

CRANFIELD UNIVERSITY

SARA ABDALLA

AN E-GOVERNMENT ADOPTION FRAMEWORK FOR  
DEVELOPING COUNTRIES: A CASE STUDY FROM SUDAN

SCHOOL OF APPLIED SCIENCES

PhD

Academic Year: 2007 - 2012

Supervisor: Dr Ip-Shing Fan  
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## **ABSTRACT**

Over the past decade, rapid progress in ICT has encouraged many governments to incorporate new technology into their national economic development strategies. E-government is an important application within ICT and has become more significant in the agenda of policy and decision makers the world over.

E-government created a new medium that changed the nature of the whole public sector and its relationship with its constituencies. It has had a profound effect on various socio-economic and political aspects of society. E-government provides delivery of public services in a much more convenient and cost-effective way, offering huge opportunities to improve public sector efficiency. However, the process of change also gives rise to new challenges and difficulties, especially in developing countries, where many initiatives have not been successful. This is as a result of the massive deficiencies in basic infrastructure, human capacity and financial resources, along with the attendant political and cultural constraints. These factors are crucial and impede the adoption of e-government and the building of an information based society and economy. E-government initiatives must therefore account for the specific government systems, technological infrastructure and environmental conditions of the host country.

Many of the models and frameworks built to assist in the adoption process in developing countries have been adapted from e-government implementation experiences in Western developed countries. While there are important lessons to be learnt, these frameworks have limited application in Africa and developing countries in other regions.

Previously it was difficult to investigate e-government in developing countries due to their low levels of development. Recent advances in e-government in these countries have made it possible to conduct studies and analyse their experiences and practices.

This research empirically examined the adoption of e-government at a national and organisational level, taking the public sector in Sudan as a case study. A qualitative approach was followed and data was collected from Sudan using interviews with key officials and top managers; supported by published documents in the public domain.

The data was analysed using content analysis and the results verified with experts from a Sudanese public organisation.

The findings of the research contributed to the identification of the critical factors in Sudan, and to the development of an e-government adoption framework. The framework combines elements from the Technological, Organisational and Environmental (TOE) model; guiding decision makers to better manage issues related to the adoption process regarding the development of the technical infrastructure, management systems, values and strategies.

The use of the proposed framework can help integrate e-government into the public sector in order to accelerate social and economic progress in developing countries.

Keywords:

Critical factors, public sector, technology, organisation, environment, TOE model

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قُلْ إِنَّ صَلَاتِي وَنُسُكِي وَمَحْيَايَ وَمَمَاتِي لِلَّهِ رَبِّ الْعَالَمِينَ

{Say, Indeed, my prayer, my rites of sacrifice, my living and my dying are for Allah, Lord of the worlds.} and prayers and blessing upon his prophet Mohammad, the seal of all prophets.

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This work is dedicated to my parents and sons.

## **Biography and List of Publications**

Sara Abdallah is a PhD Researcher at Cranfield University Investigating E-government in Developing Countries. She graduated from the School of Mathematical Sciences at the University of Khartoum with a Master's degree in Cryptography. Sara is employed in the Information Technology and Networks Administration and is involved in providing high quality technology services and ICT solutions to develop the academic and management operations.

## **List of Publications**

Abdallah, S. and Fan, I.S. (2012) 'Framework for e-government assessment in developing countries: case study from Sudan', *Electronic Government, An International Journal*, Vol. 9, No. 2, pp.158–177.

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## LIST OF ABRREVIATIONS

ATM	.....	Automated Teller Machine
BPR	.....	Business Process Re-engineering
CBOS	.....	Central Bank of Sudan
DDS	.....	Decision Support System
E-government	.....	Electronic Government
ERP	.....	Enterprise Resource Planning
GDP	.....	Gross Domestic Product
ICT	.....	Information and Communication Technology
IS	.....	Information Systems
IT	.....	Information Technology
ITU	.....	International Telecommunication Union
IVR	.....	Interactive Voice Response
NIC	.....	National Information Centre
NTC	.....	National Telecommunication Corporation
OECD	.....	Organisation for Economic Co-operation and Development
POS	.....	Point of Sale
PPP	.....	Public Private Partnership
ROI	.....	Return On Investment
SMS	.....	Short Message Service
SUST	.....	Sudan University of Science and Technology
TQM	.....	Total Quality Management
UN	.....	United Nations
U of K	.....	University of Khartoum
WSIS	.....	World Summit on the Information Society



# 1 INTRODUCTION

---

The first chapter gives a background of the research (**section 1.1**); describes the research problem (**section 1.2**); the research aim, objectives and questions (**section 1.3**); the significance of conducting this study (**section 1.4**); the contribution made by the research (**section 1.5**); overview of the research methodology (**section 1.6**); outlines the structure of the thesis (**section 1.7**); finally, the chapter is concluded with a summary (**section 1.8**).

---

## 1.1 Research Background

Rapid advances in Information and Communication Technology (ICT) have enabled the development of applications such as: e-commerce, e-learning, e-health and e-government. The phenomenon of e-government started in the early 1990s and refers to the use of Information and Communication Technologies (ICTs) to improve the activities of public sector organisations. In 2001 the UN endorsed the World Summit on the Information Society (WSIS), which encouraged governments to establish, before the year 2010: “Comprehensive, forward-looking and sustainable national strategies, including ICT strategies and sector strategies, as an integral part of national development plans and poverty reduction strategies” (ITU, 2010b). 84% of the 161 countries in the ITU have already met the WSIS target of having a national ICT strategy in place (ITU, 2010b). E-government innovation has been a central focus for the public sector; with national and local governments around the world aware of the potential of utilising ICT to enhance their efficiency through access to information and providing public services electronically.

In the current information age, ICT has a profound effect on most socio-economic, political and cultural aspects of society and is a necessary tool for the implementation of national development plans in many countries. However, inadequate infrastructure and poor standards in health and education in most developing countries is impeding progress towards the realisation of a digital society.

E-government is now attracting significant research interest and it is expected to become one of the most investigated applications of ICT in the coming years (Pudjianto and Hangjung, 2009). Research already conducted highlights the benefits that e-government offers to citizens, businesses and governments. In fact, the promise of efficiency in the provision of governmental services, reduction in paper work and corruption alleviation (Ndou, 2004), has inspired many researchers to examine e-government adoption and implementation in public sector organisations.

There is currently a mixture of research into e-government. One important area of research deals with values and goals to be set and results that can be achieved through the implementation of e-government initiatives; such as efficiency, transparency, accountability, as well as free access to information and democratic responsiveness (Nour et al., 2008). However, Riley (2001) argues that e-government is a tool that has limited value in itself; its value comes from the ability to apply it to specific goals and objectives. Another aspect deals with the factors facilitating or hindering the adoption of e-government (Nour et al., 2008; Kumar et al., 2007), where models combining factors of influence have been developed and factors explained, in order to help in the adoption process at organisational, local or national level. This research is motivated by this particular aspect of adoption, as it is a crucial issue for developing countries.

The literature suggests that many e-government initiatives have not been completed successfully, especially in the developing world. 60%-80% of e-government projects fail or do not achieve their goals (Heeks, 2003; UN, 2008a). Many researchers found that e-government initiatives must take into account the diversity of government systems, technological infrastructure, culture, and political and economic conditions. They argue that the adopted values have to match the context within which the e-government is carried out. Some suggest that the incompatibility between the context and the targeted goals and values (whether political, economic or even technical) can easily lead to failure. There is an inadequate context-based framework developed for the purpose of better adopting e-government and identifying the key issues and factors affecting the adoption process, in a developing country context.

The context for this research is Sudan where the government has been taking notice of Information and Communication Technologies (ICT) since the early 1990s. ICT is seen

as a powerful tool to improve the quality and efficiency of the services provided to citizens. Real achievements started in the telecommunication sector in 1993 by establishing a modern digitalised national telecommunication network, and in 2004 the government established the National Information Centre (NIC) as the formal body to coordinate e-government in Sudan. The foundation for this was the formulation of the National Strategy for ICT in 2001 (Rayis, 2008). They followed a policy of privatising the telecommunications sector, which took place in 2005. The aim of the new policy was to decrease telecommunications costs, increase the rate of development in the field of information technology and narrow the digital divide between the rural and urban areas. As a result, various e-government initiatives have been conducted across the country.

E-government has recently emerged in Sudan and other developing countries, so many issues remain problematic. Identifying the precise problem is important in order to overcome the inherent challenges.

## **1.2 Statement of the Problem**

Although the e-government phenomenon can be witnessed widely in the public sector, many problems still surround its diffusion and adoption. The research problem in this study is identified through two main sources:

- The literature examined; in order to build the research background of e-government, understand the problems facing developing countries and identify the literature gap.
- The preliminary study conducted in Sudan at the beginning of the research in 2007. The researcher conducted eight interviews with key executives to understand Sudan's motivations to adopt e-government and what issues and factors influence the adoption process, see Chapter 4.

The findings from the literature review and the analysed data from the primary study highlighted several issues which led to the identification of the following problems:

1. E-government is more than a technological project. It is a reengineering process affecting humans, organizations, the economy, business and politics. Therefore, the social, political and cultural factors are fundamental in this massive change. These factors received less attention when setting the strategic agenda, although they have greater impact in developing countries and in particular, Arab and African countries. In Sudan as the focus of this research, these factors have a significant role in shaping the way of life and even the decision making process. Therefore, better adoption can be achieved by directing the efforts and decisions to make the right choices and actions.
2. Heeks & Bailur (2007), stated that: “there have been few, if any, analytical studies of e-government success and failure in Africa. In seeking models, we therefore turn initially to the broader literature on success and failure of ICT projects in developed countries”. The problem in using existing models is that they might not be applicable for developing countries, due to their different context and hence their different set of requirements. Therefore, there is a strong need for developing a conceptual framework that maps out a clearer picture of the specific needs and requirements in developing countries.

### **1.3 Research Aim**

This research aims to develop an adoption framework that identifies the critical factors influencing e-government adoption in Sudan. This will provide guidance to policy makers to take appropriate decisions for e-government adoption in the public sector in Sudan.

### **1.4 Research Questions**

1. What are the main elements and factors affecting e-government adoption in Sudan?
2. How can the identified critical factors help to build the holistic picture of e-government in Sudan?

## **1.5 Research Scope**

This research is examining the e-government adoption in the public sector of Sudan. The research focuses on the government-to-government domain and not the government-to-business (G2B) or the government-to-citizen (G2C) domains.

## **1.6 Research Objectives**

To meet the specific aim of this study the following objectives are formulated:

1. To establish the state of art in e-government and identify the key characteristics of the e-government concept across various contexts and perspectives.
2. To understand the challenges, barriers and opportunities hindering or supporting the adoption of e-government in developing countries, with particular focus on the Arab world and African countries.
3. To examine the models and frameworks used for technology and e-government adoption especially in the context of developing countries
4. To identify the critical factors influencing e-government adoption in the public sector in Sudan.
5. To develop an e-government adoption framework to guide policy makers in developing countries in the decision making process, using initiatives from public organisations in Sudan.

## **1.7 Overview of the Research Methodology**

The objectives in the previous section were achieved through conducting the designed research methodology described in Chapter 3 and illustrated in Figure 3-3. Next is a brief summary of the main Phases of the methodology.

**Phase one:** addresses objectives 1, 2 & 3. This phase established the research background and reviewed the literature which helped to identify the literature gap (Chapter 2 & 5). In this stage a preliminary study was conducted (Chapter 4) and the

initial conceptual framework (Chapter 5) was developed according to the findings of the preliminary study and literature review.

**Phase two:** addresses objective 4. In this phase the author gathered data from Sudan at a national level through conducting 13 open-ended interviews with key executives (Table 3-7) and collecting white papers and official documents (Appendix A). The data display, content analysis and key findings in Chapter 6 led to the refinement of the conceptual framework and the identification of the critical factors influencing the e-government adoption process in Sudan.

**Phase three:** addresses objective 5. The data gathering in this phase took place at the organisational level. Four case studies have been conducted in public organisations in Sudan, using 22 semi-structured interviews (Table 3-8) and collecting organisations documents and studies. The outcome of the analysed data (within and cross case analysis) in Chapter 7 made the final revision of the framework. Consequently this led to the achievement of the research aim by proposing an e-government adoption framework for developing countries.

**Phase four:** addresses objective 5. The illustration of how to use the framework was illustrated in Chapter 8 using one case study from Sudan. The significance of this step was to show how the framework helped to guide the decision making process. Finally, a discussion was conducted around the key results and research conclusions were drawn in Chapter 9 & 10 respectively.

## **1.8 Significance of the Research**

This research investigates the adoption of e-government in developing countries. It is an important theme for researchers, professionals, politicians and decision makers in developing countries, which are characterized by low levels of diffusion and adoption. The findings and conclusions of this study will be useful for policy makers at both the national and organisational level; to guide them towards taking correct decisions, enhance their environments and prepare the public sector for the process of change. The significance of this research can be seen through the following:



### **1.8.1 Add to research in contextual factors**

In previous e-governments studies, much of conducted research, surveys, assessments and even training programmes focussed on technical factors (Chowdhury et al., 2006; Edington and Shin, 2006; AL-Shehry et al., 2006; Esteves and Joseph, 2008). This research takes a holistic view by addressing the contextual issues, both technical and non-technical, that contribute to e-government adoption.

### **1.8.2 Add to research in Africa and the Arab World**

Many governments in the Arab World and in Africa are embracing digital knowledge. However, there is relatively little research related to e-government in either region. There needs to be significantly more examination, testing and modification to suit the context of these countries.

### **1.8.3 Add to research in Sudan**

This research highlights the importance of e-government adoption in Sudan as a significant issue for academics and professionals. E-government is at an early stage in Sudan and there has been very little research examining this topic. The importance of this research is to help identify the challenges facing, and opportunities for assisting, the adoption process. Further, the analysis and findings from this research are expected to provide valuable information and guidelines for use in decision-making, regarding the adoption of e-government in Sudan.

### **1.8.4 Contextualise in the trends in Sudan**

Commencement of oil production in 1990s and recent rapid Telecommunications developments have transformed the economy of Sudan into one of the fastest growing in Africa. The Sudanese government also approved new investment legislation; meaning the country has stepped further towards liberalization, structural changes and privatisation. The huge investment is helping Sudan join global networks. This investigation is timely as e-government will assist Sudan build a knowledge-based economy.

## **1.9 Contribution to knowledge**

This research attempts to add significantly to knowledge and practice of e-government in the Arab/African region by shedding light on technical, organisational and environmental factors. It examined the literature in e-government experiences around the world in order to understand both the drivers as well as the specific factors that may constrain e-government adoption in Sudan. The study proposed an adoption framework that is believed to help Sudan, as well as other countries with a similar context, in the decision-making process for planning and implementing effective e-government. In conclusion, this research is novel and demonstrates a contribution to knowledge through:

- Generation of new knowledge to the field of e-government
- Identification of the critical factors influencing the adoption of e-government in the public sector in Sudan
- Developing a framework for e-government adoption in the public sector in developing countries

## **1.10 Thesis Outline**

The study presents a detailed examination of the subject background, research methodology, data analysis, findings and discussion of the critical factors of e-government adoption; and the contribution to both knowledge and practice. The flow of the research is illustrated in Figure 1-1. The next section summarises the content of the chapters:

### ***Chapter One: Introduction***

Overview of the research with clear statement of: the research problem, aim, objectives and research questions. The chapter highlights the significance of the research and contribution to knowledge. Finally, the outline of this study is provided.

### ***Chapter Two: E-government Characteristics***

The state of art in e-government in terms of: concepts, definitions and perspectives. The literature reviewed in this chapter is an attempt to better understand the challenges and benefits of adopting e-government. Thereafter, the literature covered the current situation of e-government around the world and the critical factors influencing its adoption within the context of developing countries.

### ***Chapter Three: Research Methodology***

The methodology adopted for the execution of the current research. The discussion includes: an overview of the various research designs available; their philosophical assumptions and the rationale behind the researcher choices; the selection of the case study qualitative approach; and the adopted strategies of validity and reliability. The empirical design illustrates how the research was conducted in two successive phases representing the national level and organisational level.

### ***Chapter Four: Sudan Case Study***

The historical and social background of Sudan, including: demography, politics, economy and culture. The chapter details the unique context existing in Sudan as an Arab/African country. Next, the chapter highlights the objectives and main achievements of ICT in Sudan. Finally, the chapter addresses e-government in Sudan (motivations, e-readiness and risks).

### ***Chapter Five: Framework Development***

Development of the initial conceptual framework. The chapter discusses the current frameworks available in the literature and justifies the selection of the Technology, Organisational; Environmental (TOE) model as a base for the development of the initial framework. The chapter intensively reviewed each of the identified critical factors associated with the three elements of the TOE model.

### ***Chapter Six: E-government in Sudan – National level***

The first phase of the research methodology and the findings and analysis of the data gathered at the national level in Sudan. The chapter analysed each factor and the initial conceptual framework was revised according to the findings and results at the national

level. The chapter concludes with listing the critical factors of e-government adoption in Sudan.

### ***Chapter Seven: E-government initiatives in Sudan – Organisational level***

The second phase of the research methodology and the main findings and analysis of the data collected at the organisational level. The chapter analysed each case study. The framework is revised again according to the new findings and the chapter concludes with the development of the e-government adoption framework.

### ***Chapter Eight: Illustration of Framework***

How the framework helps and guides policy makers in the decision making process regarding e-government adoption. This was illustrated through the use of one of the public organisations in Sudan. The applicability of the framework and the potential to be transferred to similar contexts was confirmed.

### ***Chapter Nine: Discussion***

The results and findings of e-government adoption in Sudan brought together. The chapter shows how the research findings answered the main research question and achieved the aim and objectives of the research. The chapter also provide the author's views on the research findings and conclusions.

### ***Chapter Ten: Conclusion***

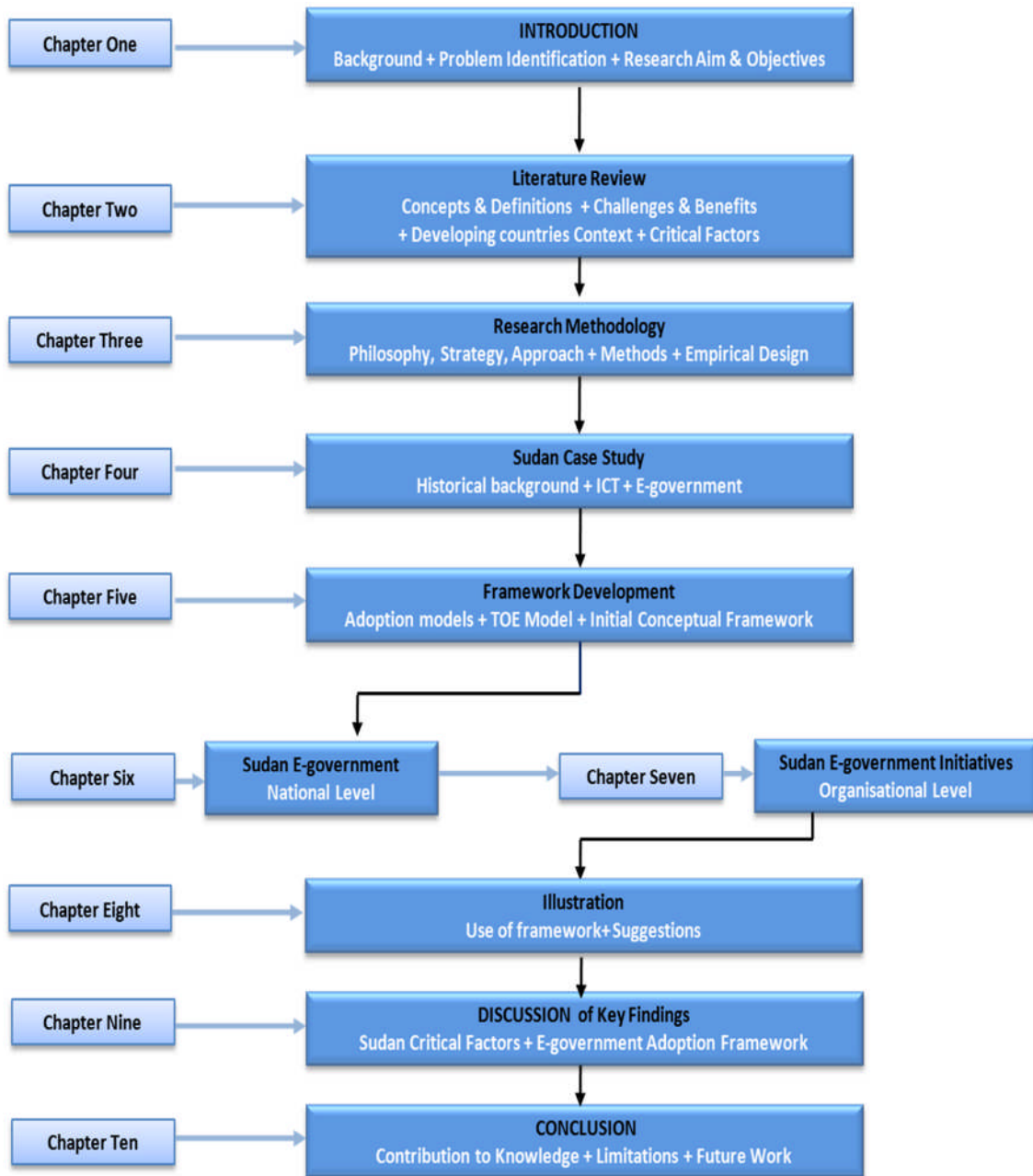
A Summary of the entire work, including: the novelty of the developed framework and the identified critical factors; and the contribution to knowledge in research and practice. In addition, the chapter presents the limitations of the research and details future work that can guide research into areas where there is potential for practical and academic development.

## **1.11 Summary**

This chapter presents the background of the subject of this study and explains the research problem, aim, objectives and main research questions to be answered. The

chapter also highlighted the importance of this research and the way it is adding to knowledge.

The following chapters describe the practical implementation of the steps detailed in the thesis outline. Next is the literature review of the areas relevant to the research topic.



**Figure 1-1: Thesis structure outline**



## 2 E-GOVERNMENT CHARACTERISTICS

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The aim of this chapter is to review the literature in order to provide a clear view of the e-government concept and its key characteristics; including: definitions, benefits, challenges and stages of e-government maturity. The chapter also aims to demonstrate the features of e-government development in developing countries, with a focus on the Arab World and Africa. The structure of this chapter is as follows:

1. **Sections (2.1 & 2.2):** A general overview of the main features of e-government; concepts, definitions and perspectives
2. **Section (2.3):** A description of the current situation of e-government around the world with greater focus in the Arab World and Africa.
3. **Section (2.4 & 2.5):** An investigation of the benefits and challenges that facilitate or hinder e-government adoption in developing countries' environments.
4. **Section (2.6):** An illustration of e-government maturity assessment models and their stages of growth.
5. **Section (2.7):** A demonstration of the e-government framework and models incorporating critical factors of adoption.
6. **Section (2.8):** An analysis and critique of the literature review.
7. **Section (2.9):** A summary of the chapter.

---

### 2.1 E-Government Overview

The former U.S. Presidential candidate (Al Gore) raised the issue of e-government, with a vision of linking citizens to the various agencies of government in order to receive services electronically (Almarabeh and AbuAli, 2010). The idea has attracted interest from other politicians, policy makers, and individuals in countries that can be either: developed or developing; capitalist or communist; democratic or authoritarian (Grant

and Chau, 2005; Stoltzfus, 2005). Unlike other concepts (such as, globalisation and privatization) which are still considered controversial (Stoltzfus, 2005; Kraemer et al., 2002), e-government is perceived as a good thing and it is rapidly developing and spreading across all levels of government (Gulati and Yates, 2011). Indeed, governments are making massive financial and political commitments in order to establish e-government systems (Stoltzfus, 2005). However, the goal and objectives of these systems vary from: a developed to a developing country; public to private sector; as well as from citizen to business or organisation.

E-government primarily refers to the use of Information Technology in governmental organisation processes, even though the use of IT tools in the public sector is not a new practice. Some countries have been using IT in their governmental processes and procedures since the 1950s (Heeks, 2002). The difference is that IT was used to automate the internal work of government by processing data, whereas now, the use of ICT is transforming the external work of government by processing and communicating data (Heeks, 2002). E-government is therefore to be seen as an evolutionary rather than a revolutionary phenomenon (Gupta and Jana, 2003). Recently there has been pressure and demand from citizens to provide services online, due to growing technological maturity lowering the risk of adopting new technologies (Accenture, 2004). There is also international pressure to participate in the e-economy and be part of the global economic network (Ndou, 2004; Ifinedo, 2005). This pressure forced policy and decision makers, including those in poor and less developed countries, to facilitate the transformation to e-government systems. Unfortunately, the transformation has often been associated with complexity and difficulty (Ifinedo, 2005) due to the multiple dimensions and perspectives involved (Alshawhi and Alalwany, 2009; Veenstra et al., 2011). E-government is surrounded by political, economic, cultural, technological and organizational factors; and these factors greatly influence the various sectors and stages of e-government progress (Ndou, 2004; Edington and Shin, 2006; AL-Shehry et al., 2006; Al-Adawi et al., 2005). The socio-technical nature of e-government suggests that these issues will need to be addressed with careful attention to context (Seifert, 2003), as the contextual nature of a country can lead to e-government difficulties. The complexity of e-government as a socio-technical system (Lau et al., 2008) challenges the transformation in many developing countries (Seifert, 2003). Therefore, for effective



e-government it is important to successfully introduce technology into the specific context (Heeks, 2003; Gupta and Jana, 2003).

On one hand, e-government offers great opportunities for governments to enhance efficiency and increase productivity, but it also raises new challenges; including the re-engineering of processes and funding and management responsibilities. The potential of e-government can be seen as a: “paradigm shift that improves how government operates and how society views, understands and interacts with government” (Parisopoulos et al., 2007).

### **2.1.1 Concepts of E-government**

E-government is relatively new and ideas are yet to mature and be well defined (Young-Jin and Seang-Tae, 2007). The concept is currently still without a universally agreed standard definition and it can mean different things to different people. Some see e-government as a goal in itself; some view it as a tool for achieving broader public sector reform goals (Yildiz, 2007). Nonetheless, there are some commonly agreed notions, including: government efficiency and effectiveness; empowering citizens, organisations and communities through access to information; strengthening levels of democracy; citizen-participation; and transparency (Oyomno, 2004). These concepts have fundamentally transformed the way of thinking and working in the public sector (Wimmer, 2002; Fountain, 2001). E-government is reforming the way governments provide services electronically and revitalising the relationship with citizens and business (Metaxiotis and Psarras, 2004). This reform process is not simply about computerising a government system; rather it is the ability to use technology: “to achieve levels of improvement in various areas of government” (Dada, 2006).

Tracing the development of e-government, Oyomno (2004) identified three distinct phases:

**Phase I:** Governments target the use of ICT (mainly Web Technology), to deliver public services electronically, in order to: “improve government efficiency, meet citizen expectations and facilitate economic development”.

**Phase II:** Governments started to do business through delivering services electronically. This was considered as a reinvention of government. Governmental organisations also began to have new features, such as: being community-owned; showing increased competitiveness; being more decentralised and market-oriented.

**Phase III:** This represents the current situation in e-government; it is about the reengineering processes needed to change the existing design of government organisations. Centralized, vertical and hierarchical structures were previously developed for the industrial economy and society, but now the aim is to build new management paradigms appropriate for the transformation to the information-based economy and society.

### **Key Concepts in E-government**

- An e-government does not represent a political ideology or philosophy, nor does it aim to give power to the government. It aims to empower individuals through access to information and knowledge (Oyomno, 2004; Jain and Kesar, 2011).
- E-government is neither about the technology nor about the “e”. It is about the “government” and the transformation of relationships with its constituents, citizens, businesses and government agencies (OECD, 2003; Shin, 2008).
- E-government is a paradigm shift that has changed the way governments and public administrations operate. It is an invention that linked public organisations with the external world and restructured the organisations’ functioning, integrating, and delivering of services (Peristeras et al., 2002).

## **2.2 E-government Definitions, Perspectives and Domains**

### **2.2.1 E-government Definitions and Perspectives**

There are many elements which comprise the e-government concept (Moon, 2002). Grant (2005) states that e-government is: “more than a pure technological phenomenon”; therefore, it requires a broad definition and understanding (Ndou, 2004). According to (Yildiz, 2007), the difficulty in defining e-government is as a result of its

multiple meanings. These meanings might depend on the specific context, regulatory environment, dominance of a group of actors in a given situation, or the different priorities in government strategies (Heeks, 2003).

E-government can be viewed within a number of disciplines; such as, Information Systems (IS), computer science, public administration and political science (Heeks and Bailur, 2007). Seifert and Petersen (2002), define two perspectives from which to identify e-government: the technical level and the political level. Some identify e-government from a technological perspective and from a business perspective (Tambouris, 2001). Lenk (2000), identifies four different perspectives of e-government: citizen, process, cooperation and knowledge management. Thus, it is more appropriate to define e-government based on its stakeholders' perspective and their aims and objectives. This is because the meaning of e-government and its adopted values and goals will largely depend on the stakeholders' interests (Stoltzfus, 2005; Yildiz, 2007). Table 2-1 lists some of the definitions grouped according to different perspectives.

**Table 2-1: E-government Definitions**

Perspective	Definition	Reference
<b>Technical</b>	"E-government refers to the use of information and communication technologies (ICT) - such as Wide Area Networks, the Internet, and mobile computing - by government agencies."	(UNPAN, 2011)
	Electronic government refers to the use of information and communication technologies, and particularly the Internet, as a tool to achieve better government.	(OECD, 2003)
<b>Political</b>	To use technology "to achieve levels of improvement in various areas of government, transforming the nature of politics and relations between the government and citizens."	(Dada, 2006)
<b>Governmental</b>	"E-government is the application of ICT by government agencies. Its use promises to enhance the effectiveness and efficiency of government and alter its relationship with the public."	(Atallah, 2001)
	"E-government refers to the use of ICT to improve efficiency, effectiveness, transparency, & accountability of governments."	(World Bank, 2009)
	"To improve government efficiency, meet and improve citizen expectations and relationships, and facilitate economic development."	(Oyomno, 2004)

### 2.2.2 E-government Domains

E-government involves various activities and stakeholders and also serves different groups of people, sectors, and organizations in a variety of domains. The World Bank (World Bank, 2007) identified three distinct domains for e-government interaction:

1. Government-to-citizens (G2C): government aims to interact with citizens.
2. Government-to-business (G2B): government aims to interact with business enterprises.
3. Government-to-government (G2G): government aims to make services more friendly, convenient, transparent, and inexpensive.

The G2G domain is seen as the backbone of e-government implementation, as it paves the way for e-government use in the country as a whole (Chen et al., 2006). Examples of the services offered in the three domains are shown in Table 2-2.

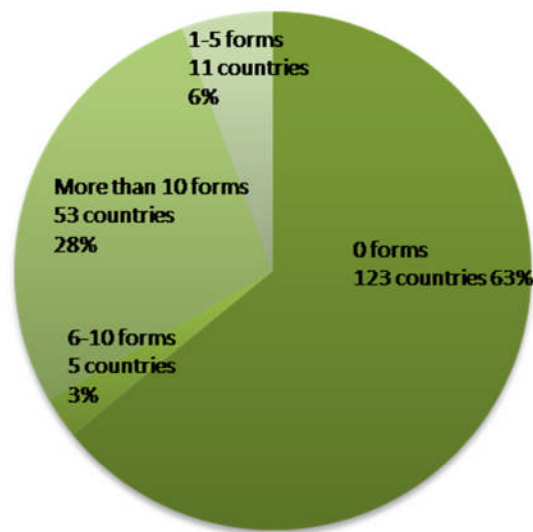
**Table 2-2: E-government domains provided services**

	<b>G2G</b>	<b>G2C</b>	<b>G2B</b>
<b>US</b>	e-Grants: providing a single, online portal for all federal grant customers to access and apply for grants.	GovBenefits.gov: providing a single point of access for citizens to locate and determine potential eligibility for Government benefits and services.	Federal Asset Sales: creating a single, one-stop access point for businesses to find and buy government assets.
<b>EU</b>	Interchange of data between administrations (the IDA program): networking of public administrative units.	Single Point of Access for Citizens of Europe (an EU-project): supporting citizens' travel within Europe.	The Net-Enterprises Project (France): allowing enterprises, through Internet, to send standardized notifications to government agencies.
<b>Singapore</b>	GeBIZ Enterprise: coordinating the purchasing needs of the public sector procurement officers.	e-citizen Portal: providing a single access point to government information and services, which are organized and integrated in intuitive categories.	G2B Portal: the entry point for all local and international businesses to access a full suite of aggregated and integrated G2B information and services.

Source: (Lee et al., 2005)

## 2.3 E-government Around the World

Growing access to ICT has encouraged many governments to integrate new technology into their national economic development strategies (Tahrani, 2010). It is becoming an increasingly important public service tool for many governmental departments around the world (Nour et al., 2008), and the scale of activity on the part of public sectors in leveraging IT has increased in volume (Smith, 2008). The vast majority of public organisations around the world have established websites and provide public information to citizens (98% with website – 2% without websites) (UN, 2010). In addition, many transactions are now conducted online; these include, applying for jobs, completing tax returns and renewing drivers' licenses (West, 2004), Figure 2-1. However, financial transactions and opportunities for interactive political and policy participation are still limited (Holden, 2003).

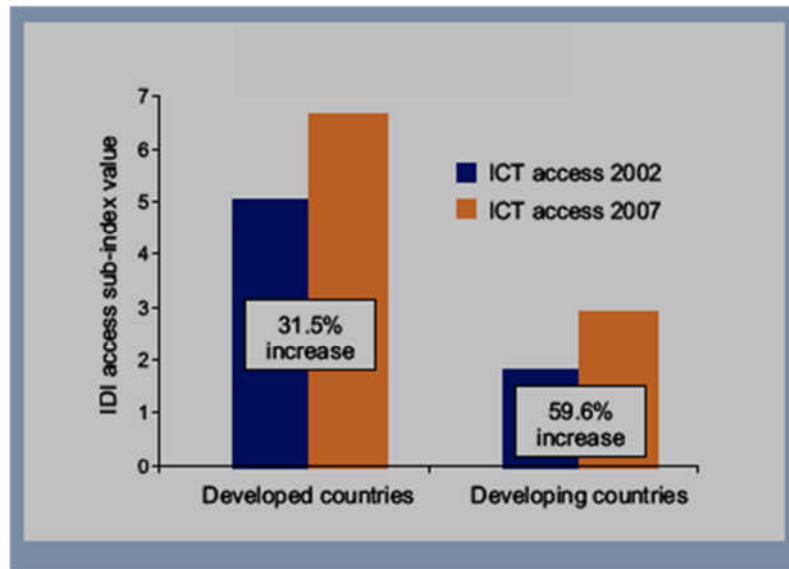


**Figure 2-1: Available static online forms**

Adopted, (UN, 2010)

Countries and regions vary in their overall performance in e-government uptake (West, 2008); for example, 40% of people using the Internet are in North America, 49% are in Japan and Western Europe, leaving only 11% from the rest of the world. The digital divide report (2006) shows that a person from a high-income, developed country is over 22 times more likely to be an Internet user than someone from a low income,

developing country. This is significant as 37% of the world's population live in low-income countries. In the least developed nations the divide is even greater, with access 10 times less than that in developing countries (Brown and Thompson, 2011). Figure 2-2 shows differences between developed and developing countries in terms of ICT access.



**Figure 2-2: ICT access: developed vs. developing countries**

Adopted, (ITU, 2010a)

Yasin and Yavas (2007) stated that the level of diffusion and dissemination of e-government has been neither homogeneous, nor has e-government evolution influenced all cultural settings equally. The statistical results from many surveys conducted by international and national organisations (UN, 2008b; EIU, 2008; Bridges.org, 2008; Kirkman et al., 2002) show that the rich, developed and westernised countries are more likely to have advanced and mature e-government systems (Kim, 2007); while developing countries lag behind the rest of the world in terms of e-government adoption and dissemination. The EIU annual ranking report (EIU, 2009) classifies this geographically, with North America at the top of the list, followed by Europe, Asia, the Middle East, Africa, and the Caribbean & Latin America. Table 2-3 shows the figures of e-government growth in some regions of the world.

Table 2-3: E-government growth across regions –

Region	2001	2002	2003	2004	2005	2006	2007	2008
North America	51.0%	60.4%	40.2%	39.2%	47.3%	43.1%	45.3%	53.1
Western Europe	34.1%	47.6%	33.1%	30.0%	29.6%	35.2%	36.8%	37.2%
Middle East	31.1%	43.2%	32.1%	28.%	27.4%	29/4%	33.5%	32.3%
Asia	34.0%	48.7%	34.3%	31.6%	37.3%	35.9%	39.5%	39.7%
South America	30.7%	42.0%	29.5%	24.3%	25.9%	28.0%	32.1%	33.3%
Africa	23.5%	36.8%	27.6%	22.0%	22.0%	24.3%	26.0%	26.3%

Source: (West, 2008)

There can be difficulties comparing countries because of their “sheer heterogeneity in terms of economic development, regime type, cultural patterns, telecommunications infrastructure and Internet usage” (West, 2004). Researchers (Khalil, 2011; AlShihi, 2006; Kovačić, 2005; Bolgherini, 2007; Al-Fakhri et al., 2008), argue that these factors result in considerable differences between states, societies and organizations.

Previously it has been difficult to examine e-government in developing countries as they were at the beginning of the process. Recent advances in e-government in these countries have now made it possible to conduct studies and analyse their experiences and practices. The reviewed literature regarding e-government implementation in developing countries reveals two groups with opposite opinions.

The first group highlight growth and development witnessed in developing countries in terms of ICT diffusion and dissemination, as well as the successful initiatives in many governmental sectors and organisations. This is evidenced by increases in ranking of developing countries in several e-readiness assessment reports; for example, UAE, Egypt, Saudi Arabia, Kuwait and Jordan rose 7 to 10 positions in their e-readiness assessment between the years 2005 and 2008 (UN, 2008b; UNPAN, 2005). West (2005) recognised that there has been success achieved in these countries, even though they are governed by non-democratic and dictatorial regimes.

The second group takes a contrary position in the literature and argue that the implementation in developing countries is still in an early stage of growth (Chowdhury et al., 2006; Chen et al., 2006; Schuppan, 2009; Basu, 2004). Progress of e-government is criticised for not being coupled with economic diversification and cultural change. In

fact, some contend that the gap between developed and developing countries is getting wider, especially in terms of Internet technology and its usage (Chen et al., 2006). This group points to inadequate infrastructure, poor financial resources and lack of technological adaptation (Brown and Thompson, 2011).

According to the ITU, the sector that has had the strongest impact in developing countries so far is the mobile telephone sector; particularly since mobiles are not just a different or complementary way of communication, but have opened up entirely new communication means in many parts of the developing world. The boom of the mobile industry has created new jobs and revenues and also contributed to economic growth by widening markets, creating better information flow, lowering transaction costs, and substituting for costly physical transport (ITU, 2010a).

Nonetheless, it is important to realise that the e-government applications around the world are not usually successful. In fact, the international failure rates are high and range between 60%-85% (World Bank, 2007; Heeks, 2006). Heeks' survey estimated that 35% of the e-government initiatives are a total failure and only 15% can be considered as a success. Moreover, only 17 countries have reached advanced levels of maturity according to the UN (UNPAN, 2005). It is argued that e-government initiatives are failing due to a lack of understanding regarding effective planning, development and deployment, (Gupta and Jana, 2003), while others assert that the project goals are too ambitious given existing capacity. (Heeks, 2002), argues that the problem in developing countries often arises due to dissimilarities in the physical, cultural, economic, and various contextual factors.

### **2.3.1 Developed Countries versus Developing Countries**

The United Nations classify countries as either developed or developing based upon the GDP per capita, human assets, and degree of economic vulnerability (UNCTAD, 2002). Current research interest lies in the contextual differences that may affect the e-government implementation process. Table 2-4 summarises some of these differences.



Table 2-4: Developed vs. developing countries

Differences	Developed	Developing
<b>History &amp; Culture</b>	Government and economy developed early, immediately after independence  Economy growing at a constant rate, productivity increasing,  High standard of living relatively long history of democracy and more transparent government policy	Government usually not specifically defined Economy not increasing in productivity  Low standard of living relatively short history of democracy and less transparent government policy
<b>Technical Staff</b>	Has a current staff, needs to increase technical abilities and hire younger professionals Has outsourcing abilities and financial resources to outsource; Current staff would be able to define requirements for development	Does not have a staff, or has very limited in-house staff Does not have local outsourcing abilities and rarely has the financial ability to outsource; Current staff may be unable to define specific requirement
<b>Infrastructure</b>	Good current infrastructure High Internet access for employees and citizens	Bad current infrastructure Low Internet access for employees and citizens
<b>Citizens</b>	High Internet access and computer literacy; still has digital divide and privacy issues Relatively more experienced in democratic system and more actively participate in governmental policy-making process	Low Internet access and citizens are reluctant to trust online services; few citizens know how to operate computers Relatively less experienced in democratic system and less active participation in governmental policy-making process
<b>Government Officers</b>	Decent computer literacy and dedication of resources; many do not place e-government as a high priority	Low computer literacy and dedication of resources; many do not place e-government at a high priority due to lack of knowledge on the issue

Source: (Chen et al., 2006)

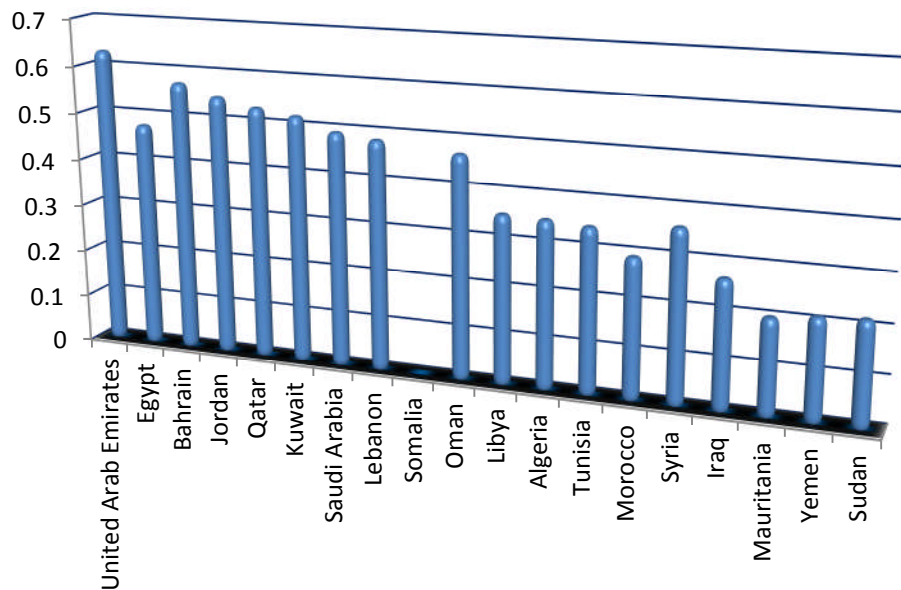
### 2.3.2 E-government in the Arab World

The majority of Arab leaders have acknowledged the necessity of utilising ICT in their governmental operations. Although it is still early for e-government to take root in most Arab states (Pons, 2004), e-government projects have been widely endorsed as a solution to a variety of concerns in public sectors in the Arab World (Salem, 2006).

The Arab World constitutes 10% of the world's landmass and 5% of global population. However, most Arab countries are considered less developed economically, socially, and politically. The Arab region in general is characterised by a high percentage of illiteracy (23%), high of unemployment (15%), poverty (except in Gulf Countries), soaring inflation rates and a lack of support for citizens' basic needs. So, while western developed countries are concerned with increasing access to information, 19% in the

Arab world have no access to clean water; and while the west plans to provide e-health, 10% in the Arab world have no access to health services (UNDP, 2009; Abdallah and Fan, 2012).

In terms of e-readiness, Arab countries vary widely. UAE and Bahrain, for example, are progressing well and enjoy relatively high levels of ranking in the UN e-readiness assessment; whereas countries from east Africa are at the bottom of the list. Figure 2-3 illustrates e-readiness across the Arab World. Thus, Arab decision-makers need to take the necessary practical steps to make their countries realize the benefits of adopting ICT technologies. This requires more research in all aspects of e-government adoption. Although many research studies have contributed to the analysis of e-government introduction and implementation in the Arab World, it is much less than required and minimal compared to research conducted in developed countries.



**Figure 2-3: E-readiness in the Arab World**

Adapted, (UN, 2008b)

The countries in the Arab world share many similarities on social, political and cultural levels. In terms of public administration, they are characterised by large public sectors, centralised governments, and a complex regulatory structure (Saidi and Yared, 2007).

However, it is difficult to characterize the region as a whole. Each country stands at a different point in economic development, political stability, ICT infrastructure and ICT utilization. This makes the experience of e-government practices and initiatives unique in each state. Table 2-5 summarise online service delivery in some Arab countries.

**Table 2-5: E-government service delivery capabilities**

	One-Way Information Flows	Two-Way Interaction	Payment Transaction	E-Democracy
World E-government Leaders (top six)				
USA	√	√	√	√
Denmark	√	√	√	√
Sweden	√	√	√	√
UK	√	√	√	√
South Korea	√	√	√	√
Australia	√	√	√	√
Arab E-government Leaders				
UAE	√	√	√	√
Bahrain	√	√	√	√
Qatar	√	√	√	√
Arab E-government Up-and-Comers				
Jordan	√	√		√
Lebanon	√			√
Kuwait	√	√		√
Egypt	√	√		√
Saudi Arabia	√			
Oman	√			
Tunisia	√			
Algeria	√			
Morocco	√			
Syria	√			
Arab E-government Laggards				
Sudan	√			
Yemen	√			
Iraq	√			

Source: (DSG and OECD, 2007)

Evaluation of e-government in the Arab World, like in many developing regions, has mainly focused on technology e-readiness assessments of public institutions (DSG and OECD, 2007). The lack of assessment at the ministerial or organisational level could be explained by the limited institutionalisation of e-government across government sectors (DSG and OECD, 2007). Table 2-6 shows the levels of assessments in some Arab countries.

Table 2-6: E-government level of assessment

	National Level	Sector Level	Ministry/ Agency Level	Unit Level	Project Level
Bahrain	√		√		√
Egypt	√R	√R	√	√	
Saudi Arabia	√	√	√	√	√
Sudan	√R				
Dubai	√		√	√	√
Jordan	√R			√	√

Source: (DSG and OECD, 2007)

R: readiness stage

Although e-government can improve the competitive advantages of Arab nations (Ndou, 2004), each Arab country is operating independently in ICT and not benefiting from Internet capabilities (El-Naggar, 2004). Moreover, all ICT efforts are running in a parallel without intersection. According to (DSG and OECD, 2007) the problem facing governments in the Arab World is the absence of a vision of a unified “whole-of-government” system of e-government.

### 2.3.3 E-government in Africa

The continent of Africa constitutes two distinct regions: North Africa and Sub-Saharan Africa (SSA). All countries in the North are part of the Arab World, with different cultural and economic characteristics from the rest of Africa (Ifinedo, 2005). The region of SSA (excluding South Africa) faces massive political and socio-economic challenges, in addition to the existing under developed human resources, deficient infrastructure, and cultural and funding constraints. The public sector also has its problems. It is based on manual filing systems, burdened by enormous movements of correspondence, duplication of files, wastage of paper, difficulty in accessing information in files, loss of data and general inefficiency of operations (Mutula, 2008).

In the ICT context, the SSA countries have critical deficiencies (Maumbe et al., 2008).

In terms of ICT adoption there is:

1. Lack of ICT policy and champions
2. Weak political and budgetary commitment
3. Resistance to change
4. Digital divide biased against a high rural population base

Nonetheless, many governments in Africa believe there to be enormous potential for e-government to help their countries improve the quality of life for citizens, increase government efficiency and help achieve sustainable socio-economic development (Maumbe et al., 2008).

There are two main issues that frame the discussion in this section; firstly, the policy and direction of e-government in Africa; and secondly, the e-readiness of e-government in the region.

Africa is starting to embrace the concept of digital, knowledge-based economies in preparation for being part of the global economic value chain (Bwalya and Healy, 2010). Although this paradigm has encouraged the escalation and adoption of ICT applications, such as e-learning and e-government (Bwalya and Healy, 2010), poor conditions on the continent are constraining the efficient use of these applications. Hence the WSIS, under the Tunis agenda (WSIS, 2005), specified that ICT plans need to be an integral part of national development strategies. Many emphasised that developing countries should work for the interaction of financial, technical, managerial and social factors in delivering government transformation through e-government (Ndou, 2004; Grant and Chau, 2005; Brown and Thompson, 2011). Others suggest a context-oriented approach as a more promising route for e-government adoption (Heeks, 2002; Dada, 2006; Schuppan, 2009). Countries including South Africa, Mauritius, Senegal and Mozambique have already shown serious commitment, by putting in place the institutional and regulatory policy frameworks for e-government development (Maumbe et al., 2008; Bwalya and Healy, 2010). A number of policies addressed the liberalization of the telecommunications sector and the ICT-based economic growth. Coleman (Coleman, 2003) suggests that an effective strategy for African e-governance should avoid three key pitfalls:

1. The adoption of technologies without developing human skills and capacities to manage, integrate and sustain them.
2. The centralized use of technologies by national government departments, without disseminating the benefit of the technology to intermediary institutions;

such as national parliaments, local governments, political parties, civil society organizations and independent media.

3. A failure to link better governance to broader and more inclusive democracy, which gives a voice to those who cannot afford technologies, but have needs and ideas to express.

In e-readiness ranking surveys conducted by international organisations (UN, 2010; Bridges.org, 2008; EIU, 2009) Africa lags behind the rest of the world in terms of technology, human capacity and e-participation. In terms of internet usage and penetration rate, no country from Africa appears among the top thirty six (Internet World Statistics, 2009). The African continent was estimated in 2007 to be home to 14.2% of the world's population, but had only 3.6% internet penetration and 2.9% of internet usage. In comparison Europe had 12.3% of world population, 11.8% penetration and 37.2% Internet usage (Internet World Statistics, 2009). However, there has been some improvement in the region according to the latest UN e-readiness' report (UN, 2010) Table 2-7.

**Table 2-7: E-readiness - selected countries in Africa**

Country	E-government development index value		World e-government development ranking	
	2010	2008	2010	2008
<b>South Africa</b>	0.4306	0.5115	97	61
<b>Botswana</b>	0.3637	0.3647	117	118
<b>Ghana</b>	0.2754	0.2997	147	138
<b>Senegal</b>	0.2241	0.2531	163	153
<b>Nigeria</b>	0.2687	0.3063	150	136
<b>Congo</b>	0.3019	0.2737	135	148
<b>Kenya</b>	0.3338	0.3474	124	122
<b>Mauritius</b>	0.4645	0.5086	77	63
<b>World average</b>	<b>0.4406</b>	<b>0.4514</b>		

Source: (UN, 2010)

## 2.4 Benefits of E-government Transformation

There are a wide range of choices and opportunities available for developed as well as developing countries by enabling ICT tools. ICT can play a profound role as part of an overall national strategy for development. The utilization of ICT in many developed countries is facilitating the transition from industrial based economies to knowledge

based societies. For instance, the European Commission consider: “a modernized ICT-enabled government is crucial to promote the growth and competitiveness of the European knowledge society” (Wimmer et al., 2007).

E-government is one, if not the most significant application in ICT. It has the potential to improve the capacities of government institutions and to offer opportunities to better resolve problems facing the public administration in most developing countries (Schuppan, 2009). In Africa this may include management, information processes, statistics, time and/or cost of services and public participation (Schuppan, 2009). In the Arab world, the digital economy improved the Gross Domestic Product (GDP), budget surplus and trade surplus via e-business and e-government (Azzam, 2002).

