Individuals in the governance value chains need to understand their responsibilities with regard to the

management and integration of the open government data. Governments that plan to manage open government data and integrate the same into the different socio-economic sectors need to take inventory of the national technology and skills infrastructure and implement deliberate policies for improvement where gaps exist.

• Funding an open data programme – as open government data projects are mainly separated from the mainstream public service, it is important to ensure that there is a separate funding budget for the advancement of open government data in the public sector business value chains.

• Demand for open government data – the demand for open government data by the citizens and businesses forces the government to release huge sets of government data (big data) for onward analysis. The release of such data facilitates transparency and accountability.

• Civic engagement and capabilities for open government data – establishing civic engagement and developing appropriate capabilities for open government data among the general populace is one of the key challenges for the advancement of the open government data agenda in any given area.

## ■ Open Data Associations

There are several associations and initiatives that are being put up to drive the open data governance agenda in different contexts throughout the world. These initiatives and organisations aim to ensure that different efforts are coordinated in developing this relatively new area. The following are some of the known initiatives at the global level for open data initiatives:

1. ICSU Committee on Data for Science and Technology (CODATA) – established in 1966, the ICSU-CODATA focusses on promoting initiatives that are aimed at nurturing a culture and framework for standards, protocols and agreements that enable data to be shared and reused. It draws its membership from national scientific organisations, councils, unions and other related organisations whose mandate revolves around data.

2. Research Data Alliance (RDA) – established in 2013, the RDA focusses on implementation of policies, practices and technology infrastructure that are biased towards lowering the barriers to data exchange. Its membership is drawn from individuals and both public and private organisations.
3. ICSU World Data System (ICSU-WDS) – from its predecessor organisation established in 1957, the ISU-WDS was established in 2008 to identify, create and sustain institutions focussing on stewardship, long-term preservation and access to data. The membership of ICSU-WDS is drawn from data repositories, data service providers and their partners.

Open data science is a research area which has drawn a lot of interest from researchers of different backgrounds. There is a vast array of areas in which researchers and practitioners may take keen interest in investigating the issues around different aspects of open data given their context. Some of the key pointers include the following:

- Designing of models for open data implementation – because information environments are usually different from one another, it is important that the context in which open data is going to be implemented is thoroughly understood. The design of such models should carefully consider the characteristics of the area in which open data are earmarked to be implemented and the different other models that have already been designed for other contextual settings (Bwalya & Mutula 2014).
- Open data and smart disclosure – in the pursuit of transparency and accountability in different government business value chains and contextual setups, smart disclosure is one of the emerging concepts that are being actively pursued throughout the world. Smart disclosure is a concept that entails the releasing of information and complex data in standardised or man-readable format that enable an individual's informed decision-making.
- Open government data – contemporary e-Government design demands that it is not only designed on open technology interfaces but that even its data be revealed to the general public. The understanding is that government data belong to

the public and therefore should be presented as open government data. There are several contextual issues that need to be investigated in any given context to achieve a true opening up of the government data.

- Opportunities and challenges for open data – given the ever-evolving public information management landscape, and the short lifecycle of technologies utilised in e-Government, there is a need to investigate the different challenges and opportunities linked with the implementation of open data.

- Citizen participation through open data – open data creates further avenues upon which citizens can participate in decision-making processes and can explore the different governance opportunities. Therefore, research needs to concentrate on innovating decisive innovations that can enhance citizen participation using open data.

- Open government data in smart cities – the emergence of smart cities that advocate for intelligent information processing even to the extent of not involving the input of human beings; there are a lot of opportunities that need to be unlocked given the content in which it is implemented. Open government entails that data will be available anywhere anytime and accessible to all technology platforms. Researchers need to explore opportunities on how smart cities' conceptualisation can be linked to e-Government design so as to appropriately pursue the concept of open government data.

- Innovation through open data – research studies need to explore different possible innovations that can be done to advance the agenda of open data.

- Power relations and power structures in open data – there are different power relations and structures in open data. Research needs to explore the different dimensions of open data with dedicated reference to the local contextual political structures.

- Modelling information production and social value of open data – a sustainable harnessing of open data starts from modelling of information production value chains of open data. Researchers are encouraged to understand the different contours attributed to the social value of open data (Yang, Yang & Shiang 2015).

- Open data for sustainable development – in any given context, careful alignment of open data to the decision-making processes may go a long way in ensuring that there is requisite and sustainable development. Research needs to concentrate on how to link open data to the different developmental initiatives.
- Diverse dynamics for opening government data – as e-Government keeps on evolving, it is important to understand the forces influencing opening government data in any context where e-Government is implemented.
- Business values in open data – opening up of government data is not a public good but has some business dimensions attached to it. Research needs to understand the different business values of open data in any given context.
- Data reuse for public sector – as data are easily accessible in open data initiatives, research needs to come up with initiatives on how to promote reused data in public business processes and decision-making domains.

## ◼ Open Data Governance Around the World

Lemieux (2016) explored the journey involved in the transition from primarily paper-based to electronic or digital administrative systems. The emergence of e-Government was out of the need to open up politics to make collective decisions which have a high probability of benefiting a majority of the masses. Carothers and Brechenmacher (2014) posit that e-Government started gaining ground around the 1990s because of 'opening to politics' further opening up accountability and transparency in the governance value chains.

Open government gained popularity when Obama announced his government would pursue open government data right on the first day of his presidency (White House 2009). Since then, a lot of research on advancements of open government in real contextual settings is now taking root. For example, Harrison et al. (2011) explored the different aspects of open government in the US context and found that the USA has a well-developed

open government environment. The open data movement was spearheaded by the Obama administration. Obama's open government push was hinged upon the principles of collaboration, participation and transparency as the cornerstone of contemporary responsive government. Roy (2014) explored the open data strategies in the municipal sectors of the Canadian public sector. The study found that more than 30 Canadian local municipalities have undertaken open data initiatives. Most of these initiatives are tied to the open government data initiative (Attard et al. 2015). Al-Kubaisi (2014) investigated the development of open government data in a developing world context, that is, Qatar. Qatar's decision to grant access to government data was propelled by its desire to increase the operational efficiency and integration of the government, and also to increase citizen engagement and participation.

Kuunifaa (2011) discussed the lessons with regard to the implementation of FOI in Jamaica in a bid to extrapolate the lessons to the Ghanaian context. Jamaica passed the *Access to Information Act* (*ATIA*) in 2004 bowing to pressure from the international community to open up government data. Máchová and Lněnička (2015) discussed the contours of trust in government businesses and operations and articulated the need to open up government data in a bid to increase trust levels. In another study, Shepherd, Stevenson and Flinn (2010) investigated the implementation of the UK *Freedom of Information Act* (*FOIA*) 2000 that came into effect in 2005. The UK *FOIA* was strategically integrated into the records management practices of the United Kingdom.