As Holmes (2001) points out, the purpose of e-government is to realize the delivery of public services in a much more convenient, customer-oriented and cost-effective way. Assessment measurements show: “the close relation between e-government and other development agendas, for example education, investment policies, or telecom (de)regulation” (Gronlund et al., 2006). In fact without such alignment with developing programs the e-government will be meaningless and will likely fail (Gronlund et al., 2006). This will help to improve the quality of life of citizens and can contribute significantly to the governments’ efficiency and effectiveness. Moreover, IT is expected to create unprecedented possibilities for sustainable economic development (Avgerou, 1998) and increase transparency, accountability and democracy. This can be achieved by allowing access to information and providing decision-making participation. Table 2-8 categorises these benefits based on the e-government domains.

**Table 2-8: E-government benefits**

Domain	Benefits	Example
<b>G2G</b>	<ul style="list-style-type: none"> <li>• Improve government efficiency</li> <li>• Increase employee productivity</li> <li>• Cost effectiveness</li> <li>• Better returns on ICT investment</li> <li>• Substantial cost benefits (e.g. reusable data and applications)</li> </ul>	<ul style="list-style-type: none"> <li>• In Ontario province 44% of the correspondent of an empirical survey agree that the government functions are more efficient (Shareef and Archer, 2011)</li> <li>• Time reduction (50%) in Moroccan planning national budget due to the</li> </ul>

Domain	Benefits	Example
	<ul style="list-style-type: none"> <li>Improved data quality, availability and reliability</li> </ul>	<ul style="list-style-type: none"> <li>integration of databases</li> <li>The launching &amp; transparency website in Texas, just a few months after launching, had helped achieve savings of over \$5 million.</li> </ul>
<b>G2C</b>	<ul style="list-style-type: none"> <li>Reduce time to access</li> <li>Providing efficient government management of information to the citizen</li> <li>Better service delivery to citizens</li> <li>Greater choice of delivery channels</li> <li>Empowerment of the people through access to information</li> <li>Participation in public policy decision-making.</li> <li>New opportunities</li> </ul>	<ul style="list-style-type: none"> <li>Cost of licensing has been reduced from \$7 to \$2 per transaction in Arizona</li> <li>In Brazil, and Argentina, 10 % of the population has voted on budget proposals online or via mobile.</li> </ul>
<b>G2B</b>	<ul style="list-style-type: none"> <li>Access to view tenders &amp; ads</li> <li>Reduce time to complete export forms &amp; comply with regulations</li> <li>Less risk in business planning</li> </ul>	<ul style="list-style-type: none"> <li>E-procurement systems are saving an average of 10 – 20 % in terms of material &amp; purchase costs in Washington state</li> <li>e-government services to business and individuals in Dubai is reducing administrative costs by at least 10%</li> </ul>

Governments should not go too far in the prediction of expected benefits, however. The empirical literature displays a more restrained attitude regarding changes that took place in e-government (Centeno et al., 2004). The reality is that e-government will not solve the problem of failed development, red tape, and bureaucratic systems. Nor will it bring democracy and transparency to governance. In fact, it imposes new challenges and requirements to successfully adopt the use of technology in government processes (Atallah, 2001).



## **2.5 Barriers and Challenges of E-government Transformation**

The implementation of e-government systems is a difficult task. The obstacles and challenges facing e-government implementation can vary from raising awareness, re-engineering processes and online service delivery, right up to building human capacity and IT infrastructure.

Introducing e-government is costly and has multiple requirements of: stable technical infrastructure, a stable political system, a legal framework in place, and highly skilled people (Stoltzfus, 2005). It is also associated with other factors, such as: security and privacy, accessibility issues, prioritisation and trust in government. These challenges whether environmental, managerial or even technical appear in both developed and developing countries. The difference lies in the level of complexity and the approach of how to handle the problem. Of the two, developing countries face the greater challenges, as they need to leap-frog multiple generations of technology (Basu, 2004; Shahzad and Sandhu, 2007); and the starting point of the information era in the developing countries is far behind that of developed countries (Bolgherini, 2007).

Reviewing the literature demonstrates that there is no single way of listing e-government challenges (Gil-García and Pardo, 2005). Some classify the challenges on a dimensional basis; others focus more on the context in which the e-government was implemented, drawing more attention to the cultural and social aspects. It is assumed that the cultural values and behaviours determine different goals and objectives and therefore different challenges are explored. However, the literature does show some sort of consistency when categorizing these challenges.

The Oxford Internet Institute (OII) conducted a study exploring the barriers to e-government in Europe (Eynon and Dutton, 2007). It was concluded that the barriers have a legal, technical, social or institutional context that works against e-government progress. The barriers were grouped into seven categories:

1. Leadership failures
2. Financial inhibitors
3. Digital divides and choices

4. Poor coordination
5. Workplace and organizational inflexibility
6. Lack of trust
7. Poor technical design

Research addressing the challenges specific to developing countries was classified slightly differently, Ndou (2004), identified six major challenges:

1. ICT infrastructure
2. Policy issues
3. Human capital development and lifelong learning
4. Change management
5. Partnership and collaboration Strategy
6. Leadership role

According to the World Bank Centre for Democracy and Technology there are three major challenges (Brown and Thompson, 2011) in the context of developing countries:

1. Infrastructure development
2. Law and public policy
3. Digital divide

The discussion above highlights the range of highly complex and diverse challenges facing public sector managers as they work in the e-government arena. It also indicates that success is not only about selecting the right technology, but also about managing organizational capabilities, regulatory constraints, and environmental pressures. For e-government managers to be successful in their initiatives they must be aware of these challenges and use appropriate strategies to overcome them (Gil-García and Pardo, 2005).

The implementation of other e-business systems, including Enterprise Resource Planning (ERP), also provides learning lessons for transformation barriers and challenges. ERP is also considered complex system in their nature and many studies

contributed to identify the Critical Success Factors (CSF) that affect the ERP implementation. For example Ngai et. al., (2008) identified 18 different CSF including:

*Appropriate business and IT legacy systems; Business plan/vision/goals/justification; Business Process Re-engineering; Change management; Communication; Data accuracy; ERP strategy and Implementation; Organizational characteristics; Software Development, Top management support; National culture; and Country related requirements.*

Holland and Light (1999) argue that ERP problems from a management perspective can be classified in three categories: strategic, organisational, and technical. Therefore, they grouped the CSFs into Strategic and Tactical factors. The Strategic group include success factors such as: vision, strategy, top management support, plans, and legacy systems. In the Tactical group, they identified factors such as: business process change, monitoring, personnel, client consultation and acceptance.

## **2.6 E-government Maturity Assessment**

As stated previously, governments are investing intensively in e-government implementation (Grant and Chau, 2005). E-government assessment informs politicians, decision makers and organization leaders as to the opportunities that the technology could offer the government. It also raises their awareness of the limitations and threats of the new innovation (Leitner, 2003). However, the lack of formal methods and approaches for assessing e-government initiatives has led to a significant slowdown of e-government development at a national level (Kunstelj and Vintar, 2004). Many existing approaches tend to focus on the technical factors (Esteves and Joseph, 2008), often missing the human and organisational factors, which are believed to have significant influence in e-government diffusion and adoption (Ndou, 2004; Heeks, 2005). Some methods are more useful for comparing performances and benchmarking, and not providing guidelines to help a country identify areas of weaknesses or potential improvements (Bhatnagar, 2004). There is a need for more useful tools with a holistic view, to help politicians and policy makers establish priorities in their decisions and set development and investment directions (Misra and Dhingra, 2002).

One of the most popular approaches to assess e-government initiatives is by using maturity models. The terms “maturity” and “immaturity” are often used to characterise the state or a given level in a continuous process (Layne and Lee, 2001). Most maturity models establish stages or phases; starting with electronic provision of rudimentary information and ending with fully integrated online services, incorporating transaction capability (Maumbe et al., 2008). These stages inspire a sense of progress and growth as seen in the Layne and Lee Maturity Model, Figure 2-4; unlike more simplistic approaches, such as e-readiness tools, “which tend to inspire a yes/no answer” (Oyomno, 2004)Figure 2-4.

Although the increase in number of these models shows the lack of a universally accepted framework for e-government development (Maumbe et al., 2008), there are certain similarities. Assessing the growth in stages helps to avoid dead ends and suggests directions in which to grow and improve (Oyomno, 2004; Anderson and Henriksen, 2006). Currently the lack of such knowledge and awareness has led to the underdevelopment of strategic agendas and posed serious challenges to the adoption of e-government in most developing countries (Zerpa, 2009). Table 2-9 briefly describes some of these models. Each model has its own classification of levels, but they all agree that the higher the level, the more complex the technology deployed (Claver-Cortes et al., 2008).

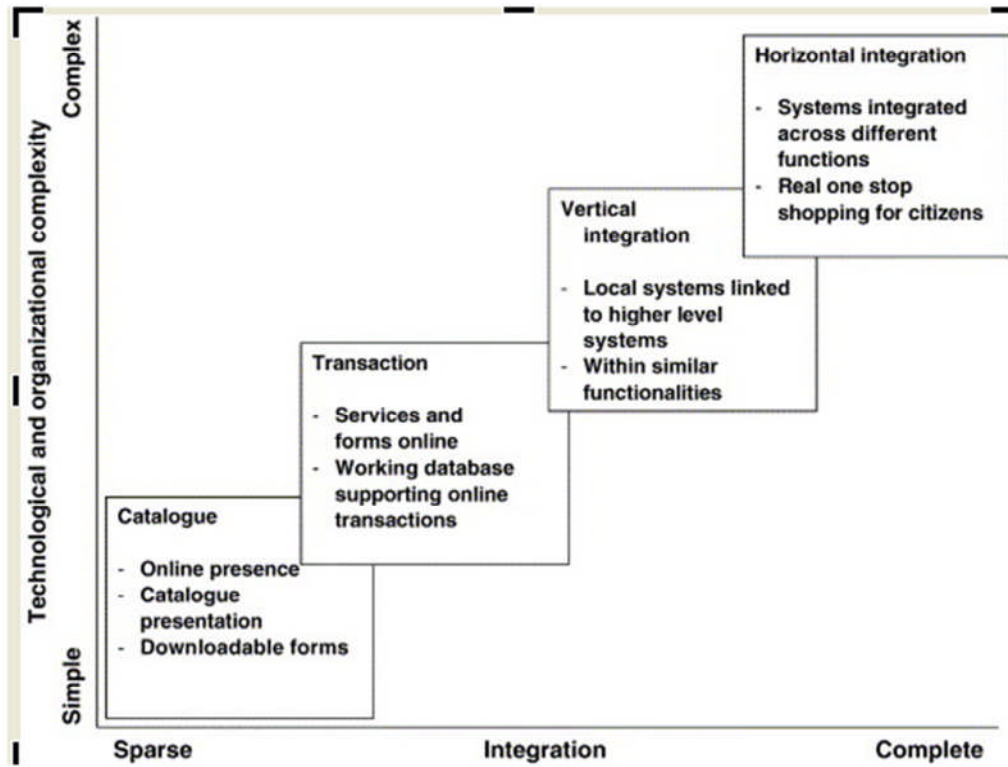


Figure 2-4: E-government Layne and Lee Maturity Model

Adopted, (Layne and Lee, 2001)

Table 2-9: E-government maturity stage models

Reference	Maturity Stages	Maturity focus
<b>Layne and Lee</b> (Layne and Lee, 2001)	<ol style="list-style-type: none"> <li>1. Cataloguing</li> <li>2. Transaction</li> <li>3. Vertical integration</li> <li>4. Horizontal integration</li> </ol>	Technological and organisational capability of integration and delivery of services
<b>United Nations</b> (UN, 2008b)	<ol style="list-style-type: none"> <li>1. Emerging</li> <li>2. Enhanced</li> <li>3. Interactive</li> <li>4. Transactional</li> <li>5. Seamless/ Connected government</li> </ol>	Technological capability to interact and provide services across different government departments with full connection
<b>Howard</b> (Howard, 2001)	<ol style="list-style-type: none"> <li>1. Publish</li> <li>2. Interact</li> <li>3. Transact</li> </ol>	Web capabilities to provide citizens with interaction and full transactions
<b>Moon</b> (Moon, 2002)	<ol style="list-style-type: none"> <li>1. One-way communication</li> <li>2. Two-way communication</li> <li>3. Transaction</li> <li>4. Integration</li> <li>5. Political participation</li> </ol>	Web capabilities to provide citizens with full service integration and high level of democracy

## 2.7 E-government Models

E-government literature describes a range of models and frameworks suggesting critical factors, useful for a variety of perspectives. The models are to provide a better understanding and visualisation of e-government adoption. However, the challenge of identifying the individual factors and their optimal combination remains an issue for both researchers and practitioners (Edington and Shin, 2006). Despite the fact that many studies have sought to identify the factors that contribute to e-government adoption (Moon, 2002): “there is a gap when it comes to integrating these factors into a holistic model” (Edington and Shin, 2006).

It is believed that an effective e-government with higher levels of diffusion and adoption requires an enabling context. This highlights a key issue; that of a comprehensive understanding of the real context of the state or organization in which the initiative is taking place (Bwalya and Healy, 2010). In the general area of technology adoption, much of the literature has focused on IT adoption in the public sector (Moon and Norris, 2005) and how this helped to enhance its efficiency and effectiveness (Moon, 2002). Some argue that e-government needs to focus on the different collection of attitudes, values along with social, political and cultural factors (Heeks, 2002; Kim, 2007; Grundén, 2009).

In e-government, number of studies has contributed in identifying critical factors for adoption. As the purpose of this research is to investigate e-government adoption in the public sector domain in developing countries, the author disregarded factors identified in other domains and sectors.

### **Heeks design-reality gap model**

In an attempt to understand the failure of e-government in developing countries, (Heeks, 2003) built his model on the assumption that success and failure of e-government depends on the gap existing between the current situation (*reality*) and the (*design*) for e-government in the future. Heeks identified seven dimensions in order to understand the design-reality gap, abbreviated in the acronym (ITPOSMO) Figure 2-5. Following is a brief description of the seven dimensions:

**Information:** the formal information held by the digital system and involves: data stores, data flows and data management. The informal information held by the people using the system.

**Technology:** the components of digital IT.

**Processes:** the activities undertaken by stakeholders involving information-related processes and broader business processes.

**Objectives and values:** the key dimensions, through which factors such as culture and politics are made manifest.

**Staffing and skills:** both the quantitative and qualitative aspects of competencies including staff and other users.

**Management systems and structures:** the overall management systems and structures established to organize e-government system operations.

**Other resources:** the required time and money to implement e-government.

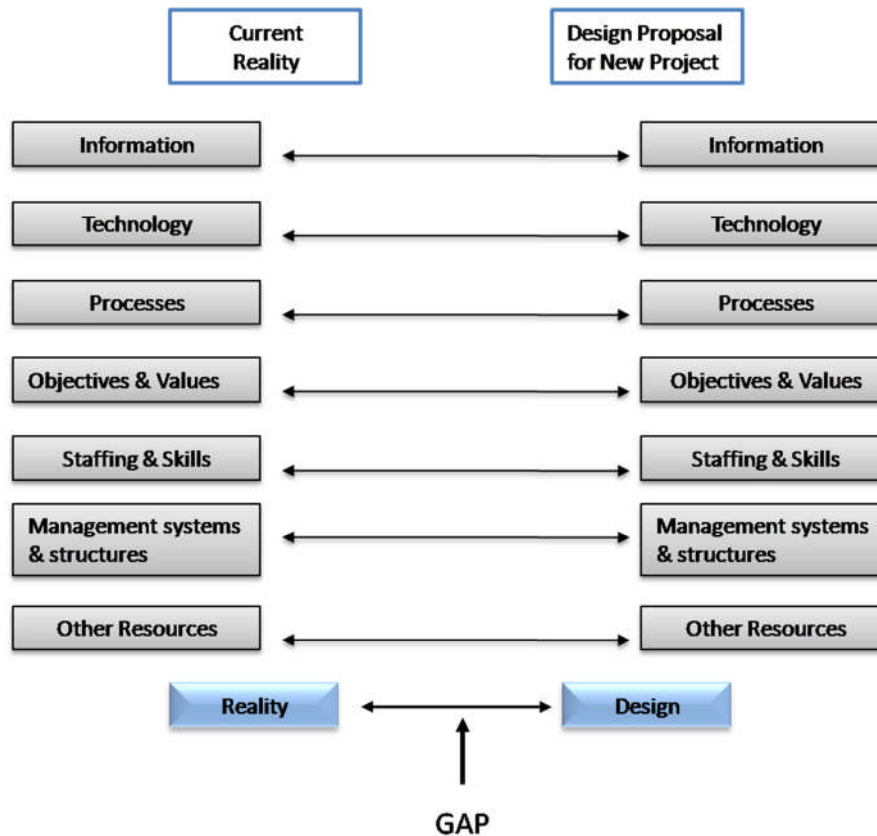


Figure 2-5: Design-reality gap in e-government projects

Adopted, (Heeks, 2003)

**Ebrahim and Irani e-government adoption framework**

(Ebrahim and Irani, 2005), proposed a strategic e-government adoption framework and five dimensions as barriers to e-government adoption. Ebrahim and Irani believe that benefits and barriers associated with e-government should be considered as factors that influence the implementation process. Table 2-10 shows these various dimensions.

**Table 2-10: Dimensions of e-government adoption**

Dimension	Examples
<b>IT infrastructure</b>	<ul style="list-style-type: none"> <li>• Complex systems</li> <li>• Lack of reliable networks and low capacity</li> <li>• Lack of government systems integration</li> <li>• Lack of documentation</li> </ul>
<b>Security &amp; privacy</b>	<ul style="list-style-type: none"> <li>• Threats from hackers or viruses</li> <li>• Absence of privacy of personal data</li> <li>• High cost of security applications</li> <li>• Unauthorised access to systems</li> <li>• Lack of security rules, policies and privacy laws</li> <li>• Lack of risk management security program</li> </ul>



Dimension	Examples
<b>IT skills</b>	<ul style="list-style-type: none"> <li>• Lack of IT training</li> <li>• Lack of skilled and specialist IT staff in market</li> <li>• Lack of employees with integration skills</li> <li>• Unqualified project manager Shortage of</li> </ul>
<b>Organisational</b>	<ul style="list-style-type: none"> <li>• Lack of coordination and cooperation between departments</li> <li>• Unclear vision and management strategy Complex of business processes</li> <li>• Politics and political impact</li> </ul>
<b>Operational cost</b>	<ul style="list-style-type: none"> <li>• Cultural issues</li> <li>• business process</li> <li>• Resistance to change</li> <li>• Time consuming for reengineering</li> <li>• Limited financial recourses</li> <li>• High cost of IT professionals and consultancies</li> <li>• High cost of IT in developing countries</li> </ul>

Source: (Ebrahim and Irani, 2005)

### **Bakry STOPE model**

In (2004) Bakry introduced the **STOPE** model, Figure 2-6, to provide a base for the development of an international standard policy concerned with e-readiness assessment. The framework follows a comprehensive approach and identifies five dimensions (strategy, technology, organisation, people and environment). The STOPE model can be useful in decision making at different stages. Countries and organisations need to consider these dimensions if they are willing to integrate with the networked world or are planning to achieve sustainable development. Each of the five dimensions integrates factors related to:

**Strategy:** the strategy of the country with regards to the future directions, commitments and plans toward ICT development and utilization.

**Technology:** the technology concerns with ICT facilities, infrastructure, support, and ICT strategy.

**Organizations:** the organizations management, regulation, and cooperation.

**People:** people's ICT skills, training, education, and awareness.

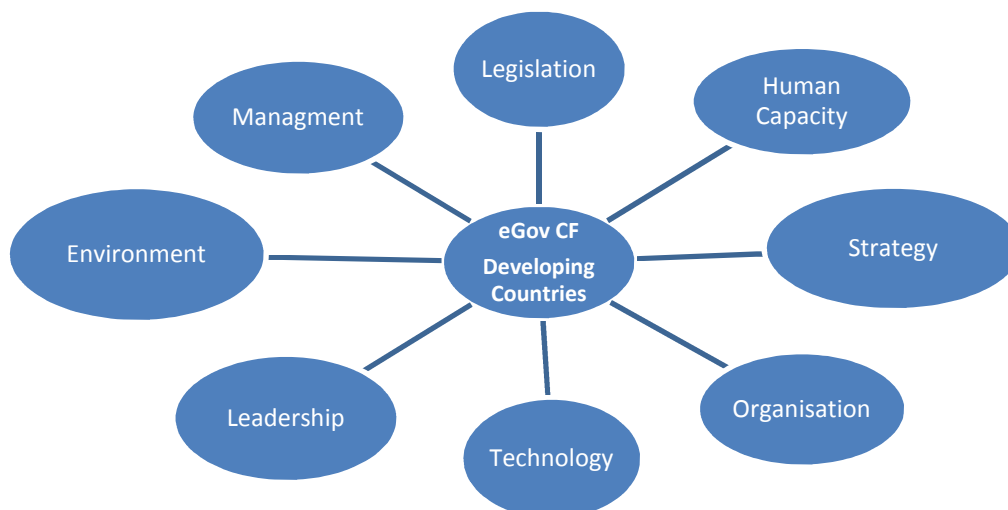
**Environment:** the environment surrounding the economy, resources, general regulations and environment.

Other frameworks in the literature highlight similar critical factors for e-government strategies and adoption, Table 2-11 illustrates some of these factors.

**Table 2-11: Frameworks for e-government adoption**

Model/Framework	Description
(Gil-García and Pardo, 2005)	Identified success strategies for e-government initiative, namely: <ul style="list-style-type: none"> <li>- Information and data strategies</li> <li>- Information technology strategies</li> <li>- Organizational and managerial strategies</li> <li>- Legal and regulatory strategies</li> <li>- Finally institutional and environmental strategies.</li> </ul>
(Chen et al., 2006)	Identified three categories of critical factor, namely: <ul style="list-style-type: none"> <li>- National e-government Infrastructure (NeI) factors</li> <li>- Culture factors</li> <li>- Society factors</li> </ul>
(Evans and Yen, 2005)	Identified five critical factor for developing countries, namely: <ul style="list-style-type: none"> <li>- Organisation factors</li> <li>- Human factors</li> <li>- Technology factors</li> <li>- Financial factors</li> <li>- Environment factors</li> </ul>

Based on the discussion above, the author defines eight factors that are likely to influence the adoption and implementation of e-government, Figure 2-6. The author contends that these factors will have a significant impact in developing countries.



**Figure 2-6: E-government critical factors**

Despite the fact that there are many frameworks and models developed to address the critical factors of adoption in developing countries, these factors have not been studied in enough depth in the literature. In addition, other factors and issues are missing in these models and frameworks.

## **2.8 Critique of the Literature Review**

E-government has created a new medium that changed the nature of the entire public sector. This has been reflected in the massive transformation in governments' relationships with their constituencies, the new service businesses and new management paradigms. However, there are remarkable differences in the level of dissemination and adoption between developed and developing countries. This is as a result of disparity within political systems, cultural settings and general infrastructure. As a consequence of this dissimilarity and based on the reviewed literature, the author classified the issues causing weak adoption in developing countries into the four categories of: technological, managerial, regulatory and environmental (Figure 2-7). A description of each category follows.

### **Technical issues**

Technology is considered as the main source of change and power for enabling the transformation process of e-government (Al-Solbi and Mayhew, 2005). However, there are many components and elements involved in ICT technology which can be classified depending on the level of implementation. For example, the emergence of e-government is directly related to the ICT infrastructure, the telecommunication network infrastructure (Basu, 2004), and their capacity, reliability and affordability. Other implementation levels are concerned with ICT strategy, layout design and technical interoperability. Lack of technical skills was found to be an important element of the technical issues. Complexity and difficulty in using e-government systems can also badly damage the relationship between public organisations and citizens and businesses (Gil-García and Pardo, 2005; Eynon and Dutton, 2007).

**Regulatory issues**

The success of e-government initiatives will depend upon the developed legal framework for their operations (Basu, 2004). This framework is a key requirement in developing countries to identify legal obstacles and specify essential legislation for their specific needs. These needs can include security, privacy and data protection and authentication. Moreover, there is a requirement for a whole legal framework to be evolved that covers all issues related to ICT and e-government applications.

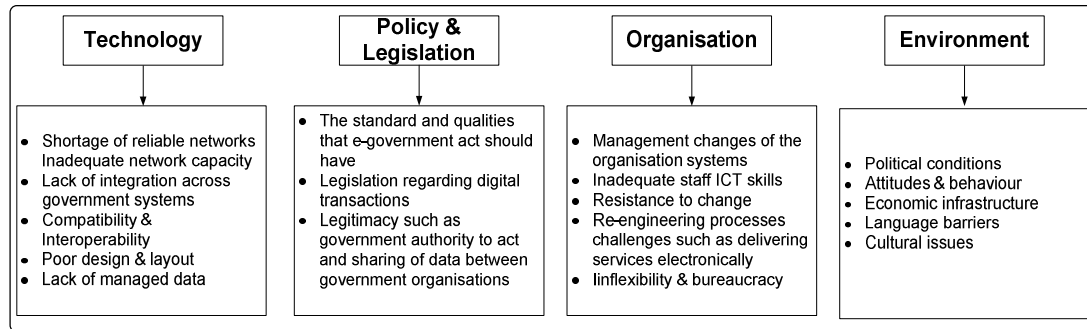
**Managerial issues**

There are fundamental changes that have to take place in the organisation culture, structure and management (Eynon and Dutton, 2007; Al-Solbi and Mayhew, 2005) to enable transformation for the new forms of e-government. These changes are often met with great fear and resistance by employees who can easily slow down the implementation of e-government.

**Environmental issues**

Transformation for e-government requires critical changes in the way of thinking in government which will be reflected in new policies and new strategies. Also, people need to change their behaviour and social norms (Al-Sebie and Irani, 2005). These changes are vital for embracing the process of transformation.

The current situation in the political, economic and social spheres directly affects the transformation process either positively or negatively. However, the compatibility with the surrounding environment is an additional factor of complexity and difficulty.



**Figure 2-7: E-government challenges**

Although, the defined barriers and challenges are faced in both developed and developing countries, the degree of difficulty of each challenge can vary from one to another (Al-Sebie and Irani, 2005). The complexity of these challenges is higher in developing countries due to the inadequacies in many aspects of their surrounding environments.

Administrations willing to adopt e-government need to manage these difficulties and complexities. They need to develop a better understanding of the challenges and barriers influencing e-government and have a framework to guide the process of adoption. Although study of e-government is part of a growing research field and there is an on-going search for critical factors, most studies in the literature are based on the context of either developed or fast growing economies (Heeks, 2003; Schuppan, 2009). This highlights the gap in the literature regarding the key issues in a developing country's environment (Edington and Shin, 2006; Nour et al., 2008). This study is to address the gap by providing a better explanation of both the challenges and unique opportunities for e-government adoption; and additionally, proposing a framework to guide the decision making process in developing countries. The significance of addressing the literature gap lies in helping policy makers in the developing world to have a better chance to create an enabled environment more receptive to innovation and change. The literature gap, apparent in e-government adoption and critical factors for developing countries, is investigated in more details in Chapter 5.

## **2.9 Summary**

This chapter presents the state of the art in e-government by reviewing the key issues related to concepts, definitions, and perceptions. These issues are explained by identifying the main characteristics and various perspectives, and their interaction necessary when embracing e-government. The interdisciplinary nature, multiple definitions and meanings reflect the complexity existing in e-government. The literature reviewed in this chapter has helped to develop a better understanding of the challenges impeding successful e-government implementation, as well as addressing the many opportunities provided to improve government efficiency and effectiveness. The literature review focussed principally on these issues in developing countries, in particular the Arab World and Africa. The review emphasised the relative lack of research dedicated to developing countries.

The investigation of e-government models and frameworks addressing critical factors of adoption highlighted many contextual factors related to managerial, regulatory and environmental issues, in addition to the technological issues. The literature review clearly demonstrated that ignorance of these elements can easily lead to failure. It also revealed the limited number of studies examining these issues and factors in a developing country's environment. The next chapter illustrates the research approach and strategy for the investigation process of this study.

### 3 FRAMEWORK DEVELOPMENT

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The aim of this chapter is to propose an initial conceptual framework, identifying the critical factors influencing the adoption of e-government in the context of a developing country.

There are five main sections in this chapter:

1. **Section (5.1):** Review the concepts of models and frameworks of e-government and technology adoption. This section addresses the models developed within two main streams: innovation behaviour and the adoption process.
2. **Section (5.2):** Introduce the TOE model and its contextual elements (Technology, Organisation, and Environment).
3. **Section (5.3):** Identify the technological factors for e-government adoption.
4. **Section (5.4):** Identify the organisational factors for e-government adoption.
5. **Section (5.5):** Identify the environmental factors for e-government adoption.
6. **Section (5.6):** Summary of the chapter.

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#### 3.1 E-government Adoption

Adoption is an act or a single-point decision (Rogers, 2003). According to Spence (1994) the adoption of a new technology is the result of a personal mental process; whereas, Rogers (2003) describes the adoption of innovation as a process that includes the generation, development and implementation of new ideas or behaviours. He explains further that the innovation-decision process: "...can lead to either adoption, a decision to make full use of an innovation as the best course of action available; or rejection, a decision not to adopt an innovation". In terms of e-government, early models did not define the adoption term clearly (Kumar et al., 2007). However,

(Warkentin et al., 2002), describe adoption as: “The intention of citizens to engage in e-government to receive information and request services from the government”. Thong & Yap (1995) describe adoption as the organisational decision to make use of IT systems to support organisation function, decision-making and management of the business. The current study follows this definition.

In spite of the wide range of research undertaken to understand e-government adoption, it remains unclear why some governments are able to adopt the new technology better than others. There is no theoretical explanation for this phenomenon, and no single adoption model can explain all cases (Moon and Norris, 2005; Warkentin et al., 2002; Coursey and Norris, 2008). Ebrahim & Irani (2005) argue that the adoption process is not straightforward and cannot be done in a short period of time, rather: “It requires an integrative architecture framework approach to place government information and services online”.

### **3.1.1 Adoption Models and Frameworks**

There has been considerable effort from international and regional institutes, as well as by individual scholars and researchers, to develop e-government adoption models and frameworks (Kumar et al., 2007; Moon and Norris, 2005; Altameem, 2007; Warkentin et al., 2002; Gilbert et al., 2004; Carter and Bélanger, 2005; Leila et al., 2006). Although, these and other studies have contributed to the theoretical understanding of e-government adoption (Warkentin et al., 2002), the author argues that most of these models and frameworks are developed from a citizen perspective (G2C) and not a government perspective (G2G), which is the scope of the current research. Moreover, the identified factors mainly address citizens’ needs (Warkentin et al., 2002) and not government and public organisation’s needs. (Ebrahim et al., 2004) describe the literature regarding e-government adoption in public organisations as insufficient with little attention given to the issue. Some go so far as to say that: “Literature on the adoption of e-government in academic journals is, understandably, almost non-existent” (Kumar et al., 2007). This demonstrates the theoretical gap existing in the literature regarding e-government adoption.



Models and frameworks that have been developed to describe the process and approach of e-government adoption have limited application in Africa and developing countries (Heeks, 2002; Chen et al., 2006; Schuppan, 2009; Maumbe et al., 2008). Therefore, this research fills this gap in the literature and addresses the need for developing an e-government adoption framework suitable for developing countries.

There can be no “one-size-fits-all” adoption framework suitable for every context. Ignorance of the specific context and characteristics of individual countries, in e-government assessment, will hinder the formulation of applicable strategies and action plans (Al-Solbi and Mayhew, 2005).

The theories and models developed have been used to explain the adoption and diffusion of technology. There are two main streams to these models based on their theoretical foundation. The first stream explains innovation in terms of behavioural intention to use technology (Cata, 2003). Examples of this type include: the Theory of Planned Behaviour (TPB) (Ajzen, 1991); Theory of Reasoned Action (TRA) (Ajzen and Fishbein, 1980); and Technology Acceptance Model (TAM) (Davis, 1989). The goal of TAM model is to provide an explanation of the determinants of computer acceptance. TPB predicts human behaviour in using computer technology based on relationships around attitudes, norms and beliefs. However, despite the fact that these models are rooted in social psychology, they are unable to explain the adoption process from an organisational perspective (Gallivan, 2001).

The second stream investigates the diffusion process within an organisation and the factors that influence technology adoption and diffusion by the entire organisation. An example of this is: “The Diffusion of Innovation” theory (DOI) (Rogers, 2003), which sets out an explanation of how an innovation diffuses through a society. The models developed under the DOI theory: “...emphasise the social construction of the technology under investigation” (Choudrie et al., 2007). These models also identified a number of other attributes which affect the rate of diffusion; including complexity and compatibility. In 1990 (Tornatzky and Fleischer) developed the Technology-Organisation-Environment model (TOE) to explain the decision to adopt a technological innovation. In the TOE model three categories of context were identified

and discussed as the main factors that influence the process of new technology adoption.

### **3.2 TOE Framework**

The TOE model has emerged as a useful theoretical lens for understanding technology adoption (Pudjianto and Hangjung, 2009). Tornatzky and Fleischer (1990) explain in their model that the decision to adopt a technological innovation by a firm is not only based on technology, but also on the related organisational and environmental contexts (Pudjianto and Hangjung, 2009). It is believed that the three identified contextual factors (technology, organisation and environment) influence a firm's innovation adoption decision Figure 3-1, which ultimately impacts upon its performance (Srivastava and Teo, 2007). Although TOE is not used widely in the e-government context, it has been employed in e-business and e-commerce. These applications have similar contexts and share common features with e-government. They all support the electronic mediation of transactions (Gilbert et al., 2004; Carter and Bélanger, 2005) and all innovations are based on Internet technology designed to facilitate the exchange of goods, services and information between two or more parties (Carter and Belanger, 2004). Table 3-1 shows some of the studies using TOE in the e-government scope.

According to Pudjianto and Hangjung (2009), the TOE framework has provided a strong base for assessing the adoption of technological innovation within different types of organisations. The author highlighted a number of advantages of using the TOE model:

- The TOE highlights the technology, organisation and environment as main contextual factors in order to achieve technology adoption; these factors are similar to the categories identified by the author (Chapter 2, Section 2-8). They are also similar to the identified factors of many of the e-government frameworks also mentioned (Chapter 2, Section 2-7). The fourth category (Regulatory) will be embedded in the developed TOE framework and will be explained later in the chapter.

- The TOE model matches with the research methodology design, as this research is executed at two levels: national and organisational. The national level is controlled by politicians, regulatory and economic conditions. This is represented in the TOE model in the Environment factor. The second level is controlled by the organisational top management and management systems. This is represented in the Organisation factor.
- The TOE is flexible and accepts the expansion of the model to include more categories and factors. This will allow the author to add multiple levels of factors and adapt the framework according to the findings of the study.
- The aim of this research is to build a holistic picture that reflects the interaction between different aspects that influence the e-government adoption process. The TOE model is designed to show such links and factors interaction.

**Table 3-1: Studies using TOE framework**

Reference	Research using TOE	Research Focus
(Srivastava and Teo, 2007a)	What facilitates e-government development? A cross-country analysis	ICT infrastructure, technology development, human capital, public institutions, macro economy
(Pudjianto and Hangjung, 2009)	Factors Affecting e-government Assimilation in Developing Countries	Top management support Organizational compatibility: Extent of coordination: Regulatory environment Competition environment ICT Infrastructure: ICT expertise
(Altameem, 2007)	E-government critical factors in public sector organisations in Saudi Arabia	Government factors, vision, strategy, Telecommunication infrastructure, top management support, organisational structure,
(Cata, 2003)	Critical success factors for e-services: an exploratory study of web-based insurance business(Cata, 2003)	Technology context; Network systems, Infrastructure compatibility, website security. Organisational context; org. culture, resistance toward IT applications, IT skills, Environmental context; competitive pressure, customer pressure, government regulation.

Based on the arguments above, the author decided to use the TOE model as the basis for the current research. The next section describes the contextual elements of the TOE model.

### **3.2.1 TOE Contextual Elements**

- **Technology context**

The technological context describes the existing technologies in use and new technologies available to the organisation. ICT technology is particularly vital for the development of e-government. Many studies utilising the TOE framework prove that successful adoption of ICT technology can help organisations exploit their potential value and benefits (Srivastava and Teo, 2007). The studies also show that the existence of a well-developed national ICT infrastructure, along with an overall conducive technological environment is crucial in the innovation adoption process (Srivastava and Teo, 2007). Many elements are involved in this process, from hardware to software; in addition to other components, such as design and interoperability (Basu, 2004; Al-Sebie and Irani, 2005).

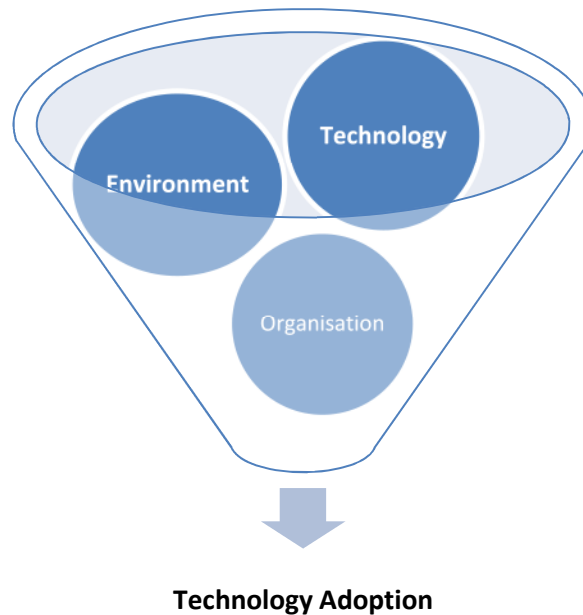
- **Organisational context**

The organisational context is a necessity for any IT innovation adoption, including e-government. Research using the TOE framework has helped to explain the tangible and non-tangible factors in the organisational context (Pudjianto and Hangjung, 2009). These include: the organizational readiness in terms of strategic planning; technical infrastructure; management systems and structures; top management; and quality of human resource (Bin et al., 2007). Moreover, e-government initiatives require substantial reform in the context of public organisations (Bin et al., 2007). This is due to the typical form of a bureaucratic organisation with a conservative culture; which raises the issue of resistance to change from new innovation (Pudjianto and Hangjung, 2009; Bin et al., 2007).

- **Environmental context**

The environmental context explains the environmental conditions in which the organizations conduct their services. The main issue within the environmental

context is uncertainty (Tornatzky and Fleischer, 1990) and how the constant changes can easily affect the innovation adoption process, particularly in developing countries. The success of e-government adoption in these countries can depend greatly on the external environment; which may include: politics, power and legal authority, cultural settings and economic conditions.



**Figure 3-1: Contextual elements of technology adoption**

This study applies the TOE model and identifies the technology, organisation and environment critical factors in an e-government domain. This is based on author understanding and critique of the reviewed literature in Chapter 2, as well as the main findings of the preliminary study conducted in Sudan, and described in Chapter 4.

### **3.3 E-government Critical Factors in the Technology Context**

Technology is a prerequisite for e-government roll out. Benefits such as efficiency, electronic service delivery and cost-effective services in the public sector cannot be fully achieved if there is a technical barrier. This is why the frequent failure, or poor performance, in e-government systems and services is often attributed to inadequate design and poor technical interoperability. However, adoption of technology remains a major challenge for developed as well as developing countries.

ICT can be seen as the bedrock for e-government technology. This includes: the Internet, web-technologies, telecommunication, networks connectivity and capacity, databases, hardware equipment, and software applications. ICT technology that shapes e-government has even more requirements; it needs interoperability, compatibility, security and reliability (Altameem, 2007; AL-Shehry, 2008).

Further, it would be erroneous to assume that the establishment of new technology only depends on technical elements. In fact, the technology context involves other abstract factors of: strategy; information and data management; and policy and legislation (Pudjianto and Hangjung, 2009; Gallivan, 2001). Without such factors, the investment in technology can simply result in failure. Avgerou and Cornford (1998) state: “Managing the technologies themselves is a complex and risky task”.

For the purpose of this study, four factors of technology have been selected. They are: ICT strategy; telecommunications infrastructure; information and data; and interoperability Figure 3-2. Their presence signifies that the e-government has established a good technical platform. Together the four factors can lift the organisation greatly in terms of technology. The next sections discuss each factor.

### **3.3.1 ICT Strategy**

A strategy is a pattern or methodology to set up a plan that integrates an organisation’s major goals and action sequences in a cohesive whole (Quinn, 1980). The first step, after deciding to enter an e-government program, is to set up a well-defined strategy. According to UN reports, 191 out of 192 countries (UN, 2008b) have completed or are in the process of formulating their ICT strategy. Developed countries are described as: “The source of inspiration, good practices and lessons learned when designing and implementing national e-government strategies, interoperability and governance frameworks” (Asthana et al., 2008).

Setting a national e-government strategy is a complex task. It requires a consideration of many aspects and processes; a holistic vision and long-term focus on objectives (Ndou, 2004). The objectives and goals incorporated in these ICT strategies are diverse; ranging from providing online services, up to the modernization of public

administration and improving the competitiveness of the national economy (Parisopoulos et al., 2007; Chen et al., 2006). The central focus of these strategies may also range from focusing on efficiency improvement to other more comprehensive issues; such as, e-democracy and citizen engagement (Alshawhi and Alalwany, 2009; Parisopoulos et al., 2007; Seifert and Chung, 2009). Comparing developed with developing countries reveals substantial differences in many key aspects, including technical and non-technical areas. Thus, strategies and directions designed for developed countries may not be directly applicable to developing countries (Ndou, 2004; Chen et al., 2006). Unfortunately, current published e-government strategies in many developing countries are imported from western developed countries, so strategy expectations may not be achieved (Heeks, 2002). An essential step is to formulate an e-government strategy driven by the specific sets of political, economic and social conditions and requirements of the country/organisation (Jansen, 2005). This will help the policy and decision makers to identify pathways and ensure that their efforts are leading the government in the right direction of good governance (Parisopoulos et al., 2007).

In the Arab World, some countries managed to establish a clear vision and strategic agendas. “Countries like Dubai, Egypt, and Jordan are developing blueprints for their societies to join the information age” (Atallah, 2001). E-government strategies in the Arab world have been through different stages. These were:

*1990-1999:* To make the federal government more results-oriented, effective, efficient and citizen-centered.

*2000-2009:* Reinventing the way of doing business, by making it more interactive and transactional (*without changing the basic structures of governments*).

*2010-2019:* Enabling dramatic changes to the government; through empowering the electorate and allowing direct citizen participation in the creation of an Information-based society.

### **Strategy Structure and components**

The planning of strategy is usually carried out at the highest level of the state or organisation. It helps the leadership to shape a country or an organisation's future and manages change, by focusing on an ideal vision of what an organisation should and could be 10 to 20 years in the future. E-government strategy is still in its infancy, so whether the planning be rigid and comprehensive, or flexible and incremental, is not yet clear (Weerakkody et al., 2007). Regardless of the approach, most strategic documents are organised under a common structure; expressed by the vision, mission, objectives and plans guiding the move towards e-government. According to UNPAN this includes:

- Clear definition of e-government, covering key areas to be addressed and identification of all customers
- Vision that is easily understood and succinctly expresses the concept of and plans for e-government
- Specific goals and objectives that can be monitored and measured
- Identification of policies necessary to support e-government

A successful organisation or company will include, in their designed strategy, a clear vision that defines the scope and direction of the organisation over the long term. Also, it includes a clear formulation of its values, objectives and action plans. The plans should be designed based upon the available resources and environmental forces in a given context (Jansen, 2005). In this study, the strategy is conveyed by the important factors of vision and action plan. They demonstrate movement in the right direction towards e-government.

#### **3.3.1.1 Vision**

Vision has always been an important element in any strategy. It provides a clear picture of where the organisation wants to be in the future. A key factor driving the achievement of any e-government program is the vision it adopts (Grant and Chau, 2005). The strategy document usually includes a vision section; typically: "A general statement about the outcome to be pursued in order to advance the progress of e-government" (Parisopoulos et al., 2007). The vision statement might be very vague and



fanciful or clear and precise, just like a mission statement (Bennis and Nanus, 1985). According to Allen (1995) for a vision to be efficient it must:

- Be coherent enough to create a recognizable picture of the future
- Be powerful enough to generate commitment to performance
- Emphasize what realistically can be
- Clarify what should be

The aims and objectives that come from e-government visions usually focus on one or two elements Table 3-2. According to Altameem (2007) the main concern of e-government should be in satisfying citizens' needs and improving their quality of life. It is emphasised that the vision acts like a road map to give direction in the provision and improvement of services to the public.

### **3.3.1.2 Plan of Action**

An action plan is a list of all the steps needed to take to reach a particular goal, and a timetable for achieving each step. Developing the action plan can vary if it is set for a short or long term; and whether it consists of simple steps, or constitutes quite a complex plan. It is stated in the Caribbean strategy document that e-government introduction should take place in phases and consider investment plans and sustainable results in the economic, social, cultural, and environmental spheres (UNPAN, 2004). It is always better to make explicit the aim of the action plan and specify and prioritise the e-government projects and tasks. For example, the European 'e-Europe' action plan aims at maximising the complementary national and European policy instruments. The plan focuses on expanding e-government services across Europe (Codagnone and Wimmer, 2004).

In 2006, the Dubai School of Government hosted a high-level seminar on building an effective e-government action plan. It developed an integration framework and named pilot projects; which included a Business Integration Framework and Common databases in the government. Table 3-2 provides examples of action plans.

Table 3-2: E-government Strategy in selected developed and developing countries

Strategy	Developed	Developing
<b>Vision</b>	<p>The U.S. government adopted the following three strategic principles in the implementation of e-government: (1) citizen-centred, not bureaucracy-centred; (2) results-oriented; and (3) market-based. In short, e-government implementation strategy of the U.S. is market-based with the aim of serving and supporting citizens' specific requirements, which is assessed by clear and specific results. (Chen et al., 2006)</p> <p>The vision of e-government strategy in Denmark was: "digitalisation must contribute to the creation of an efficient and coherent public sector with a high quality of service, with citizens and business at the centre" (OECD, 2005)</p>	<p>Abu Dhabi has developed an ICT strategy whose aim is to "to develop a world-class customer experience for users of government services". Its aim is to "drive government modernisation through positioning the government as a customer focused service provider". (Morgan, 2010)</p> <p>The vision of e-government in Egypt is described as: "delivering services to customers at their fingertips to their taste and style with appropriate efficient and allowing them to participate in the decision making process. Customers include: citizens, businessmen, investors and companies". (Bedair, 2011)</p>
<b>Plan of Action</b>	<p>There are five priority areas and objectives for The EU 2010 addressed in the action plan, which underline the commitment of the European Commission to delivering tangible benefits to all citizens:</p> <ol style="list-style-type: none"> <li>1) No citizen left behind.</li> <li>2) Raising efficiency.</li> <li>3) Implementing e-procurement.</li> <li>4) Safe access to services EU-wide.</li> <li>5) Strengthening participation and democratic decision-making (Codagnone and Wimmer, 2004)</li> </ol> <p>In 2006 Singapore has launched the Intelligent Nation 2015 (IN2015) master plan. Key thrusts include:</p> <ol style="list-style-type: none"> <li>1) Establishing an ultra-high speed, and trusted infocomm infrastructure</li> <li>2) Developing a globally competitive infocomm industry</li> <li>3) Developing a globally competitive infocomm manpower</li> <li>4) Spearheading the transformation of key economic sectors, government and society through more sophisticated and innovative use of infocomm. (IDA, 2011)</li> </ol>	<p>In Bahrain, the liberalisation of the telecom sector remains a priority. Accordingly, the Second National Telecommunications Plan of Bahrain, adopted in 2008, aims at improving the institutional framework of telecommunication regulation in order to make telecommunications services "increasingly available and internationally more competitive in terms of the range of services offered as well as prices." (ITU, 2010b)</p> <p>In Jordan the e-government strategy for (2006 – 2009) identified four pillars upon which its success is contingent; institutional framework, legal framework, ICT infrastructure and Business. (Anonymous, 2009)</p>

### **3.3.2 IT Infrastructure**

The United Nations (2008b; 2005) reports still consider technical infrastructure problems as a barrier that divides the world between those who have access to technology and those who do not. The ICT Development Index (IDI) published by the ITU shows that between 2007 and 2008, all 169 countries achieved better scores in terms of ICT diffusion. However, developed countries ranked at the top of the IDI index, whereas developing and low-income countries were at the bottom (ITU, 2010a). Similarly, the results from The World Bank demonstrate the digital divide between high-income economies having 416 PC/1,000 people and low-income economies with only 6 PC/1,000 (World Bank, 2003). In terms of Internet penetration and usage the Internet World Statistics (Internet World Statistics, 2009) show that the Middle East and African regions trail Europe and the Americas [North America 13.5%, Europe 24.2%, Africa 5.6% and the Middle East 3.2%]. The UNDESA (2008b) e-readiness index indicates that most developing countries have minimal web presence, with little telecommunications infrastructure and a very few computers to access the internet.

A large diversity among developing countries also exists. According to the UNDESA index (2003), 0.67% and 1.93% of the population in India and Indonesia had access to the Internet respectively; while, 25.15% and 51.84% had access to the Internet in Malaysia and Singapore. Similarly there were 7 PC/1000 persons in India and 24.7 mobile subscriber/1000 persons, while there were 558 PC/1000 persons and 700.9 mobile subscribers/1000 persons in South Korea. Some argue that the observed variations are due to the differences in economic, cultural preference, policy and organizational dimensions.

Recent reports and indexes note a general growth in ICT over recent years in developing countries, with some indicating it has been equally strong and even slightly higher than in developed countries (ITU, 2010a). For example, the number of Internet users has been growing at 37% annually in the Arab world (ITU, 2010a). However, differences between developed and developing countries still exist and are most evident in the uptake of mobile and fixed broadband Table 3-3.

Table 3-3: Technology statistics per 100 inhabitants

	Fixed telephone lines	Mobile cellular subscriptions	Mobile broadband subscriptions	Fixed broadband subscriptions
<b>The Americas</b>	28.1%	94.1%	24.2%	15.5%
<b>Europe</b>	40.3%	120.0%	46.3%	23.9%
<b>Africa</b>	1.6%	41.4%	3.6%	0.2%
<b>Arab World</b>	9.4%	79.4%	9.7%	2.3%

Source: (ITU, 2010a)

The IT infrastructure barrier existing in governments and organisations can be monitored by viewing different indicators, such as: reliability, affordability, websites and e-services (EIU, 2009; Gil-García and Pardo, 2005; Ebrahim et al., 2004). Websites are particularly pertinent as they represent the main source of government information (Choudrie et al., 2009). However, government websites in developing countries are associated with several difficulties, including layout, search and navigation (Choudrie et al., 2009).

The UN (2008b) uses two indexes to measure the technology factor: the *Web index* and the *Telecommunication index*. The Web Index measures the online presence of national websites; it looks at how governments are providing information, policies, and services. The UN uses a five stage model to measure the maturity of Web presence:

1. ***Emergence:*** Creating a government website with limited / static information
2. ***Enhanced:*** Updating information regularly.
3. ***Transactional:*** Provides users with reasonable levels of interaction enabling them to download forms
4. ***Interactive:*** Enables users to complete transactions, such as: obtaining visas, licences, passports, birth and death records, online safely and securely
5. ***Connected:*** Provides services across administrative and departmental lines with the highest level of integration

The Telecommunications Index is composite of five primary indices relating to a country's infrastructure capacity as they relate to the delivery of e-government services. The indices are:

1. Internet Users /100 persons
2. PCs /100 persons
3. Main Telephones Lines /100 persons
4. Cellular telephones /100 persons
5. Broad banding /100 persons

The ITU, EIU, and Accenture each use slightly different indexes and indicators. However, the Accenture assessment is mainly designed for developed countries.