Myrseth, Stang and Dalberg (2013) posit that metadata are very important with regard to the definition of e-Services offered within the e-Government systems. Metadata for e-Government applications need to be monitored using semiotic data framework used in the definition of syntactic, semantic and pragmatic data quality. Pasco and Ona (2017) analysed the Philippine's e-Government drive and identified inherent gaps

that existed in the policy regime. Paterson et al. (2016) posit that in the Australian polity, open government has culminated in significant net benefits to the economy. In monetary terms, it was reported that a total of AUS$25bn net value was realised out of implementing OG in Australia. In order to realise such benefits, the Australian government has invested heavily in open broadband connectivity and ensured that there is supportive open government legal and institutional frameworks such as the Australian Governments Open Access and Licensing Framework (AusGOAL). The understanding is that by the end-of-the-day, there will be 'open by default' e-Government data in the Australian public sector.

From the foregoing, it can be posited that the key challenge in the integration of open government initiative revolves around

**BOX 9.1: Kenya open government data initiative.**

1. Launched in 2011 to make government data accessible to the public free of cost.

2. The 2013 constitution recognised principles for public participation and an open society.

3. Kenya Open Data Initiative (KODI) aims to increase data availability and user accessibility to empower vulnerable groups.

4. Data release calendar to articulate schedule for publishing of government data.

5. People request data through 'data suggestions' on the portal.

6. Interpret raw materials into graphs and simple language.

7. Organise discussion forums and develop tools to monitor site's usage.

8. Portal has blog post section which highlights data for consideration by the public.

*Source:* Open Government Working Group (2007).

poor understanding of what open data entails. Many government departments generally do not understand what open government data entail.

# ∎ Freedom of Information and e-Government

In the developing countries' contexts, there has been a lot of effort that has been put in towards ensuring that FOIs have been enacted into laws so that they have a tangible impact on the data and information management agenda. However, many of the developed countries have enacted FOIs and are now discussing other aspects of FOI enforcement such as addressing the challenges that come with FOI implementation given their different contextual settings. For the fact that e-Government has an established requirement that it should pursue the agenda of ensuring that there is adequate government information and services in the public services domain for accessing by as many citizens and businesses as possible, enactment of the FOI will further advance this agenda.

Martínez Usero (2006b) analysed the evolution of FOI law in Spain for over a period of 30 years starting with the 1978 constitution, with specific focus on the management of the public administration services, technology determinism of public service transformation and automation of data processing. '[The motivation for adoption of FOI] laws in Spain [emanated from] the transition from dictatorship to democracy in 1975' (Martínez Usero 2006b:1).

# ∎ E-Government as a Lever for Openness and Transparency

Many research studies have shown how e-Government can be used as a lever for opening up government data and correspondingly increasing the level of efficiency and transparency in the public sector delivery value chains. Pierce (2007) looked at data governance as that which lays the necessary structures for decision-making, alignment processes and communication facilitating

the strategic objectives for data quality to be achieved. Abdugaffarovich, Abbasovich and Bakhtiyarovich (2015) tackled the security dimension with regard to integrating e-Government systems with open government data. The study explored what security threats are known in efforts dedicated to facilitating open government data in e-Government environments. With the increased access to government information brought about by open government data conceptualisation, there is also increased security risk occurrences that have to be expected. The security dimension of e-Government directly impacts on the integrity of the government information and if not carefully managed may culminate in big information and financial loses on the part of the government. In understanding the security attributes of government information, the following basics have to be taken into consideration:

1. Need to understand the overall classification schemes employed to identify what type of information the government wants to release to the general public and which one does it want to retain for itself.
2. '[What] technological, managerial and legal risks are [associated with] processing government-held information'? (Abdugaffarovich et al. 2015:134)
3. How to ensure that there is information integrity facilitated by ensuring that there is data consistency by avoiding the overlapping of instances of data stored in multiple databases and/or repositories.
4. What are the data storage strategies? – are they stored in one repository or are they spread across the government networks?
5. What security procedures are utilised in the processing of information?

# ◼ New Dimensions in Data Science and e-Government

## ◼ Big Data Analytics

Advancements in computing power have culminated in the design of powerful algorithms that are able to detect trends,

patterns and correlations in data sets using advanced visualisation techniques. Big data analytics encompasses a group of tools and methodologies that are able to analyse huge quantities of data and are able to transform it into useful insights. Many governments and data organisations are continuously recognising the power of big data analytics in combing through huge sets of data for insights into decision-making processes. Big data analytics enables the understanding of complex phenomena by dissecting it into smaller, useful parts which can be analysed from multiple dimensions, thereby allowing policymakers to extract hidden insights from huge and complex data sets.

## ■ Predictive Analytics

Of late, there has been a huge demand on the part of the policymakers to make carefully thought decisions that will have optimal impact on the society. Other than in government, there is a continuous demand on businesses to make investment decisions which are certain to culminate in profitable moves in any given context. Predictive analytics is a candidate intelligent information processing solution which measures the future impacts of today's actions. Predictive analytics encompasses the use of advanced technology solutions to analyse complex data with a view of determining patterns to predict future scenarios and outcomes.

## ■ E-Government 2.0

It cannot be denied that the digital government landscape is constantly changing given the different changes in the socio-economic landscape (Janowski 2015). Chun et al. (2010) posit that although Government 2.0 is penetrating the different governance establishments throughout the world, there are a lot of challenges that need to be overcome if Government 2.0 were to be realised (Anthopoulos & Reddick 2014). Roy (2014) posits that the emergence of Government 2.0 brings citizens at the centre of innovation. Open government data allow citizens to

access and critically analyse government data and understand patterns that can be critical in the innovation processes. The role of citizens in such an environment changes, which enables them to propose new policy areas and technical orientations to be implemented.

Some of these challenges (Yang & Wu 2016) include: How to appropriately analyse huge sets of data collected through crowdsourcing and out of the many public business processes? How to optimally apply social media platforms as a progressive innovation for e-Government? How to appropriately facilitate engagement of citizens in the realm of e-Democracy? How to design open government platforms to facilitate the changing role of citizens as collaborators in the analysis of government information and formation of policies? What are the key interoperability issues in Government 2.0? What are the security dimensions in the implementation of open government data?

# ■ Challenges to Opening Up Government Data

Although many governments around the world have accepted the idea of opening up their data and information resources, there are a lot of challenges and limitations depending on the different contexts that need to be overcome if open government data were to be realised. Some of these challenges include the following:

1. Open government cannot be achieved without extensive use of technology as an enabler.
2. The onus of opening up government data should not be left to technology alone but should be administered by means of a complex decision-making process.
3. Open government is 'emerging around the world with diverse levels of maturity and implementation degrees' defined by different levels of advancements towards knowledge economies (Sandoval- Almazán 2015:13). Governments need to ensure that limitations to the achievement of the knowledge economy such as the reduction of the digital divide are clearly addressed.

4. Open government data can be achieved with appropriately integrated systems within a government organisation facilitating requisite coordination of communication within the different organisational units and individuals.
5. There is a need for applications and data to be mapped to each other using the same language and this must be planned in advance in the design of the integration initiative.
6. A critical issue in the integration of OG data into the e-Government initiative is the ownership of the data (Rocheleau 2006). In ensuring that there is integrity in the public information activities, it is important that people must be held accountable for the information assets and appropriately supported by the different technologies available.
7. The cost dimension is a very important dimension to the successful implementation of open government data. It is important to ensure that the cost of implementing the open government data initiatives is correctly recouped and the business values clearly defined.