### **3.3.3 Information and data**

Information is defined as: “Any piece of knowledge which may rationally be applied to a decision by a person who has the authority and responsibility to take that decision” (McCosh et al., 1981). In the digital era in which we now live, information is formulated in bits which are later shaped as documents with text, graphs and images. The amount of digital information produced is 1-2 Exabyte per year, with a 50% rate of growth (Brown and Duguid, 2000). Data comprises any facts, numbers, or text that can be processed by a computer. Today, organisations are accumulating vast and growing amounts of data in various formats which are stored in different databases. This can include transactional data from sales, costs, payroll, and accounting. Data has no significance beyond its existence, while information is data that has been given meaning.

In the e-government environment information is at the core of all initiatives (Gil-García and Pardo, 2005). It is about the capture, management, use, dissemination, and sharing of information; thus, handling of data is very important in developing countries. “To lose a paper there means queuing from line to line; filling form after form and moving from office to office” (Brown and Duguid, 2000). More problems appear when data is required for development purposes, as most of the necessary and up-to-date data is often unavailable (Schuppan, 2009; Mutula, 2008). According to Schuppan (2009), increasing the use of IT applications can help to produce data with better quality and accuracy and generate statistical reports which may have greater developmental impact.

There are a number of strategies that can be followed to deal with e-government information and data which include: developing appropriate data structures and standards; and arranging for feedback from users (Gil-García and Pardo, 2005). Dawes and Redman (1996; 1996), gave great attention to data quality and data accuracy. Poor data quality can have a negative impact and lead to customer dissatisfaction, increased costs, and lower employee job satisfaction, worst of all, it compromises decision-making. Redman argues that the science of data quality has as yet, not created standard measurement methods for any of these issues.

Many advantages can be gained from having organised, well managed data. In the public sector this means facilitating the sharing of information without the need for duplicating data collection, processing, and storage; consequently, the heavy paperwork load and data processing costs are reduced (Dawes, 1996).

### **3.3.4 Interoperability**

The IEEE identifies the Interoperability of computer systems as: “The ability of two or more systems or components to exchange information and to use the information that has been exchanged” (IEEE, 2011). Technically it means hardware devices, communication devices or software components can easily communicate and work together. However, there are other dimensions of interoperability. These include business and government interoperability of processes, where the business processes or administrative services can connect and integrate with each other through communications processes. From an e-government perspective Pardo (2011) argues that interoperability: “...represents a set of multidimensional, complementary, and dynamic capabilities needed among organizations in order to achieve successful information sharing”. Hence, e-government requires both technical and organisational interoperability in order to allow information sharing and integration within and across public organisations.

Before the advent of the Internet it was hard for organisations to communicate and exchange information. New web-technology created a platform for integration and sharing of information, making the issue of interoperability less problematic. However, high levels of compatibility are far way from being achieved (AL-Shehry, 2008),

especially in developing countries. In Jordan the lack of interoperability and standardization led individual ministries and governmental departments to use many different architectures and systems that are not particularly interoperable (Anonymous, 2009).

The problems arising from the lack of interoperability compelled the EU, in its e-government action plan for 2005, to make the development of a European Interoperability Framework (EIF) a priority in the pan-European e-government strategy. Although there is no standard framework as yet, many issues have been raised, including: standards, security, open systems and databases integration. The Lithuanian e-government action plan developed an interoperability framework (Gatautis and Vitkauskaite, 2009) including:

- Definition of standards and rules
- Adoption of protection, security and authentication mechanisms
- Change management procedures and customization techniques

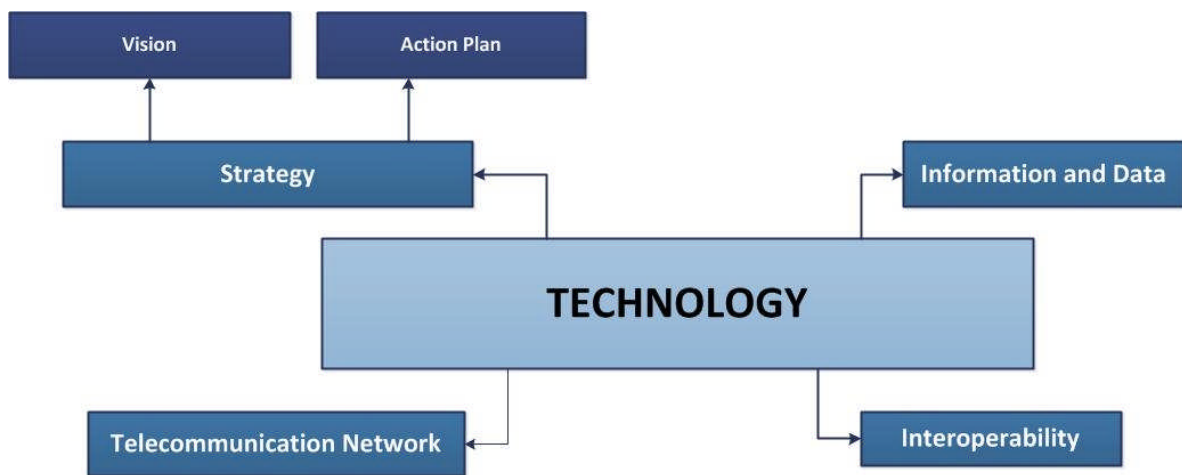


Figure 3-2: Technology factors for e-government adoption

### 3.4 E-government Critical Factors in the Organisation Context

The recent introduction of ICT has led to radical changes in the way public organisations perform their activities. Therefore, more researchers are investigating the

organisational factors and examining their impact on technology adoption. Fountain (2001), states: “Information technology and organisational / institutional arrangements are connected reciprocally. Both function in this framework as dependent and independent variables”.

Scholars have started to focus more on organizational issues and address the relationship between: Information Technology and human activity; organizational culture and structure; and change management. The redefinition of these factors is a prerequisite to achieve successful change process. According to Moon (2002) these are critical factors in organisational technology adoption.

Many studies show that a high number of e-government initiatives, in different types of organisation, fail or do not achieve their goals. The literature attributes the failure to a variety of reasons, including: lack of executive and top managers’ commitment; employees’ resistance to change; lack of skills and training programs; lack of awareness and conceptual understanding; old and inflexible management systems (AL-Shehry, 2008; Schein, 2010; Burn and Robins, 2003; Koeberg and Chusmir, 1987).

Although a wide range of factors are important to consider in the organisational context, this research focused on four main organisational factors: Organisation culture, Human capacity, Top management, and Change management Figure 3-3. Each factor generated further sub-factors and elements. The next sections describe these factors in more detail.

### **3.4.1 Organisational Culture**

The term ‘culture’ refers to the beliefs, values and behaviour held by a society (Burn and Robins, 2003). From an organisational perspective, culture can be defined as: “A system of shared values and beliefs that produces norms of behaviour and establish an organisational way of life.” (Koeberg and Chusmir, 1987). Organisational culture is defined by (Schein, 2010), as: “The shared understanding of how an organisation works”. Schein also argues that the organisational culture has a major impact on successful change initiatives. Many researchers highlighted the strong relationship between organisational development and organisational culture. According to Burke



(1994) organisational development is a process of fundamental change in an organisation's culture.

A number of organisational culture models have been developed to relate IT adoption with organisational culture in public organisations and identify factors that may influence the adoption process. These models can help organisation leaders to manage the effect of organisational cultural behaviour which may impede the adoption of technology. Schein (2010) developed a model to explain the basic elements of culture. In his model, Schein identified three main elements: basic assumptions, espoused values and artefacts. The use of this model helps organisation leaders to understand cultural elements, and examine the relationship between assumptions and common business practices within the organisation. According to Schein (1985) these assumptions were invented or developed by the organisation members in order to cope with the problems of external adaptation or internal integration. Quinn and Denison (1984, 1991) models also identified cultural characteristics that impact the organisation performance and effectiveness. This include: flexibility, adaptability and involvement. These elements direct leaders to the areas that need training and awareness to reduce resistance and allow collaboration and sharing. Johnson and Scholes (1999) identified six dimensions in their model called "paradigm culture web". The dimensions helped to illustrate the organisation employees' behaviour towards each other and towards external environment. This explained the attitudes related to information sharing, collaboration, control, distribution of power and resistance to change.

Although this discussion emphasises that transforming the organisational culture is a key factor to facilitate technology adoption, it could also occur in the opposite direction. Leidner and Kayworth (2006), claim that the organisational culture can be altered due to the involvement of new technology. In fact the implementation of technology can change the shape of the organisation, its processes, nature of jobs and the overall routine (Cata, 2003).

Although organisational culture is an implicit aspect, it can be characterised by explicit elements such as values, collaboration, share of information, resistance to change and experience (AL-Shehry et al., 2006; Altameem, 2007). The two factors that have received a great deal of attention in the literature, especially in developing countries are

‘share of information’ and ‘resistance to change’. Both factors are described in more detail in the next sections.

#### **3.4.1.1 Share of Information**

E-government is about information exchange both between and within different departments and organisations. Public sector organisations are already aware of the importance of information sharing for addressing policy issues and optimizing the business of government. The use of ICT has helped to achieve greater levels of information flow and exchange, but it can also raise security and privacy issues.

Technically, the share of information can be a complex task. In developing countries with bureaucratic systems, the problem is that flow within organizations is strictly controlled with limited access to, and sharing of, information and knowledge (Yang and Maxwell, 2011). Employees are not willing to share information scattered among organisational departments creating: “...the information isolated island.” (Huaiming et al., 2006). Huaiming et al., further contend that governments must break the monopoly and unlock the information held by all the levels of governments and departments, and integrate the information resource.

#### **3.4.1.2 Resistance to change**

As e-government requires fundamental change, resistance from some employees is to be expected. Wargin and Dobiey (2001) address many of the reasons behind resistance to change, such as: lack of skills required for using the new technology, lack of understanding the ‘big picture’, changes in the organizational structures and redistribution of power. Luke (1982) also sought to explain resistance to change. People are seen to resist anything that can cause work disruption or interrupts their routine. There is also a reluctance to take time and learn something new, especially if there is a lack in understanding the capabilities and use of new equipment.

Dent and Goldberg (1999) argue that individuals are not really resisting the change itself, but rather they may be resisting the loss of status, loss of pay, or loss of comfort. Ho & Ni (2004) assert that organisations employing people with sufficient intellectual

capacity to understand the vision for an innovation, and are willing to take the time and effort to persuade and motivate others to support the idea, are more likely to become an innovative organization (Altshuler and Zegans, 1990).

### **3.4.2 Human Capacity**

Most e-government readiness assessments involve measuring the adequacy of human resources (Ojo et al., 2007). It is a basic requirement for e-government adoption to have employees capable of accessing, and using information in a powerful and efficient way. For example, the E-Envoy office in UK provided a skill assessment toolkit ('skills map') as part of the Online Strategy to prepare government agencies for e-government adoption (Ojo et al., 2007). However, this is a challenging requirement for most public sectors in the developing countries. The percentage of illiteracy is often high and the percentage of ICT illiteracy is even worse. The level of education is also very low compared to developed countries. According to Najjar (2003), the population must have suitable education levels and must be ICT literate. Therefore, establishing ICT teaching institutes and training programs for both basic skills and professional levels are very important for producing skilled human capacity and hence, better chances for e-government adoption. However, some argue that human capacity development should not simply be seen as a means to acquire basic skills, instead it is a lifelong learning process (Ndou, 2004). That is why policymakers are mainly concerned with two issues: firstly, to ensure that all ICT users have the basic competencies to access and use ICT effectively; secondly, is to develop and train ICT professionals with special ICT skills. This policy is considered to be more beneficial and effective for sustainable economy development (Najjar, 2003). The World Bank revealed that successful e-government projects expend at least 10% of their budgets on training (Ojo et al., 2007).

Many governments around the world have adopted a long term strategy and set action plans to boost ICT education at primary and secondary schools and increase content on basic ICT in school curriculum. For example, in Albania, a Master plan has been approved for e-schools to integrate ICT into the high school curriculum (ITU, 2010b). It is reported that the current number of institutions and high level ICT education and

training in developing countries does not satisfy the demand for ICT professionals both in terms of the quantity and quality (Ndou, 2004).

### **3.4.3 Top Management**

Top management is the person or group of people who directs and control the organisation at the highest level (Altameem, 2007). They are the leaders of the organisation. According to Cavaness and Manoochehri (1993) the top management include all managers who have the authority to establish and enforce policies and guidelines. This explains the importance of top management as a critical factor that can allow acceptance and adoption of e-government, or lead to failure of the project (Altameem, 2007).

Caldow (2001) argues that leadership is at the heart of e-government success, and the OECD (2003) emphasises that strong leadership can speed the process of e-government implementation. The OII (Eynon and Dutton, 2007) see that the lack of adequate leadership can lead to slow and patchy progress to e-government.

Traditionally top managers only supported IT when convinced with the outcome benefits, like Return On Investment (ROI) (AL-Shehry, 2008). This attitude has now changed and top managers regard ICT highly. They now play a significant role in supporting and facilitating technology adoption (Altameem, 2007; Alshehri and Drew, 2010). Top managers are able to identify the business opportunities provided to their organisations by the new technology (Cata, 2003).

Special characteristics and skills of leadership are required, such as: awareness, strategic thinking, and commitment to the e-government project. Some argue that there is no way for e-government success without sustainable leadership commitment (Ojo et al., 2007). Lack of commitment means loss of staff and expertise. This is known as “brain drain”, and the public sector in many developing countries continually suffers and complains about it. Many reasons can be behind this problem, but unsatisfactory financial conditions in public sectors are the main cause for brain drain. According to (Dutta and Coury, 2002): “Brain drain is the result of non-recognition of the importance

of knowledge and knowledge workers by many developing countries”. This is an obstacle that can lead to serious delays in terms of e-government progress and success.

The strong characteristics displayed by Top management need to be available at all stages of e-government development. Aware leadership has to exist at the early stages of the initiative in order to explain the concepts, and create interest and awareness. It is needed during the initiative to manage the change and give support; and when the initiative is in its final stages leadership should make sure that the required flexibility and adaptability has been achieved (Aldrich et al., 2002).

#### **3.4.4 Change Management**

Change management refers to the management of change in procedures established within organisations. These changes revolutionize and reinvent government processes and functions (Ndou, 2004). Change management is usually needed when there is change in the internal and external environment that influences the organisational performance. This may include change in technical and managerial variables; or in the political, cultural and economic environment. According to (Veenstra et al., 2011), the impediments of public sector change can be categorised in three groups: governance (including political and legal), organisational and managerial, and technological.

Change can be either incremental or radical. An incremental change occurs within the established management structures and processes; whereas radical change takes place in different structures or processes. According to Altameem (2007) incremental changes only affect part of the organisation, but radical change breaks the frame of reference and creates a new balance. The empirical research has indicated that introducing IT might improve the organisation’s technical efficiency, but does not necessarily lead to significant organisational changes (Heintze and Bretschneider, 2000). According to Kraemer and Dedrick (1997) the role played by information technology is often no more than reinforcing “existing tendencies” of organisations.

Veenstra (2011) believes that the basic idea of transforming government is to realise changes in public sector practices and structures. However, the action of change is not

straight forward and it is more difficult in large complex organisations. Further it can be risky and even lead to failure (Altameem, 2007).

In e-government adoption, public organisations have been poor at managing the e-government projects and at managing the change (Heeks, 2001). Therefore, many consider change management to be a critical factor in e-government as governments are faced with the challenge of transformation and the need to modernise administrative practices and management systems (Tapscott, 1996). In this sense, it needs to address issues like new ways of processing and performing tasks and new work practices (Ndou, 2004b). This may include Business Process Re-engineering (BPR), bureaucratic practices and flexibility.

#### **3.4.4.1 Business Process Re-engineering**

BPR came as a response to the changing business environment and therefore it is a mandatory for change management (Scholl, 2005). The experience and knowledge in BPR is mainly derived from the private sector (Thong et al., 2000), which has different characteristics from the public sector. The literature has documented many experiences in BPR in private organisations, but very little is known about BPR in the public sector. However, some argue that the documented methods and insights may apply equally in public organisations (Scholl, 2005).

Since the 1990s private organisations have been applying major Business Process Change (BPC) (Burn and Robins, 2003) and recording many successful initiatives in the Information System area (Thong et al., 2000). Nonetheless, this is not a guarantee for success in public organisations, due to their different environments. For example, public organisations work under legal and formal constraints, which increase the difficulty of redesigning procedures to support the redesigning of processes (Thong et al., 2000).

Transformation in e-government cannot be realised without BPR (Veenstra et al., 2011). Before a business process is changed or re-engineered it has to be carefully analysed, documented, and assessed for streamlining potential (Scholl, 2005). However, Heeks argues that in an e-government context processes should remain without changes in the initial stages. He suggests that in order to reduce the risk of failure in e-government it is

better to avoid BPR and instead look at optimisation or minor modification of existing processes within the e-government application design.

#### 3.4.4.2 Bureaucracy & Flexibility

The traditional paradigm that has prevailed in the public sector, characterised by a bureaucratic, hierarchical structure and rule-based management is no longer producing efficiency in the new information era. The bureaucratic practices are problematic due to rigidity, hierarchy and *routinization* (Luk, 2009). ICT is now causing a paradigm shift and replacing the traditional processes with competitive, flexible, vertical/horizontal structure and integrated organisation (Tapscott and Caston, 1993). In fact, inflexibility is blocking the recognition of e-government benefits and inhibiting learning from good practice (Eynon and Dutton, 2007).

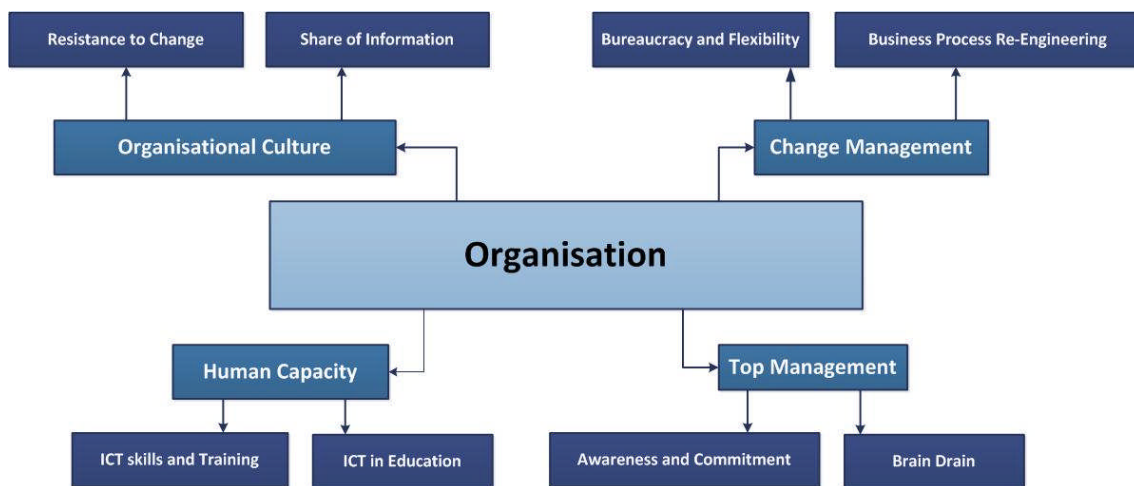


Figure 3-3: Organisation factors for e-government adoption

### 3.5 E-government Critical Factors in the Environment Context

Basu (2004) stated that: “In order to make e-government implementation relevant for Africa, serious consideration must be given to the social, cultural, and economic differences in e-government development”. Further, Heeks and Bailur (2007) highlight the need to consider the contextual factors beyond the desired technological sophistication. The environment is mostly associated with the political, cultural,

economic as well as the regulatory aspects (Bolgherini, 2007; Bakry, 2004; Hameed, 2007; Ahn, 2011), illustrated in Figure 3-5.

### **3.5.1 Political Environment**

The political environment in which e-government initiatives are undertaken is of importance because politics represents the: "...authoritative allocation of values or goals for the society" (Nour et al., 2008). The e-government system embraces political values the same way it embraces efficiency values (Nour et al., 2008; Bolgherini, 2007). These values involve public accountability, citizen participation, efficiency, democratic responsiveness, integrity and service quality, and security (Bwalya and Healy, 2010; Ahn, 2011; Al Nagi and Hamdan, 2009). However, not all values share the same level of importance; rather they receive different degrees of emphasis depending on the political environment. For example, political accountability, democratic responsiveness, and transparency will receive great emphasis if there is a high level of democratization existing in the political environment (Nour et al., 2008). According to Heeks (2003), one reason for e-government failure in developing countries is that it is designed within an environment which has a 'role culture', that values rules and logic; while the political environment in developing countries has a 'power culture', which values self-interest and hidden agendas.

Further problems associated with the political environment are: political turbulence, civil wars and low levels of democratisation. These create a difficult environment for e-government development and adoption. According to Ndou (2004) citizens lose trust in their governments whenever there is a history of dictatorship, political instability or large-scale of corruption. It is also emphasised that the many political problems limit the benefits of e-government.

However, the negative impact of these factors can be mitigated if there is a strong political support for IT solutions. Adoption of IT reforms is possible when politicians have the will and capacity, to impose change on the current system. It has been reported that the strong political will of EU leaders, as well as the determination to build a knowledge based society and economy, are very good lessons that developing countries' leaders may well learn (Seifert, 2003). The political leadership and support is



sometimes prompted by lobbying political parties, private sector advocates or IT companies (Ahn, 2011; Orrego et al., 2000).

### **3.5.2 Cultural Environment**

Rosman et al., (2009) define culture as the way of life of a people; while the Hofstede definition describes culture as: "...a system of collectively held values" (Hofstede, 2005). The success in ICT applications has been associated with the cultural sensibility (Choudrie et al., 2010). In terms of technology adoption researchers seek to describe how cultural values and beliefs can affect the usage, perception and adoption of new technology. Various studies were carried out to understand the influence of culture on e-government adoption (Yasin and Yavas, 2007; Khalil, 2011; Kovačić, 2005; Hill et al., 1998). As a result multiple factors were identified, including: language, social norms, education; in addition to the factors related to ICT of: fear of technology and lack of trust in technology (AlShihi, 2006; Altameem, 2007). It has also reported that transferring e-government to a different cultural context is neither an easy task nor is it a smooth process (Davison and Martinsons, 2003).

There is still a gap in the literature of understanding how national cultural influence the use of ICT. Models which are developed for this purpose are still limited in the literature, and many of the current studies have been criticized "for adhering to a static view of culture through the use of quantitative methodology" (Seng et al., 2010).

Hofstede, Hall and Florance (2005, 1976, 1961) revealed a number of dimensions to explain their cultural theories. Hall identified four dimensions of culture. He distinguishes between countries with high-context and low-context. In a high-context culture, there are many contextual elements that help people to understand the rules. As a result, much is taken for granted. In a low-context culture, very little is taken for granted. Hence, there is more explanation and less misunderstanding. Later, Florance developed his six dimension cultural model called value-oriented model. Hofstede identified four dimensions of national culture. His model has been criticised to be biased toward Western culture and as a result he identified a fifth dimension to overcome the gap in his model.

The Hofstede model, is the most well-known and has been widely used in academia (Kovačić, 2005). Researchers from the Middle East, the Arab world and Africa have also used the Hofstede model to highlight the impact of their national culture on ICT applications and practices (Choudrie et al., 2010; Al-Gahtani et al., 2007; Erumban and De Jong, 2006; Muinde, 2009). Nonetheless, some critics described the Hofstede methodology as a flawed method and that his work does not relate to individual level. Despite the criticism of the Hofstede model, the identified cultural dimensions are sufficient to cover the scope of this research. Also, these dimensions highlight the diversity in behaviour and attitudes within one group. This is important for investigating national culture in Sudan because of the multi-culture make up among the Sudanese society, and hence among members of public organisations. The Hofstede model is also useful for the current study because it illustrates the relation between national culture and the economic and political aspects. The Hofstede model helped to explain the national cultural impact by viewing the culture subjectively and breaking it into five dimensions. Four of these dimensions were found to be related to the current research focus on e-government adoption in the public sector in Sudan. Following is a brief description of each of the four dimensions:

- (1) **Power distance (large vs. small):** this refers to the degree of inequality and its acceptance among people with and without power. Countries with small power distance have better attitude towards using communication technologies.
- (2) **Individualism vs. collectivism:** how members of the culture define themselves apart from their group. Countries with highly individualistic culture are more likely to have a positive attitude toward using ICTs.
- (3) **Uncertainty avoidance (strong vs. weak):** this relates to the degree of anxiety society members feel when in uncertain or unknown situations. Countries with weak uncertainty avoidance are faster and quicker in adopting new technologies and implementing ICTs.

**(4) Long versus short-term orientation:** the importance attached by the society to the future versus the past and present. Societies described with long term orientation are more positive toward adopting and using ICTs.

### **3.5.2.1 Cultural impact on ICT**

Many studies have been carried out to show the relationship between the national culture and the ICT usage and adoption (Khalil, 2011; Kovačić, 2005; Hill et al., 1998; Heeks and Bhatnaga, 1999). Although, these studies demonstrate that ICT is increasingly taking place in a cross-cultural context (Walsham, 2002), they also reflect the fact that different cultures react differently to new products and technological innovations; meaning that the formulation of a country's ICT strategy must consider its individual social and cultural features. The Bridges.org (2008) suggested that: "The unique cultural and historical environment of a region must be taken into account as part of a national ICT policy to truly gauge the country's e-readiness for the future." However, the relationship between national culture and ICT adoption in general or e-government specifically is not a simple causal relation (Kovačić, 2005); rather, it is a dynamic relationship where e-government can have an impact on the national culture as well. Heeks (2003) refers part of the failure of e-government projects in most if not all developing countries to the scant consideration of the specific national country context in terms of cultural issues (including: organisational culture, social issues, literacy, gender and religion). However, it is important to remember that other factors play a significant role in the adoption of e-government. Bagchi et al (2004) argue that: "While cultures can promote, resist, or shape technology use, they do not wholly determine technology use".

### **3.5.2.2 Arab World Cultural Characteristics**

The Arab world is characterised by high-context culture where personal relationships and the context of the communication process are more important than the content of the communicated message. People prefer face-to-face interactions over other channels of doing business. This demonstrates that trust in Arab culture is established through an elaborate social process and many researchers have concluded that it is high on group

and family collectivism and power distance, and low on future orientation (Yasin and Yavas, 2007).

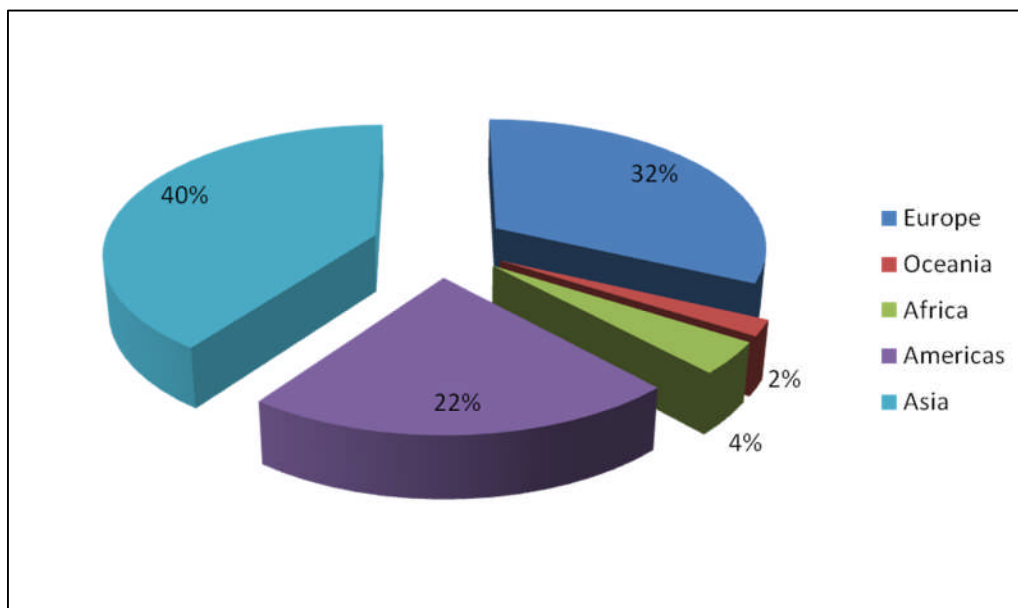
In terms of dealing with technology and information, there are many concerns over security and fear of technology; language is a barrier for most consumers, which is exacerbated by the shortage of Arabic software. In addition, there is tendency to control information in a centralized manner (Yasin and Yavas, 2007).

### **3.5.3 Economic Environment**

The recent literature in e-government highlights the close relationship between the level of progress in e-government evolution and the economic development of a country (UN, 2010; Holmes, 2001; Gronlund et al., 2006; EIU, 2010) . According to Mamaghani (2010) new technologies can play an important role in accelerating economic growth, promoting sustainable local development and reducing poverty. However, until the early 1990s, there was no evidence of a significant impact of ICT on economic growth. More recent studies have started to show that ICT plays a vital role in advancing economic growth and reducing poverty (Hameed, 2007; Braund et al., 2007). Firms using ICT in developing countries can directly influence productivity, cost effectiveness and competitiveness in industry. For example, in Pakistan the size of IT industry is approximately US \$ 700 million, with annual software industry turnover of US \$ 70-80 million. Further, the IT professional services (ITPS) industry generates direct employment for over 120,000 people (Hameed, 2007). In India the total revenues of the software and services industry are projected at US\$12 billion. In sub-Saharan Africa, governments taking advantage of the growth of telecommunications sector in the region fuelled by economic liberalization policies and the growth of web-space are attempting to establish e-government systems (Schuppan, 2009; Mutula, 2008). The Internet Dubai City (IDC) estimates that by 2011, the Middle East and Africa (MEA) region will be a US\$46 billion IT market. These figures indicate dynamic growth opportunities beyond the region.

Further, the “e-readiness index” and the “ICT Development Index” developed by the UNDESA (2005) and ITU (2009) both show correlations between GDP per capita and countries’ e-readiness rankings. According to UNDP surveys e-government systems are

already helping save approximately 2% of the annual U.S.A. GDP (Bwalya and Healy, 2010). Moreover, research from Telecommunications Management Group shows that: “For every 1% increase in a country’s Internet penetration, GDP per capita increases by US\$493 and a 1% increase in mobile penetration results in a per capita increase of US\$240” (ECA, 2008). Figure 3-4 shows the percentage of ICT investment across the world.



**Figure 3-4: ICT investment across the world**

Adopted, (ITU, 2009)

According to Avgerou (1998): “Within a global economy which is increasingly more technology and information intensive: Unequal distribution of resources, such as telecommunications and technical skills, causes concern about the ability of developing countries to participate in the emerging world economy”. However, some believe that ICT and its applications give hope for these countries to improve their economy; Kofi Annan (2011), former UN Secretary General, stated that: “The Internet holds the greatest promise .... it offers the best chance yet for developing countries to take their rightful place in the global economy”. But this will require developing countries to implement the necessary structural factors of investment in education and infrastructure combined with strong political leadership in order to compete and contribute in the global network economy (Mamaghani, 2010).

### **3.5.4 Regulatory Environment**

According to Basu (2004) the success of e-government initiatives and processes are highly dependent on the government's role in ensuring a proper legal framework for their operation. Ndou (2004) argues that dealing with e-government is similar to signing a contract. The policies, legislations and law of this contract have to be identified. These include, electronic signatures, electronic archiving, freedom of information, data protection, computer crime, intellectual property rights and copyright issues.

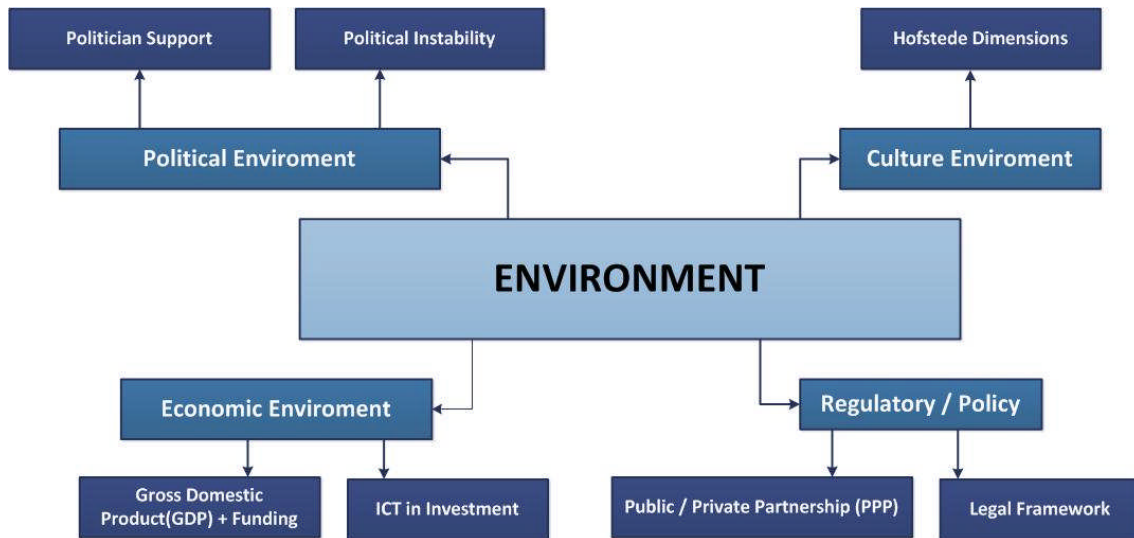
The open nature in e-government systems makes the data more vulnerable and easier to manipulate. Therefore, protecting confidential information becomes a key concern of all constituents and stakeholders, requiring governments to enforce laws relating to privacy. Also, many risks related to authentication, legal recognition and security are visible in electronic transactions between local and state governments or between organisations. This highlights the need for developing and designing digital signature and Public Key Infrastructure (PKI).

A major aim for e-government is to facilitate access to technology, especially the Internet. The rate of access in developing countries is very low compared to those in developed and free countries. Hence, it is important that governments in these areas make sure that they have established successful e-government projects where no one is prevented from technology or information access. However, due to the lack of such policies and strategies, many are excluded from access to the Internet in developing countries.

In order to protect and secure these electronic activities governments should develop a legal framework. According to (Basu, 2004) the legal framework ought to preserve basic public policy and assign responsibility regarding data ownership and rights. It must also provide a mechanism by which legal requirements are enforced.

Although an e-government legal framework is not yet established in many developing countries, some have introduced legislation following the UNCITRAL Model Law in Electronic Commerce. Malaysia established the digital signature bill in 1997. Singapore

has its own Electronic Transaction Act in 1998 which covers digital and electronic signature and electronic records.



**Figure 3-5: Environment factors for e-government adoption**

### 3.6 Summary

This chapter has identified many factors in relation to the technology, organisation and environment contexts. The factors extracted from the literature are believed to be of high significance for e-government adoption from a governmental perspective. Although numerous other factors exist in the literature, two issues were considered: the emergence stage of e-government; and the context of developing countries.

The chapter has achieved its aim by proposing an initial conceptual framework, providing a holistic view of critical issues in e-government adoption. The framework followed a multidimensional approach, offering a practical framework to be used for further investigation in public sector organisations.

The proposed framework is carried on to the next phase of the research, as a guideline for examining the challenges and difficult issues facing the e-government adoption process.





## 4 Research Methodology

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This chapter addresses important choices, resources and information regarding research design principles. This information is to help to make the right decision regarding the nature of the research problem and how it should be investigated. There are several options in terms of research approaches and techniques that can be used in the research design. The choices made in methodology for this study are related to the research aim and research problem: to identify the critical factors, in order to develop an appropriate e-government adoption framework for Sudan.

This chapter presents the research methodology design, and it is structured as follows:

1. **Section (3.1):** Provides an overview of the research methodology and includes: the philosophical paradigms, research approaches and strategies, data instruments, research validity and generalizability.
2. **Section (3.2):** Clarifies the rationale of the research choices and justifies the selection of the qualitative case study approach. This section explains why this and other selections of the methodology represent a good choice for the specific research inquiry.
3. **Section (3.3):** Describes the steps of the empirical research design, and details the data collection methods and techniques used in the current research.
4. **Section (3.4):** Summary of the chapter.

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### 4.1 Research Methodology Overview

E-government is classified within the Information Systems (IS) field, which encompasses many areas, including: technology, computing, management and political science. This interdisciplinary nature made it particularly difficult to select an appropriate strategy and research approach. Galliers (1992), claims there is no specific

framework available to combine all aspects of knowledge needed for the study of IS. Therefore, the methodology adopted in this study became a matter of selection between the most useful methodologies related to the type of research problem.

Governments around the world are going through a transformation process under the name of e-government. The transformation has provided new ways of managing public organisations, as well as introducing innovative ideas for building up relations with individuals, businesses and other government agencies. This research is concerned with these relations and how the new governmental processing operations can be more successfully adopted in a particular environment. Rogers (1971) argues that research in adoption needs to be much more process oriented, qualitative and follow events sequentially over time, in order to understand the process.

Research is a systematic process of inquiry to explore and discover knowledge about something happening or existing in society, science or nature (Neuman, 1994). The research methodology as identified by (Remenyi et al., 1998), is the procedural framework within which the research is conducted. Some see the research methodology as the approach taken to research. However, the choice of an appropriate research methodology is a basic requirement in order to achieve a final result of high quality (AL-Shehry et al., 2006). There is no single ideal solution; there are a series of compromises (McGrath et al., 1982), and each research design will have its advantages and disadvantages.

In choosing the research methodology there are a number of factors to be considered, as (Yin, 2003), states: “the characteristics of the research inquiry will greatly influence the selection of an appropriate research strategy”. These characteristics include the research topic, the objectives, research questions and nature of the research problem. Other pertinent factors to be considered are: the time allocated to conduct the study; access to the research sites; and the researcher’s experience and skills.

The views and insights described in this section have inspired the author in the choice of the research methodology. Moreover, the opinions from expert people in the research site informed many elements during the research design stage.

### **4.1.1 Research Design**

The research design is a logical sequence that connects the empirical data to a study's initial research questions and ultimately to its conclusions (Yin, 1994). Therefore, the research design of a study is defined as a set of guidelines and instructions to be followed in addressing the problems. The current research problem tackles the contextual factors that may obstruct the adoption of e-government in Sudan. This research aims to investigate these problems; identify the specific challenges to overcome them; and highlight possible opportunities. This will be achieved through the development of an e-government adoption framework, which can be used by Sudanese leaders and policy makers. Hence, to formulate the research design for this study the author followed Crotty's (1998) principles. Crotty identified four principles in order to build an appropriate research design framework: the research philosophy, research approach, research strategy and research methods.

### **4.1.2 Research Philosophy**

Philosophy of research means the basic beliefs about the world we live in. There are two assumptions that shape the way of thinking about these beliefs: the 'ontology' and 'epistemology' assumption (Burrell and Morgan, 1979). Ontology refers to the nature of the world or reality. To the realist the social phenomena have an existence which is independent of its social actors. Therefore, the study of ontology produces understanding of knowledge. On the other hand, epistemology is concerned with the study of knowledge and what we accept as being valid knowledge. Epistemology answers the question of how things really work, and what are the best ways to acquire knowledge (Lincoln and Denzin, 1994).

Understanding the philosophy of the research helps to recognize which research design will be most advantageous. It shows the relation between data and theory and hence helps to frame the research design (Easterby-Smith et al., 2002). Neuman (1994) divides the philosophical stance into four main paradigms: positivism, post-positivism, realism and constructivism. Table 4-1 shows the main characteristics of each type. However, in one extreme, the positivist asserts that only phenomena that are observable and measurable can be validly regarded as knowledge. The measurable evidence that

positivism depends upon has a high level of control over the phenomena. On the other hand, constructivism attempts to understand the phenomena from the point of view of participants who are directly involved with the particular phenomena (Irani, 1999; Collis and Hussey, 2003).

**Table 4-1: Research philosophy paradigms**

	<b>Positivism</b>	<b>Post-positivism</b>	<b>Realism</b>	<b>Constructivism</b>
<b>Epistemology</b>	Objective point of view	Findings probably objectively true	Both subjective and objective points of view	Subjective point of view
<b>Ontology</b>	'Real' reality but apprehendable	'Real' Reality but only imperfectly	Virtual reality shaped by social, political, cultural and economic values	Local and specific constructed values

Source: (Lincoln and Denzin, 1994; Merriam, 1998)

### 4.1.3 Research Approach

The research approach is identified by (Jankowicz, 2000), as a: “systematic and orderly approach taken towards the collection and analysis of data so that information can be obtained from those data”. There are three well known types of research approaches: qualitative, quantitative, and mixed method. The choice between the three types takes into account the research aim and objectives to be achieved. The next section addresses the main characteristics of the two methods and constructs a comparison between them.

#### 4.1.3.1 Qualitative Approach

The qualitative research approach was developed in social science to enable researchers to study social and cultural phenomena. It is a method that represents data as narration and is conducted through intense contact with the field or life situation. The qualitative method comprises many attributes; most importantly is that the qualitative data focus is on naturally occurring, ordinary events, in natural settings. Well-collected qualitative data will be rich and holistic, with strong potential for revealing complexity. The qualitative method provides explanations to extend our understanding of the phenomena, or promotes opportunities of informed decisions for social action. It also contributes to theory, policy making and social consciousness (McMillan and Schumacher, 2001). These features help to achieve the goal of understanding rather than

prediction of dependent variables (Royce, 1995). In addition, qualitative research is conducted through an intensive prolonged contact with the field (Merriam, 1998), which makes it a powerful method for studying processes.

The qualitative method does however, have its weaknesses. The complexity and richness of data can obscure the analysis process. More significantly it leaves the data open to interpretation; both interviewee and researcher bias become a real threat. Finally, the overall situation is dynamic and the case's circumstances can keep changing, which may affect the research validity and verification (Cornford and Smithson, 2006). Table 4-2 shows both strengths as well as weaknesses of applying the qualitative research method.

**Table 4-2: Qualitative approach - Strengths and weaknesses**

<b>Strength</b>	<b>Weakness</b>
The qualitative analysis allows a complete rich and detailed description	Qualitative difficult to analyse and needs high level of interpretative skills
An attempt to take account differences between people	Great chance of bias
Does not reduce complex human experiences to numerical form and allows a good insight into the person's experiences and behaviour	Hard to draw brief conclusions from qualitative data
Results are said to be rich, deep and meaningful	Qualitative faces difficulties in terms of comparisons
Ambiguities which are inherent in human language, can be recognised in the analysis	Low level of accuracy in terms of statistics

Source: (Bernard, 2000)

#### **4.1.3.2 Quantitative Approach**

The quantitative method can be described as an extreme of empiricism, which relies on control and explanation of the phenomenon (Altameem, 2007). It is a method that tends to measure "how much" or "how often" (Nau, 1995). Creswell (2003) argues that the quantitative approach is most appropriate when the problem is to identify factors that influence an outcome; understand the best predictors of outcomes; or the utility of an intervention. Moreover, in order to perform tests in the quantitative approach, the method has to be expressed in terms of "operation"; such as, surveys, laboratory experiment and mathematical modelling. The analysis of data will depend on statistical principles. Qualitative research is preferred when there is little previous research into

the phenomenon to be investigated and it needs to be more understood. Table 4-3 shows the differences between the two methods in terms of concepts, processes and analysis.

**Table 4-3: Qualitative approach vs. Quantitative approach.**

<b>Qualitative</b>	<b>Quantitative</b>
It is often an inductive process and the language is informal	It is a deductive process and the language is formal
Can be faster and cheaper compared with quantitative	Can be relatively slow and more costly compared with qualitative
Concepts are in the form of themes, motifs and taxonomies	Concepts are in the form of distinct variables
Analysis proceeds by extracting themes or generalisations from evidence and organising data to present a coherent picture	Analysis proceeds by using statistics, tables or charts
Procedures are particular and replication is difficult	Procedures are standard and replication is assumed

Source: (Bernard, 2000)

#### 4.1.4 Research Strategy

The choice of which strategy to follow is dependent upon the nature of the research problem (Noor, 2008). Yin (1994) argues that there are five main research strategies to carry out social research: case studies, experiment, surveys, histories and analysis of archival information, Table 4-4. The advantage and disadvantage of each strategy depend on three conditions:

- The type of question
- The control the researcher has over behavioural events
- The focus on contemporary as opposed to historical events

**Table 4-4: Research Strategies**

<b>Research strategy</b>	<b>Question Type</b>	<b>Control of behaviour</b>	<b>Focus on contemporary events</b>
<b>Case study</b>	How, why & what	No	Yes
<b>Experiment</b>	How & why	Yes	Yes
<b>Survey</b>	Who, what, where, how much & how many	No	Yes
<b>Archival analysis</b>	Who, what, where, how much & how many	No	Yes/No
<b>History</b>	How & why	No	No

Source: (Yin, 1994)

However, under the qualitative approach researchers identified dozens of research strategies with different criteria and explanations. For example, Creswell (2009) identified five qualitative research strategies: biography, phenomenology, grounded

theory, ethnography and case study, whereas (Robson, 2002) pointed to grounded theory, ethnography and case study strategies.

#### **4.1.4.1 Single/Multiple Case Studies**

Case studies can be multiple or single. A single case study can provide valuable information about the research question from one organisation, as it provides rich descriptions of the organisational context. On the other hand, multiple case studies can strengthen the end results by replicating pattern-matching (Yin, 1994). The logic underlying the choice of multiple case studies is that it either predicts similar results (literal replication) or produces contrasting results, but for predictable reasons (a theoretical replication), (Yin, 1994). Yin also suggests that as long as the researcher has sufficient access to cases for replication, then they should choose to conduct multiple case studies. It is more important to clarify the deeper causes behind a given problem and its consequences than to describe the symptoms of the problem and how frequently they occur (Flyvbjerg, 2002).

#### **4.1.5 Research Methods**

Research methods describe the tools and resources used for data collection, and the tools and techniques applied for data analysis. The next two sections describe the two methods of data collection and data analysis.

##### **a) Data Collection**

The literature identifies many methods and tools for data collection. These tools are known as “source of evidence” and can lead to more robust results and conclusions. Authors including Yin and Benbasat (2009; 1987) addressed several sources of evidence that can be used in case studies. These include: documents, interviews, archival records, direct observations, field notes and physical artefacts, (Table 4-5). The goal of using multiple sources is to obtain a rich data set surrounding the specific issue of research and thereby capture the contextual complexity (Benbasat et al., 1987).

Table 4-5: Data resource evidences

Source of Evidence	Strengths	Weaknesses
<b>Documents</b>	<ul style="list-style-type: none"> <li>- Stable can be reviewed repeatedly</li> <li>- Unobtrusive not created as a result of the case study</li> <li>- Exact</li> <li>- Broad coverage</li> </ul>	<ul style="list-style-type: none"> <li>- Retrieval can be low</li> <li>- Biased selectivity</li> <li>- Reporting bias</li> <li>- Access may be blocked</li> </ul>
<b>Archival Records</b>	<ul style="list-style-type: none"> <li>- Same as for documents</li> <li>- Precise and quantitative</li> </ul>	<ul style="list-style-type: none"> <li>- Same as for documents</li> <li>- Accessibility due to privacy reasons</li> </ul>
<b>Interviews</b>	<ul style="list-style-type: none"> <li>- Targeted</li> <li>- Insightful</li> </ul>	<ul style="list-style-type: none"> <li>- Biased due to poor constructed questions</li> <li>- Response bias</li> <li>- Inaccuracy</li> <li>- Reflexivity</li> </ul>
<b>Direct Observations</b>	<ul style="list-style-type: none"> <li>- Reality</li> <li>- Contextual</li> </ul>	<ul style="list-style-type: none"> <li>- Time consuming</li> <li>- Selectivity</li> <li>- Reflexivity</li> <li>- Cost hours</li> </ul>
<b>Physical artefacts</b>	<ul style="list-style-type: none"> <li>- Insightful into cultural feature</li> <li>- Insightful into technical operations</li> </ul>	<ul style="list-style-type: none"> <li>- Selectivity</li> <li>- Availability</li> </ul>

Source: (Benbasat et al., 1987)

#### b) Data Analysis

In a qualitative approach the analysis is one of the most difficult tasks, and for case study research it is one of least developed techniques. Yin (2003) states that data analysis consists of examining, categorising, tabulating or otherwise recombining the data collected to address the initial focus of the case study. There are many ways to analyse data in the quantitative approach, but fewer in the qualitative approach, which are also less well formulated. However, the literature describes approaches of analysis such as: content analysis, thematic, comparative and narrative. Thematic and comparative are often used for analysis in the same project. The former identifies emergent themes from data and the latter contrasts and compares themes between different people or groups. This approach is most useful when categories are not predetermined. In narrative analysis, the researcher presents the details of the data and explains it using participants' words. This approach is very specific and limited to presenting rather than analysing and developing useful meanings. Content analysis has been recognized for over 50 years (Weber, 1995) and is widely used as an analysis tool in qualitative research (Weber, 1995; Krippendorff, 2004). Krippendorff (2004) defines



content analysis as: "the use of replicable and valid method for making specific inferences from text to other states or properties of its source". Some suggest that content analysis allows closeness to the text, which can provide valuable cultural visions and/or understanding of human thought over time. According to Krippendorff, content analysis provides new insights and increases researcher understanding of a particular phenomenon. However, a major limitation of this method is that it can be time consuming.

#### **4.1.6 Validity & Reliability**

In order to judge the quality of the research design, Merriam identifies three principles to be tested; validity, reliability and generalizability (1995). Validity ensures the researcher really measured what should be measured, following the objectives and purpose of the study. Further, it guarantees that the study is free from any bias in terms of inferences and conclusions (Creswell and Miller, 2000). Reliability is the degree to which a tool can generate consistent results that should be free from measurement errors. Reliability is a necessary step to have a valid measure, but it does not guarantee its validity (Neuman, 1994). A powerful way to reach research validity and reliability is to conduct a preliminary or pilot study in the early stages of research. There are other devices to ensure validity and reliability; such as, use of multiple sources of evidence, triangulation and consultation. A number of researchers (Merriam, 1998; Robson, 2002; Creswell and Miller, 2000; Lincoln and Guba, 1985) identified several strategies for validation. These strategies are frequently used by qualitative researchers. Some of the identified strategies are as follows:

1. Prolong the processes of data gathering on site
2. Employ the process of "Triangulation"
3. Rich, thick description
4. Clarify
5. Engage in peer consultation

#### **4.1.7 Generalizability/Transferability**

Generalizing the results of research from a sample to a population still generates argument among researchers. Quantitative researchers construct their research in such a way so as their empirical results can be generalised to a large population. However, generalizability (also known as external validity) within the qualitative approach is rare as the population is not large enough (Miles and Huberman, 1994). Moreover, case study as a method is criticized for being un-generalizable (Robson, 2002; Eisenhardt, 1989); that is to say, the conclusions reached cannot be generalized beyond the area of the study. Therefore, some suggest that the goal should be “theoretical generalizability” (Hillebrand et al., 2001). Alternatively, Lincol and Guba (1985) suggest transferability as a parallel concept for generalizability. They also argue that transferability is more applicable for qualitative research and it means research results can transfer to situations with similar parameters, populations and characteristics (Robson, 2002; Lindlof and Taylor, 2002).

### **4.2 The Rationale of Research Methodology Selection**

It is important to justify the research approach selection and rationale. This will help to validate and guide the research process.

#### **4.2.1 Constructivism Research Philosophy**

The actions examined in this study are shaped by the cultural, historical, political, and social norms in the Sudanese context. Thus, the research is based on an epistemological foundation, in which reality is different and related to the unique understanding and experience of the world. In this sense, reality in this research is completely subjective (Roots, 2007). Constructivism on the other hand, seeks to develop subjective meanings of participants understanding (Creswell, 2003). These meanings help the researcher to look for complexity of views and focus on the specific context in which people live or work, in order to understand the historical and cultural settings of the participant (Creswell, 2003). Further, many see constructivism as an approach of qualitative research. Therefore, the researcher considered the constructivism paradigm as the philosophical stance for this research.

### **4.2.2 Qualitative Research Approach**

Many argue that the qualitative method is most appropriate when the main objective of research is to improve the understanding of a phenomenon (AL-Shehry et al., 2006; Royce, 1995; Altameem, 2007). It also helps in understanding how people perceive a problem, based on building a complex and holistic picture (Creswell, 2003; Kohlbacher, 2006; Patton and Appelbaum, 2003). Further, Cassell and Symon (1994) explain that the qualitative method is more appropriate if the research question is concerned with organisational processes. Therefore, researchers have widely used qualitative research. The rationale of the author's selection to employ the qualitative method is addressed in the following points:

- The objective of this research is to understand more about e-government, as there is little published about e-government in developing countries at the start of this research.
- The research focuses on the e-government adoption process in organisations and seeks to learn more about the practices and key challenges.
- The complexities surrounding the e-government adoption process in organisations need rich and deep empirical data. Using qualitative data means providing a level of richness that will allow the researcher to conduct an in-depth investigation.
- The main advantage of using qualitative data is in building a holistic picture of the research problem. This is a major focus of this study's research question and one of the existing gaps in the literature in assessing e-government in developing countries. Applying the qualitative method will help to fill this gap.
- Finally, the main aim of this research cannot be reached using mathematical or experimental operations.

### **4.2.3 Case Study Research Strategy**

The case study is a research strategy that focuses on understanding the dynamics present within single settings (Eisenhardt, 1989). It attempts to learn about a complex situation through extensive description and contextual analysis (Kohlbacher, 2006; Stake, 1995). Yin (2003) defines a case study as an: “empirical inquiry that investigates a contemporary phenomenon within its real life context, especially when boundaries between phenomenon and context are not clearly evident”. The case study is a powerful strategy in theory building. It will start from specifying the research questions and be carried on until case closure (Eisenhardt, 1989). A cornerstone of theory building is to specify how a set of factors are related (Whetten, 1989). According to Eisenhardt (1989) “the results are novel, testable, and empirically valid”. Thirty-six per cent of researchers use a case study or case studies in their research (Chen and Hirschheim, 2004). According to Gall (1996) researchers generally conduct case studies for one of three purposes:

1. to produce detailed descriptions of a phenomenon
2. to develop a possible explanation of the phenomenon
3. to evaluate the phenomenon

Collis & Hussey (2003) consider the case study as an ideal methodology when a holistic, in-depth investigation is needed and when there is a lack of knowledge. Many features of a case study approach are illustrated by (Yin, 2003; Easterby-Smith et al., 2002; Stake, 1995):

- The phenomenon is examined in its natural setting
- There is little or no control over events
- More than one entity can be examined at the same time
- More than one method can be used for collecting data
- Changes in site selection or data gathering instruments can take place
- Difficulty in separating analysis and interpretation from data gathering
- Knowledge is constructed rather than discovered or found
- Generalisation is based on a limited number of cases

- Generalisation does not result from the statistical inferences but through deep understanding of the phenomenon.

Walsham (1995) argues that case studies are appropriate for interpretive research in IS. Benbasat (1987) states three reasons why case study is an appropriate strategy when researching in IS:

- It enables the researcher to understand the nature and complexity of the process taking place.
- Case study allows the researcher to study IS in its natural settings.
- A case study approach enables a researcher to gain valuable insights into new topics emerging in the rapidly changing IS area.

As a result of these characteristics Hakim (1992), contends that case study, as a strategic approach, is applicable to organisations and institutions in both the private and public sectors.

From the discussion above, the case study as a strategic research methodology is expected to help greatly in the understanding of the e-government phenomena in its natural setting. Hence, the author asserts that it is a suitable strategy for this study for the following reasons:

1. There are numerous challenges and complex issues facing e-government adoption. This study exhaustively examines the technical, organisational and environmental aspects interrelated in the e-government phenomena. It makes the relationships between these issues and their impact on e-government progress more explicit.
2. An in-depth examination of the nature and context of the environment related to e-government is required. A context based understanding is needed to explain the role of the relevant factors shaping the adoption of e-government in the Sudanese context.

3. The case study allows the author to go beyond the data, recognise new ideas, understand the concepts and link the patterns and themes. This can greatly help in the e-government adoption theory building.

Based on the points above, the author chose to use case study as a vehicle for the current empirical research, aiming to develop a prescriptive socio-technical framework. This framework will be useful to guide the e-government adoption process in developing countries in general, and in Sudan in particular.

The number of case studies is important in research design. Eisenhardt (1989) (1989)suggested that the number of case studies should be  $(4 \leq x \leq 10)$ , whereas Gable (1994) determined that multiple case study research should include up to five cases. There are other considerations when deciding upon the number of case studies to carry out.

- The number should be predetermined, rather than be based on the factors of the research.
- The number should be defined by how much is known about the phenomenon after studying a case and how much will be added from investigating more cases.
- The research question and data collected are to determine if the collected data is sufficient for analysis.

In order to satisfy the aim of this thesis, the author decided to carry out case studies at two levels: National level; and Organisational level. At the national level the author focused on policy making and strategic thinking in e-government adoption for the whole public sector. At the organisational level, four case studies were conducted to examine the various organisations' initiatives. The criteria developed by the author to select the case studies, is explained in Section 1.1.1.2.

#### **1.1.1.1 Unit of Analysis**

The unit of analysis is related to the problem of defining the "case". A case study can be an event or an entity. It can also be a country's economy or economic policy (Yin, 1994). The unit of analysis is related to the primary questioning of the research. Yin

(2009) suggests that there can be more than one unit of analysis, depending on the research design. This research is conducted at two levels (“national” and “organisational”) and is concerned with two units of analysis. The first represents the unit of analysis for the national level and defined as the “state”. The second represents the unit of analysis for the organisational level and defined as the “government organization”.

#### 1.1.1.2 Justification of Case Studies Selection

Having chosen the constructivism case study strategy for this research project along with multiple case studies, it is important to justify the selection of the specific case studies.

The criteria for selection were extracted from the literature, as well as from academics and experts who are aware of, and involved in, e-government implementation in Sudan.

The five elements of the criteria are described in the following and Table 4-6 illustrates how the highlighted criteria were applied to each organisation.

- ***Valuable data and information:*** The organisations selected were in a position to provide views and insights regarding e-strategies, policies, drivers and barriers. The staff in these organisations were able to describe in detail the current situation and had clear ideas about how things should work in the future. This was expressed subjectively in the form of words, phrases or text; as in data provided in documents. There was a sufficient amount of documentary data in papers, presentations and reports. The author was allowed access to this, as well as to the data centres and computer laboratories.
- ***History of ICT experience:*** It is important to examine the research problem within organisations having a record of ICT use. All organisations selected had varying degrees of experience in adopting technology. Each organisation had gone through the experience of introducing e-government initiatives; however they were at different levels of adoption at the time of investigation.
- ***Ease of access:*** access to organisations had to be considered. The research had time limitations and traditionally, the Sudanese have little tolerance for student

requests. Priority was given to organisations with fewer regulations in terms of access and offering information. The professional relationships and network of the author significantly facilitated access to most organisations; more so than following customary official channels.

- ***Size of organization:*** Sudan is a huge country in area and its citizens are spread widely. Services provided by government are supposed to reach all citizens, everywhere. Therefore, the author selected large organisations with branches in both rural and urban areas. This is to ensure effective examination of the technical and organisational management issues, which can be major challenges for e-government adoption.
- ***Other opinions:*** The author had many discussions regarding the organisations to be investigated. The opinion and recommendations from academics and practitioners were very valuable and assured that the organisations are representative. They were able to direct the author to organisations with differing levels of success and failure, and with various periods of adoption

Accordingly, the author selected four case studies:

1. Higher Education
2. E-Banking
3. Interior Ministry
4. Electricity Corporation

The choice of the case studies emphasizes their representativeness for multiple reasons:

- There are 30 ministries in Sudan. As each case study above belongs to a different ministry, the four case studies represent 13% of the country's ministries.
- The organizations' services target large numbers of population if not the whole population.
- The organizations provide essential and basic services for the citizens: education, civil services, finance and electricity.



Table 4-6: Criteria of case study selection

	Higher Education	E-banking	Interior Ministry	National Electricity Cooperation
<b>Valuable Data &amp; Information</b>	Expert people & available documents, presentations, studies	Expert people & available documents, presentations, studies	Expert people	Expert people & available documents, presentations, studies
<b>ICT Experience</b>	7 years	10 years	7 years	10 years
<b>Easy Access</b>	Researcher field of work	Researcher colleagues & supervisors	Through Steering Committee	Followed official procedure
<b>Size of org. (25 states)</b>	10 states connected	10 states connected	Centralized	13 states connected
<b>Other Opinions</b>			Recommended	

### 4.3 Empirical Research Design

An empirical research design is an action plan for getting from one step of the methodology to the next (Yin, 2003). The empirical design was developed for this study based on seven steps, as shown in Figure 4-1. According to (Al-Sebie, 2005) drawing the research protocol is important:

- To make sure the right data is collected and put into a manageable format.
- To follow the root from which knowledge was developed
- To provide a map that other researchers can follow

The following section describes the work carried out in each step.

#### **Step 1: *Conducting the preliminary study and identifying the research problem***

After establishing the research back ground, it was important to understand the real drivers that compelled the government in Sudan and its organisations to adopt e-government projects. The author conducted a pilot study between October and December 2007. The aim of the study was to understand the various circumstances encompassing Sudanese e-government; its values, vision and goals. Additionally, the

study aimed to specify precisely the issues related to the implementation process; including challenges, problems and opportunities. This helped to build an initial picture about the context of the project and hence address the critical issues and factors that could be influencing e-government implementation in Sudan. The first results showed that the e-government project, which officially started in 2001, had hardly been examined and most areas were still unclear. Further, the interviewees in the pilot study highlighted issues and challenges related to a variety of aspects; from technology, electricity, funding, strategies and planning to illiteracy, behaviour and interest. The matching between the initial findings from the preliminary study with the literature reviewed subsequently helped to clearly identify the research problem.

The study was conducted using eight open-ended interviews, which took place in work place offices and lasted for between one to two hours. The interviews were held with state e-government authorities and IT professionals (members of the Steering Committee and Technical Committee); academics (university staff in schools of engineering and computer science); politicians and private sector consultants (Council of Ministers and private companies). Additional data was gathered through informal dialogue, government agency websites, publications and articles. This was then collated with the interview data and analysed using the SWOT tool of analysis. The detail of the analysis and its results is described in Chapter 4 (Section 4.6).

### **Step 2: *Reviewing the literature***

A comprehensive review of the literature was conducted to cover the major field of investigation (e-government) and other related areas throughout the course of the research. In the field of e-government this had to include the background, concepts, scope and settings, challenges and benefits. As the research focus was in the government domain, the researcher considered the literature related to the role of e-government in the public sector. In addition, e-government assessment and stages of growth, models and frameworks developed in e-government and other disciplines (IT and IS) were thoroughly reviewed. More significantly, was the deep review of the key issues that impact upon the adoption of new technology in general, and e-government innovation in particular; such as, organisational and environmental issues. The critique of the literature highlighted the substantive and empirical gaps, as demonstrated by the

lack of information regarding e-government in developing countries and the absence of guidelines and frameworks that could help to overcome some of the obstacles and lead to better levels of adoption.

### ***Step 3: Developing a conceptual framework***

Identifying the research problem and reviewing the related literature enabled the development of the initial conceptual framework. The framework is based on the Technology, Organisational and Environmental (TOE) model defined in the literature and described in Chapter 5. The author constructed the framework and its critical factors according to the initial findings from the SWOT analysis of the preliminary study, combined with the identified factors and key elements from the literature review. The development of the first conceptual framework is a major step in theory building and it is considered a type of intermediate theory (Carroll and Swatman, 2000), that attempts to connect all aspects of inquiry (problem definition, purpose, literature review methodology, data collection and analysis). The development of the initial conceptual framework will help develop understanding of the research problem and lead to the development of the second and third conceptual frameworks. The series of conceptual frameworks will conclude a “web of meaning” (Neuman, 1994) which relates to the main identified concepts and themes.

### ***Step 4: Implementing field work***

As the research progressed, the research methodology was revised and altered to help answer the basic research questions. The author adopted constructivist philosophy and employed a qualitative case study approach. An important decision was to apply the methodology in two phases:

1. Investigate e-government in Sudan at a national level. Collect data, analyse it and then revise the conceptual framework initially developed. This stage took six months to be completed in 2008.
2. Investigate e-government at an organisational level. Collect data from multiple case studies, analyse it and make a final revision and modification of the

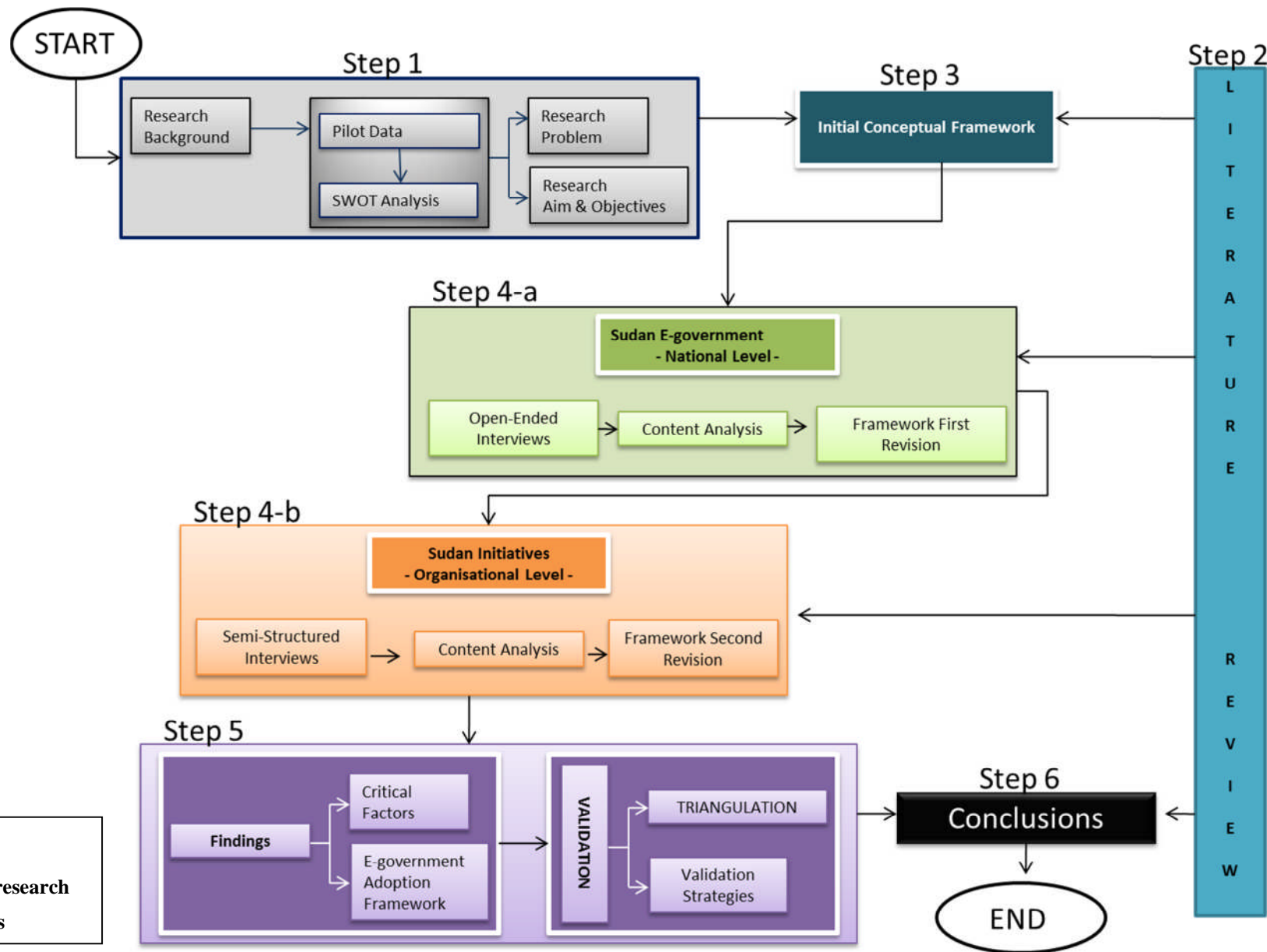
developed framework. This stage was conducted in 2009 and it also needed six months to complete the work.

**Step 5: *Validating the Process and Findings***

In order to validate the methodological process, the author followed five different validation strategies, described in Section 3.3.3.1. At this step the research has reached its aim by identifying the critical factors influencing e-government in Sudan and developing an e-government adoption framework. For external validity, the results of this study are expected to be transferable. Therefore, the author conducted an illustration step using a Sudanese public organisation. The aim of this step was to ensure the flexibility and capability of the framework to guide policy makers in the decision making process. The confirmation at this stage means that the findings of this study can be transferred to similar contexts.

**Step 6: *Drawing Conclusion***

This is the final step of the empirical research design where conclusions were drawn and directions for future work suggested.



**Figure 4-1:**  
Empirical research  
design steps

### **4.3.1 Data Collection**

In this research three methods were used: interviews, document reviews and direct observations. The next section describes the use of each tool in this research.

#### **4.3.1.1 Interviews**

Interviews were conducted according to a designed plan. The plan was to have two rounds of interviews. In the first round the researcher used the open-end type, which took place immediately after developing the conceptual framework. The aim of this round was to reveal the interviewees' perception of e-government and why the government is embarking upon the e-government project, and utilising it as a new tool for processing government operations. Further, to ascertain the issues surrounding the adoption process in technical, organisational and environmental aspects. To obtain a broad opinion, the interviews in this round took place at a national level and the interviewee represented senior people involved in e-government in Sudan. The analysis of these interviews resulted in a significant revision of the conceptual framework, which led to the identification of a list of critical factors.

The new version of the framework was subsequently used in the second round of interviews. Semi-structured interviews were selected this time, as the author was aiming to determine how the factors identified from the first round were involved in reality; and how this influences e-government adoption in public organisations. Closer inspection helped to verify and validate the list of critical factors and hence develop the e-government adoption framework. However, capturing the core meaning and understanding of the information is challenging for the interviewer, (Stake, 1995).

All interviews were conducted personally. Prior to each interview, initial contact was made either directly via telephone or the secretary's office, giving a general background to the research and the type of questions and information needed. Before starting the interview, a covering letter was handed to the interviewee. The letter included the researcher's background and briefly explained the aim of the research. The letter also guaranteed that all information provided would be completely confidential and the

interviewees would remain anonymous. Permission was taken to record the interviews, but the recorder was switched off whenever requested.

The total number of interviews was thirty five (thirteen in the first round and twenty two in the second) Table 4-7 and Table 4-8. The themes of the two rounds were different. The focus in the first round was on perceptions and conceptual understanding. Therefore, more emphasis was placed upon policies and ICT strategies. The focus in the second round was to gain a full description of the various events and initiatives. Conducting the two types of interview was to help reveal the unique story of e-government in Sudan.

**Table 4-7: Round (1) - National level - open-ended interviews**

	Interviewee	Duration	Type
National Information Centre (NIC)	General Director/ (NIC)	2 hrs.	f2f
	Head/ E-government Master Planning Committee	2 hrs.	f2f
	Head/ Training Department	2 hrs.	f2f
	CEO/ (NIC)	1½ hrs.	f2f
National Assembly	Head-Deputy /Media and Communication Committee	1 hrs.	f2f
Private Sector	General Manager/ Private IT Company	1 hrs.	f2f/
	E-government consultant	---	e-mail
Academic	Ex-Vice Chancellor/ Sudan University of Science & Technology	1½ hrs.	f2fl
	Staff/ Electrical Department/ University of Khartoum	2 hrs.	f2f
	Staff/ Computer Department/ Albyan University	1/2 hr.	Telephone
Professionals	General Manager/ Africa Technology City	2 hrs.	f2f
	Member/ Steering Committee	2 hrs.	f2f
	Member/ Steering Committee	2 hrs.	f2f
<b>Total</b>	<b>13</b>		

Table 4-8: Round (2) - Organisational level - semi-structured interviews

No.	Case Study	Interviewee	Duration
1.	Ministry of Higher Education and Scientific Research (MHESR)	Head/ Consultancy Committee	½ hr.
		Head/ University of Khartoum Information Network (CEO)	2½ hrs.
		Head / Sudan University of Science and Technology Computer Centre	2 hrs.
		CEO/ Consultancy Committee	2 hrs.
2.	National Electricity Corporation (NEC)	General Director/ (NEC)	½ hr.
		General Director/ Sales (Acting)	½ hr.
		Director/ Computer Department	1½ hrs.
		Director/ Statistics & Information Department	1½ hrs.
		Director/ Communication Department	3 hrs.
		Member/ Statistics & Information Department	2 hrs.
3.	E-banking System (EBS)	Ex-General Director/ (EBS)	2 hrs.
		Deputy General Director/ (EBS))	2 hrs.
		General Director/ (EFS) ( <i>E-banking Financial Systems company</i> )	1½ hrs.
		IT Manager/ Central Bank	2 hrs.
		EBS Technical Team: Manager/National Switch Services Centre Manager/Financial Network Service Centre Manager/Electronic Cheque Clearance Centre	3 hrs.
		Banker (Private Bank)	1 hr.
5.	Interior Ministry	General Manager/ Information Department	1½ hrs.
		Manager/ IT Department	1 hr.
		General Director/ Khashib Company ( <i>Software Systems for Interior Ministry</i> )	1½ hrs.
		Technical Team (1)	1 hr.
	Total	22	



#### 4.3.1.2 Documents

The advantage of using documents is that they are stable and can be reviewed repeatedly. Therefore, the author was keen to collect all available documents. This included: white papers, studies, minutes of meetings, policies and strategies, presentations, reports, project plans and reference materials available on the internet. Table 4-9 and Table 4-10 show the list of documents collected at the national and organisational level. This material was important to both support and compensate for any limitations that may exist in the interviews, as well as to cross validate the data gathered in the interviews.

**Table 4-9: National level - state documents collection**

<b>White Papers</b>			
<b>No.</b>	<b>Document Name</b>	<b>Year</b>	<b>Source</b>
1.	National strategy	2001	NCSP
2.	Quarter national strategy for ICT industry	2001	NCSP
3.	E-government master plan	2007	NIC
4.	Five-Year Plan for the strategy of the knowledge society (2007 – 2011)	2007	NCSP
5.	The directing plan for e-government	2009	NIC
6.	The NIC Act	2010	NIC
7.	The NIC in brief	2010	NIC
<b>Studies and Presentation</b>			
<b>No.</b>	<b>Document Name</b>	<b>Year</b>	<b>Source</b>
1.	Towards e-government in Sudan	2007	Council of Ministry
2.	Internet market and the essence of development	2007	NTC
3.	NIC governmental websites evaluation	2007	MCA
4.	ICT strategy in Sudan (workshop)	2009	SUST
5.	NIC presentation		NIC
6.	Sudan digital magazine	2011	NIC
7.	Developing internet services in Sudan	2007	Sudan Internet Society
8.	Internet issues	2007	NTC
9.	The importance of Internet services	2007	Private telecommunication company
10	The national ICT report	2011	Ministry of ICT
11	Software industry in Sudan	2009	Albyan College of Science Technology
<b>Meeting Minutes</b>			
<b>No.</b>	<b>Document Name</b>	<b>Year</b>	<b>Source</b>
1.	E-government administration committee	2007	Council of Ministry
2.	Five year plan	2007	NA
3.	Law of informatics crimes	2007	NA
4.	Law of electronic transaction	2006	NA
5.	Technical steering committee	2007	NIC

Websites			
No.	Website Name		
	<ul style="list-style-type: none"> <li>National information centre</li> <li>Council of ministries</li> <li>ICT ministry</li> <li>National telecommunication Corporation</li> <li>Sudatel</li> <li>National digital certification</li> </ul>		

**NCSP:** National Council for Strategic Planning

**SUST:** Sudan University for Science and Technology

**NTC:** National Telecommunication Corporation

**NIC:** National Information Centre

**NA:** National Assembly

**MCA:** Ministry of Council Affairs

**Table 4-10: Organisational level - case studies documents collection**

	Higher Education	E-Banking	Interior Ministry	Electricity Corporation
<b>Documents &amp; Studies</b>	<ul style="list-style-type: none"> <li>MHED E-Government Initiative</li> <li>Virtual Libraries in Sudan Universities</li> <li>SUST strategy for the years (2007-2012)</li> </ul>	<ul style="list-style-type: none"> <li>E-Cheque Clearing</li> <li>Assessment of Online services in the Banking Sector</li> <li>E-banking in Sudan (PhD)</li> </ul>		<ul style="list-style-type: none"> <li>Prepaid study</li> <li>Electricity Information Systems Review</li> <li>Electricity Annual Report</li> </ul>
<b>Website</b>	<ul style="list-style-type: none"> <li>MHED</li> <li>U of K</li> <li>SUST</li> <li>Other universities websites</li> </ul>	<ul style="list-style-type: none"> <li>Central Bank of Sudan</li> <li>Electronic Banking Systems</li> <li>Ministry of Finance</li> </ul>	<ul style="list-style-type: none"> <li>Interior Ministry</li> <li>Traffic Police</li> <li>Kushite Company</li> </ul>	<ul style="list-style-type: none"> <li>National Electricity Corporation</li> </ul>
<b>Presentation</b>	<ul style="list-style-type: none"> <li>MHED ICT Initiative</li> </ul>	<ul style="list-style-type: none"> <li>Image Clearance Cheque</li> </ul>	<ul style="list-style-type: none"> <li>Civil Record – Initiative</li> <li>Sudan Interior Ministry E-Passport System</li> </ul>	<ul style="list-style-type: none"> <li>Electricity Grid Network Control System</li> </ul>
<b>Newspapers &amp; Periodicals</b>		<ul style="list-style-type: none"> <li>Sudan Banking &amp; Finance Academy</li> </ul>		<ul style="list-style-type: none"> <li>National Electricity Corporation Long-Term Plan</li> </ul>

• **HED:** Ministry of Higher Education

• **U of K:** University of Khartoum

• **SUST:** Sudan University for Science and Technology

### 4.3.1.3 Observations

In most case studies conducted, the author was allowed to: meet employees from different departments, formally and informally; tour the offices; watch demonstrations; and visit the database centres. Observations were recorded using notebooks. Notes are useful to bridge any gaps existing in the other tools of data collection.

Figure 4-2 shows the current research methodology selections.



Figure 4-2: Research methodology selection

### 4.3.2 Data Analysis

The author selected content analysis as a method for analysing the data gathered. According to Weber (1995) content analysis uses a set of procedures that ensures valid inferences. It helps to tell the story of the data through analysing the content of the raw data, the themes and main ideas. In this study, a list of categories and themes had already been highlighted in the initial conceptual framework. Therefore, a technique of pattern matching was applied (Yin, 2009); according to Yin pattern matching strengthens the internal validity (2009). Further, the analysis allowed more themes to emerge from the data and hence new factors were identified and the initial framework revised. Another advantage which justifies the selection of content analysis is the possibility to go back to the original raw data and check for missing themes or wrong

categorisation (Woodrum, 1984). Woodrum also maintains that content analysis has the potential to study attitudes, organisations and human relations (1984). However, Yin (2009) argues that in case study research much of the analysis depends upon the author's own style of rigorous thinking. This makes the analysis process prone to researcher bias; therefore, the author took measures to overcome this issue.

### **4.3.3 Validity, Reliability, Transferability**

The analysis in this study reveals two main findings: the critical factors influencing the e-government adoption in Sudan; and the development of the e-government adoption framework for developing countries. It is important to prove rigor of these findings and ensure good quality of research. Therefore, the author measured the three criteria of validity, reliability and transferability using the strategies included in Section 4.1.6. However, it is difficult to ensure the meeting of these criteria in a qualitative research approach (Lincoln and Denzin, 1994). Nonetheless, conducting these measurements helps to check and improve the research quality as well as to achieve dependable conclusions. Different strategies were adopted for each criterion as explained in the following sections.

#### **4.3.3.1 Validity**

- ***Preliminary Study***

In the initial stage of this study the researcher conducted a preliminary study using open-end interviews. The interviews were held with senior executives and ICT policy makers in Sudan. This helped to understand the overall context of e-government in Sudan and identify the problem of e-government adoption in the public sector. The process of data gathering and analysis is described in detail in Chapter 4.

- ***Prolong the Processes of Data Gathering on Site***

In a dynamic environment with continuous changes, it is important to collect data over extended periods of time. This helps to ensure the accuracy of the findings. Therefore, the author decided to collect data and conduct the planned

interviews in two different rounds and at different levels. The duration of each round was approximately eight weeks, and the whole process took over a year in which to conduct all interviews. The multiple rounds of data collection and different stage interviews were highly significant because the political and economic conditions were continually changing. These changes had direct and indirect impact on e-government adoption in Sudan. Without the longitudinal process in collecting the data the author would not be able to observe the impact and confirm the importance of the identified factors.

- ***Employ the Process of "Triangulation"***

According to Robson (2002), triangulation means using more than one method of data collection; such as, documents, interviews, multiple-case studies, secondary data and direct observation. Hakim (1992), claims that combining many sources of evidence makes the case study one of the most powerful research designs. In addition, it meets the need of clarifying the meaning, validating the process and verifying the repeatability of interpretation or observation (Stake, 2000).

The use of triangulation in this study was of great assistance in addressing the potential problems of validity. This is summarised in Table 4-11.

**Table 4-11: Triangulations**

Source of evidence	Triangulation
<b>Multiple Case Studies</b>	Use of four case studies. Each case belongs to a different sector and delivers different type of services. All cases provided important data, experiences and records. The available information helped in confirmation and verification of the identified critical factors of e-government adoption in public organisations in Sudan.
<b>Interviews</b>	Use of open-end and semi-structured interviews. The interviewee positions and experiences enabled the author to obtain valuable information regarding the critical factors and their influence in the adoption process.
<b>Documents</b>	Use of different types of documents collected at the national and organisational level. The documents are with high credibility and contain detailed and updated information regarding the e-government initiatives at both levels. The documents include:  White papers - organisational records - reports - meeting minutes

Source of evidence	Triangulation
	Also include referential materials: Informal documents – presentations – studies - workshops materials - newspapers and periodicals
<b>Secondary Data</b>	Use of secondary data. This provided important information and data supporting and confirming the analysis and findings of the study. The source of secondary data was mainly from : <ul style="list-style-type: none"> <li>• Previous researches and studies</li> <li>• Statistics and surveys conducted by international and national organisations (UN, World Bank, EIU, Arab League, Africa EIGAD)</li> </ul>

#### 4.3.3.2 Reliability

- ***Clarifying***

Clarifying the research findings is a crucial issue, as it allows the reader to understand the author's position and any biases or assumptions that may impact upon the inquiry (Merriam, 1998).

In order to clarify findings in this study, the author showed awareness of any biases that might inform the research at any stage, in addition to the triangulation applied to validate the findings. Yin (2009) suggests that a chain of evidence should be established to increase the research reliability. However, the author also developed a chain of evidence through:

- Keeping correspondents' contacts, interview records, transcripts, research design and procedures in a safe and accessible place. This permits others to inspect any of this material.
- Keeping collected data in well organised forms and records. These records are available for others to access and the data can be easily retrieved for checking or re-analysis.

- ***Engage in Peer Consultation***

This provides an external check of the research process; it means hard and honest questions for the author about the research methods and interpretations

(Lincoln and Guba, 1985). Such consultation, if done systematically, will help to ensure pooled judgment.

In this study the author was involved with the case studies at an early stage. Positive relationships were developed, which helped to maintain regular contact and discussion, facilitating further access when queries arose during the research progress. In addition, continuous debates were held with peers and colleagues. These discussions and debates dealt with a number of issues in the research, such as: research problem, design, methods, interpretation, themes and findings of the research.

#### **4.3.3.3 Transferability**

- ***Rich, thick description***

The author produced full details of each and every piece of information provided during the research time. The use of the qualitative approach helped to gain rich data, with many examples and a comprehensive explanation, providing thick description of the whole process. This can be seen in Chapters 4, 6 & 7.

Reporting details of participants and settings under investigation, in a rich and thick description allows readers to make decisions regarding transferability (Merriam, 1998; Lincoln and Guba, 1985; Erlandson et al., 1993). Therefore, the author asserts that the high level of detail provided in this study will enable readers to determine if the proposed framework for e-government adoption in Sudan can be transferred into other developing countries in the region. Further, whether the findings of the critical factors in Sudanese public organisations can also be considered and listed as critical factors influencing the initiatives in other public organisations with similar characteristics.

- ***Discussion of Key Findings***

According to Holloway (1997), it is crucial to establish the truth and authenticity of a piece of research. Therefore, the author conducted a detailed discussion in order to reject or confirm the research findings.

The design of this study consists of two levels: national and organisational. Thus, the critical factors identified initially were confirmed the first time at the national level and

second time at the organisational level. Furthermore, a cross analysis was conducted in Chapter 10; the cross-analysis helps the researcher to see beyond the initial impressions and find evidence using multiple viewpoints (Eisenhardt, 1989). In this study, the cross analysis allowed the author to compare the findings of the two levels highlighted in Chapter 6 & 7; and also to compare the four case studies analysed in Chapter 7. This helped confirm the importance and significance of the research findings and outcomes. These findings were further linked to the updated literature to confirm their validity and ensure their relevance.

#### **4.4 Summary**

This chapter provided an outline of the research methodology and justified the selection of the research strategy and methods.

The aim of this chapter was to provide an appropriate research methodology for the purpose of the research problem: understanding the challenges facing the up-take of e-government in Sudan and hence developing an adoption framework.

The methodology was based on constructivism. This was considered apposite since the research is seeking to understand the challenges of Sudan e-government through interpreting human perceptions. The case study strategy is discussed and was conducted at a national level (Chapter 6) and organisational level (Chapter 7), through multiple case studies from Sudanese public organisations. This selection was made because: the area of e-government adoption in Sudan has not been studied in sufficient detail; and it allows investigation of technical, organisational and environmental barriers in their natural settings. The author chose the qualitative approach to help understanding e-government in the Sudanese context, using interviews as the main source of data, to allow in-depth investigation. The next chapter provides a background of Sudan (the focus of this research) and highlights its main characteristics regarding e-government initiatives.



## 5 SUDAN CASE STUDY

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This chapter describes Sudan, highlights its background and main characteristics, and gives a general overview of ICT and e-government initiatives in the country. The chapter also presents the SWOT analysis of the preliminary study conducted in Sudan. The findings of the study helped to identify areas of strength, weakness, opportunities and threats that influence e-government adoption in the public sector of Sudan. The chapter is structured as follows:

1. **Sections (4.1 & 4.2 & 4.3):** A brief summary of the main features of Sudan: history, governance, demography and economy.
2. **Section (4.4 & 4.5):** A background description of ICT and e-government in Sudan.
3. **Section (4.6):** A presentation of the preliminary study. This includes the data analysis and findings.
4. **Section (4.7):** A summary of the chapter.

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### 5.1 Sudan History, Location and Area

#### 5.1.1 History

Sudan was a British colony that achieved independence on 1<sup>st</sup> January 1956, being one of the first countries in sub-Saharan Africa to gain independence from the colonialism that occurred in Africa in the 1860s. Throughout its history, Sudan has been divided because of the Arab heritage, associated with northern Sudan; and its African heritage in the south. The two regions are: "...divided along linguistic, religious, racial, and economic lines and the cleavage has generated ethnic tensions and clashes, resulting in civil war." (Metz, 1991).

The civil war between the North and South lasted for more than two decades, being the longest civil war in the twentieth century. The violence, famine, and disease during the war killed more than 2 million people, forced an estimated 600,000 people to seek refuge in neighbouring countries, and displaced approximately 4 million others within Sudan (US. DoS, 2011). The conflict held back the country's social and economic development, leading to political instability and an endless cycle of weak and ineffective military and civilian governments (Mahdi and Dawson, 2007). In 2005 the Comprehensive Peace Agreement (CPA) was signed; and in 2011 a referendum took place to determine whether the south region should remain part of Sudan or become independent (World Bank, 2011). Southern Sudan voted in favour of independence and on the 9<sup>th</sup> of July 2011, the country was split into two separate states (CIDA). The UN estimates that approximately 2 million displaced people have returned to South Sudan. The division affected the politics of the whole country and led to dramatic changes in terms of demography and economy.

Unfortunately, since 2003 Sudan has been beset by another conflict in the western region of Darfur. According to the UN this has driven two million people from their homes and resulted in more than 200,000 deaths (UN, 2007). The Darfur problem has led to one of the most serious humanitarian crises in recent world history, badly affecting the economic development of the entire country (Young, 2004).

### **5.1.2 Location and Area**

Sudan is located in the north-eastern part of Africa (Figure 5-1), and occupies the central region between Africa and the Arab World. The location results in Sudan's unique characteristics, as it is the main passage between north and south of Africa. Sudan was also the main route for the pilgrim and trade convoys that crossed from the west of Africa to the Holy Lands in Makah, until the middle of the current century (CoM, 2011).

Africa consists of two regions: North and Sub-Saharan African (SSA). The location of Sudan classifies it as one of the 21 SSA countries. The northern part of Africa is economically and culturally comparable to the Middle East (Ifinedo, 2005). SSA (apart from South Africa) is associated with poverty, high rates of illiteracy, civil strife and

chronic under-development (Ifinedo, 2005). Sudan is also part of the Arab and Islamic World.

The total area of the Sudan is approximately one million square miles (about 2.5 million km<sup>2</sup>), making it the largest country in Africa and the Arab World and ninth largest country in the world Figure 5-1. Its area constitutes 8.3% of the total area of Africa. Sudan borders nine countries: Central African Republic, Chad, Democratic Republic of Congo, Egypt, Eritrea, Ethiopia, Kenya, Libya, and Uganda.



Figure 5-1: Map of Sudan

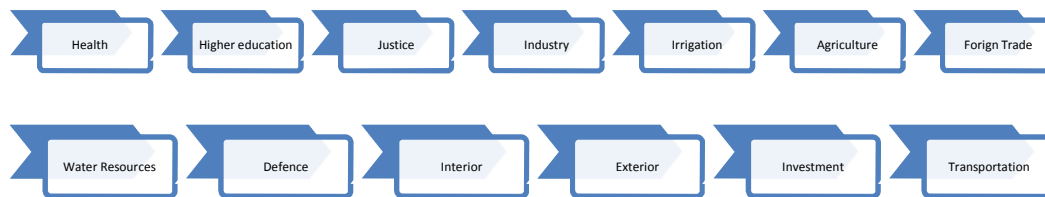
## 5.2 System of Governance

According to the 2005 Interim Constitution, the system of governance is federalism. There are three levels of governance:

- *National governance*: for protecting the sovereignty of Sudan, guaranteeing safety of its lands and enhancing the welfare of its people.
- *State governance*: forms the 25 states covering the whole of Sudan and provides public services to citizens
- *Local governance*: available all over Sudan.

There are 25 states: 15 in the North and 10 in the South (Sudan Government, 2005).

There are 13 different areas of responsibilities in the government administration hierarchy (Figure 5-2), and 92 central organisations. The number of workers in public services was estimated to be 700,000 in 2000, excluding those in the Army and police (UN, 2004).



**Figure 5-2: Government areas of responsibilities**

## **5.3 Sudan Demography and Economy**

### **5.3.1 Sudan Demography**

Sudan is home to more than 40 million people. According to the census conducted in 2008 (CBS), 42% of the population were in the age range, 0 to 14; and 52% were between 15 and 59. The illiteracy rate is above 50% and unemployment stood at 15% (CBS, 2008).

Sudan's population is one of the most diverse on the African continent. It has a very wide, multi-ethnic and multi-culture makeup. There are close to 600 ethnic groups and over 100 spoken languages in the South. This makes effective collaboration a major political challenge. Most of the urban areas are in the northern part and the 30 million Sudanese who live in this region are predominantly Arabic-speaking Muslims. Arabic is the official language and Islam is the state religion, Table 5-1.

### **5.3.2 Sudan Economy**

Sudan is classified as one of the least developed countries in the world, with an average per capita income of US\$350 (CIDA, 2005). However, oil production in the 1990s, turned the Sudanese economy into one of the world's fastest growing, with total GDP at

current market prices increasing from just over US\$15 billion in 2002 to almost US\$37.6 billion in 2006. The economy depends largely on the agriculture and oil sectors. Together these two sectors form about 64% of the total local GDP (EC and ACP, 2008). However, in the late 1990s the telecommunications sector broke through after rapid development to be the 4th largest component of the economy (Rayis, 2008).

Sudan started to make changes and modernise its basic infrastructure, in transport, energy and water, as a precursor to industrialization. According to Weissbach (2008) the rapid growth in Sudan's economy is transforming the nation. It was reported in the Sudan-Europe forum held in Khartoum that: "If Sudan is allowed to continue on its current course, it could positively impact the entire region, and set an example for development throughout the continent." (Weissbach, 2008).

Nonetheless, there are many obstacles to economic growth in Sudan. In October 1997, the U.S. imposed comprehensive economic, trade, and financial sanctions. More importantly: the Darfur conflict; the aftermath of two decades of civil war in the south; the lack of basic infrastructure in large areas; and a reliance by much of the population on subsistence agriculture, remain major challenges to Sudan.

The public and private sectors are now both playing a growing role in the economy. The government is trying to encourage the private sector to participate in the national economy. In the last few years, the government has introduced a number of initiatives to promote investment and capital flow in the development process. They passed a number of laws to encourage and attract investors; such as, exempting or reducing the taxes on some imports. Recently the country began to move forward and transfer from a socialist to a market-based economy (CoM, 2011).

**Table 5-1: Sudan Information**

Element	Figure
<b>Total area</b>	2,505,810 sq km
<b>Population</b>	42,292,929 (growth rate: 2.5%);
<b>Languages</b>	Arabic (official), Nubian & other local dialects
<b>Ethnicity/race</b>	black 52%, Arab 39%, Beja 6%, foreigners 2%, other 1%
<b>Religions</b>	Islam (Sunni) 70% (in north), indigenous 25%, Christian 5% (mostly in south and Khartoum)

<b>Literacy rate</b>	61% (2003 est.)	
<b>Economic summary</b>		
	GDP/PPP (2005 est.)	\$84.93 billion; per capita \$2,100.
	Real growth rate	7.7%.
	Inflation	11%.
	Unemployment	18.7% (2002 est.).
	Labour force	11 million (1996 est.)

## 5.4 ICT in Sudan

Sudan's experience during the last two decades in both building and capitalising on ICT as a gateway for sustainable development is a landmark in the country's history (Hamdy, 2007). Sudan is deploying ICT technologies as an enabler (or instrument) of development. To this end, the government drafted a 25 year National Strategy for the period 2007-2031, to promote the ICT industry. In the year 2001 the government approved the national strategy for building the information industry in Sudan. The strategy is embodied in:

*“the firm foundation of information industry ... leading to the widest dissemination and utilisation of information, ... which shall contribute to achieve economic growth, job opportunities ... and eradication of poverty”* (NTC, 2008).

The Sudanese government is committed to the objectives determined by the WSIS held in Geneva in 2003 and in Tunisia in 2005, as well as the internationally agreed development goals; including those contained in the Millennium Development Goals (ESCWA, 2009). Sudan has made considerable efforts to accelerate the implementation of WSIS action plans; the most important of which was the establishment of several ICT institutional bodies to play the role of regulating, planning, training and executing ICT projects and initiatives. Table 5-2 presents most official ICT institutions formulated by the government.

Table 5-2: ICT institution bodies

No.	Year	Institution	Role
1.	1993	<i>The establishment of the Sudanese Telecommunications Company (SUDATEL)</i>	Its main services include provision of mobile services, fixed-line services, carrier and wholesales services. Represents a major step to develop the Sudanese telecommunications infrastructure, and to exploit the Sudanese revolution in communications and information
2.	1996	<i>The establishment of the National Telecommunication Corporation (NTC)</i>	NTC was formed with a view to provide an effective regulatory framework and adequate safeguards to ensure fair competition and protection of consumer interests
3.	2001	<i>The establishment of the National Telecommunications Council</i>	Carries the heaviest burden in presenting plans and supporting programs for implementing the strategy of the State
4.	2002	<i>The establishment of the Ministry of Sciences and Technology</i>	The Ministry is responsible of supervising IT, namely in areas of research and technology
5.		<i>The National Information Centre (NIC)</i>	The Centre was established as a response to the WSIS goals and recommendations. It is one of the largest institutions working under the command of the Ministers' Council (at a time) and considered as the main body responsible for implementing most IT projects including e-government
6.	2010	<i>The establishment of the Ministry of Information and Communication Technologies</i>	The duty of the ministry includes laying down the policies of communications. The Ministry's main focus is to facilitate the communications services

Source: (ESCWA, 2009; Sudan and NTC, 2008)

The strategy called for the adoption of financial, economic, commercial, educational, industrial and information policies that encourage and support the targeted objectives (ESCWA, 2009). The main objectives articulated were:

- Developing national human capital in knowledge technologies
- Achieving e-readiness and bridging the digital divide
- Facilitating individuals to enrich the national content and political involvement of citizens through virtual organizations and e-voting
- Building an electronic government and civil society organizations

An important outcome from these themes was promoting the role of the private sector and encouraging private investment. Privatisation in the telecommunications sector, which took place in 2005, had a major impact in: decreasing telecommunication costs; increasing the rate of development in the field of information technology; and narrowing the digital divide between the rural and urban areas (Mahdi and Dawson, 2007; Nour, 2011).

As a result, by the year 2010 there were four mobile and fixed lines telecoms companies with more than 21,000 km fibre optic, 18 million subscribers (45% of the population) and 4.2 million Internet users. The income in 2009 reached US \$3 billion, making the Sudan telecommunications sector one of the fastest growing markets in Africa (World Bank, 2011).

The Sudanese government also recognised the importance of developing policies and procedures that guarantee a well-developed ICT infrastructure through legislation; vital to increase citizens' confidence and trust. In this regard, the government managed to enact new legislation, including the Computer Crime Act 2007 and the Electronic Transaction Law. In addition, it introduced standards for ICT hard technology and software. An important achievement was establishing the Computer Career Council.

Sudanese people from various backgrounds and with different qualifications all showed interest in adopting ICT, and the government gave support. The ICT community established Sudanese IT and Internet societies and most Sudanese newspapers are now published online. In 2010 the ICT community started producing the first weekly ICT magazine. Public and private TV channels broadcast ICT programs (ESCWA, 2009), aiming to raise awareness among citizens. This led to pressure on the government from the citizens and the "aware community" requesting more access to information and a greater role in decision making.

Despite the progress achieved in ICT in Sudan, it is still immature compared to other developed or rapidly developing countries. The complex issues surrounding Sudan politically, economically and socially have hindered many initiatives. There are obvious difficulties facing ICT initiatives in such a developing country, with comparatively few resources and low levels of funding from state and local governments. Some citizens



may be looking forward to being part of the information society and even be demanding electronic service delivery, but this is a small percentage of the society. More than 40% of people in Sudan are below the poverty line (CIA, 2008) and their priority is a better quality of life. This meant that the attention of policy and decision-making leaders drifted towards other problems of peace, security and citizens' basic needs. The difficulties facing ICT in Sudan can be generalised in the following challenges (NCSP, 2001):

- The vast and wide geographical area of Sudan
- Bureaucracy
- Organizational structure
- Education and training system
- Public awareness
- Legal framework
- Institutional framework
- International and regional partnership
- Allocation of funds

As funding is a major obstacle for ICT projects, which are expensive by nature, the government established the Informatics Support Fund in 2003, with a remit to fund informatics development projects in Sudan (ESCWA, 2009). This Fund provides support for the development of the communications infrastructure. It also seeks to provide services in different areas in Sudan, attempting to bridge the gap between urban and rural areas in the country.

#### **5.4.1 ICT Projects and Applications**

Internet services started in Sudan in 1998, but it was only in the early 2000s that the government began to give real attention to ICT and involve IT at a large scale in government operations and processes. The number of applications and projects are still limited and are yet to mature. As is the case in many countries, the first utilisation of ICT was through the private sector. E-business in the private sector prompted the government to adopt its own e-business, but it is still limited when compared with government economic activity in general.

Table 5-3 lists some ICT projects and applications. They are at different levels in their progress, but all projects played a significant role in the development and adoption of ICT in the government.

**Table 5-3: Selected ICT projects in Sudan**

No.	Project	Achievement
1.	Computer to each family	Computers were issued to 50,000 State employees through their unions and organizations at reduced prices
2.	Labs of secondary schools	Distribution of 1104 computer labs to 1104 schools, by '14' Computer for Every school, started in 2007 and on-going
3.	Universal Service Centres	Construction of 153 centres, 108 were provided with computers. 2433 people were trained and graduated from these centres
4.	Dual Universal Service Centres	20 USC in technological learning institutions each annexed with e-clinic
5.	E-government support project	800 computers to 16 states to establish data centres to be connected to the National Information Centre (NIC) and later on linked to its Electronic Data Centre (EDC)
6.	Computer literacy project (e-citizen)	Contributing to training of around 200,000 citizens through e-citizen project.
7.	Project Sudanese universities and the Virtual Library	Network was established by the Universities of Sudan to support the virtual library. 1430 of computers to 29 universities in 2006
8.	Support the National Archives	financial support by buying Scanners, providing 120 computers and completing the network equipment in 2007
9.	Support to training centre of Ministry of Public Training	Supported with 30 Computers for training staff.
10.	ICT research laboratory	Establishment of new research centre at the University of Khartoum. Work is underway for establishing two new centres in other universities.

## 5.5 Sudan E-government

According to the Sudanese government, e-government means:

*“Simplifying services and procedures and exchanging information electronically among the different community sectors, as well as prompting governmental work efficiency.”* (NIC, 2007a)

E-government is a significant objective, if not the most, in the nationally approved strategy for ICT in Sudan. The government recognized the important role that e-government can play in terms of economic and social development and in 2001, the President of the Sudan announced the decision to embark upon e-government. The announcement indicated that the country was ready at the national and organisational level to move forward and make the transformation to the new government paradigm.

The mission of e-government in Sudan is to achieve citizens’ satisfaction through providing information and services with distinction, transparency and quality; and to contribute in reaching sustainable development. This mission was adopted in the e-government vision which focused mainly on: good governance, social and economic development and ICT utilisation.

*“Realising excellence in governance and creating enlightened community for achieving social and economic development through the proper use of advanced information and communication technology”* (NCSP, 2001)

The government was also committed to the e-government aims and objectives highlighted by forums in the African region. Sudan is one of the 19 countries belonging to the foundation, Common Market for Eastern and Southern Africa (COMESA). In December 2007, COMESA developed an e-government framework under the Regional ICT Support Programme (RICTSP). The strategic aim of the project was in targeting effective use of ICT in order to reduce the costs of trade and investment; thereby to stimulate economic growth, reduce poverty, reduce the digital divide and contribute to the regional integration agenda (COMESA, 2010).

The e-government project in Sudan is the responsibility of the National Information Centre (NIC). This centre was formed in 2004, and it is in charge of all ICT related projects within government (NIC, 2007b). Initially the centre worked under the command of the Council of Ministers. After the creation of the Telecommunications and Information Technology Ministry, the NIC became one of its administrations.