Arora and Gupta (2017) posit that in order to achieve the aspirations of open government initiative in e-Government, there is a need to implement data warehousing in e-Governance. Data warehousing enables the implementation of a centralised database or repository which enables users to simultaneously access data from the database for different uses and analyses. Data warehousing is implemented in tandem with data mining which enables extracting of vast amounts of data for effective decision-making in the e-Government environment.

Sandoval-Almazan (2015) aimed to clear confusion among researchers and data or information practitioners with regard to the understanding of open government and posited that the genesis of open government can be traced to the 1970s when it was linked to government secrecy. One of the key pillars of OG is the need for citizens' rights to access government information within the freedom granted by democracy. Richardson (1973) posited that FOI is to be considered as a basic component of the democracy process and dispensation. FOI is the cornerstone for transparency in the government's business processes and

citizens' participation in the governance processes (Ohemeng & Ofosu-Adarkwa 2015). With the emergence of technology platforms, open government data are understood as a technology institution that is at the centre of turning government data into open data that can readily be utilised by the citizens and businesses (Kassen 2018).

With the advancements in big data analytics, huge sets of government data generated from massive government operations – namely, geospatial data; weather and satellite data; data on health, energy and finance; etc. – can now be easily accessed and analysed from multiple dimensions unlike the case long ago where such data were trapped in dusty government reports with no one accessing them (Chui, Farrell & Jackson 2014).

The emergence of new technologies such as IoT, big data coupled with predictive analytics and geospatial information systems present a possibility for dealing with complex scenarios brought about by the highly volatile e-Government environment. The use of big data analysis for the data generated from the public service business processes may lead to understanding the level of performance of each department in the governance value chains and therefore enable the design of strategic initiatives to sustainably improve service delivery. Predictive analytics enables advanced analysis of current data to extract meanings and patterns that can be used to make decisions in governance value chains in a bid to reduce the degradation of land, reduce energy consumption, improve water management and be used in the detection of early warning signs of disaster.

# ■ Conclusion

This chapter has discussed data governance, open government and FOI as initiatives that are being explored in data and information to open up government data and processes so that stakeholders and citizens can have an idea of the current

happenings in the governance landscape. The chapter further explores the recent developments in open government data and articulates how these developments are going to change the e-Government landscape. The last section looks at the different challenges that can be encountered during the implementation of open government data initiatives.

## ■ Directions for Research and Practice

Many countries the world over have not yet started implementing open data and open government data in their e-Government design value chains. Research should explore how these conceptualisations can be included in actual e-Government design applications in order to facilitate transparency in governance platforms. The most recent call for achieving a truly accountable government is the need to not only open up data but to also open up government processes so that citizens are the actual decision-making platforms of e-Government systems. Further, the opening up of governance data presents an opportunity for researchers to explore and design alternative governance models such that open data can be deployed in opened-up e-Government systems.

# Intelligent Public Service Administration Through Big Data

## ◼ Overview

There is generally increased application of big data analytics in different contexts examining trends or patterns in multidimensional data generated from different business processes. Because of an exponential increase in data, some of the public data qualify to be big data. Intelligent public administration entails that big data are going to be analysed from multiple vantage points enabling the unearthing of patterns in public or personal data that could never be achieved not long ago. This chapter explores different ways of analysing big data and how e-Government can be designed to handle big data applications.

# ◼ Introduction

With the increased need for integration, interoperability and interconnectedness of e-Government with other information-intensive systems and platforms (e.g. social media), there is too much information that needs to be processed in short intervals of time and integrated into the different management channels. Diverse and dynamic information from heterogeneous sources is easily and instantly captured, stored, analysed and integrated into different business value chains (Bwalya 2016). The emergence of big data provides opportunities for e-Government researchers and practitioners to further investigate the analysis models of big data and integrate them into e-Government designs (Bwalya & Mutula 2015). Although there is a general mismatch between public data and the desire to integrate big data in public service delivery platforms, different intelligent public service models are transcending towards presenting themselves as potential tools for big data analytics.

As already stated in the previous chapters, advancements in technology have enabled e-Government to deliver intelligent public services. Some of the recent advancements such as cloud and fog computing, big data and predictive analytics and recent conceptualisations in machine learning have been changing the learning models of machines and development of more effective man–man communication, smart city conceptualisations, etc. These developments have revitalised the way public services are accessed towards improved pervasiveness and intelligence. Further, with the intelligent information society (IIS) and the 4IR upon us, it is clear that the evolution of e-Government towards more efficient and effective variants will continue. The IIS is based on the tenets of the 4IR. The 4IR will ensure availability of innovative and intelligent solutions to a majority of people's problems, which will further call upon e-Government to suit the bill of unending innovative possibilities. Therefore, e-Government will be able to handle dynamic and complex governance information needs which will most likely be made available by intelligent IT applications.

The emergence of the IIS puts emphasis on the harnessing of business or societal value through the application of cutting-edge intelligent IT tools and platforms through the cycle of 'generation, collection and analysis of massive volumes of data' (Report 1247 2017:n.p.). IIS re-emphasises the need to refocus innovations and human efforts in information capturing, representation, storage and processing so as to enable seamless flow and integration of information and knowledge in different socio-economic value chains. The paradigm shift to focus more on information other than conventional production factors such as labour and capital ensures a great chance for the convergence of product innovations, increased processing and decision-making powers of intelligent machines which follow learning models based on real and complex human cognitive capabilities. This is brought about by fast learning made possible through the recognition of contextual value in a given situation through data-based learning.

This chapter articulates the recent developments in technologies and strategic conceptualisations of e-Government design and implementation. The potential of IoT, cloud computing, big data analytics, and mobile technologies (ICBM technologies) enables data processing and capabilities in ways that were not perceived just 10 years ago.

# ■ The Fourth Industrial Revolution and e-Government

In moving in tandem with the development projectiles and transformation of society from mechanisation to industrialisation and to informatisation, e-Government has largely transformed towards intelligence applications in the developed countries. Some of the industrialised countries that have aggressively pursued implementation of 4IR include Japan (Reconstruction Strategy; New Robot Strategy), USA (SmartAmerica Challenge and BRAIN Initiative), Germany (Industry 4.0 Strategy) and China (China2025 and Internet Plus Strategy). These countries have

realised the potential of disruptive technologies in transforming their socio-economic development projectile agenda. Although this is the case, the developing countries are jumping onto the bandwagon of countries aggressively pursuing the knowledge frontiers of e-Government. For example, South Korea is putting in place strategic initiatives so as to better position itself towards taking a global leadership role in 4IR (Report 1247 2017). These initiatives have been embedded into the different socio-economic structures of the Korean republic.

# ■ Big Data, Cloud Computing and e-Government

With an exponential growth of data generated in different business processes, big data were born around 2014. Apart from the need to catapult quality of service delivery within the public service delivery frameworks, e-Government can also be used as an information provision and analysis platform (Bwalya & Mutula 2014). As government processes produce a lot of information of variable dimensions (big data), the need for e-Government systems that provide analytical capabilities cannot be overemphasised. In the city of London, for example, the smart city/e-Government platform, the Land-Use and Transport Interaction Model (LonLUTI) and the London Transportation Studies (LTS) collate and analyse huge sets of geospatial data and other usage data on an everyday basis to identify patterns and modes of transportation utilised to predict the needed future transportation needs and interventions, for example, identify stretches of land where infrastructure upgrades need to be employed.

Mergel (2016) articulates the emergence of big data in the public sector and the corresponding huge computational power needed to perform advanced data analytics (Saxena 2017). In the public sector domains, big data exist in diverse forms such as images, video data, messages, and updates found in business processes, social networks and geospatial data (Mergel 2016).

Data obtained from different sources are combined with administratively collected data to form huge, multidimensional data which are traditionally very difficult to analyse. Big data allow data from different sources of the public sector or any part of the socio-economic sector to be analysed simultaneously, therefore enabling intelligent decision-making in the public sector. The simultaneous analysis of data from different sources enables collation of different aspects from the diverse data to form a single perspective from the data which forms the common trait from the analysed data. Woodside, Amiri and Boldrin (2015) opine that there are significant cost savings that can be harnessed in the utilisation of different forms of technology in the government business processes geared towards the provision of effective and efficient services. With the need for big data penetration in the public sector delivery value chains, it is important for government departments to be e-Ready (Klievink et al. 2016).

Big data are usually huge, heterogeneous and unstructured data. Chen and Zhang (2014:n.p.) posit that big data are associated with technical 'challenges such as data capture, data storage, data analysis and data visualisation'. Another dimension of big data is that it consists of huge sets of data, structured or unstructured, which incorporate multiple facets in themselves and which cannot be managed (captured, stored, processed and analysed) using typical database software. Further, big data are enormous data which are normally in the range of terabytes.

As big data are mainly unstructured, it is very difficult to analyse using conventional methods. It is characterised by four Vs: volume, velocity, variability and variety. Volume is associated with the scale of data but with regard to big data, this cannot be measured using conventional methods in megabytes but can still be processed by social scientists. Instead of megabytes, big data are so quantitatively huge in that they are expressed in terabytes and petabytes which demand huge server capacity (McKinsey Global Institute 2011). Thus, it can be summarised that velocity entails that big data are associated with huge volumes of data in the

region of terabytes, petabytes of data extracted from geospatial applications which can be mapped to real-life situations which can further be analysed to obtain insight (Baskerville et al. 2013).

Velocity entails the speed with which patterns in real-time streamed data can be recognised, therefore bringing out capability to do analysis in extremely huge volumes of data. Velocity entails that data flow into government departments at intense rates putting on the line the capacity of the government to process and timely analyse the information. This entails that the government department(s) may miss out on the opportunity to get afore-awareness on the impending happenings in its area of jurisdiction; variety articulates the different forms of data (such as photo, web, geospatial, mobile, video and audio) which need more effort to be structured in a database. Big data are multidimensional data obtained from different sources, namely, blogs, tweets, wikis, videos and audios, which come in many data formats unlike online transaction processing (OLTP) data which are well-defined and have a fixed schema. Veracity refers to highly fuzzy, unstructured data which create unstructured data. Variability means that the meaning of data can change rapidly, thereby making the analysis of data very challenging. Because of the huge volume of information generated in government business processes, it is difficult to quickly extract information that may carry huge sets of insights. Big data analysis makes it possible to quickly extract information from huge sets of data that may be of value to the different socio-economic setups. The Vs of big data are shown in Figure 10.1.
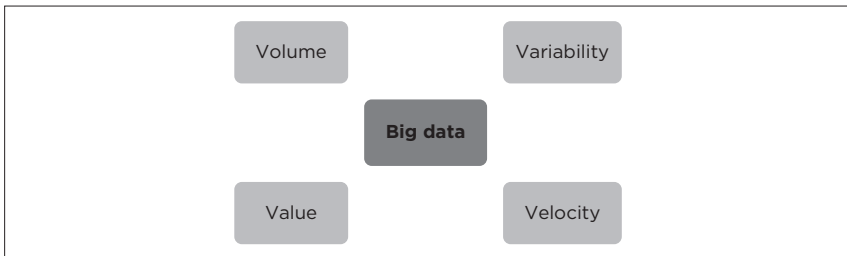


**FIGURE 10.1:** The Vs of big data.

Apart from the formulaic four Vs, Tomar et al. (2016) have articulated other characteristics of big data analytics as follows:

1. Digital footprint – big data are a result of everyday activities created from tweets, texts and even credit card payments, which culminate in digital footprints that are aggregated into big data. Digital footprints are an offset of digital interactions which are the result of ICT utilisation in the different socio-economic setups.
2. Machine learning – with the increased automation in the data analysis procedures, machine learning is one of the technology applications that can be used in e-Government applications. Automatic processing of e-Government requests can be achieved by the increased advancements in machine-to-machine communication. Using geometric and probabilistic models, patterns in the data generated by the different government processes can be achieved by powerful analytics programmes which automatically identify patterns in the data.
3. Complexity – owing to the fact that big data come from different sources, in heterogeneous formats, 'it is [difficult] to link, match [or] transform data across systems' (Agbaje, Awodele & Ogbonna 2014:19). Without a carefully designed analytical methodology, it is possible that big data analytics loses its currency and hence its importance.
4. Variability – in the highly dynamic e-Government environments, there is a high velocity and variety of data with flow rates inconsistent with periodic peaks. This demand requires the design of highly adaptive systems with dynamic data storage and processing capabilities.

Many organisations are transforming their organisation's data management roles to include cloud and fog computing as a progressive, reliant data and information platform. The emergence of cloud computing has enabled the reduction of the cost in the putting together of e-Government infrastructure, as cloud and fog service models can be integrated into the e-Government design. In order to harness the benefits from e-Government designed on cloud computing platforms, Moldovia has implemented M-Cloud which is a shared government

technology platform (Mocan 2012). Using this model, all the electronic public services are going to be hosted on the cloud, where the M-Cloud presents itself as the private government cloud that will be able to deliver all cloud services (software as a service [SaaS], infrastructure as a service [IaaS], platform as a service [PaaS]).

Further, the cloud computing environment offers scenarios for seamless and elastic technology resource sharing and provision of unlocking opportunities for ubiquitous information management (Schubert & Jeffery 2013). Cloud computing is espoused upon the fusion of grid computing, virtualisation and web technology usage. It cannot be overemphasised that cloud computing is a paradigm shift from the traditional computing technology model where heterogeneous end-users are able to access computing resources and information using identical operations (Ukil, Jana & De Sarkar 2013). Aubakirov and Nikulchev (2016) explored the different cloud options that were considered for e-Government design in the context of Kazakhstan and found that many of these options improved public service efficiency. Cloud computing provides virtually shared IT resources with desired flexibility and modularity reducing the cost of providing requisite IT services. Given this fact, many organisations even in the context of Africa, such as the University of Johannesburg, have migrated many of their information management tasks to the cloud where its employees use thin clients to access cloud services.

Figure 10.2 highlights the three basic levels of cloud computing which articulate the basic elements of cloud computing.