### **5.5.1 Motivation**

A government decision to adopt e-government in its public organisations can only be taken if there is strong motivation to encourage the transformation to the new government paradigm. Such a decision must be driven by compelling reasons which may appear in many aspects:

#### ***Political and Cultural Motivation***

E-government requires meeting many of the political and cultural goals of the Sudan National Strategy. Political opinion is behind the government's desire to spread the culture of peace, social integration and making the values of equality, transparency and freedom a reality. These issues have been topical for some time and citizens hold different opinions. However, the government argues that enabling e-government tools will encourage citizens' participation, increase their trust and allow democratic practices. For this, the government is seeking to draft and pass the necessary legislation to govern informatics; the rights and freedom of use of information; and communications technology, in accordance with international conventions.

The majority of the population is made up of young people. This young generation is more interested in electronic communication and they often prefer to communicate using e-mails, text messages or voice messages. The electronic services introduced in schools and education were very well received and compelled the government to deliver more services electronically. Introducing more initiatives will need well trained and skilled people, which will improve the human capacity of the whole nation.

### ***Economic Motivation***

The national strategy has the clearly stated aim of establishing an economy that is able to make best use of advanced ICT tools. Sudan has a poor economy, and the promise of e-government to increase Return On Investment (ROI) is very attractive to the government. There is a strong notion that e-government leads to reduction in cost and time, and decreases levels of corruption. This belief has encouraged public organisations to compete for and launch e-government initiatives as a tool to enhance efficiency and increase productivity.

New trends in the Sudanese economy towards liberalisation and privatisation are being boosted as a result of the advantages of the open-market, globalisation and opportunities for participation in international economic development.

The objectives targeted in the national strategy (to improve citizens' quality of life and provide better life-chances), are stimulating the government to endorse competition and business concepts.

### ***Managerial Motivation***

The new federal system brings about distribution, sharing and delegating of authority and information. E-government is a catalyst for the government to improve its administrative reforms, reduce bureaucracy and simplify complex operational processes.

### ***Geographical Motivation***

Sudan covers the largest area in Africa and the Arab World. Public organisations have branches scattered all over the country and services have to be delivered to all citizens. Those from far afield struggle to receive services due to cost in time and money; this encourages the government to deliver services electronically. The climate of Sudan can be severe and impact upon transportation, making communication between the local state and federal government very difficult and sometimes impossible. The government adopted e-government as a solution to facilitate communication between different parts of the government.

### 5.5.2 Sudan e-readiness

In 2006 the government conducted a comprehensive nationwide survey exploring the e-readiness for the country. The survey covered most of the essential aspects:

#### 1. The readiness of the government sector and the infrastructure

- Readiness of ministries
- Readiness of States
- Readiness of communities

#### 2. The infrastructure and accessibility to the world wide web

#### 3. The readiness of the country

#### 4. The readiness of the economy and the business sector

- The economic environment
- Policies and economic systems
- External investment
- Competition in the IT market
- The software market
- E-business

As a result, many describe the progress achieved in the last ten years in Sudan (in terms of IT infrastructure, human capacity and legislation) as remarkable. A survey supported by *InfoDev* for ICT and education in Africa, stated that:

*“Sudan’s experience of the last two decades in building and capitalizing on ICT as a gateway for sustainable development is a landmark in the country’s history. The institutional, legal, and regulatory frameworks were reformed to advance ICT as tools for integrating the economy into the global market”* (Hamdy, 2007).

However, internationally the situation is different. Sudan was ranked 150, 161 and 154 out of 192 in UN e-readiness assessment, (UN, 2010; UN, 2008b; UN, 2005)). Sudan rates as below average in the e-readiness assessment. The world average for 2008 is 0.4514; and for the North Africa region it is 0.3403; while the Sudan e-readiness index scored only 0.2186 (UN, 2008b). Applying the UN five stages Maturity Model, Figure 5-3 shows the assessment in service delivery of five selected countries, including Sudan. The ranking of these countries in the UN e-readiness report are: Canada: 10, UAE: 34, Kenya: 79, Yemen:122, Sudan:161.

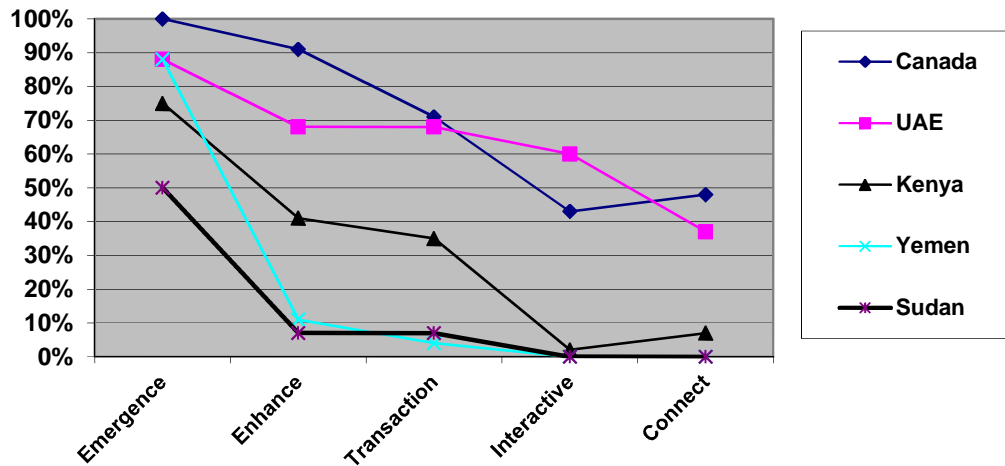


Figure 5-3: E-government service delivery - selected countries

Adapted (UN, 2008b)

### 5.5.3 Risks of e-government adoption

The plan for implementing e-government, designed by the National Information Centre (NIC) in Sudan, has highlighted a number of risks that may impede the development of e-government adoption (NIC, 2010). These risks include:

- Weak support from senior politicians
- Economic boycott
- Resistance to change in civil service
- Inadequate funding
- Lack of trust to use ICT technologies.

### 5.6 Preliminary Study

The aim of the preliminary study is to gather information prior to the full research study. The information may be limited, but it is usually valuable and sufficient to help to identify the research problem.

The author conducted this preliminary study with the goal of finding out how e-government in Sudan started; why the government is making such a commitment; and what is it expecting to gain.

The preliminary study found that government transformation and adoption of the new technology was shaped by the cultural, economic and political climate in Sudan, as well as technical issues and challenges. The aim of the research was refined to provide guidelines and direction, to help in the decision making process, through developing a context-based framework. The findings from preliminary study directly contributed to building the initial conceptual framework.

The study took place in Sudan on October 2007, during which time 8 open-ended interviews were conducted. As the interviews were aiming to understand perceptions and views in order to build the big picture, the author targeted senior and high ranking officials from different backgrounds and with different interests. These included: politicians, academics and practitioners.

It is important to note that the preliminary study was conducted at the beginning of the research, but dramatic changes happened later regarding the political and economic situation in Sudan, along with developments in the ICT field. Nevertheless, the later findings supported the propositions identified in the preliminary study.

### **5.6.1 SWOT Analysis**

The acronym SWOT stands for Strengths, Weaknesses, Opportunities and Threats. The Strengths and Weaknesses represent the internal factors and the Opportunities and Threats represent the external factors. The SWOT is not meant to give specific solutions, but to help to understand why strategic planning in an organisation could fail. This can be of great assistance in the future decision-making process of the organisation.

However, SWOT analysis has been criticised as being too subjective and of over simplifying problems. But this technique was considered sufficient by the author to achieve the aim of the preliminary study. The SWOT provides the necessary outlines to



identify the research problem and research aim. Moreover, the author is seeking to understand perceptions and hence subjectivism is more appropriate.

### 5.6.2 Open-ended Interviews

The selected interviewees either head, or are members of the various committees responsible for policy and decision making for e-government, or ICT in general, (Table 5-2). The author also formally and informally met IT professionals, engineers, officers, academics, politicians and private consultants.

**Table 5-4: Preliminary study open interviewees**

	Interviewee	Duration	Type
Experts & Consultants	Strategy planning expert	1/2 hrs.	Telephone
	Software engineering expert	1½ hrs.	f2f
Officials	Deputy Manager Director/ NIC	1 hr.	f2f
IT Professionals	Member/Technical Steering Committee	2 hr.	f2f
	Member/Training Committee	2 hr.	f2f
Academic	Staff/Faculty of Engineering/UofK	1½ hrs.	f2f
	Staff/School of Computer Science/UofK	2 hr.	f2f
Politicians	CEO/Council of Ministers	2 hrs.	f2f
<b>Total</b>	<b>8</b>		

### 5.6.3 Preliminary Study Findings

The main findings of this study are summarised in Table 5-5. The description of each element of the SWOT analysis is presented as follows:

#### Strengths

- The recommendations of the 1989 conference on economic development identified the necessity of including the private sector to strengthen the national economy. The outcome of this conference was the establishment of the Sudan Telecommunications Company (Sudatel), from a collaboration between the public and private sectors; a unique venture in the Arab World and African Region at that time. This enterprise ended the monopoly in the telecommunications industry, and since then the government has granted

licences to several Internet Service Providers (ISP). The country's new policy aimed at encouraging the private sector by means of providing ICT investment in different areas.

- A key strength was the formulation of the 25 year national strategy. The strategy had a clear vision for achieving an informatics society, strongly supporting the development of ICT and designating that it should be involved in all segments of the economy. This was followed by the formulation of the National Strategy for building the ICT Industry. Applying the e-government project was at the heart of the ICT strategy.
- This ICT strategy represents the starting point of the telecommunications revolution in Sudan. A modern telecommunications infrastructure was established and expanded all over the country, creating communication networks in most parts of Sudan. This allowed the execution of some phases of the Sudanese Universities Network to facilitate their linking with the Arab and International Universities Network and the implementation of a number of IS; such as Bank, Passport and Identity Card systems.
- An important step was establishing the National Information Centre (NIC) at the Council of Ministries, and IT Units at Ministry level, as well as founding a ministry of science and technology. The government has adopted a number of initiatives to eradicate ICT illiteracy and emphasised the need for establishing database centres. Incorporating computer, information technology, and communications in the Educational Revolution Programs has been central to the strategy.
- Although the level of awareness and commitment is not as high as the government intends, many politicians are very supportive and willing to help in adopting e-government. Top managers are competing to improve their organisations' performances.

### **Weaknesses**

- The cultural setting in Sudan is a very complex mixture of race, language, traditions and religion. The society is fragmented between: Arabs and non-Arabs, Muslims and non-Muslims, Arabic speakers and hundreds of domestic dialects. This fragmentation makes it difficult to achieve reasonable levels of citizen satisfaction.
- The poor economy is considered as the number one obstacle to ICT projects. The country lacks basic infrastructure and the general budget is unable to cover the basic needs of citizens. Hence, finance decisions mostly support and give priority to development projects; frequently taking from ICT budgets if there is a shortfall.
- Since independence, Sudan has enjoyed only a few spells of political stability. The long wars and many conflicts in different parts of Sudan, the national disputes causing major social and economic problems, in addition to the great number of refugees and displaced persons, have all distracted the attention of politicians and senior leaders. Moreover, the embargo and sanctions against Sudan led to the isolation of the country and weak relations with the international community. This prevented Sudan from having any role in the global network economy.
- There is a high percentage of illiterate, unemployed people with low levels of education. In addition, social norms of Sudanese people could minimise the benefit of using ICT technologies. For example, people sometimes believe that their applications will never be processed unless they have a face-to-face conversation. They can deal with privacy issues in an irresponsible way and easily exchange passwords. Moreover, Sudanese people had little trust in technology or the government; this explains the resistance among citizens as well as public organisations employees.
- Public organisations, in terms of structure and management systems are very traditional. The move to new forms of networked governance is not easy when

the public sector is characterised by bureaucracy, centralisation, and a large complex structure. The complexity of procedures slows down the transformation process and weakens the level of innovation acceptance.

- Data quality in the public sector in Sudan suffers from various problems. The data is sometimes inaccurate, inconsistent, and incomplete. Senior managers have pointed to the problems they had to face as a result of incorrect data structures and definitions.
- Lack of resources exists in many areas, but the lack of ICT skills and well trained staff had created a lot of resistance. On the other side the public sector keeps losing the well trained and professionals in the IT field, due to low income.
- Despite the huge efforts and progress in the telecommunications infrastructure, it is still lacking essential components and it is far from satisfying the needs of the ICT market in the country. Many aspects of ICT technology are still very weak and the digital divide is huge across the country, being much worse in the rural areas and civil war zones.

### **Opportunities**

- E-government initiatives have been introduced in education institutes, rural and urban areas, and civil services sectors. People were able to realise its benefits leading to additional demand for e-government facilities. As a result the government launched new initiatives, increased the number of computer centres and kiosks, and provided more training. All this, has and still, contributes to building an information-based society, which is a major aim in the strategic agenda.
- The economic conference held in Sudan in 1999 that recommended privatising the communications and information sector in Sudan, provided the opportunity to the private sector to launch initiatives, revive the telecommunications sector and modernise it. Moreover, it is creating a competitive market for ICT components and lifting standards in the sector.

- The open nature of e-government provides a golden opportunity for Sudan to make itself known to the outside world and remove some of its isolation. If the new environment of e-government is well utilised it can help in building new channels for relations and networks, in addition to facilitating information and knowledge exchange and transfer.
- The e-government capability of interaction and participation will strengthen democratic values and practices. With well-designed government websites citizens, businesses and employees will have the opportunity to communicate and participate in the decision-making process.
- Launching e-government means introducing changes in the organisations' structure and procedures. This is supposed to simplify its procedures and improve integration between departments and across organisations. More importantly, it will help public organisations to provide accurate, well formulated and up-to-date data. Because of the vast geographical area in Sudan, most organisation leaders and top managers support the adoption of e-government as it solves the problem of communication and service delivery in the many branches scattered over the country.

### **Threats**

- A low standard of living, due to low income in the public sector is leading to more emigration of employees from public organisations, particularly among IT experts and highly skilled ICT professionals.
- The continuous and rapid growth of ICT technology can be challenging for Sudanese institutes and public organisations to cope with in terms of training, adoption and implementation. Ultimately this will lead to a wider digital divide.
- The consequences of political instability in the Middle East and neighbouring countries could always be a threat for the economy and political situation in Sudan. In addition there is uncertainty in relations between Sudan and the international community, which may lead to more sanctions and continued isolation.

**Table 5-5: Summary of Preliminary study SWOT analysis**

S	W
<ul style="list-style-type: none"> <li>• Formulation of national ICT strategy with clear vision and objectives</li> <li>• Growth and steady progress of economy</li> <li>• Establishment of modern Telecommunications infrastructure</li> <li>• Competitive local IT companies</li> <li>• Important role of private sector in the economy and investing in the telecommunications sector</li> <li>• Political support and will</li> </ul>	<ul style="list-style-type: none"> <li>• Digital divide</li> <li>• Low awareness among citizens &amp; political leaders</li> <li>• Lack of budget</li> <li>• Lack of IT management</li> <li>• Computer illiteracy</li> <li>• No security control</li> <li>• Weak effect of legislation &amp; policy</li> <li>• No clear measurements and evaluation</li> <li>• No priorities in implementation</li> <li>• Wide multi-culture and multi-language society</li> <li>• Resistance to change</li> </ul>
O	T
<ul style="list-style-type: none"> <li>• Improving quality of life through building an information-based society</li> <li>• Information and research opportunities</li> <li>• Regional influence, especially in Arab and African countries</li> <li>• Linking local and government departments with the centre</li> <li>• Increase in investment</li> <li>• Exchange of information</li> <li>• Role for business and private sector</li> <li>• Creating a knowledge-based economy</li> </ul>	<ul style="list-style-type: none"> <li>• Cannot cope with IT development</li> <li>• Cannot satisfy market demand</li> <li>• No guarantee for sustainable financial banking</li> <li>• Losing key staff</li> <li>• Unstable political conditions</li> </ul>

## 5.7 Summary

This chapter gave a general overview of Sudan and revealed the complexity of the cultural mix and unstable political conditions. It also demonstrated that the economy is turning from poor to fast growing, with the telecommunications sector playing a pivotal

role. The chapter also highlighted the history of introducing ICT, the main projects and achievements, and explained the motivation for adopting e-government into the public sector in Sudan.

The preliminary study was presented, including the SWOT analysis, which addressed the strengths, weaknesses, opportunities and threats. The findings helped to define the key issues and elements relating to the uptake of e-government in Sudan. The findings from this study together with the factors discussed in the next chapter helped to build the initial conceptual framework.





## 6 E-GOVERNMENT IN SUDAN – NATIONAL LEVEL

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This chapter reports on the national level e-government framework factor analysis, as described in step 4-a (Chapter 3, Figure 3-1).

The goal is to confirm the significance of the identified factors in the conceptual framework and explore any new key factors and elements that might influence the adoption of e-government in Sudan at a national level. The analysis reflects the thinking and strategic directions of the e-government policy makers. Accordingly, this chapter includes four main parts:

1. **Section (6.1):** Data analysis procedure. This part describes the analysis steps, from start to finish, including data processing and structuring of findings.
  2. **Section (6.2):** Analysis of factors. The analysis in this part was guided by the initial conceptual framework and therefore consists of three main sections: (1) Analysis of the Technology factors; (2) Analysis of the Organisation factors; and (3) Analysis of the Environment factors.
  3. **Section (6.3):** Sudan e-government. This part highlights the Chapter findings and shows how the analysis helped to answer the main research question of building a holistic picture. The findings were compared with the reviewed literature and a conceptual matrix was built.
  4. **Section (6.4):** Revision of the initial framework. The findings in the previous section called for revision of the framework which was modified in light of the new complete picture.
  5. **Section (6.5):** Summary of the chapter.
-

## **6.1 Data Analysis Procedure**

Content Analysis is adapted so as to be used in this study to identify, tabulate, code, and categorise the primary patterns in the data.

In the previous chapter the author developed an initial conceptual framework; the factors already classified in the framework were coded and presented as the first set of codes. In the analysis process the primary data was pattern matched with the pre-coded factors, while the new identified factors and emergent themes were classified and new codes were created as needed.

Miles & Huberman (1994) distinguish between the two analytical approaches of “variable-analysis” and “process analysis”. In the variable approach, the data is segmented into small chunks, coded, retrieved and a researcher will look for conceptual patterns. The process approach will give more consideration for time, sequence and settings. Although both modes are considered useful, this research adopts the variable approach as it emphasises the conceptual understanding (Miles and Huberman, 1994).

As discussed in Chapter Three, the author used a combination of resources to collect the primary data, including: interviews, informal discussion, documents, and observation. This data was then analysed following the analytical steps suggested by Creswell (2009) and illustrated in Table 6-1. The data analysis is an iterative process, and by moving backward and forward between the analysis steps a researcher obtains a better understanding and explanation of data (Creswell, 2009; Miles and Huberman, 1994). Therefore, a number of iterations were made during the analysis process especially between the steps 1, 2 and 3.

Table 6-1: Analysis steps

No.	Step	Description
1.	Preparing data for analysis	<ul style="list-style-type: none"> <li>- Transcribing interviews and translating them into English.</li> <li>- Organising the documents and observation notes</li> <li>- Prepared tables according to the pre-coded set of factors</li> </ul>
2.	Reading through all the data	The author went through the whole data and wrote general ideas about its information and the participants thoughts.
3.	Coding process	Using the prepared tables and fitting the findings into the pre-defined codes. Newly identified topics and findings were given new codes
4.	Identifying themes/factors	Narrating a story around the new findings through connecting the different themes and factors.
5.	Interrelating themes/factors	Performing an analytical discussion about the factors and their interrelation, the multiple perspectives and themes.
6.	Interpreting the meanings	The author gave meaning to the data, through comparison with the literature and the author's own understanding and interpretation

Step 3 “Coding Process”, in Table 6-1: Analysis steps is further detailed in Table 6-2. The procedure in both tables is applied again in (Chapter 7) for analysing the primary data collected at the organisational level.

Table 6-2: Coding steps

Coding Steps	Description
Decide the level of analysis	A word, set of words and phrases all accepted to constitute a concept.
Decide how many concepts to code for	Although there was a pre-defined set of codes, great flexibility was introduced during analysis and new concepts were accepted for coding. As a result the initial 3 categories and 12 factors resulted in 3 categories with 12 factors and 26 sub-factors
Decide whether to code for existence or frequency of a concept	The coding is for frequency as it indicates the importance of the factor, but since most interviewees are leaders and key executives, concepts with one existence were not undervalued
Decide on how to distinguish among concepts	The scheme of coding had a high level of generalization. Words around, or with the same meaning, are coded under the same category
Develop rules for coding your texts	Two rules were created for translation to assure consistency: <ol style="list-style-type: none"> <li>1. Make implicit concept explicit</li> <li>2. Revise translation with professionals</li> </ol>
Decide what to do with irrelevant information	Irrelevant information is simply ignored in this analysis
Code the texts	This was done manually by the researcher as neither the number of concepts nor the number of interviews were too large to manage

The following sections report on steps 4, 5 and 6 of the analysis based on the TOE aspects of the initial framework and its associated steps.

## 6.2 Technology Factors Analysis

This section describes the technological factors at the national level in Sudan and includes: ICT strategy, IT Infrastructure, Information and Data, and Interoperability. As mentioned previously in the Literature Review, these are deemed essential for e-government adoption in the context of a developing country.

### 6.2.1 ICT Strategy

The National Strategy of Sudan, concerning long term issues, is designed for 25 years. Every five years a “new term strategy” is formulated separately and revised. Accordingly, the strategy is constructed at a high level following a top-down approach. Most interviewees, pointed to the National strategy as providing a solid foundation that gave strength and power for ICT implementation in Sudan. A senior member in the steering committee said:

*“It is because of the National Strategy, its policies, vision and objectives that Sudan witnessed the ICT revolution.”*

The ICT strategy section, in the National Strategy, addressed the many issues of: vision, main mission, objectives and adopted values in the ICT context. Moreover, it has named the most important projects to be conducted, such as: e-government, e-education and e-business. The e-government project then became a strategic goal in order for the government to achieve good governance and leadership. In 2003 a technical committee was formed to follow up the implementation of the ICT strategy.

However, not everything in the ICT strategy was adequately addressed, for example: e-readiness issues, evaluation and change of management. Also the strategy did not emphasise strengthening citizen-participation through specific initiatives and programs.

In terms of design and formulation of the strategy, professionals and experts in strategies noted the absence of a clear approach and specific methodology of designing the strategy. A strategy expert stated:

*“We do have good hopes of designing a powerful strategy ... nonetheless, the current strategy needs structuring and formulation”.* It was emphasised though that formal strategic behaviour is not part of the Sudanese culture.

The author also observed that it is difficult to judge if the values and objectives addressed have been fully or partially achieved. This is due to the absence of a proper evaluation or assessment tool for e-government and ICT initiatives in general. In a press interview the deputy head of the NIC stated: *“...conducting evaluation is not part of our culture”.*

However, many interviewees argue that the major achievement of the ICT strategy in Sudan can easily be observed and recognised in its technological aspect.

#### ***Key findings***

- A clear strategy that strongly supports the ICT initiatives
- E-government is a strategic goal
- The strategy had a top-down approach
- Missing issues: strategy assessment and citizen-participation

#### **6.2.1.1 Vision**

The vision describes the broad understanding of e-government and what the Sudanese government is aiming to adopt. Politicians and officials have been arguing that the government is now moving towards a more citizen-centred government. Moreover, the citizens are not simply considered as recipients of government services, rather they are seen as the owners of these services. Therefore, the e-government vision was described as:

*“Society satisfied with how it is served by its government.”*

A respondent from the NIC argued: *“We meant this vision to be precise and give a simple and strong message at the same time for our citizens”.* The vision as described by some officials: *“...reflects our true aims and intentions.”*

The author argues that this is a very wide and over-ambitious vision, which needed to be determined by a clear mission and objectives. The current e-government mission as

written in the strategy referred to the utilization of ICT as a powerful tool for efficiency and effectiveness and to achieve sustainable development. The objectives on the other hand addressed the important values of equality, transparency and good governance. The main objectives are stated as follows:

- Encouraging balanced services (rural/urban, economic/environmental, centre/regions)
- Improving the quality of life for poor communities
- Strengthening good governance and broadening public participation
- Facilitating, improving and reducing the cost of services delivered for stakeholders
- Providing accurate information for decision makers and researchers
- Providing a better environment for investors

Although the identified objectives explicitly showed the consideration of all citizens everywhere, a respondent from the private sector commented

*“We are used for setting well designed strategies in developing countries ... but in reality things might be different ... for example, there is no noticeable progress in terms of decision participation and improving standards of living ... nonetheless, there has been some progress in providing technology and information access for citizens in rural areas. Also, public services are recently with better quality, but new achievements are witnessed in ICT government investments.”*

From the author’s point of view, there must be a clear and well-designed plan that is easily understood by e-government participants to allow the fulfilment of the objectives mentioned earlier.

#### ***Key findings***

- |   |
|---|
| <ul style="list-style-type: none"><li>▪ The vision indicates the moving towards a citizen-centred government</li><li>▪ The vision is too wide and might be over ambitious</li></ul> |
|---|

### 6.2.1.2 Plan of Action

The setting of ICT strategy in Sudan was not complemented by a central plan of action. Many interviewees expressed their concerns about not having a clear plan of action with the naming and prioritising of specific projects. This was repeatedly remarked upon by interviewees. For instance:

*“The main problem is that we do not have an action plan. This is weakening the implementation of the strategy”* (steering committee member).

At a later date however, a Master Plan for e-government was proposed which identified five different phases:

***Phase one:*** Preparing studies and pioneer projects

***Phase two:*** Basic preparation, developing the methodology of managing the projects and determining standards and frameworks of policies and technological bases

***Phase three:*** Infrastructure projects, such as: National network, national database, electronic payment and electronic signature

***Phase four:*** The e-government phase. To build an e-government portal and services application. Also building of communication points for e-government and developing methods of evaluation

***Phase five:*** Project sustainability: quality, confirmation and continuation in the educational and managerial procedures.

The so called “master plan” has not detailed the relationship between the proposed initiatives and the defined e-government vision and objectives. Moreover, this plan was associated with poor estimation of timing and without any cost estimation or prioritisation of initiatives. Also there are no clear plans designed to overcome the organisational, political or cultural challenges. In addition, the evaluation section which emphasised the importance of conducting regular assessment and monitoring mainly



concentrated on the ROI evaluation and rarely pointed to methods and tools for assessing service delivery efficiency and citizen satisfaction. However, the interviewees hardly refer to this as an action plan.

***Key findings***

- No overall action plan at the national level
- Initiatives introduced are not being executed according to their significance

### **6.2.2 IT Infrastructure**

The IT infrastructure is a key element in the technology factor. It includes the many components of hardware, software, connectivity and database management systems. However, most of focus in this factor was directed towards building a modern digitalized national telecommunications network in Sudan. ICT professionals claim that this was the most important and challenging component for a developing country like Sudan. Further, they argue it is the first step in bridging and narrowing the digital divide between rural and urban areas. As a result of the huge effort in this element, the telecommunications sector in Sudan became the fastest growing fixed telephony market and the fastest growing telecommunication sector internationally, with an annual growth of 30%. There has also been a major increase in the number of mobile subscribers. It is reported that telephone density rose to 45% in 2010, meaning an increase of more than 283 times from early 1990. A senior IT manager explained:

*“ ... everyone is able to use the mobile ... you do not have to be educated or have special skills ... in fact large number of illiterate people are using the mobiles to conduct their own business ... because they only need to learn very basic and simple skills.”*

Further potential exists because of the extended national electricity network, especially in rural areas. This helped to expand the government network and connect 14 out of 26 states in Sudan (14 out of 16 in the new map). The establishment of the powerful network allowed the provision of a wide range of electronic services, such as: exchange of money through the mobile phone; online job search and telemedicine; in addition to the potential for video conference and online meetings.

A senior IT manager said ...”these services had a huge impact in terms of time and cost reduction and they were very useful at a very high level ... for example, sometimes ministers coming from states faraway are unable to physically attend the council of minister meetings, also it was used for conducting TV interviews and reporting from war zone areas ...”.

Another interviewee said “... the revolution witnessed in the telecommunication in Sudan ... has truly improved the life of citizens and it is strongly helping in bridging the digital divide and building the information society”.

According to government white papers and official documents, Sudan has made remarkable progress. However, in comparison to world international statistics, Sudan is still below average. Table 6-3 illustrates the figures of the UN Telecommunication index for the year 2010.

In terms of Internet connectivity and software components, Sudan has very low speed Internet services with limited capacity, and also the software systems and applications are underdeveloped and not used in large-scale.

**Table 6-3: UN e-readiness, Telecommunication index - selected countries**

Country	Index value	Estimated Internet users per 100 inhabitants	Main fixed telephone lines per 100 inhabitants	Mobile subscribers per 100 inhabitants	Personal computers per 100 inhabitants	Total fixed broadband per 100 inhabitants
<b>UK</b>	0.7164	79.62	54.24	123.41	80.23	28.21
<b>Greece</b>	0.3829	32.60	53.65	123.90	9.43	13.53
<b>Malaysia</b>	0.3438	62.57	15.89	100.41	23.15	4.82
<b>UAE</b>	0.5434	65.15	33.63	208.65	33.08	11.79
<b>Sudan</b>	0.0711	9.19	0.86	27.05	10.71	0.11
<b>Egypt</b>	0.1256	15.42	14.73	50.62	4.60	0.94
<b>Nigeria</b>	0.0594	7.27	0.86	41.66	0.85	0.02

Source: (UN, 2010)

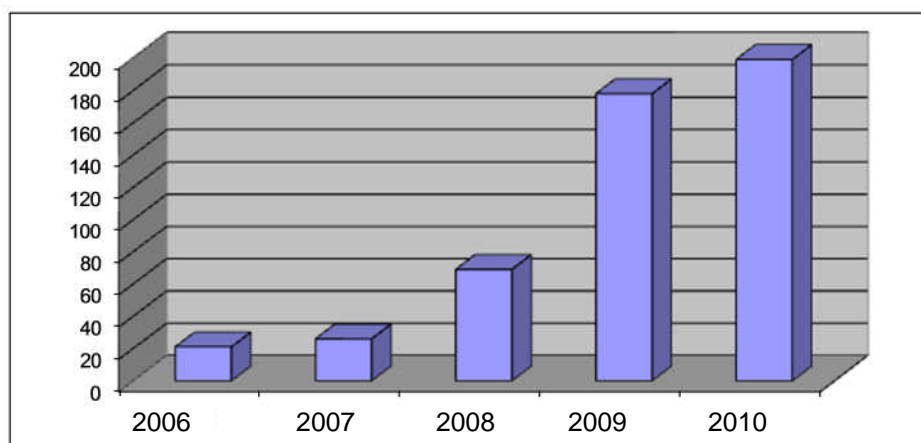
### Websites

The number of government websites has risen significantly from 2007 to 2010, as shown in Figure 6-1. All 30 federal ministries have established their websites. However, the websites have poor layout, poor design and the information is not regularly updated. More importantly, most of these websites have only static information and often only one-way communication. Although this seems to be affecting percentage usage, a senior manager explained:

*“As far as the websites are concerned, they were weak due to the lack of the national standards; yet from the beginning we were concerned with establishing employee friendly apparatuses, then web-presence ... presently we are focusing on web-content”*

However, it is important to point out that many government agencies’ websites are much more advanced and well-designed than the ministry or sector websites. A senior manager clarified:

*“... this is mainly because some government organisations are more powerful than the whole ministry or sector ...for instance the Oil organisations, the National Television, the electricity, all these organisations have a very high profile”*



**Figure 6-1: Government Websites**

**Key findings**

- Powerful national telecommunications network
- The network covers most areas of Sudan reducing the gap between rural and urban areas
- Providing electronic services is changing the style of life in Sudan
- Low level of using advanced software systems and low Internet services
- Poor layout of government websites and limited online services

**6.2.3 Information and Data**

Information has been classified by the Sudanese government into four categories: (1) Information for public access with no limits. (2) Information with limited access. (3) Confidential information. (4) Highly confidential information

E-government is related to the first type, which is information published about the government. This information is not sensitive in terms of security and confidentiality. The government is keen to publish such information to show itself to citizens and the world. Although the government encourages this data to be distributed through websites, mobile phones and call centres, it is also aware of the poor quality of available data.

In a large country like Sudan, it is easy to observe that there is a problem in capturing, storing, archiving, sharing and managing data. IT professionals who understand that e-government is about handling information believe that without standard classification of information and documentation, it is very hard to realise the benefits of e-government. An IT manager stated:

*“We need to build strong and powerful database systems, refine public data and carefully manage information ... otherwise e-government will be meaningless and the public sector will have poor levels of effectiveness”.*

According to the comments of number of IT professionals, the quality of data in the public sector in Sudan suffers from a variety of problems. The accuracy of data can be very low, or old and not regularly updated. Sometimes it simply does not exist. A senior

manager voiced concerns arising from the problems they had to face as a result of incorrect data. A member of the technical committee claimed:

*“We need data to be collected from the field to edit our databases. The data has to be collected according to well defined structures and definitions and follow specific standards”.*

This was highlighted later by NIC staff member who said

*“We are totally aware of the data problem in Sudan. Therefore, the NIC has prepared standard forms for data collection. As a first trial 1000 copies of these forms were distributed across the different states and special training was provided for local staff. The training aims at understanding the new formats and procedures of filling and handling of data. Additional training was provided for techniques of collecting data and types of approaches to obtain information from citizens, especially in rural areas where people might be reluctant to offer personal information”.*

As Sudan has been growing rapidly in the telecommunications business, it had to take further steps in terms of information management and utilization of advanced technologies. Therefore, the ministry of ICT introduced the Geographical Information System (GIS) and launched a number of Total Access Centres (TAC) across the country. Both projects consider the needs of the citizens and provide public information with high quality.

***Key findings***

- |   |
|---|
| <ul style="list-style-type: none"><li>▪ Clear problems in data quality and accuracy</li><li>▪ No well-defined structure for data collection</li></ul> |
|---|

#### **6.2.4 Interoperability**

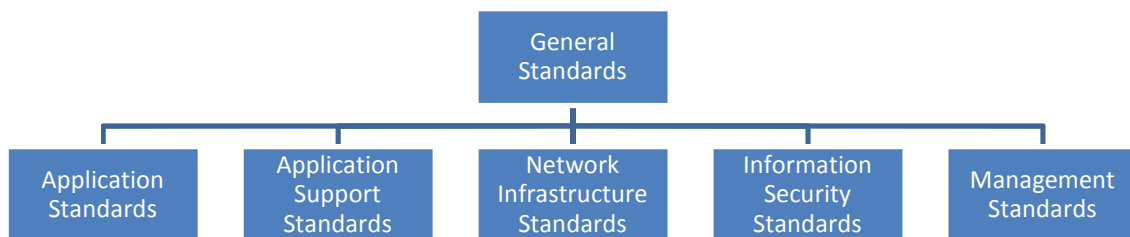
Many projects have been carried out at different government ministries and their attached units, but it is not clear yet if the applications and systems installed will be able to successfully interoperate. At the moment the initiatives are scattered and isolated. An IT manager said:

*“At the beginning the thinking was narrow and participants were looking for quick results... so, the issue of interoperability was policy makers and organisation managers ignored the issue as they were unaware of the importance of it; even IT managers underestimated the consequences of neglecting the issue of interoperability at an early stage ... however, soon interoperability will appear as a major issue ... the problem of solving interoperability can be very costly.”*

Real consideration of interoperability issues actually started at a late stage whereas factors of security, standards and open source received substantial attention at national level.

### **Standards**

The draft master plan for e-government in 2007 included a separate section for e-government standardisation. The proposed framework, shown in Figure 6-2, included standards for five different areas. According to the e-government policy the standards should be based on existing government ICT resources and works.



**Figure 6-2: Standards framework**

A senior manager in the NIC said: *“We understand that without uniform standards overall e-government effectiveness cannot be achieved.”*

The manager further explained that the NIC, in collaboration with the National Telecommunication Corporation (NTC), formulated many committees for setting hardware, software, training and information security standards. These include standards for:

- Software and web development; software procurement and usage of licences; and system analysis
- Network and hardware specifications
- Fileservers; PCs and laptops, (types and capacities)
- Confidentiality; insurance; security policies and management (security levels and usage of anti-viruses)
- Geographical Information Systems (GIS)

A senior member in the NIC described the work in standardisation and said: *“We are not trying to reinvent the wheel, but to customise according to the requirements of the Sudanese citizens.”*

However, according to the author’s observations, the actual issuing of technical standards was relatively late, which may have had an impact on the interoperability of the various systems.

### **Security**

The percentage of Internet usage and Internet Penetration is increasing significantly in Sudan. Hence, security became a critical factor in ensuring information and data privacy and protection. The NIC made a step forward and established a special department for Information security. The department is responsible for keeping information safe and secure at all times, as well as developing and determining security standards and measurements. The NTC also established the CERT Centre, with a vision “for a secure online community”; tasked to raise security efficiency to protect information and computer networks. Therefore, the centre takes action against any security incident, and acts as an advisory service for citizens and companies in any case of information crime.

However, some obstacles highlighted in this aspect are:

*“The necessary background to deal with security problems threatening our computer networks, application systems and public information is still low among employees in public organisations...”* (Technical committee member).

*“Citizens and civil service employees lack the required knowledge and awareness of information privacy and security ... this can cause a lot of harm, therefore public organisations and civil societies should work together to tackle the problem”* Academic Staff.

As yet no major security incidents have been reported. This is mainly because e-government is at an early stage and online services and e-payment are still very limited.

Another significant advancement has been the establishment of the National Committee for Electronic Authentication. The committee managed to create Sudan Public Key Infrastructure (PKI), which is helping in building trust in e-services. According to Head of the Committee this is very important because there is a deeply held belief that all government information is vulnerable and exposed.

***Key findings***

- Isolated systems without technical capabilities of compatibility and interoperability
- Late issuing of technical standards
- Relatively low level of security and lack of know how
- Establishment of PKI and digital signature for secure electronic authentication

## **6.3 Organisational Factors**

This section provides a description of the organisational factors as identified in Chapter 3, comprising: organisational culture, human resources, top management and change management. E-government participants agreed on the importance of the organisational issues, describing the organisation as the entity or unit through which the e-government's initiatives can be introduced.

### **6.3.1 Organisational Culture**

The organisational culture is a complex issue for e-government policy and decision makers. They are fully aware of the required change and necessary replacement of old management systems and structures. This will necessitate a change of norms; new ways



of thinking; and the learning of new skills. Correspondingly, this requires a change in the mind-set of the top managers and employees in the organisation.

*“The sense of having a government with “citizen-focus” is still absent in the government mind ... the civil officer does not understand the concept of serving the citizen or that this is part of his job. On the other hand the citizen is not contributing by holding the government to account ...”* (steering committee member)

#### **6.3.1.1 Sharing of Information**

Recognition of the value of information increases the demand for its provision and sharing. According to a senior government officer:

*“This fact is clear for managers at high national levels, this might not be the case at an organisational level where a culture of sharing and collaboration can be different”.*

Another respondent declared:

*“It is a matter of competition between organisations ... the understanding is that this information is unique ... why share with others and lose prestige, power and importance ... and give other organisations the chance to progress and be in a better position”.*

However, technical people had a different opinion. A member of the technical e-government committee explained:

*“From a technical point of view we are working hard to build national databases that are open for access, unifying application systems and enforcing the use of open source ... this is mainly to facilitate and allow sharing and exchange of information in a fast and convenient way”.*

Another technical member argued: *“we are not expecting any resistance to prevent the exchange of information from technical and IT professionals in public organisations ... this might happen amongst managers and other staff members ... for IT people this is the core of their work ... their real enjoyment is when they experience successful*

*exchange of information between organisations and branches scattered all over the country ... it is a technical challenge that they would like to overcome”*

#### **6.3.1.2 Resistance to change**

Change is a must in life, but the transformation for e-government is huge and has major impact in politics, economics, culture and social life. It has been reported that:

*“This can be seen through the rise in unemployment; loss of markets; decreasing power of authorities and top managers; breaking-up of previous teams and groups of work; lower income for individuals and institutes; and criticism of previous work. Moreover, there is a possible political dimension arising from those holding an opposite opinion who may behave irrationally”.*

The author contends that these reasons are sufficient to create high resistance and confrontation among different sectors in both society and government. Some suggestions were reported in order to counter some of the resistance; there must be a clear strategy in place. The new system has to be well explained and transparent, whilst providing information and participation. The timing and environment have to be considered as well, with opportunities provided for those who could be affected. For example, the reengineering process in the main headquarters of one of the ministries faced a lot of resistance. After couple of months the ministry announced a new training programme and asked for full details of people’s qualifications; the training was provided and the updated information allowed for a restructuring and redistribution of the employees.

#### ***Key findings***

- Information is considered a significant value in e-government
- The culture of sharing information exists amongst top managers and IT personnel
- Competition between organisations discourages sharing of information
- There is high resistance to change to the new forms of e-government
- The change affects the political and cultural values

### 6.3.2 Human Capacity

#### 6.3.2.1 ICT Skills and Training

One of the major areas of concern in the national ICT policy is human capacity development. This is important for e-government adoption and will prove to be very useful. However, this will require a sizeable training programme for all the country's public sector personnel. A member of the steering committee commented:

*“We are very aware of the fact that ICT skills and training are key factors for e-government adoption”.*

Another member from the NIC also mentioned:

*“Providing training at all levels from basic ICT skills up to advanced and professional training are all top priorities for the NIC”.*

A number of reports show that there are several useful projects underway, including: “a computer for every family”; “a lab for every school”; and “a laptop for every university lecturer”. These projects proved to be very valuable and provided opportunities for training and the learning of basic ICT skills. More than 100,000 computers were distributed during these projects. However, the most important project related to ICT in the public sector of Sudan, was “Eradicating Computer Illiteracy for State Employees”. The project adopted different methods and considered the different ages, levels of education and specialities of participants. A large leap in ICT literacy was witnessed in a short period of time. The aim of the project was to promote a culture of ICT usage amongst government employees, eradicate their computer illiteracy and help them to get rid of their fear of using computers and new technology.

The NIC is the main body responsible for training all government employees; so far, employees of more than 10 ministries have been trained. The NIC also launched training centres in other states and by the end of 2007 there was a total of 117 centres, whilst the number of graduates was 130,855. The number of trainees exceeded 8000; including state leaders, ministers, consultants, deputies, general secretaries and other employees. The Minister of Information and Communication Technology announced:

*“We are aware that this number is relatively low, but in order to satisfy the rising demand for skilled and well trained employees we will continue training public sector employees until we achieve our ultimate goal ...”*

Although the training now seems to be more systematic and many public, private and NGOs are providing training with multi-dimensions and at multi-levels, there are still some challenges facing these initiatives. Interviewees showed awareness and expressed their concerns about the many obstacles facing the training programs and projects. A major challenge is the huge digital divide between rural and urban areas in terms of computer literacy and access to the Internet. Despite the multiple programs and initiatives introduced to provide ICT training at different levels, the number of skilled, trained staff competent with the requisite ICT remains very limited. A member of the training unit in the NIC remarked:

*“We provide reasonable levels of training for employees in the different sectors and organisations. We even offer training abroad for staff to gain advanced ICT skills, but it often they quit after short time and prefer to move into the private sector rather than take government positions”*

#### **6.3.2.2 ICT in Education**

The national policy for ICT in education was launched in 2002 and in 2004. Accordingly, ICT was introduced into secondary education curriculum following the goals declared in the ICT summit in Geneva. There are plans to incorporate ICT at all levels by the year 2015. The aim of the new policy was to integrate ICT into education and training at all levels by facilitating ICT training programmes in order to satisfy educational and employment needs. Nonetheless, the ICT infrastructure, limited numbers of skilled staff and weak preparation delayed the progress of many initiatives. A steering committee member claimed:

*“... there must be good preparation, a thoroughly designed plan that addresses all requirements and needs before the start of any initiative, or it will be more costly to repair the damage ... one example is the large amount of money spent preparing computer laboratories for some primary schools in rural areas ... after taking*

*measurements and purchasing equipment it was found that the electricity grid did not reach the school areas ...”.*

Another interviewee gave further examples:

*“Some schools requested preparation for sizeable computer labs to satisfy the high number of pupils ... the school was not able to start using their labs because they had no trained staff”.*

However, many respondents argued that there has been considerable progress in terms of ICT education. Many of these projects were co-ordinated with the UNESCO and other international organisations. Table 6-4 highlights some of these projects.

**Table 6-4: ICT education projects**

Initiative	Description
<b>Computers in educational institutes</b>	The Ministry of Education has started providing schools and teachers' institutes with computers. An order to import 10,000 or more computers has been placed to provide the rest of the educational institutions with computers. There is an initiative for developing an educational management information system.
<b>The development of an ICT system</b>	The system will connect schools, process exam corrections, and display the grades of the Sudanese Certificate on-line.
<b>EMIS Project</b>	This project will connect school localities and states on the national level. The project will start in 2007 after signing the agreement.
<b>Open University of Sudan Development</b>	CfBT Education Trust is a leading education consultancy and service organisation that has undertaken two consultancies for the Open University of Sudan in Khartoum, providing training for trainers and advice on the curriculum for the OUS on its recently introduced distance learning programme to improve the methodology and subject knowledge of English-language teachers working at primary and secondary schools throughout the country.

In higher education the number of graduates in all ICT disciplines is growing by 3-4 thousand each year. However, according to a senior member of staff in Computer Science:

*“The number of skilled and highly trained staff who are well acquainted with the ICT tools is still limited. The current status of the local software industry is not satisfactory.*

*It suffers from lack of proper management and financing, but the availability of well-educated young men and women has encouraged local and foreign firms to invest in new ventures in the software business”*

***Key findings***

- Systematic ICT training program for all government personnel
- Strategic aim to eradicate ICT illiteracy
- Lack of highly skilled government employees
- Incorporating ICT in all levels of the education curriculum
- Positive role of ICT graduates in software business

### **6.3.3 Top Management**

#### **6.3.3.1 Awareness and Commitment**

The government is taking responsibility for raising awareness among individuals and within public organisations. It has announced its commitment to adopt new technologies and reengineering processes for the benefit of efficient and effective government service delivery. Awareness and commitment have been highlighted as priorities in the ICT strategy and were part of the e-government master plan. The aim of raising awareness was to provide citizens and government employees with the necessary knowledge and skills for interacting with the new working environment. In this respect many activities took place in several areas; for example: running of seminars, workshops and conferences. These events take place at different levels and are conducted in many parts of the country. Many interviewees referred to the “Information Forum” as an important annual event which was held eight times, each time in a different state and attended by key executives, ministers, local government officers and IT professionals. In 2011 Sudan hosted the 15<sup>th</sup> regional FP7 Euro-Africa ICT Awareness Workshop. Several awareness workshops have already been organized within the framework of the Euro Africa-ICT Initiative, in order to enhance the participation of African organizations in FP7 collaborative projects. The Sudanese media is also contributing in raising the level of awareness through dedicated programs on TV and radio, as well as articles in newspapers, specialist IT magazines and websites. Further, the government encourages

the establishment of Internet and Information societies and NGOs, and supports them both financially and with 'know-how'.

The ultimate goal of raising the awareness of government officials is to ensure their commitment; an important factor in guaranteeing continuity and sustainability of e-government development. Respondents reacted differently to this issue; some believed that lack of commitment is due to lack of awareness and recognition of e-government benefits and outcomes. On the other hand, some argued that top and key leaders' commitment is shifted toward other issues and major problems facing the specific ministry or organisation.

Other interviewees describe the situation in a differently, saying that many leaders and top managers are clearly aware of the potential value of e-government. They emphasise that people with a strategic way of thinking and wide scope of understanding are present in most Sudanese government organisations. What is not available is the style of leadership to pull the initiatives together, and enthusiastically drive them towards successful adoption.

#### **6.3.3.2 Brain Drain**

The "brain drain" phenomenon is severely affecting the public sector. An IT manager complained:

*"Losing IT staff and experts threatens the success and completion of e-government initiatives".*

To explain the phenomenon many respondents reasoned that it is not just low wages that pull top managers and professionals out of the public sector. The style of work in the public sector still suffers from bureaucracy, rigidity and low levels of participation. Intellectual people cannot tolerate the control, slowness and rigidity in decision making and operational process. An IT consultant commented:

*"They [top leaders] prefer to move to more flexible environments where they can find better chances of creativity".*

**Key findings**

- Multiple activities for providing awareness programmes through different channels
- Inadequate commitment among top managers
- A phenomenon of losing IT staff to the private sector
- The style of management work leads to more brain drain

### **6.3.4 Change Management**

Change management is seen as the most difficult task facing public organisations when replacing existing, traditional procedures. This is because each and every staff member has to help and support the change in organisation management. A senior manager stated:

*“The planning and designing of change management for complex organisations is hard enough let alone applying and implementing such change.”*

#### **6.3.4.1 Bureaucracy and Flexibility**

The move to new forms of networked governance is not easy when the public sector is characterised with bureaucracy, centralisation and a large and complex structure. Many interviewees agreed that the government systems are bureaucratic, slow and not yet ready to accept innovation. One interviewee said:

*“Our public organisations are characterised with high levels of bureaucracy and this is a huge challenge for top managers to make the change”*

However, some seem to be more optimistic. A senior manager said:

*“All newly established government organisations are built according to the modern organisation structure. As for other organisations, they are responsible for taking decisions and making suitable changes to enable modernisation in order to cope with the new features of the government”*



These comments referred to the decision making at organisational level, which is another challenging issue. Taking decisions in the Sudanese public sector context is very difficult. The procedures are inflexible and this rigidity creates inefficiency in the decision making process. According to one interviewee:

*“The aim of these procedures is to avoid errors and mistakes in the decision process; in fact, it is causing delay and damage that is very hard to overcome”*

Another interviewee explained further:

*“Despite the need for introducing on e-government tool ...complexity, inflexibility and bureaucracy are already hindering organisations from improving their efficiency. However, we are always trying to study other experiences and best practices in the region, but the real benefit was achieved due to collaboration with the private sector, which offered very good lessons in terms of managerial methods and procedures.”*

A number of interviewees pointed out that the public sector in Sudan controls and delivers most basic services for its citizens and remains far from being fast, efficient and flexible. But, they also highlighted the need to consider that the public sector always acts in a different way from the private sector.

#### **6.3.4.2 Business Process Reengineering**

BPR is a radical change in an organisation's process management to improve its performance and increase its efficiency. An important step in Sudan was the establishment of the re-engineering committee. A member of the committee complained:

*“In this committee we coordinated with the Bureau of Work Administration ... however, after some time we were stuck, because instead of designing for re-engineering processes we were simply trying to enhance the current working system.”*

The government of Sudan is encouraging public organisations along two lines: building Office Automation systems; and adopting BPR. The plan is to apply both concurrently; Office Automation is a base for BPR, whilst at the same time BPR directs the building of Office Automation systems. It has been reported that, if BPR is adopted properly it

will decrease headcount and increase productivity. This is because BPR will enforce the rethinking of processes, which may lead to the removal and/or automation of some process steps, as well as the reengineering of a part or the whole of the process flow. The report also adds that successful implementation of BPR facilitates parallel execution of independent processes in an organisation. Also it can reduce time spent between sequential processes. However, so far the positive experiences of implementing BPR in the region, in addition to the successful examples (although limited) in the private sector have motivated more public organisations to apply BPR and Automated Systems.

***Key findings***

- Complex and bureaucratic management systems
- The process of decision making is slow and difficult
- Awareness of the importance of BPR
- Learning from experiences in the region and the private sector

## **6.4 Environmental Factors**

This section describes the environmental factors which, relatively, have been less examined in the literature, compared with technological and organisational factors. In this study the environmental factors include: political, cultural economical and regulatory.

### **6.4.1 Political Environment**

The introduction of e-government will allow citizens to access government information and thereby give them the opportunity to participate in decision-making. According to UN e-readiness report (2008), the e-participation in Sudan was 0%. Norris (2001) states that the internet will help politically marginalized citizens to: “...raise their voices high in policy processes.”