The layer with the highest degree of abstraction is the one detailing the essential characteristics of cloud computing applications. One of the key concepts upon which cloud computing is hinged is resource pooling which entails that the cloud resources are accessible using a multi-tenant model by many end-users simultaneously. Cloud computing uses dynamic provisioning which allows a single resource to be accessed by multiple
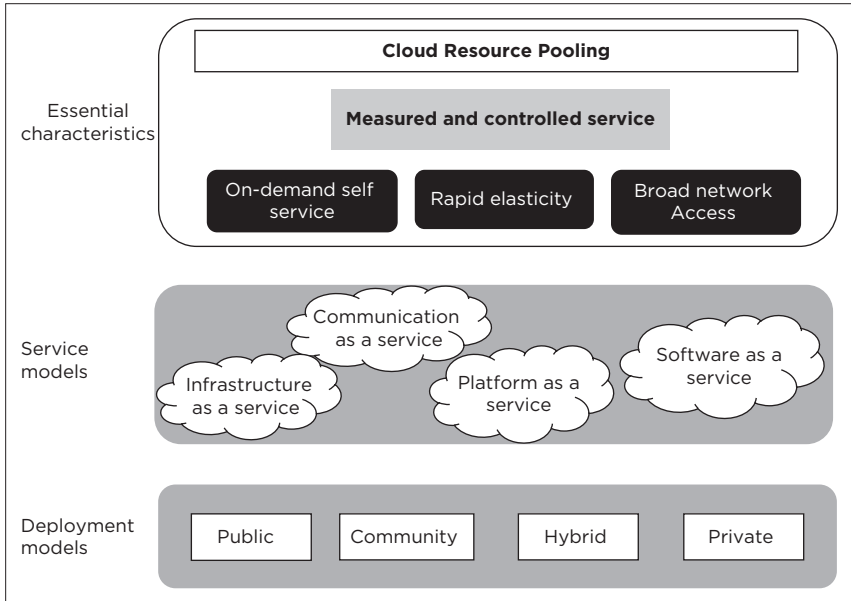
**FIGURE 10.2:** Key elements of cloud computing applications.

applications simultaneously. The cloud services are measured or timed and controlled to ensure that there is no abuse of the service. Each cloud service needs to be offered immediately (on-demand self-service), in many cases without the intervention of a human being. The cloud services also need to be flexible and allow requisite broad network access – this means that the cloud services need to be vendor neutral, and heterogeneous network configurations should be able to access the services using identical operations or open interfaces. The middle layer articulates some of the different service models that are used. The most common service models include IaaS, PaaS, SaaS and the communications as a service (CaaS). These service models are essential in the design of cloud computing applications as they articulate the different characteristics that each model should have. The lowest layer discusses the different deployment models which include the public, community, private and hybrid models.

Therefore, one of the key challenges of cloud computing has been providing the desired quality levels in the applications provided via web-based platforms. It is anticipated that solutions need to be found on how the access of cloud services can be improved through web platforms.

Governments' use of cloud and fog computing has culminated in the design of government cloud data which provide ubiquitous data centres that can be accessed through mobile technology solidifying the achievement of pervasive access to government information and services (Liu 2010).

From the general definition of cloud computing given above, the following are the essential characteristics of cloud computing:

1. On-demand self-service: without the need for human action, applications can be accessed automatically.
2. Broad network access: using standard procedures, applications can be accessed by thin or thick clients over a network.
3. Resource pooling: the use of the multi-tenant model to facilitate pooling of resources to multiple consumers.
4. Rapid elasticity: capabilities in the fog computing environment can rapidly or elastically be provided, thus rendering consumer capabilities unlimited.
5. Measure service: using a form of a metering capability, resource usage can be monitored depending on the type of service desired (storage, bandwidth, processing, etc.).

In order to appropriately and adequately integrate cloud computing into the design of e-Government systems, it is important to ensure that there is a clear understanding of the key elements of cloud computing. Understanding the key tenets of cloud computing requires familiarity with the key elements in the cloud computing environment. Some of the key elements include:

1. Virtualisation – an application which allows execution of a 'guest application' and data with the 'guest server'. This is done in recognition of the fact that at some point in time the 'guest application' will detach from the physical server and that the cloud service can be accessed by other cloud applications.

This is a convenient application which is up and running at a given period of time but not always.

2. Dynamic partition – allows variable allocation of memory and CPU processing to multiple concurrently running applications and data in one server. In this arrangement, some applications may need unequal portions of memory, therefore dynamic allocation kicks in.

3. Hypervisor – software applications running on different operation systems, protocols and programming models (SOAP, Linux, Java, C++, Windows, etc.) are allowed to coexist in the same server at the same time using the hypervisor.

4. Data migration – in situations where there is unforeseen demand for various applications for the server's capacity, the hypervisor senses that there is a need to perform data migration which allows the operating system and the given application to be executed on another server with the status 'available'.

5. Usage management – there is a need to measure the usage of the cloud client CPU processing, input/output and memory utilisation per application. This enables the monitoring patterns of the different user agents.

6. Enforcement of location transparency in resource pooling – a key requirement for resource pooling. Location transparency entails that the actual location of the cloud resource need not be known by the end-users of the cloud services (Rana et al. 2013).

In the contemporary world, Chen and Hsieh (2014) opine that big data are one of the most critical issues facing digital government. Many governments fail to cope with the massive data generated from the different business processes of the public services on an everyday basis. In order to address data and information explosion experienced on an everyday basis, there is a need for governments to procure expensive and high-quality IT solutions with higher computer processing power and deploying them in the core public business processes. Many of the developing countries do not have the necessary capacity to procure expensive and effective IT solutions and are therefore left out from integrating big data and predictive analytics in their

e-Government programme designs. Chen and Hsieh (2014:n.p.) have delineated 'the defining features of Big Data and [proposed] a Big Data typology suitable for the public sector'.

In general, it can be posited that the advent of the big data era opens up huge opportunities and innovative capabilities in the public service delivery value chains. In realising the advances in technologies for big data capturing, processing and analytics, many governments around the world have jumped onto the bandwagon of establishing smart governments propelled by big data. Smart government is an advanced form of e-Government where availability of big data and predictive analytics allows increased automation in the public business processes. Because of Internet and social media data being integrated into the e-Government systems, it is easy for huge sets of data to be deposited into the governance systems. Contemporary governance value chains demand that these huge sets of data need to be analysed instantaneously as they are gathered or pulled from the networked public service business processes culminating in an urgent need for advanced big data processing capabilities.

One of the key characteristics of cloud computing is that the actors or agents in the cloud computing environment are not expected to own the IT resources (such as servers and networks) they use but access these virtually through a communications platform. Two models are used in accessing the cloud services: pay-per-use or the subscription model and the resources made available to the clients are virtually made available and shared to several other users in a multiple tenants' model (ITU 2012).

## ■ Internet of Things and e-Government

The IoT presents itself as a network of sensors and networks which are able to intelligently scan the environment and timely process data for integration into the different socio-economic decision value chains. The IoT thrives in environments where a

good number of nodes and network coordinators are able to manage and facilitate intelligent information processing so that value-added information is readily available for utilisation in diverse decision-making processes. A practical use of IoT is in the bus information systems in Seoul, South Korea, where information display platforms are available at bus stations, displaying information on the exact location of the buses operated by the different bus companies. The nodes inserted on the road network go off when the bus reaches a certain point and instantaneously send information to the information display platforms. By so doing, it is possible to even approximate the number of minutes one has to wait before a desired bus can reach his or her spot. With the intelligent IT envisaged to be implemented in South Korea, it is possible that interaction models of such a system will be possible.

# ■ Business Intelligence and e-Government

According to Sallam et al. (2017), the following are some of the key capabilities for BI and analytics platforms that are going to be critical for future e-Government applications:

- Increased capabilities for users to connect to both structured and unstructured data stored on-site or in the cloud. Such capabilities will solidify the role of citizens as partners in the governance value chains.
- E-Government durability is going to be increased as there will be increased capabilities enabling platform security, auditing platform access and utilisation, enhanced BI capabilities culminating in optimal performances of the technology platforms, thus ensuring higher availability and disaster recovery. Advancements in BI development promise a lot of improvements in data management. E-Government platform capabilities are going to be improved given the self-contained ETL capabilities and improved data storage made possible by the automatic indexing of data and processing scheduling.

- As there is a strong push for improved analytic capabilities in e-Government, analytic dashboard endowed with interactive capabilities and content with visual exploration lessens the burden that may come with big data analytics. The said dashboards are embedded with advanced geospatial analytics that make it easier for citizens and businesses to access reports using appropriate visual representations which can easily be understood.

# ■ Smart Cities and e-Government

With the emergence of smart cities, there are many opportunities that have been unlocked. Within the ambit of e-Government, smart cities are used to form the basis for ubiquitous access to information and knowledge resources which is the hallmark of contemporary e-Government applications. The emergence of smart cities eases the implementation of e-Government which aims to realise the benefits of open government data. Smart cities entail the generation, processing, analysis and sharing of vast quantities of data focussing on citizens, city infrastructure and services (Kitchin 2016). Integration of smart cities and e-Government in the design phase can enable e-Government to be integrated into the different socio-economic fibres of the area in which it is implemented. Advances in IT have culminated in conceptualisations of smart cities which aim for an environment where information can be captured seamlessly from the environment using intelligent capturing and processing of information.

In the contemporary implementation of e-Government, it cannot be denied that there is a need to link overall implementation designs with the emerging technology and public service innovation, namely, smart cities and predicative analytics. Within the same conceptual boundaries, the mayor of the city of London launched the 2020 Vision Report in 2012. This strategy was hinged upon the need to harness and leverage the technological capacity and expertise of the private sector in designing

innovations in the smart city project. The understanding was that all the different interventions within the ambit of smart cities were to be implemented within the realm of e-Government.

In areas where there is slow penetration of e-Government citizen usage, innovative ideas such as gamification can be used to nurture the interest of citizens in engaging with government or accessing public information using technologies. Gamification uses game design principles to influence interest in non-game activities.

## ■ Crowdsourcing and e-Government

With the emergence of open government data, crowdsourcing is a term that is fast gaining popularity in the e-Government agenda, especially with regard to promoting civic engagement, public value and transparency.

Advancements in innovation in e-Government have enabled innovative models of democracy such as the proliferation of e-Democracy which is seen even in the developing countries' contexts. The online e-Democracy models have realised participatory decision-making using online platforms. In the emerging conceptualisation of governance, the citizen is rightly considered as the partner in the governance agenda. In the USA, SeeClickFix.com presents itself as an online service platform that accords the opportunity for citizens to report issues that are not of emergency nature in their communities. Morabito (2015) articulates the transformation of perceptions of public service, especially towards a prosumer era, focussing on the transactional nature of the relationship between citizens and the government. The traditional model of government emphasised the role of citizens as tax payers who expected the government to provide services, namely, road construction, hospitals and schools. The contemporary understanding of citizens' role in government has changed to that of partners who should equally take responsibility of public services. A mature model of this thinking, mostly

pursued in the developed countries, involves having well-thought-out integration platforms of citizens as participants in the decision-making processes of the government, especially through technological means. An example from the developing countries' contexts is the involvement of citizens in the police community as privates so that the police and citizens coalesce to enforce order and sanity in the communities.

Citizens can now be adequately included in the governance value chains. For example, citysourced.com developed applications that enable citizens to report information on civic matters happening in the communities to the local authorities for action.

# ■ Intelligent Information Society and e-Government

Intelligent information society is expected to transform many aspects of society and eventually culminate in improved quality of life for human beings. The understanding is that most of the chores that human beings have to take care of in society are going to be performed by machines or that the different technology innovations are going to reach levels where they can literarily replace the input of a human being. The following are some of the anticipated innovations with expected increased penetration of ICTs in the different socio-economic value chains:

1. Robotics – anticipated development of robots which have capabilities to replace human beings in many government business processes, household chores, nursing, etc. For example, the advancements in artificial intelligence to the point of producing sex dolls which mimic human behaviours in sexual relationships demonstrate lack of limitations for technology innovations envisaged in the IIS.
2. Self-driving cars – with a goal of minimising motor vehicle accidents emanating from human error, self-driving cars are now nearing commercial usage, especially in the USA (e.g. Google cars) and China (Baidu).

3. Three-dimensional printing – a manufacturing model where individuals are given an opportunity to easily turn their ideas into actual products. The construction of a house in France entirely using 3D printing in 2018 demonstrates the unlimited possibilities of emerging technologies.
4. Wearable technology – the application domain of virtual and augmented reality is widening to include usage in clothing and medical fields.
5. Connected homes – freeing humans from house work by introducing self-controlled appliances made possible by the advancement of innovations upon IoT (Anthopoulos 2017).
6. Smart cities – the development of ecosystems in cities or urban areas capable of predicting and offering solutions of current or future problems, namely, those related to safety, health, energy and pollution.

Intelligent processing of information in the e-Government space will further be boosted by crowdsourcing. Crowdsourcing uses an alternative approach to big data where the former follows a more person-centred approach and the latter follows a machine-centred approach. The conceptual beacon of crowdsourcing is that it relies on contributions from a large number of people to obtain ideas, services or content. Crowdsourcing is a candidate application that can be used in facilitating much improved participation of citizens in the governance business processes, and also in citizens' inclusion in the governance value chains as partners.

White Paper (2014) opines that intelligent infrastructure for e-Government applications constitutes the integration of sensors, networked communication and computing software/hardware into the physical infrastructure realm enabling ubiquitous access to information resources. Intelligent infrastructure is hinged on recent technology advancements and evolution such as cloud/grid computing and smart cities. These advancements have culminated in previously passive infrastructure such as bridges, street lights and homes becoming self-controlling, able to communicate with humans and other nearby devices and

gadgets, as well as being imbued with an appreciable degree of analytical capability. The intelligent components and devices are connected to the Internet allowing them to work together in the collection of contextual data from multiple sources, thereby enabling them to carry out integrated functions.

Innovative and intelligent public service administration is going to be achieved if the public sector executes resource and skill partners with the private sector within the PPPs. The PPPs have been seen in many innovative public administration endeavours, especially in the European context, and the partnership has been recognised as having a potential for being long-standing with mutual benefits and royal relationships (Roman & Miller 2013). In the contemporary public administration agenda, where there is a need for an enhanced capacity for data processing from live public business processes which is in most cases large quantities, the need for big data processing capacity cannot be overemphasised. The private sector may come in with regard to providing much-needed financial capital which is cardinal in the erection of requisite ICT infrastructure to support big data clouds and relevant big data analytics technologies capable of processing huge data sets simultaneously. Apart from the above, the private sector brings on board expertise in big data processing which may be lacking in many respects in the public sector.