Equally, it is an opportunity for national government to link local government departments with the centre. This is very beneficial in a large country like Sudan, having 26 federal states which all need to communicate with the centre.

#### 6.4.1.1 Politician Support

E-government readiness starts with political will. Some politicians in Sudan argue that the government has recognised the important role that ICT can play in the socio-economic development of the country. Hence, ICT is receiving strong political backing and most of the recent ICT initiatives that emerged in the last few years have been either introduced or adopted by the various national government institutes or organisations.

However, many interviewees expressed other views: *“... politicians can play a vital role in e-government adoption ... yet the political leaders’ support is not as strong as it should be, in fact sometimes the political will and commitment is extremely weak, due to lack of awareness and lack of the conceptual understanding of e-government”*.

Various participants point to politicians’ commitment as an important determinant of e-government success. A politician said:

*“... politicians’ commitment in a country like Sudan means secure funding and sustainable support through the different stages of e-government progress and development.”*

On one hand, e-government concepts and values of transparency, accountability and democracy, will not be attractive to politicians and leaders in a country with high levels of corruption and a non-democratic system (where accountability is not part of the culture). However, on the other hand many political leaders show an interest and a strong desire to support e-government as a powerful tool to enhance government efficiency and improve its effectiveness.

#### 6.4.1.2 Political Stability

Since independence in 1952 Sudan has enjoyed only a few spells of political stability. *“The long wars and national disputes ... caused huge social and economic upheavals ... which are seen in the destruction of infrastructure and the great numbers of refugees and displaced persons”*.

This political unrest and civil war is hindering the nationwide implementation of development programs. Further, political and financial decisions are largely influenced

by the surrounding economic and civil conditions; so decisions will not go in favour of initiatives like e-government, e-health or other similar projects.

However, recent peace agreements are helping to bring more stability and security to the country. This is providing opportunities for policy makers to focus on the country's development and service improvements. According to a senior manager, more benefits are expected.

*“Sudan is moving towards a pluralist and more democratic system and it is adopting more open and free values ... e-government is needed to strengthen the democratic practices, public accountability and public participation in the decision making process ... however, this will be difficult without political stability”.*

***Key findings***

- Strong political decisions have been taken in favour of e-government
- More support from politicians is needed as they play an vital role in introducing and adopting e-government initiatives
- Politically unstable conditions are hindering the adoption process

#### **6.4.2 Cultural Environment**

The large diversity in Sudanese culture is a clear feature. It has been reported that:

*“The wide mixture in Sudanese society is adding strength and richness to the e-government initiatives ... it is also adding more challenges and obstacles ...”*

According to some managers, cultural differences (in terms of behaviour, beliefs and attitudes towards ICT) are creating more problems and challenges for the adoption of e-government in Sudan.

Other cultural features were also highlighted by the interviewees. Participants pointed to some attitudes and behaviours that affect the use of ICT, such as: the lack of how to deal with information; the poor handling of the technological equipment; and the low level of innovation acceptance. Experts and managers regard this as due to the two main factors of illiteracy and low levels of education.

#### **6.4.2.1 Hofstede Dimensions**

This section examines more cultural issues through the use of the four dimensions identified in Hofstede Cultural Model.

	Power distance	Uncertainty avoidance
Technology	<ul style="list-style-type: none"> <li>The establishment of the new telecommunications infrastructure was carried out by the government's national telecom company. The company was totally state-owned and Internet services were also provided by government agencies. The negative impact on ICT was:               <ul style="list-style-type: none"> <li>Limited type of telecommunication services</li> <li>High price of telecom and Internet services</li> <li>Low level of competition and marketing</li> </ul> </li> </ul> <p>( However, this was changed later in 2005 when the government announced the end of monopolisation)</p>	<ul style="list-style-type: none"> <li>The replacement of the old telecommunication system and traditional ways of connectivity into a modern digitalized system in a huge country like Sudan, with its many difficulties in travelling, limited resources and limited technical skills, was considered very risky. No similar projects or experience were present in the region, yet professional engineers with government support decided to introduce the new technology. The decision indicated the courage and readiness to take risks and avoid uncertainty involved in the new project.</li> </ul>
	<p><b>Individualism vs. collectivism</b></p> <ul style="list-style-type: none"> <li>The priority is still the group in Sudanese culture. Therefore, the smaller the group the less the consideration given. Many ministries will be well equipped with ICT technology, while smaller branches can be much less well equipped. Similarly, while the big states can enjoy high levels of ICT utilisation, local governments can have limited access or no ICT technologies.</li> </ul>	<p><b>Long vs. short-term orientation</b></p> <ul style="list-style-type: none"> <li>Due to the Sudanese culture, which is short-term oriented, there was a rush into the e-government project without full technical preparations, such as:               <ul style="list-style-type: none"> <li>Preparing technical standards</li> <li>Good designing and planning for web-presence</li> <li>Prior collection of data and information</li> </ul> </li> </ul>

	Power distance	Uncertainty avoidance
<b>Organisation</b>	<ul style="list-style-type: none"> <li>The large PD in Sudanese public organisations exists in the extended hierarchical structure, centralized decision making and inequality in power distribution between organizations (or departments within the same organization). Committee and board members are often top leaders in the organisation or experts from outside.</li> <li>The large PD among top managers and leaders had a positive impact on ICT and e-government implementation. In organizations with successful e-government experiences, the leaders used their power to enforce the use of ICT tools and insist on applying e-government initiatives</li> <li>No channels allowing upward mobility of the organisation's employees. So, it is not easy to find initiatives that are introduced because of the employees' pressure and demand.</li> </ul>	<ul style="list-style-type: none"> <li>In Sudanese culture there is always a tendency for avoiding the unknown. People mostly prefer traditional procedures and tools, as long as they do the job. This is delaying change and negatively affecting the adoption of innovation and new technology</li> <li>Organizations have many rules, laws and systems and are highly bureaucratic in order to avoid any unknown risks or threats. A manager commented:  "The new profile of e-government requires a total change in an organisation's systems and structures. We are not sure if the change to the new system will work successfully, therefore we cannot ask our organisation's top managers to make the change. While we are aware of the lack in resources, we are even not sure of the support of the end-user for such change .... this is too risky, and it is irrational sometimes to take high risks when it is about the public services and needs"</li> </ul>

	Individualism vs. collectivism	Long vs. short-term orientation
<b>Organisation</b>	<ul style="list-style-type: none"> <li>Individual employees are not under the pressure of accountability or assessment. Therefore, they are not always supported with ICT tools that help to improve their performances:               <ul style="list-style-type: none"> <li>There is no active e-mail system in most organizations.</li> <li>The facilities for sharing information at low levels are almost absent in terms of technology and management. Employees suffer as e-government initiatives operate in isolation and rarely coordinate.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Looking for quick results, organisations will often spend a large amount of money seeking foreign ICT consultancy instead of investing the same amount of money in local staff training.</li> </ul>



	Power distance	Uncertainty avoidance
Environment	<ul style="list-style-type: none"> <li>The power is in the hands of a few, mainly high level politicians and top government leaders. Without their support and power, many initiatives cannot be implemented. It is common for an organisation's leaders to invite one of the most influential politicians to launch an event or specific project to gain their commitment and support</li> </ul>	<ul style="list-style-type: none"> <li>This is obvious among the financial decision makers, who find it very hard to take the risk and dedicate large resources for e-government projects with all their unknowns and uncertainty of success.</li> </ul>
	Individualism vs. collectivism	Long vs. short-term orientation
	<ul style="list-style-type: none"> <li>Individuals are not highly regarded in the public sector in Sudan. Most decisions and policies regarding ICT in general and e-government in particular are top-down. Individuals are not offered the chance to participate in the decision-making process, nor to contribute to policies and establishment of rules.</li> </ul>	<ul style="list-style-type: none"> <li>A very common attitude amongst Sudanese people is their low tolerance for change and impatience for results. They expect good, quick results, and would prefer to complete the job inefficiently rather than wait for perfection. This not just negatively affects the use of ICT, but it also makes it difficult to see the improvements and enhancements that ICT can add to the organization's end results.</li> </ul>

***Key findings***

- Illiteracy and language barriers
- High power distance, which is sometimes used in a positive way
- Weak understanding of individualism
- High uncertainty avoidance, which affected the financial ICT support decisions and the organisations' change decisions
- Short term orientation, which affected the introduction of ICT technology and organisations' long term plans

**6.4.3 Economic Environment**

**6.4.3.1 Gross Domestic Product (GDP) and Funding**

The Sudanese economy has grown rapidly over the last five years, with total GDP at current market prices increasing from just over US\$15 billion in 2002, to almost \$37.6 billion in 2006. Real GDP growth was especially strong in 2005 and 2006, registering increases of 7.9 and 12.1 per cent, respectively. However, the economic conditions are likely to change after the splitting of Sudan into two separate countries (North & South). This is essentially due Sudan's economy booming on the back of increases in oil production and most of the oil being produced belonging to South Sudan.

The Sudanese economy generally lacks adequate financial resources and so there is no stability or continuity in financing the various projects and initiatives. In addition, there is no approved fund dedicated to e-government. A senior manager in the NIC explained that what funding there is for ICT projects mainly comes from three resources: Loans, Grants and Direct Finance.

The senior manager explained further that, there are different levels of funding. The loans to the tune of \$44 million supplied by the Ministry of Finance have only come on stream recently. Grants have been insufficient despite the input of overseas resources. Direct finance provided by the development budget of the government is extremely inadequate as expenditure on development comes after expenditure on salaries and wages.

In spite of considerable efforts to overcome the funding problem, some senior managers still do not consider it has been enough. One senior manager said:

*“This is a very complex problem; financial authorities still consider e-government initiatives as luxury projects compared to the basic needs for citizens, like clean water, health care and assistance for war zones”.*

However, not all managers are of the same opinion; some argue that the problem is as a result of the lack of awareness and understanding of e-government capability and its positive impact upon the country’s basic problems.

#### **6.4.3.2 ICT Investment**

African organisations are preparing for substantial investment in ICT in order to meet the market demand for telecommunications services in Sub-Saharan countries. In Sudan the ICT contribution to the national economy has been remarkable. Telecommunications investment has jumped from just \$500,000 in 1994 to over \$3 billion in 2010. This made ICT in Sudan one of the most attractive fields for domestic, regional and global investment. Consequently, this has had a direct impact on economic growth, with an increase in employment in a variety of economic and social sectors. The number of employees in the telecommunications sector (2011) stands at over 8000 (not including associated workers). Some studies estimate the increase in per capita income, as a result of using the various services and applications offered through ICT technologies, at about 6%.

In 2006 the Sudanese government established the African Technology City, incorporating science, technology, industry and business. The aim was to build an important base in the region and attract international companies to invest and integrate with the local ICT market.

In terms of legislation, Sudanese investment law considered IT service projects as strategic projects, therefore exempting them from business profit tax for ten years and also providing customs exemptions.

Some professionals argue that overall ICT investment in Sudan is still not enough, and that the only real achievement is related to the telecommunications infrastructure; moreover, investment in other ICT components is still low and requires more resources. According to a senior IT manager:

*“There are many factors that need to be adequately addressed, like technical issues, legislation issues, competition and market power”.*

***Key findings***

- Challenging economic conditions
- Huge shortage in e-government funding from the government
- Resources for e-government funding are: Loans, Grants and Direct Finance.
- Large ICT investment which greatly influenced the economy
- The stable growth of the economy in the last few years is likely to change due to the political changes

#### **6.4.4 Regulatory Environment**

##### **6.4.4.1 Legal Framework**

The NIC Act (1999), did not contain any reference to, or authorisation of, e-government. The new Act (2010) passed by the Council of Ministries gave authority to the NIC to coordinate the e-government project. The Act authorised the NIC to establish IT units in public organisations, to coordinate with it and collect data from a variety of sources. The Act also permitted the NIC to access to information stored in data centres.

There is no national legal framework developed for the purpose of regulating e-government implementation in Sudan. E-government needs legislation to be prepared prior to the implementation phase, but many acts and laws related to e-government and ICT have only been approved relatively recently. It is also crucial for the success of e-government initiatives to develop legislative protection in order to reassure citizens. This increases their confidence in organisations which use the Internet, as this is still culturally new. It has been reported:

*“The legislation concerned with e-government is new ... it is not an old pursuit which is solidified by practice, it is dynamic and wide in scope ... Therefore, it is important because of every movement in this field.”*

The recent acts and laws covered important issues which have direct influence in the adoption of e-government, as shown in Table 6-5.

**Table 6-5: Legislation pertaining to e-government**

Law	Status
Law of National Telecommunication Authority	<i>adopted</i>
Law of National Information Centre	<i>adopted</i>
Law of Science and Technology Minister	<i>adopted</i>
Law of Computer Crime - 2007	<i>adopted</i>
Electronic transaction Law	<i>adopted</i>
Information Access Law	<i>To be approved</i>
E-authentication Law	<i>To be approved</i>
Computational Methods Profession and Employees	<i>To be approved</i>

The NIC is now working on fundamental laws for the approval of: digital signature, Public Key Infrastructure (PKI), and electronic documentation.

Nonetheless, enacting these laws was not straight forward. According to a senior manager in the steering committee:

*“We needed a lot of preparation. For example we had to train the law enforcement agencies, explain the terminologies and clarify the risks and threats resulting from the miss use of ICT”.*

Another issue highlighted was the need to raise both individual and official awareness of rights and responsibilities regarding access to information, privacy and security.

The overall legislation seeks to create an environment that encourages competence and innovation, and most importantly protects innovators and users.

#### **6.4.4.2 Public Private Partnership (PPP)**

Based upon recognition of the importance of Public-Private Partnership (PPP) in enhancing economic development, the Sudanese government is constantly seeking partners to participate in the implementation of the national strategy in general and ICT in particular. An important factor that influenced the adoption of PPP was the liberalisation of the Sudanese economy, which helped to build strong relationships with the private sector. This led to the private sector being represented in all committees and task forces entrusted with the development of the national ICT strategy. According to the NIC plan, 20% of e-government and ICT projects should be sponsored by the private sector. However, the private sector is already contributing in a variety of initiatives, including: e-government projects, development of electronic smart city, distance learning and telemedicine. Yet, the most significant contribution from the private sector is the partnership in telecommunications, where four private companies have emerged. The joint effort between both private and public companies led to the establishment of the largest telecommunications network in the region.

##### ***Key findings***

- Absence of a legal framework
- Issuing of number of important acts and law regarding the ICT in Sudan
- Challenges facing the approved acts including: awareness and training of law enforcement
- High adoption of the PPP policy in the ICT sector

### **6.5 Sudan E-government: Critical factors and holistic picture**

The findings of the data collected from Sudan helped in interpreting the e-government phenomenon in the country. It shows how the process of e-government adoption is shaped by technological development as well as the contextual elements that exist in the organisational and environmental aspects.

Next is an analytical summary based on the author's observations and analysis of the key findings.

### **E-government adoption at the national level in Sudan**

As the data was collected in an extended period, with several visits made to the site, the author was able to monitor the progress of e-government adoption in Sudan. From the author's point of view, the development of e-government in Sudan has been through three stages.

#### ***Stage one: Initiation stage***

This is considered the first stage of exploring e-government in Sudan. It started in the early 1990s when Sudan developed its National Strategy. The strategy is strongly linked to the ICT revolution in Sudan, which led to the dramatic change that took place later in the public sector. However, this stage experienced many obstacles and was characterised by uncertainty due to the lack of understanding of the concepts and potential of e-government. Formal bodies and institutes responsible for e-government implementation were ill equipped and lacked the know-how. The surrounding environment was far from being ready for such transformation and therefore there was a clear absence of politicians' support at the national level. Understanding the necessity of: supporting business operation processes in public organisations; building a powerful and accessible information network; and creating an attractive working environment, was still considered poor. Therefore, the achievement in terms of organisation change management, new legislation, and ICT training was hardly recognised at this early stage.

However, the main breakthrough at this stage was the introduction of new technology. This was as a result of the government's decisiveness and firm commitment to introduce ICT into the country and replace the existing telecommunications network with an advanced and highly reliable network. Key executives and policy makers soon realised that in order to fully achieve this aim, the government had to allow the private sector to play a bigger role in this change. Therefore, wide partnership was established with the private sector through the new PPP policy. At that time, Sudan started to produce oil for

the first time in its history. This had a significant impact in the economy. The new features of the economy and the achievements made through the technological initiatives signalled the start of a new era for Sudan and led to a quantum leap in term of ICT adoption throughout the whole country.

### ***Stage two: Recognition Stage***

This is the stage where more understanding and commitment were realised. The issues and challenges facing the adoption process started to be discussed at the highest levels of the National Assembly and Council of Ministers. Leaders and policy makers understood the need to approve new legislation and rules in order to organise the implementation of e-government. The vision of moving towards an information-based society was very clear by this time and policy decisions pointed to the necessity of involving ICT curricula (and programmes) in education. Also, ICT training had been provided for all government (including high ranking and senior) personnel. Training programmes were very advanced, with some were conducted abroad. The government addressed the problem of losing qualified, professional staff and made every effort to improve their working conditions. More importantly, decisions regarding funding were not left solely to the finance people; instead the government produced plans and established IT funds. Senior government officers started to give serious attention to the issues of information quality, web content and security and demanded that standards be set. Although in this stage Sudan had stepped forward in the adoption of e-government, the planning process and priorities were still not very clear. Many, initiatives seemed to be either ill- prepared or not representative of a main concern. Therefore, these initiatives received a relatively low level of adoption.

### ***Stage three: Progressing Stage***

This represents the current stage, which has witnessed a total change in the mind set of top leaders and policy makers. This was reflected in the national focus on the development of basic infrastructure, including: the building of schools, universities, hospitals, electricity national grid, high ways, and water dams; in addition to the concern of developing regulatory frameworks and a stable economy and political system. This explains the huge improvement in many areas, and particularly in the



increase of ICT applications applied in government operations. Many features characterise the e-government initiatives in this stage. For instance, the new initiatives are mostly based on: well defined and strategic plans; issuing of open policies and regulations regarding ICT investment; integrating e-government into the public sector; gaining competitive advantage; and revitalising the relationship between government and its departments and organisations. Although, this indicates the progress in technology, organisation and environment elements, not all aspects developed the same way. The online and advanced electronic services are still very limited; the smooth transition of information and decision making based on high quality of information departments is not available due to the lack of interoperability and integrated systems; and large numbers of top managers lack the adequate IT knowledge. However, from the author's point of view, there are two main decisions that can be considered a turning point in the e-government adoption process at this stage.

- The establishment of the Technology and Information Ministry, which helped in raising e-government issues and ICT in general to the highest authorities in government.
- Empowering the NIC through approving its new Act. This act gave the NIC authorization to play the role of supervising, monitoring and coordinating e-government implementation at the national and organisational level. This helped in dealing with the project as a one entity and addressing all relevant issues. The NIC was able to make a balance in the progress of the adoption process by considering all government institutes and also by focusing on the political, cultural and organisational context in parallel with the technological elements.

The analytical description of e-government progress in Sudan shows that the curve of adoption is rising rapidly, and more success stories are being added to best practice knowledge. Furthermore, a better understanding of the challenges facing the adoption process has been obtained. Therefore, in this stage, policy makers were able to identify clearly the critical factors and explain their impact on the adoption process of e-government initiatives in Sudan.

The key findings illustrated previously helped to deeply understand the issues and challenges relevant to the Sudanese context; accordingly, a number of new elements and critical factors were identified. The developed understanding and findings enabled the author to organise these factors according to their impact on the adoption process. Some of these factors inhibited the successful adoption of e-government initiatives in the public sector. While other factors acted as a catalyst that supported the progress of the implementation and adoption process. The list of the new arrangement of the critical factors is illustrated in Table 6-6.

**Table 6-6: Sudan e-government critical factors**

Factors as catalyst for e-government adoption in Sudan	Critical Factors	Factors inhibiting the e-government adoption in Sudan
<b>Technology</b>		
Clear vision	ICT Strategy	Absence of action plan
Improving methods of data collection	Information & Data	Low level of data quality and accuracy
Modern telecommunication infrastructure	IT Infrastructure	Poor websites
	Interoperabilit	Absence of standards Lack of security
<b>Organisational</b>		
	Organisational Culture	No understanding of information sharing Resistance to change
Involvement of ICT in education	Human Resources	

Factors as catalyst for e-government adoption in Sudan	Critical Factors	Factors inhibiting the e-government adoption in Sudan
Available ICT Skills & Providing ICT Training		
Providing Multiple Channels	Change Management	Bureaucratic & Inflexible systems Difficulty in organisation BPR
Raising level of awareness and commitment	Top Management	Problem of “Brain Drain”
<b>Environmental</b>		
	Political	Political instability Weak political support
Positive impact of:		
- Power Distance		Low level of education
- Long-term orientation		High percentage of illiteracy
- Ancertainty avoidance	Cultural	Negative impact of Individualism
ICT investment opportunities	Economy	Low GDP & inadequate funding
Adopting PPP policy	Regulatory	Absence of polices and legal framework

The significance of listing the factors is that they incorporate into the main body of the framework developed for e-government adoption in Sudan.

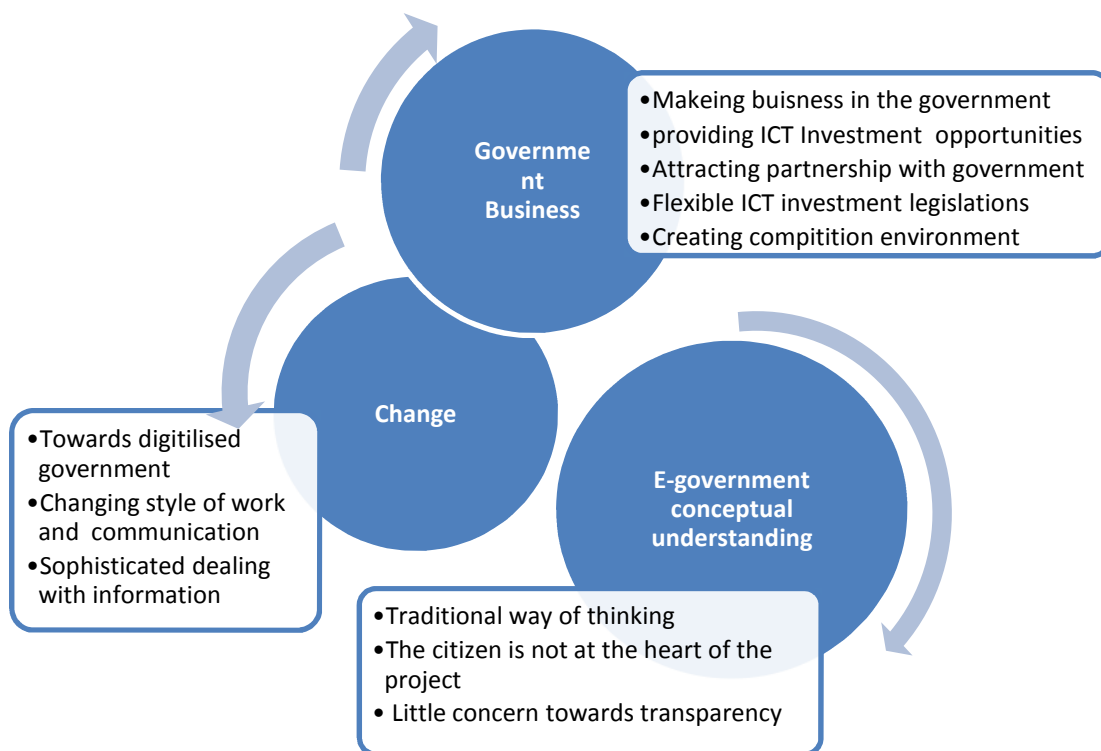
The significance of the framework developed in this chapter is that it highlights the links between the technological, organisational and environmental elements and their joint role in the process of change. It also shows how the change in one element can

affect another; for example, the USA political sanctions against Sudan limited relationships with large international ICT companies. This badly affected foreign ICT investment in the country, as technology companies in USA and Western Europe were prevented from building partnerships and participating in Sudanese projects.

The overall picture developed from the findings and analysis in this chapter has helped to develop a deeper understanding of the fundamental change in how the government thinks and works in the new environment. The author highlighted three main areas of change: e-government conceptual understanding; change in the public sector; and the government business and investment orientation. These changes are described briefly in Table 6-7, and illustrated in Figure 6-3.

Table 6-7: Conceptual Matrix

Concept	Description
<b>E-government conceptual understanding</b>	<p>The way of thinking did not really change at a national level. It seems many leaders like to think of e-government as a tool for improving the government operational processes, i.e. a tool that serves the government more than to serve the citizens. Therefore, the values of participation and free information access remain missing.</p> <p>It was possible for the government to employ e-government as a powerful tool to improve its transparency. Failing to successfully adopt the e-government tool led to a large rise in the level of corruption and Sudan became one of the bottom five countries in the list of ‘transparency evaluation’.</p>
<b>Change</b>	Change took place at national level in many ways. For example: Government institutes have changed their structure and buildings; Qualifications for employment have changed; Use of digital media for communication and meetings; Appreciation for the role of information in the new era and hence sophisticated dealing with information. As a result, e-government adoption enabled a change in the style of work in government.
<b>Government business and investment</b>	The government is enjoying its new way of conducting business, especially through investing in ICT. Therefore, legislation and rules were updated and more opportunities of ICT investment were provided. This led to the creation of a competitive environment, which enhanced the type of ICT services.



**Figure 6-3: E-government concepts in Sudan**

Both, the list of the critical factors and the framework are needed for the creation of a holistic picture of e-government in Sudan. This has greatly helped in answering the main research questions.

## 6.6 Revision of Framework

The nature of the open-ended interviews and the large amount of data provided in documents, in addition to the analysis in Section 6.3, enabled a better understanding and defining of the key issues affecting the adoption of e-government in Sudan, at the national level. Hence, new critical factors were identified within the Technology, Organisation and Environment factors. Figure 6-4 shows previously identified factors as well as new factors.

### 6.6.1 Technology Factors

The four main technology factors are: ICT Strategy; Information & Data; IT Infrastructure; and Interoperability. *ICT Strategy* was previously shaped by the two

factors identified in the literature: *vision and plan of action*. The other three factors have been addressed with more specific sub-factors, based on the findings and analysis in this chapter.

In the *IT Infrastructure* factor, ***telecommunications network***, received a lot of attention from the government and it was considered a critical factor for the progress of the whole project. Another factor related to the *IT Infrastructure* is the government ***websites***. This factor has so far is received less consideration, but e-government developers have pointed to its importance as the main channel of online service delivery.

In the *Information & Data* factor, the problem of ***data collection*** in Sudan was considered as one of the obstacles, due to the attitude towards providing and handling information. Also, the low ***quality*** and ***accuracy*** of data was considered crucial and has been highlighted as a critical factor.

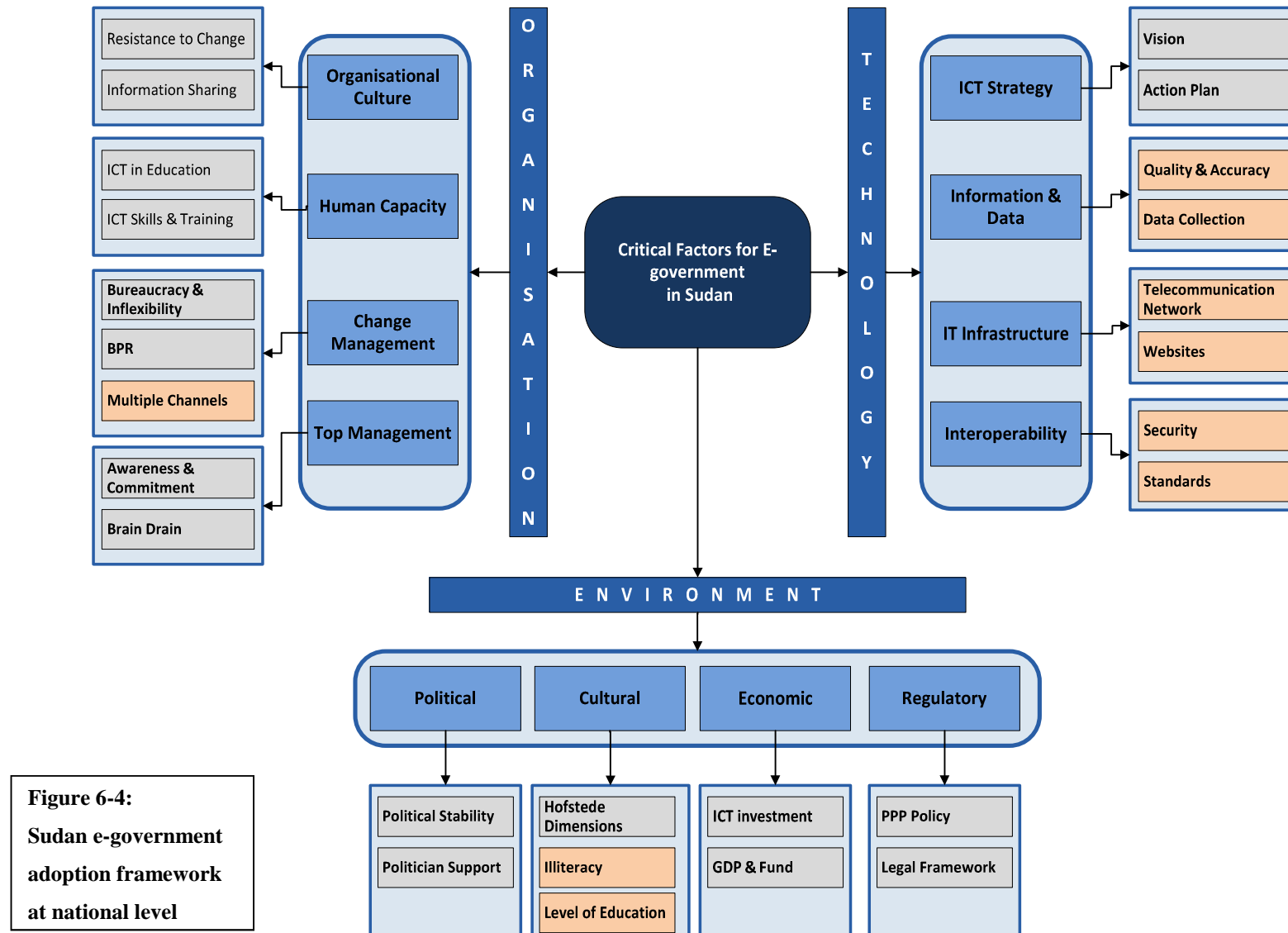
The *Interoperability* factor has addressed the importance of two main sub-factors: ***security*** and setting ***standards***, for the various issues related to e-government adoption and implementation.

### 6.6.2 Organisation factors

The analysis of the *Change Management* factor showed the importance of facilitating ***multiple channels*** to provide the government's electronic services, such as SMS messages, IVR and e-mails. This is due to the difficulty web-services sometimes face with internet connectivity or a lack of skills to use the web technology.

### 6.6.3 Environment Factors

According to the Environment analysis, the *Cultural* factor demonstrated a great impact on e-government adoption in Sudan. The interviewees expressed their concerns and indicated ***illiteracy*** and ***low levels of education*** as two major obstacles facing the adoption of e-government.



**Figure 6-4:**  
Sudan e-government  
adoption framework  
at national level



## **6.7 Summary**

This chapter presents the qualitative analysis of the data gathered at a national level in Sudan. The chapter achieved its aim of highlighting the technical, organisational and environmental issues as critical factors influencing the adoption of e-government.

The findings highlighted the importance of many specific elements in e-government adoption in Sudan. These include: forming ICT strategy with clear vision and plans; applying advanced IT infrastructure; managing the organisational change and resistance to change; and providing adequate training. Also, the analysis showed the important role that can be played by political leaders and top managers, in a developing country context, by using their power distance to enforce e-government initiatives. Further, the analysis helped to address the environmental factors in the Sudanese context and showed how the specific environment greatly influenced the adoption of e-government at a national level. This includes the regulatory environment which highlighted the importance of some policies (like the PPP policy) which had a significant role in the adoption of the technological factor in e-government.

The investigation process and analysis in this chapter has also led to the identification of more specific critical factors. These include the telecommunication infrastructure, data collection, security, standards and low level of education.

These factors appeared as significant elements for e-government adoption at a national level. In the next chapter these factors are re-examined at an organisational level, in order to confirm their significance and to investigate how they affect e-government adoption and implementation in practice.



## 7 E-GOVERNMENT INITIATIVES IN SUDAN – ORGANISATIONAL LEVEL

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After the development of the ‘e-government framework in Sudan’ in Chapter 6, this chapter examines the adoption process at an organisational level. Investigating both the national and organisational levels ensures that the policy impact to real progress is captured. It also serves to reduce potential bias due to stakeholder bias. The two stakeholder groups also help to reduce researcher bias due to personal experience.

Four case studies were conducted in order to achieve the aim. Multiple case studies were selected for the purposes of similarity. Semi-structured interviews were used to collect the data, in addition to documents and observation. The data collection methodology has been reported in Chapter 3. The analysis went through two phases: within case study analysis; and cross-case analysis. The findings and analysis supported the relevance of factors and confirmed their significance in the e-government initiatives in public organisations in Sudan. Accordingly, this chapter includes the following sections:

1. **Section (7.1):** Describes how the “within case study analysis” procedure was carried out.
  2. **Sections (7.2, 7.3, 7.4, & 7.5):** Presents the analysis of each of the four conducted case studies.
  3. **Section (7.6):** A summary of cross-case analysis.
  4. **Section (7.7):** Development of the Sudan e-government adoption framework.
  5. **Section (7.8):** Summary of the chapter.
-

## **7.1 Within Case Study Analysis**

The within case analysis allows the researcher to tell the story of the conducted case study. This helps to better understand the phenomenon in its natural settings (Yin, 2009). Therefore, the analysis in this chapter helped improve the understanding of the adoption of e-government in the context of Sudanese public organisations. Further, the collected data evidence filled gaps from the previous analysis.

As the examined factors were pre-defined, the researcher used semi-structured interviews, which helped to answer the research questions and achieve the aim of building an e-government adoption framework. The procedure followed for data processing and data analysis at the organisational level is similar to the procedure used in analysing the collected data at the national level. Tables were used again, but each case study had its own set of tables. So, each case had 12 tables (Technology factors: 4 tables; Organisational factors: 4 tables; and Environmental factors: 4 tables). The interview transcripts were read and the data was classified and categorised according to the pre-defined coded critical factors. The process was repeated to confirm the findings and investigate the existence of new factors. Finally, the analysis was completed by a case study report that includes the database evidence. However, the analysis of this round of interviews was less arduous as the author's understanding was deeper and the pattern matching was clearer. Although, the interviewer had good control of these interviews, interviewees were still able to be dominant in expressing their views and new ideas. This helped to find the uniqueness in each case study and hence understand more about the influential factors in the adoption process.

After selecting the case studies the author made an initial visit to the specific organisations to make sure that these cases can give adequate answers and information to the research questions. The researcher made detailed preparation in order to access these organisations, including preplanning for the interviews and the several visits made to each site. Due to the researcher's background in IT and contacts within these organisations, the researcher was allowed frequent access to the organisations; to visit the database centres; to watch presentations; and to talk to employees. Although, the process of conducting these case studies was difficult, costly and time consuming, it

helped to understand the whole context of the case studies, enabling closer observations to be made.

## **7.2 Higher Education (HED)**

Higher Education in Sudan started in 1902 with the establishment of the University of Khartoum, still the largest university in the country. The Higher Education Ministry was established in 1971. The ministry develops policies, plans and programs for scientific research and coordination between institutions. It consists of scientific research institutes, universities and government and private research centres (HED website).

Student intake into higher education in Sudan jumped from 6,080 in 1989 to 38,623 in 1999/2000, to 167,354 in 2009/2010. The number of higher education institutions increased from 5 universities in 1989 to 26 universities and institutes in 1996. These figures encouraged the move to a more modern way of technical connectivity; and increased collaboration and sharing of knowledge between Sudanese universities.

### **7.2.1 HED Objectives**

The main objectives of HED are:

- To provide citizens with a high quality education and the knowledge and skills necessary to align its programs with society and the labour market; along with a fair distribution of access to higher education, available to all segments of society
- To produce diversification in higher education and encourage life-long learning, as well as contributing to the dissemination of knowledge to all segments of society.
- To develop the use of modern technologies to support the educational process
- To establish international cooperation and strengthen scientific links between the Sudanese higher education institutions and their counterparts around the world

### 7.2.2 HED E-government Initiatives

The Higher Education Ministry's e-government initiatives were formally started in 2004 when a consultation committee was formulated to establish the National Universities Network project. The project was driven by the expansion in the ministry, with the aim of facilitating access to information and delivering services electronically, as one of the e-government projects. Figure 7-1 shows the terms of the Higher Education steering plan for ICT.

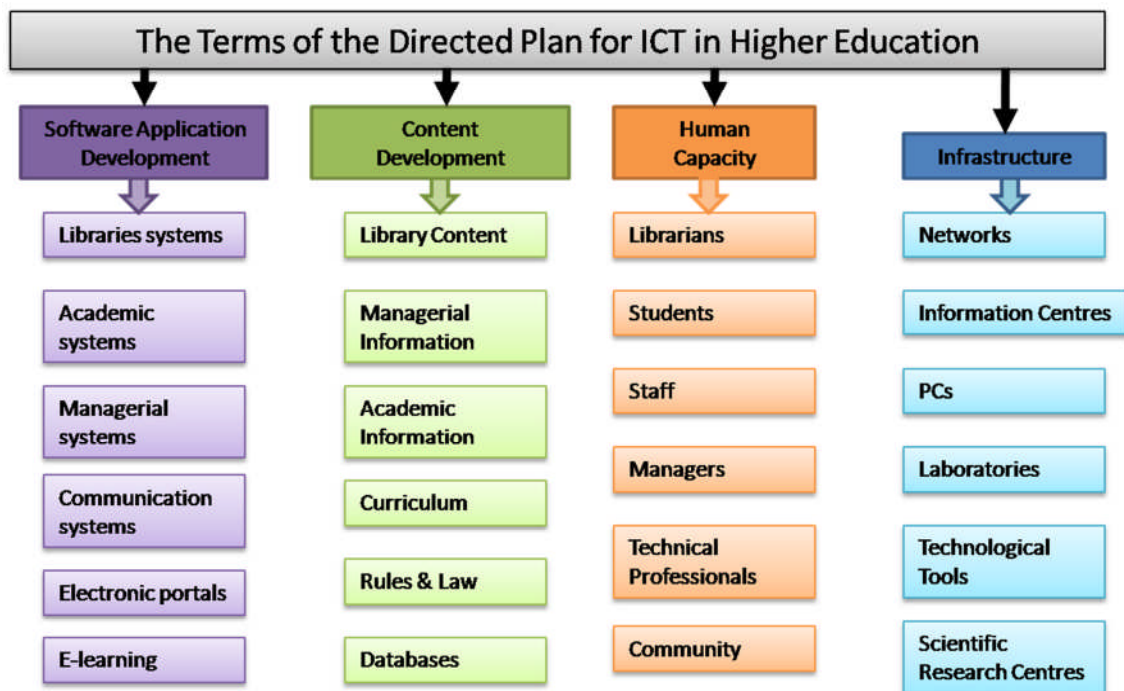


Figure 7-1: Steering plan terms

There are two main ICT initiatives under the National universities Network project:

1. The Sudanese Universities Information Network (SUIN)
2. The Sudanese Universities Virtual Library (SUVL)

The initiatives are funded by the Sudanese Information Technology Fund (SITF). The overall goal of these initiatives is to provide connectivity among Sudanese educational institutions; increase sharing of knowledge; help universities build their information infrastructure; and extend the value of digital libraries. As a result more than 31 institutes are connected, Figure 7-2. In 2006, implementation of the Virtual Library was

established, but the databases are still centralized and access has to be through one of the two hosting universities. In addition to the virtual library there are number of projects provided through the SUIN, including:

- Timetable Management System
- Student Registration System
- Video-conferencing
- SMS System
- Training System
- E-learning

These projects serve large number of students and staff:

- Number of students: 600,000
- Staff member: 13,000
- Post Graduate: 40,000
- Managers, researchers, polytechnic and e-learning students.

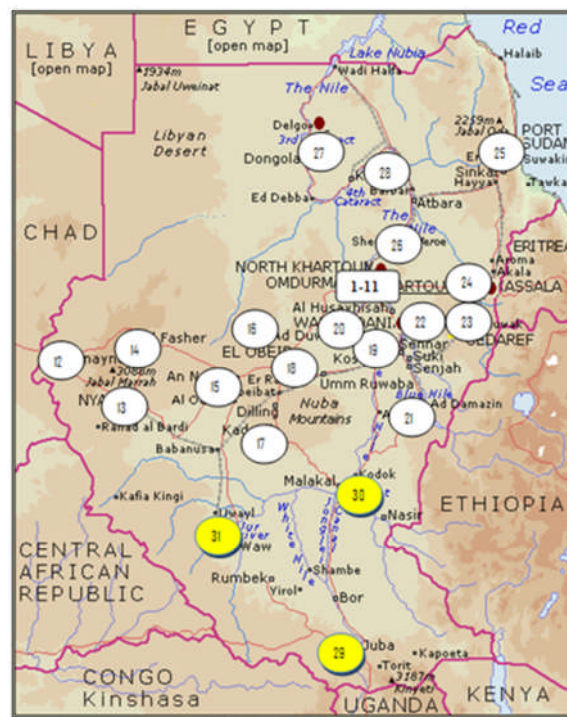


Figure 7-2: HED network across Sudan

### **7.2.3 HED Initiatives Analysis**

The data display and analysis of the technology, organisational and environmental factors are shown in Appendix (E.1-HED Initiatives).

### **7.2.4 HED Ministry case study summary**

The significance of the HED Ministry initiatives lies on their role of transforming, dissemination and producing knowledge and experience to the whole society through the use of ICT. This has put the HED at a leading position, where many of the current initiatives in the country are overseen by universities. However, despite the fact that the HED initiatives can be the key for achieving the government strategic aim of building a Sudanese knowledge-based society, the HED lack the sufficient political and finance support. Without such support the HED will not be able to facilitate collaboration and exchange of information between Sudanese universities and institutes or with its counterparts in other countries.

The impact of the HED initiatives is not limited to the contribution in building a knowledgeable society, but the SUIN and SUVL had influenced the human capacity development, the modernisation and productivity of the academic institutions, and the economic growth.

## **7.3 Electronic Banking System (EBS)**

The initiation of the Central Bank of Sudan (CBOS) was based on the issuance of the Bank of Sudan Act of 1959. The Bank opened for business in 1960.

Finance in Sudan was formerly traditional in nature and primitive in operation, with transactions made in cash. This has radically changed, with the banking sector making huge steps towards embracing new systems of online banking. These steps were essential to cope with the new information era emerging in Sudan, and to achieve the government's strategic agenda of building a Sudanese information-based economy.



### **7.3.1 EBS Objectives**

1. Achieving stability of prices; maintaining stability of the exchange rate; efficiency of the banking system
2. Formulating and implementing monetary policy, depending on market forces, so as to achieve the overall objectives of the national macro economy in consultation with the Ministry of Finance
3. Organize, monitor and supervise banking business; strive to promote, develop and raise efficiency to achieve balanced economic and social development
4. Discharge of duties; exercise of powers; and supervision of the banking system by both the ordinances of Islamic Shaaria Law and conventional banking customs

### **7.3.2 EBS E-government Initiatives**

In 1999 the CBOS established the Electronic Banking System (EBS) Company. The company is dedicated to introducing technological banking solutions, with the main objective of its initiatives being to electronically connect the banks in Sudan, and provide electronic payment services in and out of Sudan.

Although there have been many initiatives introduced by the banking sector in Sudan, this study focuses upon those introduced by the EBS Company. There are five main initiatives.

#### **1. SWIFT**

The Society for Worldwide Interbank Financial Telecommunication (SWIFT) is a shared worldwide data processing and communications link and a common language for international financial transactions. To enable Sudanese financial institutions to leverage the benefits of this international network, the Swift Service Centre was established in 2000 to connect Sudanese Banks to SWIFT. Ninety per cent of banks in Sudan transfer their financial data through the centre.

#### **2. Electronic Cheque Clearance Centre**

Traditional means of clearing cheques were cumbersome and time consuming. In the old system, cheques were bundled at the end of a working day and then physically sent at the beginning of the next working day to the regional clearing/settlement point. This created huge inefficiency, leading to interruptions and the risk of security breaches, meaning the number of court cases involving cheque handling were continually on the rise. This has now been replaced by the Electronic Image Based Cheque Clearing System, developed by the international company, Progress Soft. According to Progress Soft:

*"This system establishes an automated electronic web-based cheque clearing mechanism and replaces the current costly and time consuming manual method. It uses computing equipment and communication infrastructure to move information more efficiently between depositing and paying banks within the same day".*

By using the image based cheque, the process of clearing the front and back of cheques can be captured as images and electronically transmitted.

As the new system was installed with collaboration from other countries in the Arab World, it allowed connection of the cheque clearance system with similar international switches.

### **3. National Switch Services Centre**

The use of credit cards, Automated Transaction Machines (ATM) and Points of Sales (POS) were once rare in Sudan, but have now been introduced by the National Switch Centre. All requests received from ATMs, POSs, branches, voice authorizations and international associations (VISA, MasterCard and AMEX) are processed via the Centre.

### **4. Financial Network Service Centre**

The Centre established the Financial Information Network, in order to develop and manage the financial services virtual private network (VPN). The aim is to connect financial institutions across the country; currently there are 27 banks connected to this network with an additional 500 branches. Almost 50% of these branches, which are

scattered over 14 cities, are already connected. The Centre is designed to increase speed in transferring financial data between institutions and provide services of network security, transaction authentication and network management.

## **5. Banking System and Software Development Centre**

This Centre is responsible for the development, promotion and implementation of banking applications and software for the banking sector in Sudan. The aim is to automate banking process operations; therefore the centre provides many services such as:

- Core banking system and Internet Banking Services
- VBS, Virtual Branches System that enable any branch banking
- Home Banking Services; SMS, WAP, IVR Banking Services
- IBR, Inter Branch Reconciliation System

### **7.3.3 EBS initiatives analysis**

The data display and analysis of the technology, organisational and environmental factors are shown in Appendix (E.2-EBS Initiatives).

### **7.3.4 EBS case study summary**

The initiatives led by the Central Bank of Sudan and its EBS Company have totally changed banking from an old and traditional system, to a modern, fast and efficient one. Many factors contributed to this development, including: the advanced level of technology and high quality of data; the provision of IT knowledge and training; the learning of lessons and experiences from other countries in the region; and the creation of an enabling working environment. All these factors helped to obtain a relatively high level of adoption and ensure the initiatives' sustainability.

It is important to differentiate in the e-banking system between the level of adoption in the Central Bank and the level of adoption in the other banks and related organisations. From the author's point of view this is as a result of low involvement from senior bank managers in the stage of planning and strategy design. They still prefer working with

their traditional banking system and low risk business, rather than to move towards the new global trend of online banking.

The strategy of banking privatization and investment policy are seen as key factors that allowed the whole transformation. As a result the modern banking system is internationally recognised and internally it is playing a significant role in the banking industry in Sudan. However, due to the poor economy, the initiatives were found to be more useful for public and private organisations than to the society and citizens. Nonetheless, the electronic system has fortified economic momentum and money circulation, which helps in the growth of the country's economy.

## **7.4 National Electricity Corporation (NEC)**

Electricity services were first introduced into the Sudan in 1908. The National Electricity Corporation (NEC) Act was passed in 1982 to look after the National Grid. Large developments have taken place since then and the maximum installed capacity reached 1234.6 MW in 2008.

The amount of electricity generated is not sufficient to meet the demand of the country and it only serves 30% of the population. The long term plan is to increase the generation capacity to 23,000 MW by the year 2030, which is expected to satisfy 80% of the population.

### **7.4.1 NEC Objectives**

The NEC aims to be the best in the business, exceed customer expectations and meet Sudan's development and social requirements through a highly motivated and well trained workforce. The NEC assigned itself a number of objectives:

- To exploit the available energy resources and meet the country's requirements for power supplies for different purposes.
- To benefit from the technological advances in the electricity industry and related services.

- To maximise the potential of investments which could enable the NEC to develop its service capacities.

#### **7.4.2 NEC E-government Initiatives**

In 1990, the NEC decided to revolutionise its performance and adopt ICT as a powerful tool to make a total change and build a modern organisation. As a result the NEC achieved the ISO standards for its high performance and Total Quality Management.

The IT department developed many systems and IT applications within the e-government initiatives. However, the prepaid electricity initiative is a new idea developed by international energy companies. It is an attractive service that gets more customers without experiencing the problems of overdue payments.

##### **Prepaid Electricity Service**

The new system allows citizens to prepay for electricity services. Under the old system commercial losses reached 40% due to non-payment of bills, meter tampering, inefficient billing and collection. The NEC introduced the pre-payment initiative to reduce losses. Each customer is provided with an identification card and number, and they can pre-pay for a quantity of electricity via mobile phone or at a vending point. A keypad communicates via a twisted telephone pair with a remote meter; the switched meter then provides the appropriate quantity of electricity. The new system overcomes many problems in the billing system. Meters are inaccessible and cannot easily be bypassed or interfered with. Problems of identifying precise addresses and meter reader fraud are avoided.

Over 300,000 meters have been installed in the area around the capital serving about one million people. The success implementation of the initiative was described as a model for other countries in the region such as, Egypt, Nigeria and Saudi Arabia.

#### **7.4.3 NEC initiatives analysis**

The data display and analysis of the technology, organisational and environmental factors are shown in Appendix (E.3-NEC Initiatives).

#### **7.4.4 NEC case study summary**

The experience in the NEC is unique in the way it carried out its initiatives. The process of change and the use of ICT were introduced into all departments of the NEC simultaneously. As a result the uptake was parallel within the organisation and the transformation included: ICT infrastructure, re-engineering processes, change of management systems, training, development of software applications, improving the environment for individual employees, and enhancing the IT practitioners' conditions.

By following this approach the NEC was able to find out about the various challenges and obstacles at an early stage. Accordingly, the planning to overcome these challenges encompassed all areas and aspects. The change covered the whole organisation, and the progress in terms of awareness and adoption increased at all levels. The strategic thinking, good planning, and strong leadership all led to the revolution witnessed in the NEC, which became the only organisation in Sudan holding an ISO certificate.

### **7.5 Interior Ministry (IM)**

The Interior Ministry (IM) is concerned with security and is responsible for establishing controls, systems and procedures and taking measures to preserve and protect lives and property.

#### **7.5.1 IM Objectives**

The IM objectives are concerned with many issues related to citizens and the country as a whole. With respect to e-government initiatives, the main objectives are:

- Organisation and management of the civil registry and passports; citizenship and identity cards; and the organisation of the administration of immigration.
- Development of standards and controls of traffic organisation; determining the conditions for granting drivers' licenses; vehicle and traffic control on national roads.

## **7.5.2 IM E-government Initiatives**

The Interior Ministry established the Kushite Company in 2006, in order to introduce e-government initiatives within the IM. The company enjoys business ties with major international firms working in the field of electronic technologies.

In accordance with the national e-government strategy, the IM is concerned with computerising police work and keeping pace with technological advances worldwide. The Kushite Company has introduced a number of initiatives. Two of these initiatives are highlighted in this section: the E-passport, and Civil Registration Record. The company is executing these projects in collaboration with international companies with long experience in the field.