HRD (2015) attributes Seoul's vibrant e-Government to having in place robust strategic policies and strategic programmes, namely, the Mobile Seoul free Wifi network, 120 Dasan Call Centre, big data, Oasis and GIS portal.

# ■ Open Data, Open Processes and e-Government

Understanding the different exciting prospects of emerging forms of e-Government, the government of Moldovia has been pushing for open data (participation, transparency, collaboration,

new services) and open government (interactive service, collaboration, etc.) to be integrated into e-Government designs. The emergence of big data and analytics in the public sector delivery value chains enable innovation and competitiveness further facilitating active online citizen engagement and participation in governance (Morabito 2015). Wind-Cowie and Lekhi (2012) opine that the three key models of data governance are as follows:

- Paternalistic – these are collective rules and decision-making related to access and use of personal information focussing on security dimensions. For example, this can be 'legislation granting security services access to communications data' (Wind-Cowie & Lekhi 2012:45) to investigate a crime or granting access to information on children's dietary behaviour with a view to allowing intervention in children's diet.
- Deregulatory – a situation where there is a lack of rules or collective on use, granting an opportunity to individuals and the market to decide applicable rules on access and use of personal information. In this model, it is anticipated that consumer interests and good practice ought to be defined by the market forces, contextual setting and the prevailing circumstances.
- Democratic – the individual is accorded the chance to negotiate the access to personal information using the collective rules.

# ■ Research and Design of Future e-Government Domains

Many information researchers have been motivated to research different aspects of big data in the public service delivery frameworks. Many of the research endeavours have been motivated by a desire to mitigate the different challenges faced in managing huge quantities of government data. Fredriksson et al. (2017) posit that there are many challenges that pop up with regard to capturing, analysing, storing, archiving, sharing and

processing big data in government business processes brought about by massive digitisation of public services. The challenges in the implementation of big data in the public sector are mostly linked to technical, privacy, data quality and ethical concerns. There are many methods that are being employed to address the different challenges in big data. Some of the methods used in the processing of big data include data mining, artificial intelligence and machine learning (Pandey & Dhoundiyal 2015; Quick & Choo 2014).

Luna et al. (2014) have presented the different scenarios of the big data techniques used in the public sector with regard to improving the programmatic outcomes and facilitating evidence-based decision-making. The study posited that the different scenarios can be used to depict and model the different integration options for integrating big data analytics into the e-Government design agenda.

Hadoop (developed by Apache Software Foundation to be operated by large distributed computer clusters) is the primary open-source platform used worldwide as a big data platform. Luna et al. (2014) opine that Hadoop is built upon the Hadoop distributed file system (HDFS). Sangeetha and Rao (2016) have proposed a framework that can be used in big data processing analytics which cuts across almost all the key domain areas of e-Government implementation.

Bedini, Elser and Velegrakis (2013) developed a big data service architecture platform that was designed through BI tools such as SpagoBI. The analysis of the actual big data was provided as a service.

Dunleavy and Margetts (2015) proposed the 'Essentially Digital Governance' (EDGE) model which aimed to place at the centre of e-Government design and implementation the different progressive technologies such as cloud computing, robotisation and big data. The EDGE model was conceptualised out of the 1995 Hood's progressive-era public administration (PPA), the NPM and the digital era governance (DEG) model.

The NPM set out the rapid transformation agenda of the government and the DEG brought in the need for digitisation of the public services.

With the focus on big data in public service delivery frameworks, there has been a change of orientation with regard to e-Government. The emergence brings in the change in focus from merely government data to open data and open government (see Chapter 9). Originally, conceptualisation of e-Government focusses on improving public services, whereas open government focusses on enshrining a sense of public service transparency, civic engagement and interdepartmental collaboration. The ability to manage different aspects of big data in the public sector domains and the emergence of open data and open government transforms the whole concept of governance towards looking at citizens and businesses as partners in governance. For example, utilisation of crowdsourcing enables governance to reach the doorsteps of the people, thereby reducing the cost of inspection by government officials; increases civic engagement; and unleashes a feeling of transparency of the overall governance value chains.

The advantage of crowdsourcing is that the public need not physically visit a police station or go to the government department in order to report occurrences such as social unrest in the community but can easily do this using ICTs. Because of a multidimensional orientation of e-Government and big data, appropriate integration of the two cannot be done using one-dimensional approaches and expertise. Milakovich (2012) posits that there is a need to integrate the expertise from various fields, namely, political science, computer science and public administration, in order to come up with requisite methodologies and agile approaches in measuring and integrating big data into e-Government (Woodside, Amiri & Boldrin 2015).

E-Government research has different technical and managerial problems that need to be solved in any given context where it is implemented. Sangeetha and Rao (2016) point at the following

as some of the key problems that need to be considered in the design of e-Government programmes:

- technical infrastructure needed to support the different e-Government applications
- systems for automatic gathering and storage of static and dynamic data
- technology systems able to analyse big data obtained from the public business processes
- technology platforms that can enable online ubiquitous access to government data and applications
- technologies that can enable decision-makers to easily access analysed data to aid them in their decision-making processes
- technical expertise able to design and integrate different innovations into the e-Government design
- technical staff and members to ensure that technological innovations and managerial strategies are rightly integrated into e-Government implementation.

Tene and Polonetsky (2013) assert that careful analysis of big data using predictive analysis may culminate in analysis of trends and hence obtaining early warning signals for disaster. Big data analytics can present itself as an agent for reducing the time it may take to spot bottlenecks and inefficiencies giving the opportunity for the public sector to address immediate issues that may arise in the governance value chains and address in a much more streamlined manner.

Advanced capabilities in the processing and analysis of big data are important as they can be used in different ways at the national level. For example, instantaneous processing of big data can be used in disaster prevention as early warning signs can be seen in the analysis of geospatial data for threats, namely, unrest, radiation leakage, impending military attacks, climate change, impending earthquakes, tsunamis and typhoons. In the banking sector, big data can be used to detect money laundering by monitoring consumer behaviour. Analysis of consumer and commodity prices (financial market analysis) can

give indications of global financial crises in time for an appropriate response. At the national level, big data enable the monitoring of the service in different public sector frameworks and thereby provide an opportunity for the government departments to innovate ways on how to best provide the public services through ICT platforms.

## ■ Future e-Government Domains

Going forward, there are so many innovative opportunities and capabilities that are going to be unlocked. For example, Sallam et al. (2017) make bold predictions that by 2020, there will be massive improvements in the BI and analytics platforms to such an extent that smart, Hadoop/Spark-, search and visual-based data capabilities will transcend towards convergence into single next-generation data discovery capabilities. The improved and smart data discovery capabilities will go a long way in positioning e-Government as an intelligent public service administration platform. By 2020, it is anticipated that natural language and artificial intelligence will be a key feature of contemporary BI platforms.

Intelligent e-Government applications will demand that each of the challenges and entities of e-Government are carefully aligned to the overall e-Government design and implementation agenda and emerging innovative solutions within the established legal frameworks. Morabito (2015) has articulated the following governmental challenges that are experienced in contemporary e-Government environments:

1. Data ownership – in any data and information environment, the owner is mandated to take control and responsibility of its storage, distribution and use. In traditional e-Government design, the legal guardian of all the information resources is usually the government, and the citizens and/or businesses are the consumers of the information. In the contemporary e-Government environment where open data and open

government are encouraged, there is debate as to who the owner and legal guardian of the information is depending on the context in which e-Government is being implemented. For example, personal data can be created from heterogeneous sources, namely, machines and the Internet, in which case the rightful owner of the data is the authority which can verify the veracity of the data.

2. Data quality – significant costs and huge implications can be paid if mistakes are allowed in the analysis of big data (Vincenzo 2015). Junqué de Fortuny, Martens and Provost (2013) have opined that because of surpassing the workload limits on the technologies, there could be erroneous, fragmented and incomplete data from e-Government systems informing government decisions. Inaccurate data can have a huge negative impact on the integrity of data analysis and therefore compromise the effectiveness of interventions emanating from such an analysis. Contemporary data pulled from diverse government business processes and analysis from the perspective of big data emanate from the integration of all the different data aspects to form a position. The main issues in the analysis of big data in this regard emanate from integration, conglomeration and federation of data. Advancing data pre-testing procedures have begun to be seen on big data, such as Hadoop, which can go a long way in dealing with the aforementioned problems.

3. Privacy and equality issues – the managing of personal information in open governance domains is a contested terrain because it is riddled with a lot of questions surrounding civil liberties and privacy issues.

The current information handling mechanisms of big data rely on the segregation of the data over multiple servers which may be located in different locations connected by a computer and communications network and stored in distributed databases (Mukherjee, Geethapriya & Surianarayanan 2016). In such an arrangement, issues of privacy, security, fault-tolerance and access control arise. Luna et al. (2014) has posited that there are

different inherent challenges attributed to the processing of big data in any given context. Because of the nature of the data, it is difficult to store and process big data in one server. Kambatla, Kollias, Kumar and Grama (2014) opined that big data are usually scattered in different locations making it very difficult to store, process and analyse in one place.

In order to adopt the different intelligent technology solutions, there is a need for an increased e-Government readiness. Máchová and Lněnička (2015) define e-Government readiness as the level of preparedness of the country's technological and telecom infrastructure and the capacity of the citizens, businesses and governments to adopt, use and benefit from the use of modern and emerging technologies in the engagement with government entities. Some of the modern and emerging technologies include open (and big) data, cloud and fog computing, semantic technologies and social media. Daglio, Gerson and Kitchen (2015) opine that public sector innovation can be rightly facilitated by an organisation's ability to scan and learn from the past and current experiences and continuously scan future trends and integrating them into the current business models.

Future e-Government is going to take advantage of cloud and fog computing which are emerging applications to be applied at the commercial level in information management. According to Clark, Brudney and Jang (2013), cloud computing is characterised by hardware, software and network, making it viable for advanced information management tasks and public service delivery models brought out by capabilities of cloud computing such as fusion of virtualisation, grid and utility computing and web technologies. The use of cloud computing results in further reduction in the cost of public service delivery because the government does not need to invest in physical IT infrastructure but simply subscribe to cloud service providers to utilise the cloud infrastructure.

# ▪ Conclusion

The implementation of e-Government generally involves automation of public services and then system integration of different information systems utilised in different government departments to enable seamless flow of information. System integration further allows process integration systems to have interconnected logical or technical interfaces that allow them to exchange data and applications (Kettani & Mahdi 2008). It cannot be overemphasised that the design and implementation of e-Government in its different forms has generally been a complex and costly undertaking regardless of the context in which it is implemented.

There has been increased penetration of big data into the public administration value chains which is sitting at the centre of government innovation. This chapter has discussed the different intelligent technology platforms that are being designed in different e-Government designs. The chapter shows that there are a lot of perceived technology solutions brought about by intelligent innovations being designed. Although e-Government is attributed to having many benefits, there are still a lot of disadvantages that need to be carefully considered during the design process. Generally, there is a lack of awareness among public sector employees on big data. Chen and Zhang (2014) posit that this lack of awareness may cause a serious threat to the nation's cyber security and therefore should be handled cautiously.

## ▪ Directions for Research and Practice

The emergence of intelligent IT has enabled the transformation of e-Government towards intelligent government where there will be enhanced realisation of real-time communication between man (citizens) and machines (governments). This will be called 'i-Government'. The machines will be trained in such a way that they may mimic human beings in all the interactions they are involved in. Future research should investigate the different emerging themes which have been conceptualised in this book.

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# Index

Hitherto, e-Government discourse has lacked methodological and theoretical rigour and has been bereft of indigenous ways of knowing and studying the field. This book underscores the importance of indigenous knowledge and contexts, centrality of people, technology, processes and resources in the implementation of e-Government projects. Within these broad thematic areas on e-Government, this book delves in depth into the growing field of e-Government from policy, practical, theoretical and methodological perspectives. The applications of e-Government including but not limited to combating corruption, taxation, e-Participation, e-Democracy, e-Voting, e-Services, e-Policing and e-Procurement are explained. It also goes further to address the often relegated aspects of e-Government implementation, namely, monitoring and evaluation, failures of e-Government arising from ethical dimensions of technology such as privacy, confidentiality, security and what Richard Heeks referred to as 'technology-design actuality gaps of information systems'. The author has relied on a wide range of technology adoption models in presenting content and in effect brought forth diverse experiences and traditions from across the world. The book has used powerful statistical tools such as principal component analysis and multivariate analysis to measure and help the understanding of adoption and usage of e-Government solutions and factors influencing adoption. The book therefore bridges major gaps in the extant e-Government literature that is dominated by writings from developed countries. The book also helps address the paucity of materials on e-Government from developing countries, especially in Africa. It is founded on empirical research, case studies, comparative analysis and experiential knowledge from developing, transitional and developed country contexts. It has the potential to appeal to researchers of e-Government policy, which can have an impact on decision-makers.

**Prof. Dr Stephen M. Mutula, Acting Deputy Vice Chancellor and Head, College of Humanities, University of KwaZulu-Natal, South Africa**

This book engages a current and very interesting topic which is much debated by diverse researchers owing to the multidimensional nature of e-Government. Recent concepts such as freedom of information, electronic records management, metadata management, open data and open governance data, the design of open and interoperable information systems, cloud computing and the design of user-motivated access interfaces impact the design and implementation of contemporary e-Government. Given the need to investigate contemporary issues in the e-Government domain owing to the rapid evolution of government design and implementation models, the need for responsive e-Government models is urgent and unavoidable given the huge opportunity cost paid if ignored. In recognition of the 'metamorphosis' of governance models over time, this book explores pertinent issues that enable a government to remain relevant and effective to its core mandate. It contributes to advancing e-Government as a science and discipline that has its own theories and epistemologies. It explores both the managerial and technical dimensions of e-Government. The book investigates the status of development of e-Government in different African countries and collates the key issues and pointers towards the design of a conceptual model for e-Government development. These pointers given can help researchers in conceptualising one in any given contextual setting.

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