### **E-passport**

The Passport Authority and Civil Registration Records are endeavouring to issue an e-passport with a high safety specification, so as to prevent forgery and to ensure compliance with the International Civil Aviation Organization (ICAO). The project provides many benefits for Sudan and Sudanese people:

- Building main databases for the Sudanese and foreigners residing legally in the Sudan.
- Facilitating the movement of travellers at the international airport.
- Increasing the security specifications for the passport and protecting it against forgery.
- Issuance of safe certified immigration documents for citizens and readying the mechanism for biological identification.

### **Civil Registration System**

The Civil Registration System (CRS) is designed for recording data of all citizens and residents in the records specified by the regulations and systems. The system aims to achieve multiple benefits, including:

- Ensuring the rights of individuals in terms of nationality, ownership, and enjoyment of political rights.

- Creating a central database to link with the offices of federal and local government.
- Providing the organs of the State with statistical data for use in development plans for local communities in economic, political, social and military affairs.

There are two outcomes expected from the CRS; the ID card and the National Number. The ID card is the final outcome of the registration process and is a document which proves the holder's identity in all civil transactions. It also contains a National Number, a unique number relates to the family card, which identifies every citizen within their family. The benefits of using a family card and a reference for issuing other immigration and identification documents

- Protecting and regulating the Sudanese identity.
- Establishment of a central database for the population.
- Proving the family's origin and the family's relations and regulating the inheritances.
- Registration of information, its modernization and its continuous analysis.
- Issuance and protection of the certified documents against forgery.
- A referent record which guarantees the citizen political and constitutional rights.

### **7.5.3 IM Initiatives Analysis**

The data display and analysis of the technology, organisational and environmental factors are shown in Appendix (E.4-IM Initiatives).

### **7.5.4 IM case study summary**

The relative progress and success in the IM initiatives had a great impact in changing the style of life of the society. This is mainly because the type of services delivered by IM is linked to the official paperwork that citizens need to deal with on a daily basis. The improvement and efficiency in delivering these services has encouraged more citizens to adopt the IM services.



A remarkable change took place in the way the IM operate its processes, as a result of a combination of factors. IM policy makers decided to introduce e-government initiatives in a long-term process, as they were aware of the many obstacles and challenges that may face the adoption of these initiatives; especially in terms of level of education, untrained staff, and high bureaucracy. Power Distance is embedded in the working environment of the IM, and employees' acceptance of the PD as normal cultural behaviour part helped in reducing resistance to change. IM policy makers also decided to gain the support of politicians by closely linking the use of ICT to the main functions of the IM; such as, dissemination of peace and security. These approaches and attitudes have had a significant role in achieving more progress and obtaining better levels of adoption.

## **7.6 Cross Case Analysis Summary**

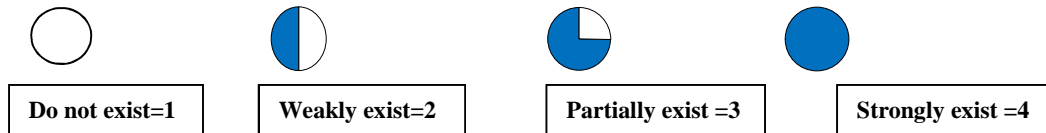
Cross case analysis is employed to obtain a deep understanding and explanation of the phenomena; and increase generalizability (Miles and Huberman, 1994). Generalizability means the findings can be applicable to similar settings.

After completing the individual “within case study analysis”, each of the four case studies was cross analysed against the other three cases. The author was careful to keep consistency without losing the uniqueness of each case study. The cross analysis of the case evidence was carried out in two stages. In Stage One, the interview transcripts are read again in order to confirm the findings. Stage Two involved analysing and comparing findings across cases.

The findings indicated that public organisations are influenced by the same set of contextual factors captured in the framework. At the same time, the organisational level highlighted other elements and factors that contribute to the adoption process. The author observed that most organisations had a good management approach to handling the constraints and challenges facing the process of change. The author believes this is because the organisations' initiatives started earlier than at the national level. Also, the awareness and commitment of organisations' top managers and leaders was relatively high.

The next sections summarise the analytical discussion of these factors coupled with illustration tables and figures. The assessment used in these tables and figures reflects the author's point of view, which is based on the data findings displayed previously.

The tables have four levels, which are set according to the scale:

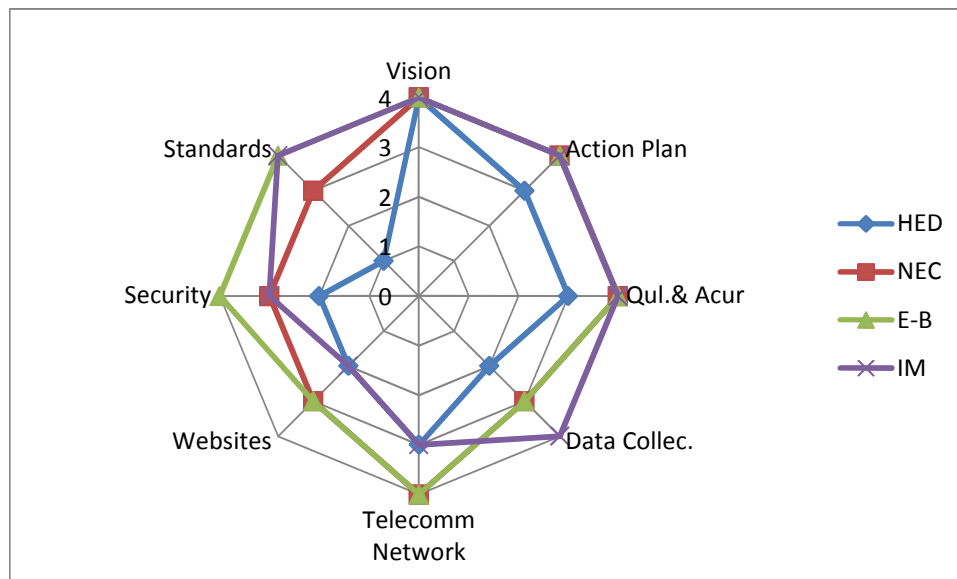


### 7.6.1 Findings in Technology Factors

Table 7-1 and Figure 7-3 show the levels of technology critical factors across the four case studies conducted in Sudanese public organisations.

**Table 7-1: Technology factors across cases**

Technology Factors	Sub-factors	HED	NEC	EBS	IM
<b>ICT Strategy</b>	Vision				
	Action Plan				
<b>Information &amp; Data</b>	Qual. & Acc.				
	Data Collection				
<b>IT Infrast-structure</b>	Networks				
	Websites				
	Security				
<b>Interoperability</b>	Standards				



**Figure 7-3: Radar diagram for technological factors**

Table 7-1 and Figure 7-3 indicates that technology is a key enabler and forms a strong foundation for the organisations' initiatives. In recognition of the need to introduce these initiatives correctly, the organisations developed scientific and systematic strategies and planning; which explains the high level of "vision" and "action plan" in the radar diagram. Accordingly, over ten years, the examined organisations have changed the way they perform their internal processes; moving from slow, manual operations to advanced electronic ones, using modern and reliable telecommunication networks.





































At the time of data collection, organisations were not provided with unified technical codes, security policies or national standards. However, each organisation followed the international specification related to its own technical and electronic service requirements. This allowed peer-to-peer communication with other similar organisations around the globe; and transfer of knowledge from all over the world into Sudanese public organisations, and vice versa. This helped policy makers create an information and knowledge-based organisation. Consequently, this led to sophisticated handling of information and strong support for taking decisions according to high quality data, as reflected in Figure 7-3. However, this was not reflected in the 'websites factor' where most are in the "one-way" stage of maturity. The data evidence shows that organisations are still under-developed in terms of web content, online services, and

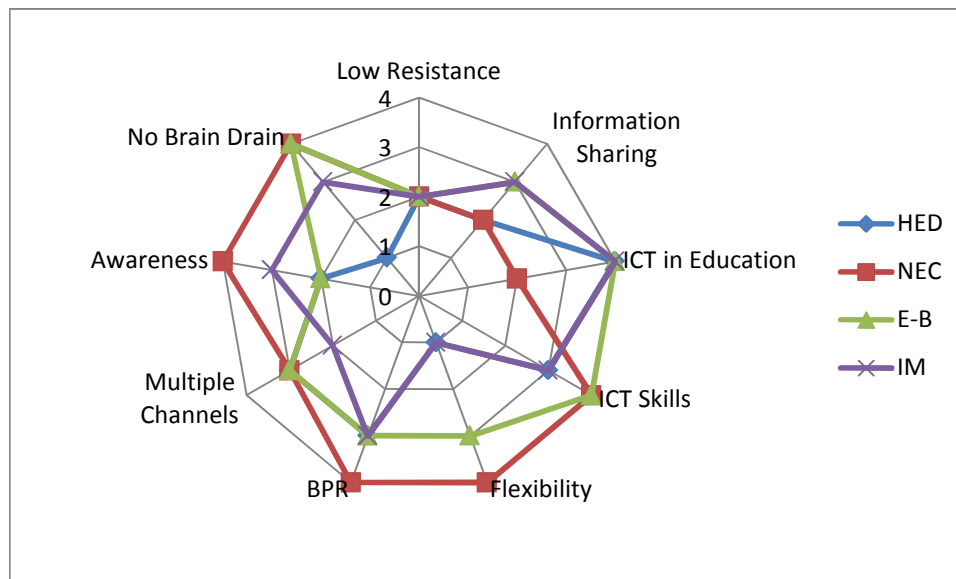
interactive communication with citizens. Further, general consideration of software applications by policy makers and IT professionals was found to be very weak. These weaknesses negatively affected the adoption process of organisations' services.

### 7.6.2 Findings in Organisational Factors

Table 7-2 and Figure 7-4 show various levels of organisational critical factors across the four case studies conducted in Sudanese public organisations.

**Table 7-2: Organisational factors across-cases**

Organisational Factors	Sub-factors	HED	NEC	EBS	IM
<b>Organisational Culture</b>	Low Resistance				
	Information Sharing				
<b>Human Capacity</b>	ICT in Education				
	ICT Skills & Training				
<b>Change Management</b>	Flexibility				
	BPR				
	Multiple Channels				
<b>Top Management</b>	Awareness & Commitment				
	No Brain Drain				



**Figure 7-4: Radar diagram for organisational factors**

Table 7-2 and Figure 7-4 indicate that the factors shaping the organisational have been deeply considered and well managed. The main challenges addressed are the “brain drain” and high level of “bureaucracy and inflexible” of management systems in some organisations. Both challenges are related to the working environment in public sectors. Therefore, policy makers were found to be striving to make changes to resemble the private sector style of work. The critical factors may vary between the four organisations, but there are common characteristics which are evident; such as the strong commitment and awareness among top managers. The data displayed in this chapter reveals the key role played by these managers in strategic thinking and making decisions to adopt new technology. However, resistance still appears from middle management and other senior staff with an ‘old style’ of management, or among employees with little IT knowledge. The resistance from senior managers was considered more threatening and difficult to handle, as it may cause long delays in the adoption process. Other resistance has been resolved by the provision of systematic ICT training, as indicated in Figure 7-4. The organisations also made concerted effort to provide electronic services through multiple channels. This was found to be very important as online service may not always be the best option in the context of developing countries, because of technical difficulties with Internet access, especially in rural areas. Another important achievement highlighted in Figure 7-4, is the business re-

engineering process carried out in organisations. This is an additional indicator showing the new trend in public organisations strategic agendas.

### 7.6.3 Findings in Environmental Factors

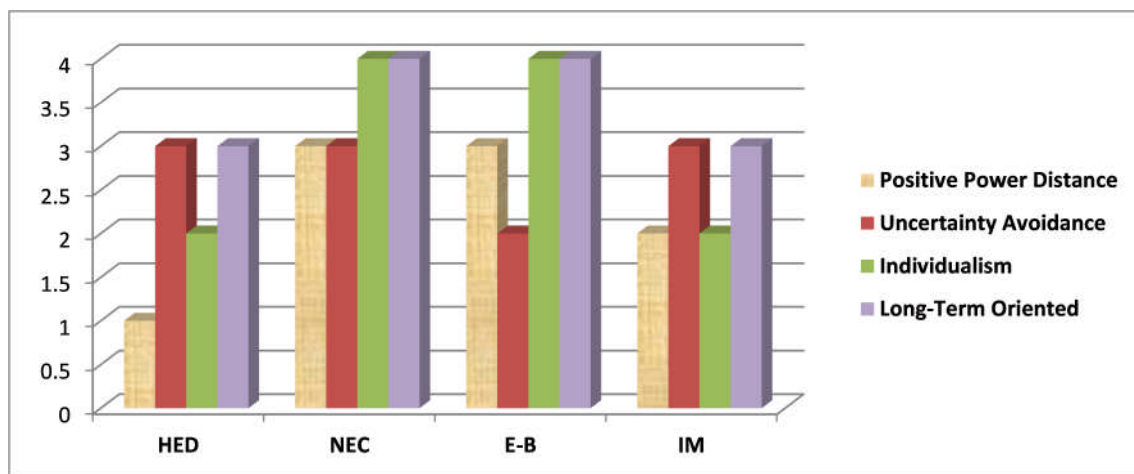
Table 7-3 and Figure 7-5 show the level of Hofstede cultural dimensions across the four case studies

**Table 7-3: Hofstede dimensions across cases**

Hofstede Dimensions	HED	NEC	E-B	IM
<b>PPD</b>	Lo	Med	Med	Med
<b>UA</b>	Hi	Med	Lo	Hi
<b>IND</b>	Med	Hi	Hi	Lo
<b>LONG</b>	Hi	Hi	Hi	Med

**PPD:** Positive Power Distance  
**UA:** Uncertainty Avoidance  
**IND:** Individualism  
**LONG:** Long-term

*Lo:* Low = 1  
*Med:* Medium = 2  
*Hi:* High = 3



































**Figure 7-5: Diagram for Hofstede dimensions**

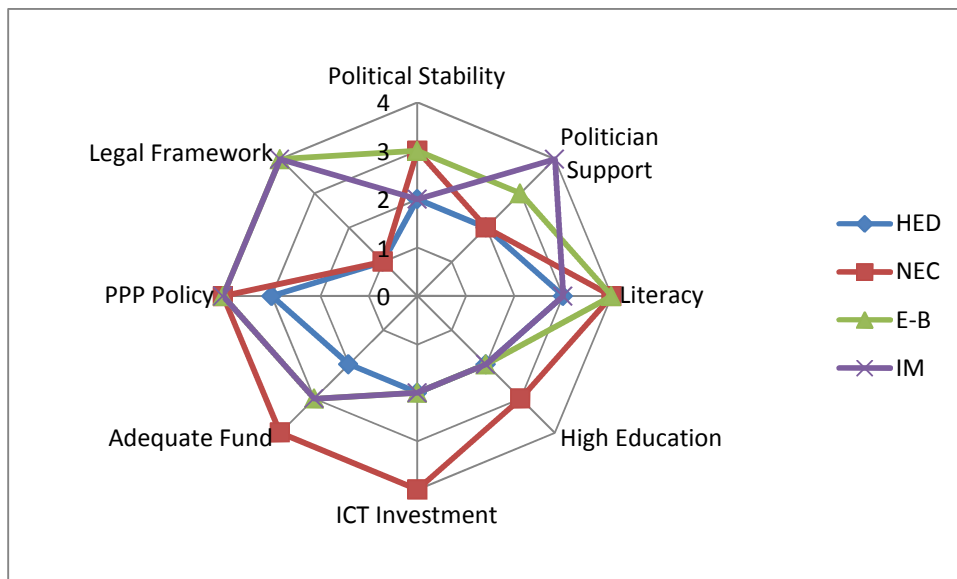
Figure 7-5 indicates the existence of the “positive power distance” among high level politicians and top government leaders. Their influence and support is crucial to see through the implementation of initiatives. In public organizations, power is in the hands of the few. Senior managers who positively use their power to enforce the introduction of ICT and e-government initiatives are therefore important assets.

The experience of e-government in Sudan demonstrates that Sudan has bold ‘risk takers’, unlike most other developing countries. Also, public organisation leaders and top managers showed that they enjoy long term orientation and have the patience to wait for good results from the initiatives. The concern for “individuals” is still a very new concept in public organisations in Sudan. This explains the low performance observed in some of these organisations.

Table 7-4 and Figure 7-6 show various levels of environmental critical factors across the four case studies conducted in Sudanese public organisations.

**Table 7-4: Environmental factors across-cases**

Environmental Factors	Sub-factors	HED	NEC	EBS	IM
<b>Political</b>	Political Stability				
	Politician Support				
<b>Culture</b>	Literacy				
	High level of Education				
<b>Economic</b>	ICT Investment				
	Adequate Fund				
<b>Regulatory</b>	PPP Policy				
	Legal Framework				



**Figure 7-6: Radar diagram for environmental factors**

The internal and external factors in the political, economic, and cultural environment overlap and influence the transformation and adoption process of initiatives by organisations.

The turbulent and unstable political system had a direct impact on network access and connectivity. The sanctions against Sudan deprived organisations from buying the most sophisticated technology and reduced its chances of competing in the global market. It also limited organisations' opportunities to access technology developed by Western companies. However, organisations managed to establish partnerships with local and foreign investors as indicated in the PPP factor, but mostly through a third party. The adoption of the PPP policy helped in addressing the insufficient funding available for the organisations' initiatives. But ICT investment, which closely relates to financial priority, has not yet reached the expected levels; due sometimes to conflicts of interest between managers. In terms of cultural factors, the examined organisations had negligible illiteracy among their staff members. This is because younger generations are being hired and hold out the promise of more change.

A missing factor of significance is the legal framework, as shown in Figure 7-6. However, some organisations have managed to develop a comprehensive set of policies and develop legislation, which facilitated the transformation process and replacement of traditional procedures with a more advanced electronic based ones.



## 7.7 Development of e-government adoption framework

This section represents the second and final revision of the proposed framework for e-government adoption in Sudan. Figure 7-7 illustrates the framework with: the critical factors identified in the initial stage (in grey); the factors defined at the national level (in orange); and finally the factors found at the organisational level (in red).

### 7.7.1 Technology Factors

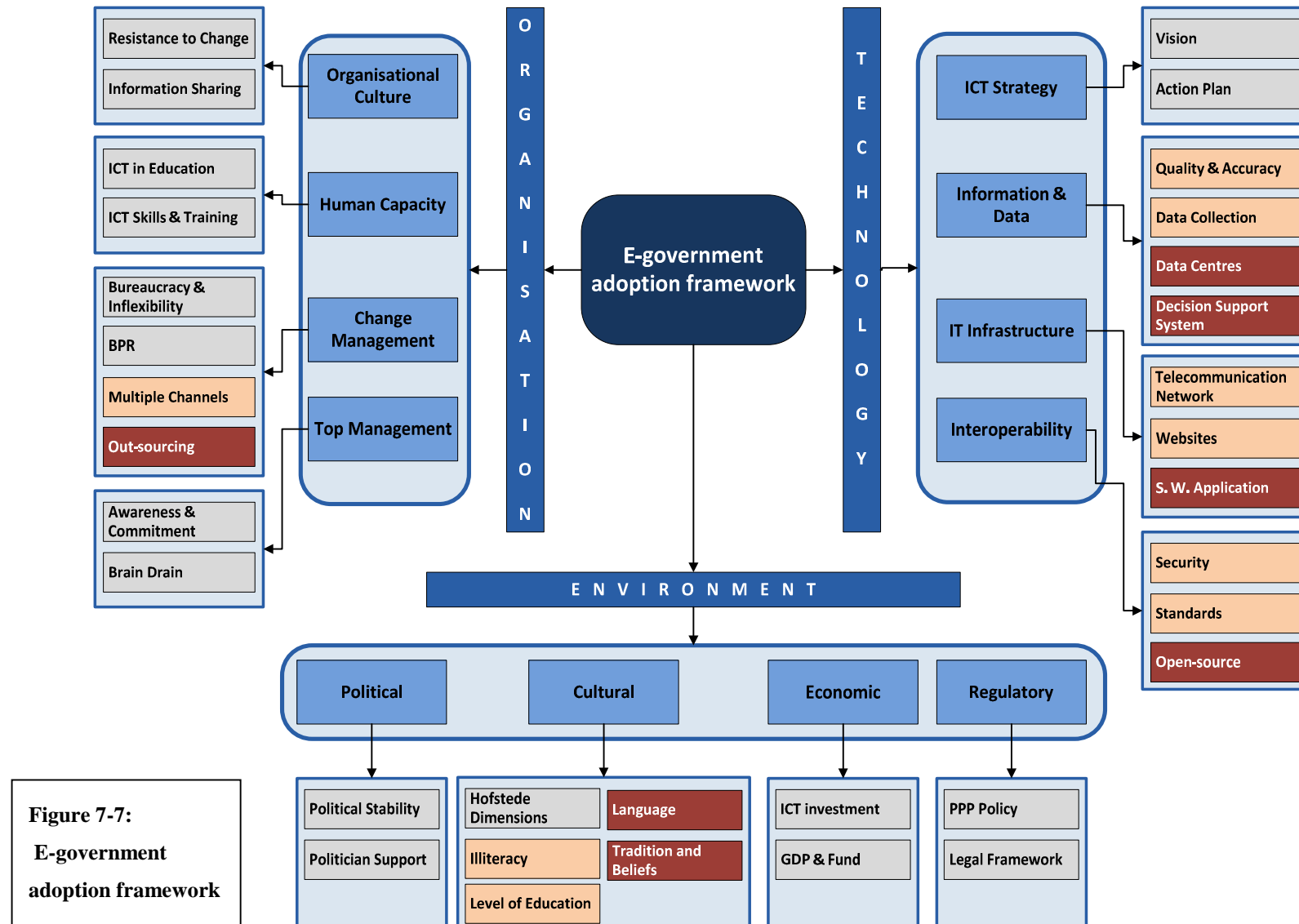
The analysis verified the influence of the four main technology factors and sub-factors. However, in the “Information and Data” factor; the establishment of **Data Centres** was important to ensure that the data is managed according to international standards, thereby allowing exchange of information. Further, it has been demonstrated that the available information has been used to support the decision making process. In fact some organisations already use **Decision Support Systems** (DSS). In the “Interoperability” factor, the initiatives have already introduced the **Open-source code** systems in order to facilitate more technical coordination and interoperability. Finally, in the “IT Infrastructure” critical factor, the organisations have paid attention to develop their own **Software Applications** as a critical factor in the initiatives adoption. This factor allows building and resettlement of technical experience.

### 7.7.2 Organisational Factor

Analysing the organisational factors confirmed their importance, and illustrated their impact on the organisations initiatives. However, organisations adopted the new trend of **Out-sourcing** as one of the policies that may help in “Change Management” and hence increase their efficiency.

### 7.7.3 Environmental Factors

The analysis proved that the environment factors impact highly upon an organisation’s initiatives. However, in the “Cultural” factor, the **Language** appeared as a clear barrier against full adoption of many of the initiatives. Further, within the “Cultural” factor the **Traditions and Beliefs** in Sudanese society are strongly interfering with the new procedures introduced by the organisations’ initiatives.



**Figure 7-7:**  
**E-government**  
**adoption framework**

## **7.8 Summary**

The analysis in this chapter aimed to understand and confirm the significance of the critical factors of e-government adoption in Sudan, at an organisational level. Therefore, the author examined four public organisations' initiatives. The in-depth analysis has greatly helped to deepen this understanding and develop new themes and factors. The new findings were significant in completing the picture of e-government in Sudan and confirming the importance of the identified critical factors in the adoption process. This helped to achieve the ultimate goal of this chapter and build an e-government adoption framework that is based on understanding the context in Sudan and its specific needs and requirements.

In order to ensure that the framework is applicable and useful in guiding the process of decision-making of e-government in Sudan, the author took a further step and validated the developed framework. The next chapter explains in detail the framework validation process.



## 8 FRAMEWORK ILLUSTRATION

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In this study a framework has been developed for e-government adoption in public organisations in the context of Sudan. The aim of this chapter is to illustrate how organisation leaders can use the proposed framework in the decision making process. The illustration process explains how the framework can help to identify critical factors and challenging issues facing the adoption process. The illustration also shows how the use of the framework gives guidance to policy makers in defining the organisation's new direction and future trends. The chapter is structured as follows:

1. **Section (8.1):** Explains the steps of how to use the framework.
2. **Section (8.2):** Describes briefly the context of the case used in this illustration process.
3. **Section (8.3):** Describes the current adoption status of the e-government initiatives in the selected case and identifies its challenges.
4. **Section (8.4):** Updates the framework according to the new findings and lists the critical factors.
5. **Section (8.5):** Provides suggestions for the existing challenges.
6. **Section (8.6):** Summary of the chapter.

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### 8.1 How to use the adoption framework

The purpose of developing the e-government adoption framework was to help policy makers in their decision making process. In this study, the developed framework forms the basis for policy makers to review their initiatives and balance priorities in their strategic planning. This is of significance in a developing country context where, most e-government initiatives are still considered to be immature and many problems were seeded at the strategy phase, leading to inappropriate decisions and actions. The

framework was developed in such a way so to assist decision makers at the national level as well as the organisational level; by highlighting the most critical contextual factors and explaining how they interact and evolve in the e-government adoption process.

The author identified three distinct steps explaining how to use the adoption framework. The author believes that by following these steps, the organisation decision makers can obtain the best results and guidance for the adoption process.

1. Review the current status and build on past experiences to understand the obstacles and factors influencing the adoption process. A categorisation of the most critical factors concludes this step to rank challenges.
2. Adapt the framework with new factors, or remove some factors when they are no longer critical in order to cope with the dynamic change in the surrounding environment
3. Prioritise future plans and initiatives in order to gain suitable balance between development of technology, organisation and environment aspects

The researcher held a group discussion with seven top managers in the National Service organisation Table 8-1. The discussion was organised according to the three steps explained. After the discussion, each member of the group was asked to fill-in an assessment sheet to evaluate the importance of the critical factors identified in the proposed framework. This helped to draw a clear picture of the situation regarding the e adoption of e-government initiatives in the NS. This picture allowed the policy makers to give suggestions to overcome the challenges facing the adoption process. These suggestions were derived from the policy makers' experiences and best practices in the NS as well as other public organisations and sectors within Sudan or in the region.

**Table 8-1: Group members NS senior managers**

No.	Group members	
1	General Manager	GM
2	Chief Executive Officer	CEO
3	Head / Strategic Planning Department	SP/D
4	Head / IT Department	IT/D
5	Head / Human Resources and Training Department	HRT/D
6	IT Professional / IT Department	IT/P
7	IT Professional / IT Department	IT/P

## 8.2 Case context illustration

The three steps were applied using experiences from the NS in Sudan. The NS is a relatively new public organisation that was established according to the 1992 National service Act. It is a civil-military organisation, where many staff members are civilians, but it is part of the military. The NS is mainly responsible for facilitating and managing the national service that each citizen should give to the country. The age at which citizens are supposed to perform their services range between 18-59 years. However, the NS collects full information on all age ranges. According to the NS key leaders this helps them to set their long terms plans. As a result, the NS deals with a huge amount of data and coordinates with all types of public and private organisations, as well as with all educational institutes. The NS has a clear objective of utilising ICT to deliver its services; to create a modern organisation in its style of work and also in the relationship with the citizens. The NS is considered a pioneer in process re-engineering and in establishing large database centres in Sudan. The following section highlights the main features of the current status of e-government in NS.

## 8.3 Review of current status

This is the first step suggested to when starting to use the developed framework. By the end of this step it is expected that policy makers will be able to draw a clear picture of the organisation status in terms of e-government adoption in the technology,

organisation, and environment contexts. The depiction is based on the assessment conducted by top managers, which ranks the factors according to their critical level.

### **8.3.1 Technology factors**

The NS policy makers decided to build the organisation upon modern foundations as part of the 25 year National Strategy. Thus, the NS developed its own five year action plan; with a focus on the construction of network infrastructure to connect its branches across the country. Transmission networks are comprised of optical fibres connecting more than 13 branches in different provinces, with a wireless network connecting all departments in Khartoum. The network facilitates online meetings and video-conferencing, which senior managers in the NS assert has saved the organisation significant amounts of time and money.

In parallel, the NS built a data centre, creating the largest electronic archive system in the country. The establishment of this centre helped improve the quality and accuracy of data as well as the speed of its processing. This was as a result of the well-defined structure of data collection; which included collection of detailed data, images and maps. Historically, the NS data collection methods relied on experiences and practices from other countries. Since 2008 the data collection was based on the national census criteria and standards. According to the managers, the availability of accurate data allowed for the production of authoritative reports, greatly assisting in the decision making process.

Despite the fact that the NS developed some rudimentary Decision Support Systems, the author noted that these were not advanced, powerful DSS. Also, the expansion of the network has not been accompanied by the provision of interactive websites and online services.

The author also observed that the software applications in use were developed by NS recruits who were originally IT professionals. But the developed applications can be without security standards and do not use open source code. Further, the NS organisation loses contact with these recruits as soon as they finish their national



service. This threatens not just the sustainability of the software applications within the NS, but also it means less chance of interoperability with other organisations.

The main issue in the current technological status is that the current strategy vision and action plan are not developed specifically to promote the adoption of ICT initiatives within the NS. Most achievements have been due to the role played by successive NS leaders.

### **8.3.2 Organisational factors**

The top managers and policy makers in the NS held the belief that ICT would considerably improve the performance of the organisation and allow it to decentralize the decision-making process. To this end, the whole organisation was restructured, including the formation of a central department at the federal level, responsible for planning and issuing policies. State and local departments were now allowed to act independently and required to implement and execute the action plans. The new structure also involved the creation of decentralised complexes to allow for ‘functional decentralisation’; these bodies being responsible for carrying out many NS tasks.

The flexibility in the existing management system was demonstrated by the unimpeded change and reengineering of processes; such as the call for citizens to register and perform their national service. The process formerly involved stopping people on public transportation, at airports or other public places. This method caused much resentment and inconvenience and has been replaced with new procedures of calling through e-mail, web, or SMS. Furthermore, the NS established new ways of coordinating with other organisations, in order to allow citizens to perform their services at more flexible times. The redesigned procedures have greatly helped in the adoption process of these services. However, due to the nature of the organisation and its relation to the military, inflexibility remains one of its main obstacles.

NS managers ensured the organisation was proactive in employing ICT skilled staff; so more than 400 people with different levels of qualifications in IT were hired. The large number of IT professionals helped to enhance the surrounding environment and make it ready for change, as pointed out by one senior manager. They also helped by offering

many training programmes within the NS, as well as for other organisations and institutes, contributing extensively to the elimination of ICT illiteracy. However, the NS experienced the loss of some of its IT professionals due to fierce competition from the private sector, which led policy makers to reconsider the working environment.

From another perspective, it was found that the NS has not yet developed an effective cultural understanding of information sharing and exchange of data; ignoring large amounts of data and records held in the NS and other public organisations' data centres. The author argues that this attitude is simply not helping the NS to be more time and cost-effective.

### **8.3.3 Environmental factors**

As the NS is one of the military agencies, it receives significant state support, including in logistics. Nonetheless, the organisation still lacks adequate funding, with policy makers relating low adoption in many areas to lack of financial support. Although the NS has not yet recognised the significance of investing in ICT to exploit the technology's large commercial potential to help in solving some of the finance problems, it has realised the need for partnerships with third parties. However, despite the PPP policy being promoted, it has only been implemented on a limited scale, (such as the partnership with IT companies for the purpose of training and facilitating e-administration).

In dealing with other policies and legislation issues related to ICT, the NS mainly depends on the NS Act of 1992. Recently the NS started to establish new rules to regulate and allow easy use of digital signature and high security standards, but it is still a distance away from developing a comprehensive legal framework.

The nature of the NS as a civil-military organisation has limited the amount of free access to information and brought about low levels of decision participation. However, new policies have paved the way for the provision of free Internet access and more citizen participation through the NS website. Also, due to the NS characteristics, most of the decision-making power is in the hands of its senior managers, who used their power positively to enforce the introduction of ICT and e-government initiatives. More

importantly, they gave considerable care to individuals by creating an attractive environment that facilitated good training, with a powerful Intranet, reliable connectivity, and more than 27 software applications for the different operations and tasks in the NS. The NS consider itself pioneer in many initiatives because they were risk takers, and that they were able to wait for ten years before they could see the big change and transformation. This seemed to be a difficult task as the NS deals with all kind of recruiters including illiterate and those with low level of education.

The main aim of having NS recruits was to foster political stability in the country, but decision and policy makers noticed that this cannot be achieved without changing the current approach. In the previous example of calling citizens for national service, the new approach relieved a lot of political tension; in fact, policy makers decided to revise the whole approach of the NS, which was originally established during the time of conflict. After the peace agreement between North and South Sudan, the NS policy makers decided to reset the whole vision and strategic aim of performing national service. Collecting data also helped workers in the NS to understand more about the distinct traditions and behaviour of people from various areas.

#### **8.3.4 Categorisation of the factors critical level**

This categorisation was built by the author in order to help top managers assess the critical factors. The assessment is based on a score ranged between 0 – 4, which helped to classify the factor's critical level. This classification can be very valuable for decision makers in public organisations in order to prioritise their actions according to the factor's ranking. It will guide them to make quick and strong decisions regarding highly critical factors. Less critical factors will still need attention and focus, while some factors with low level of criticalness can simply be avoided; or actions be delayed if the organisation has limited resources and cannot cover the requirements for all factors at any one stage. Table 8-2 illustrates the categorisation of the critical levels.

Table 8-2: Categorisation of factors critical level

Factors critical Level	Range of level	Type of actions
Highly Critical	0 - 2	This level needs immediate and fast actions. The decisions should be strong enough to allow quick results and hence balance the level of adoption between factors
Critical	2.1 - 3	This level also needs a lot of consideration and focus. Its priority should not exceed the above level, but policy makers have to quickly set plans and phases with specific schedules and timetable
Less Critical	3.1 - 4	The factors in this level are also critical and important to manage, but if the organisation lacks funds, human capacity or any other resources, policy makers should not be investing in these factors; unless factors in the other two levels were handled to the extent that they became less critical

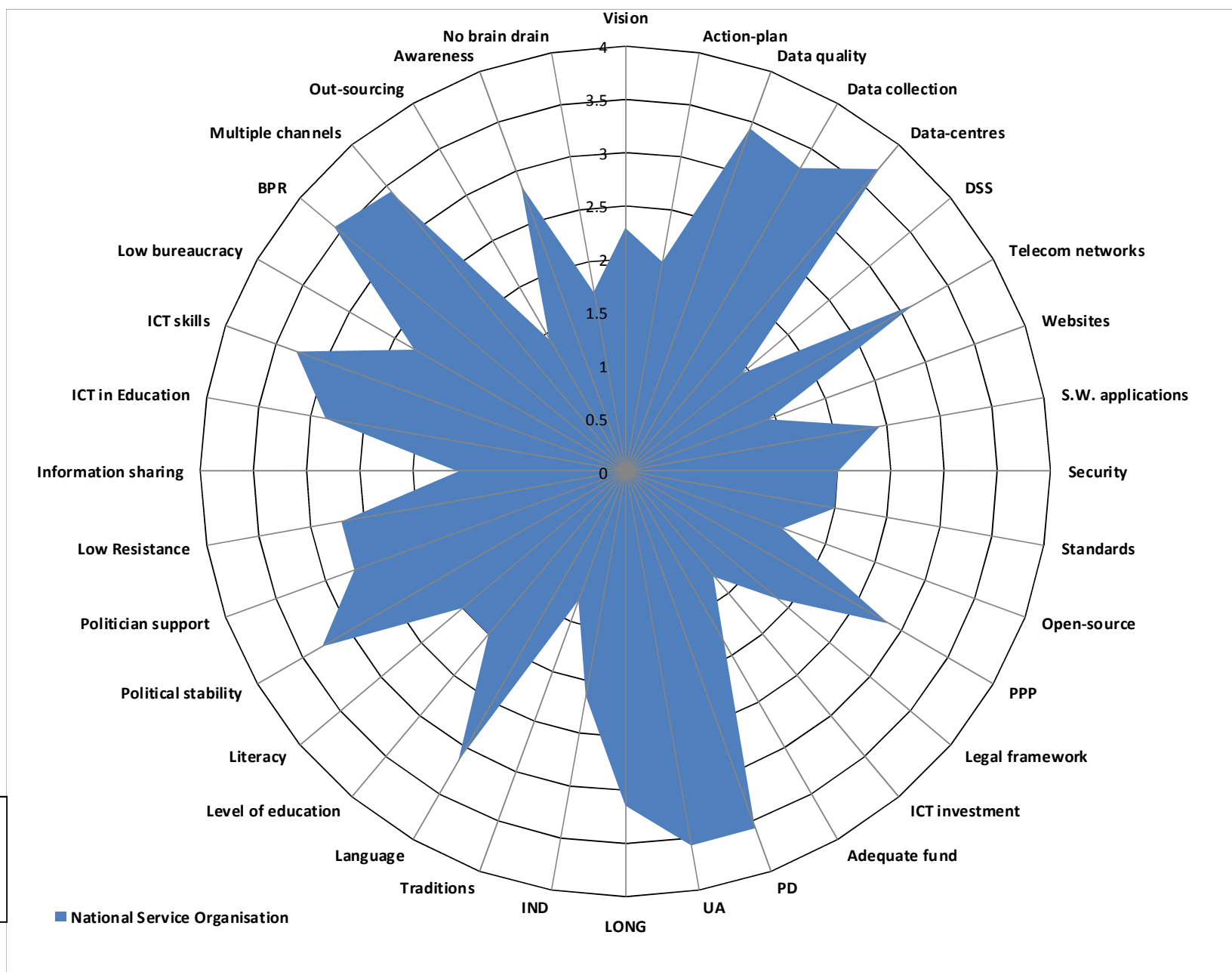
This section lists the organisation critical factors (Table 8-3) and classifies them according to the classification level explained earlier. Using the NS example, the factors are ranked according to their average score, which was calculated from the assessment made by the group of top managers in the NS.

Table 8-3: List of NS critical factors

Level	Factor	Average
Highly Critical	ICT investment	1.29
	Traditions	1.29
	DSS	1.43
	Website	1.43
	Out-sourcing	1.43
	Standards	1.57
	Open-source	1.57
	Information Sharing	1.57
	Low brain drain	1.71
	Legal framework	1.86
	Political stability	1.86
	Adequate fund	1.86
	Action plan	2
	Security	2
	Literacy	2
	Level of education	2

<b>Critical</b>	Individualism	2.14
	Vision	2.29
	Low bureaucracy	2.29
	S.W. applications	2.43
	Low resistance	2.71
	Politician support	2.71
	PPP	2.86
	ICT in Education	2.86
	Awareness	2.86
<b>Less Critical</b>	Telecom networks	3.14
	Long-term oriented	3.14
	Language	3.14
	Data centre	3.17
	ICT skills	3.29
	Data collection	3.29
	Data quality	3.43
	Multiple channels	3.43
	BPR	3.57
	Positive power distance	3.57
	Uncertainty Avoidance	3.57

The ranking of factors in Table 8-3 helped to create a clear picture that reflects the whole situation of e-government in the NS, Figure 8-1. The picture provides detailed information of the status of each factor, which can easily be compared with other elements and factors. This gave guides to policy makers in order to make the appropriate decisions in the right direction, as well as to estimate the amount of work needed to be done to obtain better levels of adoption.



## 8.4 Adapt the framework

The previous section helped to understand the context of the specific organisation and to draw a clear picture of what could be causing the delay in the adoption process in the NS. This required the framework to be adapted and modified. Based on the new findings and further discussion the NS top managers identified their new list of critical factors.

### 8.4.1 Technology factors

The technology factors identified in the proposed framework were found to be both relevant and important for e-government adoption in the NS. The top managers did not identify new factors in this aspect; but, they highlighted the significance of the ‘Interoperability factor’, and the need to recognise the security and standards issues and the importance of using open-source code software. The managers also realised that, in order to make a breakthrough in the technology factor the NS should provide a better quality of on-line services through developing more interactive ‘Websites’.

In conclusion, the top managers agreed that many technology factors were considered sufficiently critical and important to guide policy makers in technological change. But they argued that some factors had already been considered and actions taken. Accordingly they identified their new list of Technology critical factors.

NS Technology Critical Factors	
<b>ICT Strategy</b>	<ul style="list-style-type: none"> <li>• <b>Vision</b></li> <li>• <b>Action Plan</b></li> </ul>
<b>Information &amp; Data</b>	<ul style="list-style-type: none"> <li>• <b>DDS</b></li> </ul>
<b>IT Infrastructure</b>	<ul style="list-style-type: none"> <li>• <b>Website</b></li> <li>• <b>Software Application</b></li> </ul>
<b>Interoperability</b>	<ul style="list-style-type: none"> <li>• <b>Security</b></li> <li>• <b>Standards</b></li> <li>• <b>Open-source</b></li> </ul>

### 8.4.2 Organisational factors

The organisation factors were also found to be important in the NS adoption process. Top managers stated that while they were aware of many of the identified factors and challenges, they had missed the importance of some of these factors; such as, ‘Information sharing’ and ‘Out-sourcing’. They also highlighted that the transformation in the organisation structure was a crucial element that helped in adopting new forms of e-government. They also mentioned that although they provide systematic ICT training they still consider this factor to be critical, as it can guarantee the sustainability of the initiatives.

In conclusion, the top managers agreed that most organisation factors were considered critical. ‘Organisational structure’ was suggested as an additional critical factor as it is playing a significant role in the change adoption. Accordingly they identified their new list of Organisational critical factors.

NS Organisational Critical Factors	
Organisational Culture	<ul style="list-style-type: none"> <li>• Resistance to Change</li> <li>• Information Sharing</li> </ul>
Human Capacity	<ul style="list-style-type: none"> <li>• ICT Skills &amp; Training</li> </ul>
Change Management	<ul style="list-style-type: none"> <li>• Bureaucracy &amp; Inflexibility</li> <li>• Out-sourcing</li> </ul>
Top Management	<ul style="list-style-type: none"> <li>• Awareness &amp; Commitment</li> <li>• Brain Drain</li> </ul>
Organisational Structure	<ul style="list-style-type: none"> <li>• Decentralization</li> </ul>

### 8.4.3 Environmental factors

The environment factors were found to be critical in addressing the challenging issues faced in the external environment. According to the top managers, most environmental



factors represent clear challenges for the NS; especially, the absence of ‘Legal Framework’ and the lack of understanding and appreciating of the ‘Traditions’. However, top managers indicated that the ‘Language’ is not a critical issue for the NS, as most of the software applications employed and training provided are in the Arabic language. They also reported that despite inadequate ‘Funding’, ‘Politician Support’ has been strong enough to have helped the adoption process. It was pointed out that the NS needs to make more effort and enhance the working environment to keep their staff commitment and reduce the brain drain.

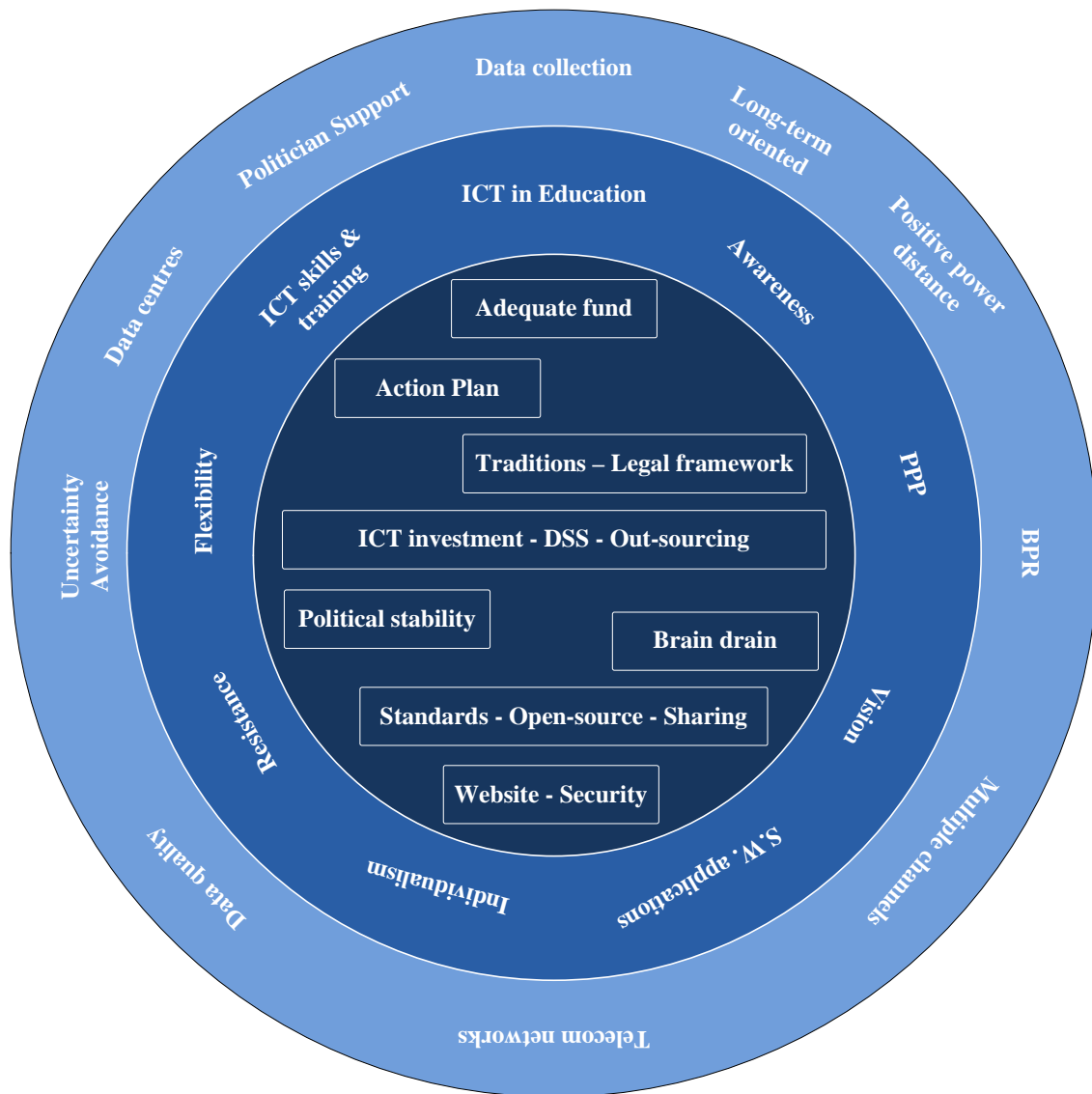
In conclusion, the top managers agreed that most environmental factors were critical. Considering the addressed issues above, the NS top managers identified their new list of Environmental critical factors.

NS Environmental Critical Factors	
<b>Political</b>	<ul style="list-style-type: none"> <li>• <b>Politician Support</b></li> </ul>
<b>Cultural</b>	<ul style="list-style-type: none"> <li>• <b>Individualism</b></li> <li>• <b>Illiteracy</b></li> <li>• <b>Low Level of Education</b></li> <li>• <b>Traditions</b></li> </ul>
<b>Economic</b>	<ul style="list-style-type: none"> <li>• <b>ICT Investment</b></li> <li>• <b>Funding</b></li> </ul>
<b>Regulatory</b>	<ul style="list-style-type: none"> <li>• <b>Legal Framework</b></li> <li>• <b>PPP Policy</b></li> </ul>

## 8.5 Prioritise future plans and initiatives

The ultimate goal of developing the adoption framework is to help leaders and top managers to make the best possible decisions regarding e-government adoption in their organisations. In this example, after understanding the areas of weakness and strength, and updating its critical factors, the author provided the top managers with a picture of the e-government critical factors in the NS. The picture in Figure 8-2 was built

according to the factors' average calculated in (step 1) and listed factors in (step 2). Accordingly, the NS top managers proposed and gave suggestions for highly critical factors in order to improve the initiatives adoption.



**Figure 8-2: initiatives critical factors**

In the following section, Table 8-4 highlights the suggestions provided by the NS top managers for the factors that scored 'Highly critical' as important actions. They believe that these actions can enhance the adoption process if implemented quickly.

**Table 8-4: Suggestions for highly critical factors**

Factor	Proposed suggestions
Action plan	<ul style="list-style-type: none"> <li>Establish a committee responsible for the formulation of action plan</li> <li>Design a long and short term action plan for e-government initiatives</li> </ul>
Website	<ul style="list-style-type: none"> <li>Improve website layout to be more attractive</li> <li>Provide interactive services in two-way communication</li> </ul>
Security	<ul style="list-style-type: none"> <li>Adopt security standards and systems to ensure confidentiality and reliability</li> <li>Provide technical requirements and policies to introduce safe digital signature</li> <li>Provide backup system</li> </ul>
ICT investment	<ul style="list-style-type: none"> <li>Discover opportunities of ICT investment</li> </ul>
DSS	<ul style="list-style-type: none"> <li>Adopting digitalised reporting systems and ensure its linking to the decision making process</li> <li>Install DSS systems</li> </ul>
Out-sourcing	<ul style="list-style-type: none"> <li>Adopting flexible management procedures to allow outsourcing</li> <li>Outsourcing of the more complex projects to ensure provision of resources</li> </ul>
Standards	<ul style="list-style-type: none"> <li>Applying the national technical standards</li> <li>Rejecting any software or technical equipment without the agreed standards</li> </ul>
Open-source	<ul style="list-style-type: none"> <li>Enforcing the use of open-source</li> <li>Using the available open-source software developed in other organisations</li> </ul>
Traditions	<ul style="list-style-type: none"> <li>Understanding the traditions and attitudes before data collection</li> <li>Conduct pilot survey</li> </ul>
Information sharing	<ul style="list-style-type: none"> <li>Issuing new rules for information sharing</li> <li>Ensuring that the new plans for creating databases, software ... etc has not been created by other organisations</li> </ul>

Factor	Proposed suggestions
Brain drain	<ul style="list-style-type: none"> <li>Integrate systems and databases across organisations to impose the situation of sharing and exchange of data</li> <li>Adopt new policies to improve the financial conditions for workforce and especially the IT staff</li> </ul>
Legal framework	<ul style="list-style-type: none"> <li>Identify areas of regulations that need to be changed or issued in order to adopt the initiatives</li> <li>Establish a committee for developing a legal framework</li> </ul>
Political stability	<ul style="list-style-type: none"> <li>Prepare backup plan for the war zone areas</li> <li>Adapt short term strategies and plans to cope with the political changes</li> </ul>
Funding	<ul style="list-style-type: none"> <li>Introducing fund solutions based on ICT investment mechanism</li> <li>Having phases of fund to allow purchasing through longer periods of time</li> </ul>
Organisational structure	<ul style="list-style-type: none"> <li><b>Restructure the organisation's administrative departments to a horizontal and decentralised form</b></li> <li><b>Restructure the organisation's operation processes to cope with the new forms of e-government procedures and functions</b></li> </ul>

## 8.6 Summary

This chapter has achieved its aim of illustrating and explaining how the framework can be used to guide decision making related to e-government adoption in public organisations. The illustration included three distinct steps: reviewing the current status and conditions of the e-government initiatives in the organisation; adapting the framework according to the new findings; and prioritising the future plan. The first step facilitated the building a holistic picture and ranking the factors. The final step helped to provide appropriate suggestions and recommendations. The proposed suggestions can direct an organisation in the right direction for transformation and process change.

## 9 DISCUSSION

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The aim of this chapter is to demonstrate a deep understanding of e-government adoption in the context of developing countries; and to show how the key findings illustrated in Chapters 6 and 7 led to the accomplishment of the research aim. Therefore, all pieces of work conducted in this study have been collated and the findings discussed according to the following structure:

1. **Section (9.1):** How the key findings of the study have met the aim of the research.
2. **Section (9.2 – 9.5):** How the research findings compared with the literature review. In this section the discussion is conducted against the significance of the research highlighted in Chapter 1.
3. **Section (9.6):** Summary of the chapter.

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### 9.1 Research Key Results

This research has two main results: the e-government adoption framework (Figure 7-9); and e-government critical factors in Sudan (Figure 6-5).

The adoption framework has been developed through adapting the TOE framework. The framework, which defines three contextual factors for technology adoption (technology, organisation and environment), helped the author to profoundly understand the impact of these factors and their links. Fountain (2001) states that:

*“Information technology and organizational and institutional changes are connected to each other. They are very dependent on how each explains the other and each has causal effects on the other”.*

This research is unique in its examination of the overlap and interaction between the technological, organisational, and environmental factors and their influence upon e-

government adoption in the context of developing countries; using Sudanese public sector organisations as an example.

The framework can help policy and decision makers in developing countries better deal with issues related to the adoption process and guide them to:

- Balance e-government priorities and more effectively integrate ICT in order to accelerate social and economic development.
- Manage the changes in the dynamic environment that characterises the context of developing countries.

The second key result from this study is the identification of e-government critical factors, in relation to the context of the public sector in Sudan (Table 6-5). The importance of defining these factors is that it illustrates the current situation and explains the challenges and opportunities surrounding the adoption process. Without such understanding it would be difficult for policy makers to set strategies and plans, or to direct government investment correctly. Currently, the decision making process for e-government adoption in Sudan suffers from under-specification of many of these challenges and opportunities.

The following sections further discuss the analysis of the critical factors and issues shaping the process of transformation in Sudanese public organisations.

The next section is a discussion of the research findings set against the elements of the “**Significance of the Research**” highlighted in Chapter 1, Section 1-7. The findings are discussed and compared to the literature review.

## **9.2 Add to research in contextual factors**

The findings in this research represent a significant addition in explaining and understanding the contextual factors influencing e-government adoption. This study shows that the combination of technical and non-technical factors is providing new insights and contributing to the introduction and uptake of e-government innovation. According to Osman (Osman, 2002):

*“These factors are not discrete in practice, but rather overlap and influence each other in shaping the processes and outcomes of change”.*

The final results and conclusions of the research confirmed that the technological, as well as the organisational and environmental contexts, all have a direct or indirect impact on the adoption process. As highlighted in Chapter 2, Section 2.1.1, the concept of e-government is not about technology, but rather one of society, culture, and politics.

A discussion of the findings of the contextual factors and their impact upon the adoption of e-government in Sudan is presented in the following three sections. In these discussion sections, the three tables (Table 9-1, Table 9-2 and Table 9-3) each include a column labelled “New Findings”. The columns are to indicate that these factors have not been addressed extensively in the literature, and that they are rarely listed among the most critical factors for e-government adoption in developing countries.

### **9.2.1 Technology Context Discussion**

The findings in this study revealed that the readiness of the technology context was crucial for e-government adoption in Sudan. It supported the communication sector in developing as an advanced transfer medium, making Sudan a technically modern state in the Arab and African regions. The evidence confirmed that factors related to pure technical issues (networks, databases, and software applications), or factors including technology processes (strategy, vision and action plans), are all important to build an enabling technology context. As described in Chapter 2, Section 2.8, the technical infrastructure, processes and procedures are all important elements for allowing e-government adoption.

Table 9-1, lists the technology critical factors found in the literature and those identified according to the findings in this study.

Table 9-1: Technology context factors

Literature Review		Identified Technology Factors		New Findings in Sudan
<b><u>ICT strategy</u></b> <ul style="list-style-type: none"> <li>• Vision</li> <li>• Objectives</li> <li>• Values</li> </ul>	→	<b><u>ICT strategy</u></b> <ul style="list-style-type: none"> <li>• Vision</li> <li>• Action Plan</li> </ul>	←	<b><u>ICT strategy</u></b> <ul style="list-style-type: none"> <li>• Action Plan</li> </ul>
<b><u>Information &amp; Data</u></b> <ul style="list-style-type: none"> <li>•</li> <li>• Quality &amp; Accuracy</li> <li>• Data Management</li> <li>•</li> </ul>	→	<b><u>Information &amp; Data</u></b> <ul style="list-style-type: none"> <li>• Quality &amp; Accuracy</li> <li>• Data Collection</li> <li>• Decision Support Systems</li> <li>• Database Centres</li> </ul>	←	<b><u>Information &amp; Data</u></b> <ul style="list-style-type: none"> <li>• Data Collection</li> <li>• Decision Support Systems</li> <li>• Database Centres</li> </ul>
<b><u>IT Infrastructure</u></b> <ul style="list-style-type: none"> <li>• Telecommunication Networks</li> <li>• Technology complexity</li> <li>• Websites</li> <li>• H.W. Components</li> <li>• S.W. Application</li> </ul>	→	<b><u>IT Infrastructure</u></b> <ul style="list-style-type: none"> <li>• Telecommunication Networks</li> <li>• Websites</li> <li>• S.W. Application</li> </ul>		
<b><u>Interoperability</u></b> <ul style="list-style-type: none"> <li>• Security</li> <li>• Standards</li> <li>• Open-source</li> </ul>	→	<b><u>Interoperability</u></b> <ul style="list-style-type: none"> <li>• Security</li> <li>• Standards</li> <li>• Open-source</li> </ul>		

### **ICT Strategy**

The findings and analysis in this study show that the approved national ICT strategy in Sudan has clearly prompted the introduction and adoption of ICT applications (principally e-government), in most departments and organisations in the public sector. It was found that all organisations used the national strategy as the foundation upon which to formulate their specific ICT strategies. This has ensured harmonisation between different departments and public organisations. The strong data emphasises that the ICT strategy was key for Sudan to be able to enter into a new information era and digital age. Lowery (2001) stated that ICT strategy:



*“Is fundamental to navigate through the exploding e-government market place, re-engineering processes and procedures to support e-government, and implementing e-government initiative”*

The ICT strategy in Sudan addressed many issues, including: vision, main mission, objectives and adopted values. However, the omission of some important elements (e-readiness, evaluation, and strengthening citizen-participation through creating specific channels) affected the success of many initiatives. The most serious omission though was the absence of a well-designed action plan at the national level. At the organisational level, the findings indicated a vastly improved situation, where action plans have been developed with named projects and determined priorities. It was confirmed by many e-government policy makers that these plans significantly assisted in the adoption process of new initiatives. According to (Moon, 2002), municipalities that did not develop a strategic plan are not achieving the higher levels of e-government.

### **Information & Data**

The evidence showed that the amount of high quality data produced was not sufficient to guide decision making in public organisations; and the low level of quality and accuracy of data affected the credibility of many initiatives in Sudan. However, organisations dealing with sensitive and confidential information handle it in a more sophisticated way and produce higher quality data. The initiatives in these organisations were found to have achieved more adoption. The relation between data quality and e-government adoption is also confirmed in the literature (Gil-García and Pardo, 2005; Brown and Duguid, 2000).

Analysis of the evidence revealed that when introducing e-government initiatives into public organisations in Sudan, the process of data collection needs to be considered in detail. Although, data collection has often been mentioned in the literature as a problematic issue in developing countries (Schuppan, 2009; Brown and Duguid, 2000), it is rarely listed among the critical factors for e-government adoption. The findings indicated that organisations following international standards for data collection had better data management and a faster adoption process. Based on the results of this study, the author identified a number of criteria in data collection.

- **Cost:** the high cost of data collection negatively affects e-government adoption.
- **Duration:** the collection of data can take long periods of time which may affect the overall adoption process.
- **Skill of Personnel:** skilled editors are required to enter and manage data.
- **Standards:** to ensure quality and accuracy data collection should follow international or national standards.

Another new finding at the organisational level revealed that the use of Decision Support Systems (DSS) provided a powerful data platform for organisation policy makers. DSS were highly effective in integrating the large quantities of data arriving from different departments, which were presented in a variety of formats. Top managers ensured that DSS have helped to: improve the quality of data; provide organisations with valuable and accessible information; and speed up the process of making decisions. A number of key e-government executives pointed out that DSS proved to be useful in highlighting the relationship between all data. According to (Wang, 2009) “These systems are capable of analysing qualitative and quantitative data and using mathematical and business models in the platform of e-government”. Therefore, the author considers DSS as a critical factor in the e-government adoption process.

### **IT infrastructure**

The establishment of the modern, powerful national telecommunications network was found to be the major achievement in Sudan, in terms of technology. Studies in the literature emphasise that building IT infrastructure, is the most challenging factor in a developing country’s environment (Brown and Thompson, 2011; AL-Shehry, 2008). According to the literature, most developing countries struggle with establishing telecommunications networks (Basu, 2004), but this study shows Sudan distinguished itself in this regard. There is national, as well as international recognition of the remarkable impact of the telecommunications network upon e-government dissemination and adoption. The increase of adoption encouraged the government to open new markets and allow the participation of the private sector in providing

communication services. This created a more competitive environment which helped in providing better services.

The success of network building was not coupled with the installation of highly advanced software applications. This was found to be missing at the national level; whereas, initiatives at the organisational level were using sophisticated software systems and applications for the main services they were providing through their initiatives. However, the organisations were found to be employing less advanced systems for administrative work. Many organisation leaders confirmed that, without the advanced software systems their initiatives would have been meaningless. The author believes that both types of software are essential for creating a digitalised environment. Software applications are one of the key components in the IT infrastructure which runs and manages e-government operational processes.

The empirical results show that government departments' and organisations' websites are at different stages of maturity; but they are mostly between stage one and two. The interviewees at both national and organisational level agreed that weak content and poor online services have affected the percentage of website usage. Many confirmed that the provision of e-payment services will increase the level of the websites' maturity and enhance their usability; and hence improve the adoption process. The latest UN e-readiness report indicates that Sudan's web-index remains below average; according to the same report this affects the adoption process of e-government initiatives (UN, 2008b).

The author concludes that all three components of IT infrastructure represent critical factors in the process of technology change.

### **Interoperability**

The late recognition and consideration of interoperability issues have hindered the exchange of information and compatibility between systems. It is confirmed in the literature that interoperability is: "...a major issue to be addressed by every e-government agency" (Wimmer et al., 2005). In this study, the two factors found to be most challenging were lack of security and lack of standards. The lack of security

influenced the level of trust in the provided services. According to Ebrahim and Irani (2005), security is the most crucial factor and it is a key element for e-government adoption. The lack of national standards and protocols for the technical components compelled organisational leaders and IT managers to follow international standards, which greatly helped the delivery of good quality services. This is also recognised in the literature: “The interoperability framework ... aims at providing security and standards elements that ensure compatibility and smooth exchange of information (Guijarro, 2009).

The findings also pointed to the importance of using open source software (OSS). Empirical data shows that the use of OSS helped to avoid the high cost of software, as well as handle the technology sanctions and technical embargo against Sudan. It is widely understood that OSS will play a significant part in the implementation of efficient and effective e-government.

Therefore, it is confirmed that e-government adoption cannot be a reality without interoperability. Three critical factors have been identified in the Sudanese context: security, standards and the use of OSS.

### **9.2.2 Organisational Context Discussion**

Organisations’ initiatives often need a change of norms and ways of thinking to replace the traditional management procedures. Some changes are incremental and some radical, but they all play a significant role in the process of change. Based on the findings of this research, these factors include: organisational culture, human capacity, change management and top management. Several studies examining the organisational context for e-government adoption in developing countries have identified similar factors (Al-Fakhri et al., 2008; Altameem, 2007; Al-Shehry, 2008). The analysis of the empirical data in this research confirmed the strong relationship between the adoption of e-government initiatives and the identified organisational factors. Table 9-2, lists the organisational critical factors found in the literature and those identified according to the findings in this study.

Table 9-2: Organisational context factors

Literature Review		Identified Organisational Factors		New Findings in Sudan
<b><u>Organisational Culture</u></b> <ul style="list-style-type: none"> <li>• Values</li> <li>• Resistance to change</li> <li>• Information sharing</li> <li>• Collaboration</li> </ul>	→	<b><u>Organisational Culture</u></b> <ul style="list-style-type: none"> <li>• Resistance to change</li> <li>• Information sharing</li> </ul>		
<b><u>Human Resources</u></b> <ul style="list-style-type: none"> <li>• ICT Skills &amp; Training</li> </ul>	→	<b><u>Human Resources</u></b> <ul style="list-style-type: none"> <li>• ICT Skills &amp; Training</li> <li>• ICT in Education</li> </ul>	←	<b><u>Human Resources</u></b> <ul style="list-style-type: none"> <li>• ICT in Education</li> </ul>
<b><u>Change Management</u></b> <ul style="list-style-type: none"> <li>• Bureaucracy &amp; Inflexibility</li> <li>• BPR</li> </ul>	→	<b><u>Change Management</u></b> <ul style="list-style-type: none"> <li>• Bureaucracy &amp; Inflexibility</li> <li>• BPR</li> <li>• Out-sourcing</li> <li>• Multiple Channels</li> </ul>	←	<b><u>Change Management</u></b> <ul style="list-style-type: none"> <li>• Out-sourcing</li> <li>• Multiple Channels</li> </ul>
<b><u>Top Management</u></b> <ul style="list-style-type: none"> <li>• Awareness &amp; Commitment</li> <li>• Brain Drain</li> </ul>	→	<b><u>Top Management</u></b> <ul style="list-style-type: none"> <li>• Awareness &amp; Commitment</li> <li>• Brain Drain</li> </ul>		

### **Organisational Culture**

Findings from organisation initiatives show that changing the mind-set of organisations leaders and their staff is very difficult and strong resistance was encountered. The resistance took many shapes. Prejudice by staff with traditional views against the new technology staff existed in many organisations. This led to a lack of communication between public administrators and IT professionals, as well as between government recruits and civilian IT professionals. Employees in most organisations resisted for reasons such as low levels of education and lack of skills. Highly educated employees in universities and ministries resisted because there will be no more bursaries or overtime in the newly automated system of work. Organisations' senior managers noticed that resistance reduced whenever adequate training was provided. Further resistance witnessed among managers resulted from the fear of loss of power and authority. All

these types were found to be common reasons of resistance in the context of developing countries (Chapter 5, Section 5.4.1.2).

From another perspective, the research findings addressed some organisations that developed their cultural understanding in terms of collaboration and sharing of information. It was found that these organisations enjoyed easy access to information, fast operation processes, and higher levels of adoption. Nonetheless, the culture to share information across organisations is generally not strong, due to: competition between departments; fear of loss of prestige; and sometimes poor understanding. Holmes (2001) states: “government employees work in a culture where information is considered an asset, best kept to oneself”. Also, experiences from other public organisations in the region show that these organisations also lack the understanding of these cultural concepts (Yang and Maxwell, 2011; Huaiming et al., 2006).

Organisational culture models such as (Schein, 1985, Quinn, 1984, Johnson and Scholes, 1999;) also helped to identify these cultural elements. Therefore, the author concludes that the organisational culture including resistance to change and information sharing are all critical factors in the adoption process of e-government.

### **Human Capacity**

The findings regarding the human capacity in Sudanese public organisations reveal the same weaknesses that exist in most developing countries. Based on the findings of this research, as well as figures from the UN e-readiness reports, this element has been shown to be highly critical in e-government adoption in the Sudanese public sector. The current level of employees’ education and skills in ICT in many public organisations is found to be insufficient for achieving successful adoption of many initiatives. However, according to the data evidence, there has been an enormous effort made to overcome this problem, by including ICT in the education curriculum at different stages. Analysing interviewees’ opinions, this factor is seen as an essential element to attain sustainable development in human capacity.

In terms of ICT skills and training, the research findings indicate that training programmes have played an important role in the adoption process. However, the

national level continues to suffer from a shortage of highly skilled ICT professionals. At the organisational level, more systematic training is provided. The analysis demonstrated that this factor is directly related to the awareness of top managers and their understanding of the importance of providing good quality training at all levels. The analysis also shows that organisations with skilled staff face less resistance, and they can quickly adapt.

The author concludes, human capacity, the involvement of ICT in education, and the skilled staff are critical factors in the adoption process of e-government.

### **Change Management**

The management of change in the Sudanese public sector was found to be a challenging and complex issue. This was more evident at the national level due to public sector characteristics of bureaucracy, slowness, and inflexibility. As described in Chapter 5, Section 5.4.4, change management as a complex dynamic process. The analysis of organisations examined in Sudan shows that although they suffer from reserve in the management system, the role of top management proved effective in making radical and incremental changes. According to the data analysis, this relates to their way of thinking.

Change needs strong, quick decisions to overcome the complexity and stay ahead of competitors (Holmes, 2001), and leaders in public organisations proved capable of taking these decisions to make the massive changes required to replace the traditional systems. The findings highlight how the use of ICT and e-government initiatives has changed the way organisations operate. The introduction of new forms, the re-engineering of business processes, and outsourcing are all shaping the new style of management. Similar practices have been highlighted in other public organisations in developing countries (Veenstra et al., 2011; Scholl, 2005).

Outsourcing has become a common management practice in public organisations in Sudan, with many ICT projects, tasks and functions being outsourced. The literature confirms that this is a new, fast growing trend in a large percentage of public organisations across the world (Shareef and Archer, 2011).

Leaders with a wide scope in their thinking, emphasised that change cannot happen without the re-engineering of many managerial, technical and regulatory processes. It was found that top managers with old styles of management represent a major constraint for change management. They prefer working with and following outdated procedures and processes. However, the data evidence shows that failure in making change and re-engineering of processes causes many deficiencies in the organisations' initiatives and the process of service delivery.

On the other hand, change resulting in greater adoption was via the provision of multiple channels, through which services were delivered. For example, delivering services through mobile phones (paying bills, exchange of money) was a great help for illiterate people, or those who have little ICT skills. Use of multiple channels also means that public services can reach areas which have difficulties in Internet access.

In conclusion it was found that change management is a highly critical factor that will influence the e-government adoption process in many ways.

### **Top Management**

Analysing e-government initiatives in Sudan shows that an organisation's top management plays a central role in establishing the new technology within the organisation. It was confirmed that without the leadership and resolve of top management, change was impossible. It is highlighted in the literature that effective top management was behind many success stories (Caldow, 2001). Conversely, whenever there was a lack of strong leadership the process of change was inhibited.

Awareness and commitment are two elements highlighted in the literature as important characteristics of organisations' top managers (Chapter 5, Section 5.4.3). However, interviewees were divided in their opinions as to the current extent of these elements. One group considered the levels among top managers as sufficient; the other group reflected the opposite view, believing that the lack of high awareness and strong commitment is the main cause of delayed progress in many initiatives. This debate in itself confirms the importance of this element in the e-government adoption process.



More crucial is the problem of ‘brain drain’. This was found to be a challenging issue throughout the whole public sector; IT practitioners and expert people will mostly prefer the working environment of the private sector. This is a common problem in almost all developing countries. In Sudan, it is seen as a threatening factor that can cause the freezing of many e-government initiatives.

### 9.2.3 Environmental Context Discussion

The research evidence proves that introducing technology is not a pure ‘technology fix’ process. It drew attention to the importance of three main factors: technology, organisation and environment. It also shows the significance of developing a regulatory framework; and understanding cultural behaviour, as well as considering the political and economic conditions. The recent literature strongly confirms the impact of these elements and factors in facilitating technological change (Al-Fakhri et al., 2008; Morgan, 2010). Table 9-3, lists the environmental critical factors found in the literature and those identified according to the findings in this study.

**Table 9-3: Environmental context factors**

Literature Review		Identified Environmental Factors		New Findings in Sudan
<b><u>Political</u></b> <ul style="list-style-type: none"> <li>• Political Stability</li> <li>• Politician Support</li> </ul>	→	<b><u>Political</u></b> <ul style="list-style-type: none"> <li>• Political Stability</li> <li>• Politician Support</li> </ul>		
<b><u>Cultural</u></b> <ul style="list-style-type: none"> <li>• Illiteracy</li> <li>• Level of Education</li> <li>• Language</li> </ul>	→	<b><u>Cultural</u></b> <ul style="list-style-type: none"> <li>• Illiteracy</li> <li>• Level of Education</li> <li>• Language</li> <li>• Tradition &amp; Beliefs</li> <li>• Hofstede Dimensions</li> </ul>	←	<b><u>Cultural</u></b> <ul style="list-style-type: none"> <li>• Tradition &amp; Beliefs</li> <li>• Hofstede Dimensions</li> </ul>
<b><u>Economy</u></b> <ul style="list-style-type: none"> <li>• ICT Investment</li> <li>• GDP &amp; Funding</li> </ul>	→	<b><u>Economy</u></b> <ul style="list-style-type: none"> <li>• ICT Investment</li> <li>• GDP &amp; Funding</li> </ul>		
<b><u>Regulatory</u></b> <ul style="list-style-type: none"> <li>• Legal Framework</li> </ul>	→	<b><u>Regulatory</u></b> <ul style="list-style-type: none"> <li>• Legal Framework</li> <li>• PPP Policy</li> </ul>	←	<b><u>Regulatory</u></b> <ul style="list-style-type: none"> <li>• PPP Policy</li> </ul>

### **Political**

The final analysis of this study concluded that the influence of politics on development programmes and technology projects, including e-government, is inevitable. Interviewees agreed that: decisions taken by politicians; political turmoil and instability; and sanctions and civil war; have often affected the progress of initiatives in many ways. The empirical data indicates that political events can lead to resistance, decrease trust, delay progress, or damage technology; and could result in the failure of the initiative. This is more widely recognised in a developing country environment. According to Heeks (2006), the issues related to the political context in developing countries are crucial to the success or failure of e-government adoption.

The political character has high power and influence in the public sector decision making (West, 2005). These decisions can act positively and help in establishing new initiatives or limit the speed of change process. Based on the findings of the Sudan case, political decisions supporting the introduction of e-government have created a solid, legal platform for e-government initiatives. Further, the support of politicians has greatly helped in overcoming many obstacles and challenges, as well as introducing new values and leading the change process. The role of politicians was found to be valuable in e-government cases in many countries in the region. In Africa, political support has helped in the uptake of e-government in (Brown and Thompson, 2011; Schuppan, 2009; Mutula, 2008). In the Arab World this has also been witnessed (Dutta and Coury, 2002; Zaied et al., 2007).

### **Cultural**

As the public sectors in developing countries share many cultural characteristics, the final results in this study match with the findings of many other studies. They all point to the cultural factor as a crucial element in the change process that results from socio-technical systems like e-government (Khalil, 2011; Kovačić, 2005; Choudrie et al., 2010). In Sudan, this was found to be even more critical, due to the complexity of the cultural climate. This is shown in the demography, language, low cultural level, and conflict due to the strong beliefs and traditions of people in the country.

The research also examined Hofstede cultural dimensions and the analysis of the empirical data produced surprising results. For example, uncertainty avoidance is a shared characteristic among under-developed societies. However, the experience of e-government in Sudan shows that the country has bold risk takers, unlike most other developing countries. Also, there is a large power distance among high level politicians and top government leaders. Their influence and support is crucial to see through the implementation of initiatives. At the organisational level, although the power is in the hands of a few, senior managers, they use their power positively to enforce the introduction of ICT and e-government initiatives, making them important assets.

Therefore, the author concludes that culture is one of the most important factors which need more focus and consideration in the e-government adoption process.

### **Economy**

The findings in this study highlight oil production and investment in the telecommunications sector as the main drivers that encouraged the rapid expansion of Sudan's economy. Historically, the poor economy and lack of budgeting has limited the introduction of technology into the public sector. Although the economy is still a critical issue, recent improvements have led to: the development of basic infrastructure; an increase in the GDP of more than 10%; and sustainable economic growth. The empirical evidence shows that the relatively stable growth in the economy has encouraged large foreign investment into Sudan. The findings confirm that the huge investment, both domestically and from abroad, meant ICT became a major component in the country's economy.

Investors not only brought technology to the market, but also competition and development of the ICT industry. The investment was supported by the government issuing new policies and passing legislation that positively influenced technology adoption; provided opportunities for the private sector; and helped integrate the economy into the global market. The strong interaction between ICT and the economy confirms the significance of having a strong and sustainable economy.

### **Regulatory**

According to the research analysis, the lack of identified policies, acts and legislation all slowed the progress and adoption of e-government into the public sector in Sudan. This also delayed: the development of standards; rules regarding digital signature; and security and authentication advancement.

The absence of a legal framework meant the lack of an umbrella under which e-government operations and electronic transactions were carried out legitimately. Basu (2004) considers the development of a legal framework as an essential element for successful adoption of e-government in the public sector. However, as the data collection of the research progressed, it was found that regulatory issues have been more recognised as a crucially important element for e-government adoption. The final results illustrated progress in legitimacy issues and authorisation.

Some public organisations were found to be more advanced in this matter. They showed great concern for legal matters, including information crime and illegal electronic transactions. The initiatives in these organisations obtained high levels of trust and credibility. The late development in regulatory issues led to the conclusion that this is an important factor that needs high regard in order to facilitate the smooth transformation of e-government transactions.

### **9.3 Add to research in Africa and the Arab World**

This study is contributing to the research conducted in the Arab World and Africa. This study can be seen as a novel to the research in East Africa. Salem and Jarrar (2011) stated: "...the best practice is not to be copied ... studying e-government projects in countries sharing similar public sector environment .... might be a better learning approach". The final results and conclusions in this study are adding to the lessons to be learned by countries from the region. This is found in the new insights provided in the proposed framework and the better explanation and understanding of the nature of the challenges and obstacles facing the process of e-government adoption. Furthermore, the findings articulated in the list of critical factors can be transferred and redefined in government departments and public organisations in Arab or African countries. This is

due to the many similarities with the public sector context of Sudan. These similarities can be seen by way of: the turbulent political conditions, poor economy and poverty, funding constraints, under developed human resources, deficient infrastructure, cultural settings and social norms. Also, the technological and organisational issues share the same characteristics in terms of ICT infrastructure, digital divide, and management procedures and processes.

The approach and methodology implemented in this study can also be followed and adopted by policy makers and organisations' top leaders. The use of the current research findings, insights, or methodologies is anticipated to help in shaping the uptake and introduction of e-government. Consequently it is expected to outline the approach for many governments in the developing world on how to successfully adopt e-government in its public sector environment.

#### **9.4 Add to research in Sudan**

There are limited data sets and literature available regarding e-government in Sudan. Therefore, this study is a significant contribution to the literature. The new findings and analysis of the empirical data add to the previously limited research conducted in this area, in Sudanese public organisations. The knowledge and understanding of the Sudanese context is also not extensive in the literature. The findings and data analysis that explained the critical issues and factors related to ICT and e-government implementation is a further contribution to the limited understanding concerning the context of Sudan's public sector. This explanation is conducted in a unique way as it covered three broad aspects presented in the technological, organisational and environmental contexts.

#### **9.5 Contextualise in the trends in Sudan**

The analysis in this research shows that the introduction of ICT in general and e-government in particular, is among a series of new trends in Sudan. There has been a movement towards a more liberal economy, privatisation, and democratic processes. Based on the analysis of the new policies and strategies, it was found that the government of Sudan has decided to capitalise on ICT as a tool for sustainable

development. Also, it has been well documented in many reports that the large investment in ICT in Sudan has put the country on the right path for poverty reduction, employment generation, and sustainable growth in the economy. The key policy makers interviewed in this research confirmed that the e-government is one of the main tools contributing significantly to modernisation and the creation of information-based society. According to (Ciborra and Navarra, 2005): “The creation of an information society, and in particular e-government implementation, would lead to better (or good) governance” (Ciborra and Navarra, 2005). The Sudan experience in building on ICT is often described as a “landmark in the country’s history”.

## **9.6 Summary**

This chapter presents a discussion of the key findings of this study. The study has identified e-government critical factors for Sudan and thereby developed an e-government adoption framework for developing countries. The building of the framework is based on the empirical data collected from Sudan in two phases. Phase One held open interviews at the national level; and Phase Two held semi-structured interviews at the organisational level. In Phase Two, four case studies were conducted in different organisations and sectors in Sudan. The framework consists of 33 critical factors and sub factors. The main categories of these factors are based on the technology, organisational and environmental classification structured by the TOE model.

The identified factors and their combination is validated from the literature and compared with other factors identified in similar contexts in the Arab World and African countries. The discussion confirms the importance and relevance of the identified factors for the Sudanese context. However, the unique characteristics of Sudan revealed some factors to be more critical for its specific context; therefore, the combination of the identified critical factors is considered to be more suitable for the environment of Sudan. Further, the discussion addresses critical issues in the relationship between the national level and organisational level and the interaction between the two levels. The discussion conducted in this chapter specifies several issues

which may help to improve the level of e-government adoption in Sudan and also provide direction for other developing countries.

In the following chapter the author will present the key conclusions of this study and the main contribution to knowledge. Further, the chapter will discuss the limitations of the study and recommendations for future work.





## 10 CONCLUSION

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This chapter aims to demonstrate the final conclusions of the research reported in this thesis. The chapter presents the following:

1. **Section (10.1 & 10.2):** A summary of research process and research findings.
2. **Section (10.3):** Contributions to knowledge and research novelty.
3. **Section (10.4):** Limitations arising from the research methodology and findings.
4. **Section (10.5):** Opportunities and directions for future work.
5. **Section (10.6):** Conclusion of the research.

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### 10.1 Summary of Research Process

The process of this research was principally carried out in four phases.

**Phase I:** Critical literature review, that resulted in understanding: the background and fundamentals of e-government; the special characteristics of developing countries context; and e-government models and frameworks (Chapter 2). Further, in-depth discussion was conducted in Chapter 5, focusing on technology adoption and critical factors for e-government adoption. This facilitated the building of the primary conceptual framework.

**Phase II:** Research methodology design was structured (Chapter 3) to collect qualitative data at two levels: national and organisational.

**Phase III:** Data collection and analysis (Chapter 6 & 7). At the national level, open-ended interviews were conducted with 13 key executives involved in e-government, in Sudan. The analysis and findings led to two outcomes: listing the critical factors for the public sector in Sudan (Chapter 6, Table 6-5); and revising the conceptual framework (Chapter 6, Figure 6-6). This required the generation of semi-structured interviews for

the organisational level. At this level, the initiatives of four public organisations were examined and the analysis required a second revision of the framework. This led to the development of the e-government adoption framework (Chapter 7, Figure 7-9).

**Phase IV:** Illustration of how the framework can be utilised (Chapter 8) and a deep discussion of the research findings and analysis conducted in Chapter 9, which drew the research towards its final conclusions and remarks (Chapter 10).

## **10.2 Summary of Research Findings**

The key findings of this research are based on the literature review reported in Chapters 2 and 5 and the empirical data derived from the work presented in Chapters 4, 6, 7 and 8. The findings are summarized as follows:

- The literature review revealed that challenges facing the introduction of e-government in developing countries need both more definition and understanding. Therefore, this research addressed the large scope of the challenges, categorised them (Chapter 2, section 2-8) and provided more information and explanation of how these challenges can impede the progress of e-government adoption.
- The literature emphasised the strong relationship between e-government and the surrounding environment; and that a successful adoption process largely depends upon understanding this environment and its requirements. Therefore, a literature analysis was performed to specify the characteristics of the context of developing countries, mainly in the region of the Arab World and Africa (Chapter 2, section 2.3.2 & 2.3.3). The findings illuminated some of the differences between developing countries the rest of the world. They revealed inadequacies in technology infrastructure, finance and human capacity; and elucidated the existing complex managerial systems and regulations.
- A list of 26 critical factors influencing the adoption process of e-government in the public sector in Sudan (an Arab/African context). The factors: highlighted the significance of ICT investment and telecommunications competition; recognised cultural conflicts and issues of power distance and risk avoidance; and addressed the need for change in organisational culture and style of management.

- A conceptual framework was developed due to the lack in the literature of theoretical models and frameworks for e-government adoption in developing countries. The framework acted as a theoretical background and combined theories and concepts from other areas of research. The structure of the framework was built on the Technology, Organisation and Environment (TOE) model. Based upon the literature review (Chapter 5) and initial findings from the preliminary study (Chapter 4), the framework incorporated 12 factors and 26 sub-factors divided between the three main categories in the TOE model.
- A comprehensive framework has been developed to address the gap in the literature regarding e-government adoption. The framework is built to fit the context of the public sector in Sudan. The revised framework captured 12 factors and 33 sub-factors, explained their presence and impact on the adoption process.

### **10.3 Contribution to Knowledge and Research Novelty**

The findings highlighted in the previous section have made a novel contribution to the theoretical knowledge in the field of e-government. The outcome of the critical factors and adoption framework also makes a constructive contribution to both academic research and practitioners. These contributions are discussed in the following sections.

#### **10.3.1 Contribution to Theoretical Knowledge**

The outcome of this study provides new insights into the current state of e-government. It is adding to the existing literature regarding e-government adoption in developing countries through several contributions. Firstly, the research is contributing to the theory of technology adoption, specifically e-government adoption. This helps policy and decision makers to obtain a conceptual understanding and comprehend the rationale behind adopting e-government. Secondly, the knowledge and findings from the study contributes to literature regarding the challenges and benefits from introducing e-government into the public sector of developing countries in Africa and the Arab World. Thirdly, this research adopts a holistic approach and supports multiple perspectives by examining both national and organisational levels, whereas (to the author's knowledge) only one previous study examined both levels. Finally, the

research provides new findings and concepts, and raises further questions that highlight directions for future work.

### **10.3.2 Novelty of Identified Critical Factors**

This research is contributing to the body of knowledge investigating critical factors that influence the e-government adoption process. This process has not been previously examined in Sudan; therefore the findings represent a novel contribution for both researchers and practitioners. The findings which are based on empirical evidence from Sudan (Chapter 4, 6, & 7) cover the technological, organisational and environmental contexts. The analysis in Chapter 6 identifies two types of factors; one that helps and supports the adoption process and one that inhibits the process. The classification of 26 factors for e-government adoption in Sudan increases the knowledge of critical factors and elements surrounding the process of change. The identified factors endorse other researchers' understanding and analysis of the benefits and challenges facing e-government adoption.

The specific combination of factors formed in this study is unique and it is completely appropriate for the Sudanese context. For policy makers and practitioners in Sudan, the confirmation of the findings, illustrated in Chapter 9, provides guidelines and assistance in how to improve the decision making process. Other countries in the region can also benefit from the final results and use the lessons learned to avoid any pitfalls or challenges facing e-government adoption.

### **10.3.3 Novelty of Developed E-government Adoption Framework**

It has been highlighted in Chapter 2 that the current literature lacks the generic and applicable models and frameworks necessary for e-government adoption in the developing countries' context. The primary contribution of this research is the development of the novel framework to address this deficiency. The proposed framework links issues related to the technical, organisational, and environmental factors. Tackling the three factors together and extending to sub-factors and indicators is a unique contribution from this research. This explains the complexity in e-government

adoption; helps policy makers to better manage their initiatives; and details the approach necessary for the new directions.

## **10.4 Research Limitations**

Although this research has achieved its aim and answered the main research questions, there are some limitations which presented in the research methodology process and findings. These limitations are highlighted in the next two sections.

### **10.4.1 Limitations of research methodology**

The qualitative approach was chosen as most appropriate for conducting the research. This has been justified in Chapter 3. However, a number of issues and limitations were encountered.

1. Collecting and analysing data in this research was time consuming and demanding in terms of personal effort and cost.
2. Analysing and interpreting qualitative data is susceptible to researcher bias. However, this was moderated through peer-to-peer conversations and regular discussions and consultations.
3. Generalising and extending the final results to encompass countries and organisations in other regions is limited for two reasons:
  - The research was conducted in the geographical area of Sudan, and confined to the public sector of Sudan.
  - The small number of examined case studies at the organisational level.

### **10.4.2 Limitations of research findings**

The findings in this research have been affected by the lack of theory in the e-government adoption research area. Effort made so far to develop theories relating to the adoption of e-government in developing countries is currently not well structured. However, building a conceptual framework at the beginning helped to reduce the effect

of the lack of theory and established the theoretical basis for the research. Further, the development of the e-government adoption framework as a final result contributes to the theory building and testing.

Despite the multiple benefits from qualitative research and the richness obtained from the gathered data, use of other strategies (such as grounded theory) could have helped in identifying more factors and gaining a deeper understanding. Also, using quantitative techniques would provide: e-government adoption rates; statistical assessments; and show the correlation between factors. Although, this would mean more robust research findings, it was not possible due to time limitations.

## **10.5 Opportunities for Future Work**

The citizen domain (G2C) is beyond the scope of this research. However, Sudanese citizens' perception and willingness to adopt e-government services was remarked upon by senior managers during the interviews. Interviewees mentioned that citizens in Sudan have the potential to deal with ICT and perceive the new technology as a way to change their life style. Some interviewees considered this insight in Sudanese society as one of the factors that helped in the adoption process. Future work can examine e-government adoption in Sudan from a citizen's perspective.

- The analysis of the empirical data in this research has confirmed the impact of culture on ICT and e-government initiatives in Sudan. The elementary results in this aspect produced new findings and indicated surprising behaviours and attitudes among decision makers and ICT professionals. These behaviours and attitudes had a strong and positive influence in the adoption of e-government initiatives. Future work can examine the cultural factor and test its characteristics more intensively. The outcome from such study could be very significant in terms of technology and e-government introduction and adoption.
- Finally, a limitation of this research is that the results cannot be generalised beyond its boundaries. However, countries with similar contexts can benefit from the current findings, which could be more useful if a comparative study was conducted across other countries in Africa and the Arab World. The findings of the study could

be compared with this research and the matched findings transferred across the region.

## **10.6 Research Conclusion**

The conclusion chapter demonstrated the final results and major contributions of this research, summarised its limitations and gave recommendations for further studies.

This research is distinctive in that it examined e-government adoption at both the national and organisational level. It is also unique in its holistic approach and examining empirically the technological, organisational and environmental issues. As a result the research identified the critical factors of e-government adoption in Sudan's public sector, and developed a comprehensive framework as a powerful tool that assists in the adoption process of e-government in the context of developing countries.

The novelty of this research can be seen as a significant contribution to the body of knowledge and its implications are vital for researchers and policy makers who are willing to make a change.





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## APPENDICES

### Appendix A Documents and Papers Collected from Sudan

No.	Document Name	Source	Description
1.	National Profiles on the Information Society in the Sudan (2010)	Ministry of Information & Communication Technology	<p>This is a comprehensive document that contain detailed and accurate information of the current situation relating to the following axis:</p> <ol style="list-style-type: none"> <li>1. The role of governments and main stakeholders in building the information society</li> <li>2. Human capacity building</li> <li>3. Resettlement of ICT in the society</li> <li>4. Infrastructure development</li> <li>5. E-government</li> <li>6. Information and External Relations</li> <li>7. The enabling environment</li> <li>8. Applications of ICT</li> <li>9. Media</li> <li>10. International and regional cooperation</li> <li>11. Building of ICT sector</li> <li>12. ICT to achieve the Millennium Development Goals</li> </ol>
2.	The National Information Centre in Brief (2010)	Ministry of Information and Communication Technology	<p>This document describes the objectives and functions of the NIC. A description of 19 national projects implemented through 6 departments namely:</p> <ol style="list-style-type: none"> <li>1. National Data</li> <li>2. Geographical information</li> <li>3. Information Security</li> <li>4. IT development</li> <li>5. Training</li> <li>6. Open sources</li> </ol> <p>In addition, a brief description of the Memoranda of Understanding signed by the NIC and similar organisations in other countries from the region including, Egypt, EAU, Syrian and Central Africa.</p>
3.	The National Information Centre Act, 2010 (2010)	Ministry of Information and Communication Technology	<p>This document contains five chapters including:</p> <ol style="list-style-type: none"> <li>1. Preliminary provision</li> <li>2. The centre</li> <li>3. The board</li> <li>4. Financial provisions</li> <li>5. General provisions</li> </ol>
4.	Plan-oriented e-government (2010)	National Information Centre	<p>A recent document that outlines the directions of the e-government plan. The plan is based on recent statistics and updated information regarding the current</p>

No.	Document Name	Source	Description
			situation of ICT in Sudan.
5.	The Sudanese Universities Information Network/ The Sudanese Universities Virtual Library (SUIN/SUVL)  Project Overview (2008)	Ministry of Higher Education and Scientific Research	This document provides an overview of the following: <ol style="list-style-type: none"> <li>1. Business Planning</li> <li>2. Network Planning</li> <li>3. Operation and Maintenance</li> <li>4. Challenges and Opportunities</li> <li>5. Proposed Network Design</li> </ol>
6.	Report about the Sudanese Universities Virtual Library Project (2008)	Ministry of Higher Education and Scientific Research	This report describes Four phases of the project plan, in addition to the obstacles and challenges facing the project.
7.	Towards a strategy for building software Industry in Sudan (2007)	Albyan College of Science Technology	This document outlined the features of a new strategy for software industry. Major sections of the document include: <ul style="list-style-type: none"> <li>• Trends governing the future of software industry</li> <li>• Critical factors for software industry in developing countries</li> <li>• Critical factors for software industry in Sudan, namely: <ol style="list-style-type: none"> <li>1. Demand for Software</li> <li>2. Human resources</li> <li>3. Infrastructure</li> <li>4. Funding</li> <li>5. Development Youth sector</li> <li>6. Protection of intellectual property and copying</li> <li>7. The national cultural wealth</li> <li>8. Laws encouraging investment and protecting software industry</li> <li>9. Commitment to work and time</li> <li>10. Open market policy in ICT</li> <li>11. Efficiency of higher education in support of the software industry</li> </ol> </li> </ul>
8.	Resettlement for ATMs Project (A technical and economic feasibility study) (2007)	Financial & Banking Systems Company	This study included in addition to the feasibility study other sections related to: <ol style="list-style-type: none"> <li>1. Development of finance sector to face globalisation challenges</li> <li>2. Deepen the use of technology</li> <li>3. The environmental impact of using the ATMs</li> </ol>
9.	A Paper on Internet Issues in Sudan (2007)	National Telecommunication Centre	This is a detailed paper about the Internet issues in Sudan and includes: <ol style="list-style-type: none"> <li>1. Internet Technology in Sudan</li> <li>2. ICT infrastructure in Sudan</li> </ol>

No.	Document Name	Source	Description
			<ol style="list-style-type: none"> <li>Demography in Sudan</li> <li>Local market competition</li> <li>Internet service providers</li> <li>Weakness of provided services</li> <li>Internet provided services</li> <li>Internet bandwidth tariff Rent and Internet prices</li> <li>Countries experiences for ICT diffusion</li> </ol>
10	The Importance of Internet Services	Forum Informatics	<p>This paper address three main issues:</p> <ol style="list-style-type: none"> <li>The importance of internet services and its technologies</li> <li>The risk and challenges</li> <li>The Internet situation in Sudan compared with the rest of the world</li> </ol>
11	Law of Informatics Crimes for the Year 2007	National Assembly	Details of the law related to the informatics crimes in Sudan.
12	Law of Electronic Transactions for the Year 2007	National Assembly	Details of the law related to the electronic transactions in Sudan.
13	The Five Year Plan (2007-2011)	National Council for Strategic Planning	<p>This document contains details of:</p> <ol style="list-style-type: none"> <li>Situation Analysis</li> <li>Challenges</li> <li>Key Result Areas and Strategic Objectives</li> <li>Cross-Cutting Issues</li> <li>Sector Priorities and Strategies</li> <li>Plan Implementation.</li> </ol>
14	Study Committees of the National Five-Year Plan (2007-2011)	National Assembly	This document presents a summary of the final results of studying the five year plan and concludes with the national assembly recommendations
15	Report on the Implementation of the Comprehensive National Strategy for ICT Industry (2002-2006)	Council of Ministers	<p>This report assess the implementation situation in the specific period and contains:</p> <ol style="list-style-type: none"> <li>Features of the strategy</li> <li>Details of performance of the strategy</li> <li>Effects on the implementation of the strategy</li> <li>Assessment of strategy implementation</li> </ol>
16	The E-government Master Plan (2007)	National Information Centre	<p>This is a comprehensive document that contains details of number of issues, such as:</p> <ol style="list-style-type: none"> <li>Broad e-government goals</li> <li>General policies</li> <li>Training</li> <li>Phases of building e-government</li> <li>Success critical factors</li> </ol>

No.	Document Name	Source	Description
			<ol style="list-style-type: none"> <li>6. Funding planning</li> <li>7. E-government security</li> <li>8. E-government standardisation</li> <li>9. Plan for BPR</li> <li>10. Monitoring and evaluation</li> </ol>
17	Towards E-government in Sudan	National Information Centre	<p>A document prepared by the NIC which outlined the main directions for the future of e-government in Sudan including:</p> <ol style="list-style-type: none"> <li>1. Reasons and needs of the e-government application</li> <li>2. Initiatives towards e-government</li> <li>3. Technology building blocks</li> <li>4. Awareness and capacity building</li> <li>5. Projects cost &amp; financing</li> <li>6. Administrative structure of e-government</li> </ol>
18	Five-Year Plan for the strategy of the knowledge society (2007-2011)	Council of Ministers	<p>This document contains the main features of the five year plan namely:</p> <ol style="list-style-type: none"> <li>1. Vision, mission and objectives</li> <li>2. General policies</li> <li>3. Challenges</li> <li>4. Information centres and decision support systems</li> <li>5. Electronic applications</li> <li>6. Computerisation and software programming</li> <li>7. Legislative frameworks</li> </ol>
19	The e-readiness report (2004)	Council of Ministers	A comprehensive document prepared for the UN survey regarding the e-readiness report for the year 2005
20	The Comprehensive National Strategy (2001)	National Council for Strategic Planning	The approved formulated strategy at the national level.
21	The Comprehensive National Strategy for ICT Industry (2001)	National Council for Strategic Planning	The approved formulated strategy at the national level for ICT industry in Sudan.



## **Appendix B Preliminary Study Interview Questions**

The questions were designed based on the four themes: Strengths; Weaknesses; Opportunities; and Threats (SWOT).

### **Strengths Questions**

1. On what basis was the decision taken to introduce e-government?
2. What are the elements that guarantee the success of adopting e-government?
3. In what way is the public sector ready for adopting e-government?

### **Weaknesses Questions**

1. What are the main challenges and obstacles facing the adoption of e-government initiatives in Sudan?
2. What are the weak points of the Sudanese public sector?
3. Why is Sudan's e-readiness below average?

### **Opportunities Questions**

1. What will e-government provide to Sudan?
2. How will e-government lead to change in the public sector?
3. What opportunities will be open for Sudan internationally?

### **Threats Questions**

1. Are there any risks of introducing e-government?
2. What type of threats can delay or stop the adoption of e-government in the public sector?

## Appendix C Open-Ended Interview Questions at the National Level

Technology
<p>1. What are the principle features of the ICT strategy in Sudan, its vision, and main objectives?  .....</p> <p>2. Are you introducing e-government initiatives according to a well-designed action plan?  .....</p> <p>3. What are the challenges facing the IT infrastructure in the public sector?  .....</p> <p>4. Have you established a powerful network that can facilitate e-government connectivity?  .....</p> <p>5. How are you dealing with the unmanaged data and limited information available in the public sector?  .....</p> <p>6. Are you able to benefit from the e-government tool and connect between different departments, sectors and organisations?  .....</p>

Organisation
<p>7. What are the main problems facing e-government adoption in public organisations?  .....</p> <p>8. Have public organisations utilised the new tool to facilitate sharing and exchange of information in a more smoothly?  .....</p> <p>9. The management systems characterised by bureaucracy and inflexibility; do they represent a major obstacle for the adoption process, and do you have other constraints in these systems?</p>

- .....
- 10.** Are public organisations prepared to change and did they take major steps, such as BPR, to allow the introduction of e-government?  
.....
- 11.** Are top managers sufficiently capable to lead the change in their organisations in terms of awareness and commitment?  
.....

### **Environment**

- 12.** Is politics influencing the e-government initiatives in any way? And are politicians supportive enough to play a significant role in the adoption process?  
.....
- 13.** How will the government fund the project initiatives?  
.....
- 14.** How strong is the investment in ICT? And is it helping in the e-government adoption process?  
.....
- 15.** Are you adopting specific policies in order to help in the adoption process; such as, the PPP policy or any other policies?  
.....
- 16.** Have you considered regulatory issues and developed a national legal framework?  
.....
- 17.** Do you apply long-term planning? Are you able to wait for results?  
.....
- 18.** Is the power used in any way to introduce and adopt the e-government initiatives?  
.....
- 19.** There are many risks surrounding e-government initiatives in Sudan; are you prepared to take risks and execute your plans?  
.....
- 20.** Has the government made any efforts to improve employees' efficiency?  
.....

# Appendix D Semi-structured Interview Questions at the Organisational Level

## D.1 Covering letter

**Starting**

**Dear Sir/Madam**

I am Sara Abdullah, a PhD. student at Cranfield University, UK. My research concerns the identification of critical factors of e-government in Sudan. Currently, little is known about e-government initiatives in Sudan. The lack of understanding as to what really influences e-government in Sudan could lead to unsuccessful implementation. The aim of the study is to propose a framework in order to help Sudan better adopt e-government initiatives and give guidance in the decision making process.

A number of interviews are being conducted with officials, non-officials and key executives. The data provided and information from top managers is significant in order to achieve the research aim and objectives.

I would like to assure you that all data and information will be regarded as strictly confidential, as well as the identity of all participants. Finally, I would like permission to tape and take notes to record information accurately; this is to help in the analysis phase later in the research.

**Note:**

If you like to receive a copy of the results and findings of this research please fill in the tear-off slip below:

-----

Name: .....

Organization: .....

Job Title: .....

Phone no.: .....

E-mail: .....

Postal Address: .....

*Thanks for your co-operation*

**D.2 Interview questions**

**Interviews**

**No:** .....      **Date:** .... / .... / ....

**Start Time:** .... : ....    **End Time:**.... : ....

**Interviewee:** .....

**Organization name:** .....

**Job Title:** .....

**Experience (no of years):** .....

<i>Factor</i>	<i>Sub-factor</i>	<i>Elements of discussion</i>
<b>Technology</b>		
<b>Strategy</b>	<b>Vision</b>  <b>Plan of Action</b>	<b>Vision, mission &amp; objectives</b>  <b>Priorities, participation, approach</b>
1. Do you have a clear strategy in your organization? And is there a clear vision? ..... 2. What are the main objectives to achieve this vision? ..... 3. Are the initiatives introduced according to a well-designed action plan? ..... 4. Who participated in designing your organisation's strategy and plan of action? .....		
<b>IT infrastructure</b>	<b>Telecommunication network</b>  <b>Websites</b>	<b>Reliable telecommunication network</b>  <b>Stage of maturity, online services</b>
5. Do you have a reliable network in your organisation? ..... 6. Are all departments and branches connected? ..... 7. Are the branches in other provinces connected and linked to the network? ..... 8. Do you have a website? If yes, what are the main services that you provide in your website? Do you provide online services? ..... 9. Has your website been evaluated? If yes, what was the result of the assessment? .....		
<b>Information &amp; Data</b>	<b>Data quality &amp; accuracy</b>  <b>Data collection</b>	<b>High quality, reliable data</b>  <b>Structure, procedures,</b>

10. How do you collect your data? Do you follow a specific structure and procedures? .....		
11. How accurate is the collected data? .....		
12. Is the processed data of high quality? Do you use this data in the reports sent to higher levels? .....		
<b>Interoperability</b>	<b>Standards</b>  <b>Security</b>	<b>Technical standards, processes standards</b>  <b>Level of security</b>
13. Do you follow specific standards? What type of standards do you apply? .....		
14. How do you deal with the security issues? Do you consider the applied security as high level? .....		
<b>Organisation</b>		
<b>Organisational Culture</b>  <b>Human Capacity</b>  <b>Change Management</b>  <b>Top Management</b>	<b>Resistance of change, Sharing information</b>  <b>ICT skills, training</b>  <b>Bureaucracy, flexibility, BPR, multiple channels</b>  <b>Awareness, commitment, brain drain</b>	
15. Did the initiatives in your organisation face any kind of resistance to change? How? .....		
16. Is the available information shared easily between departments and with other organisations? .....		
17. Do you have enough staff with adequate ICT skills?		

.....

18. Do you provide any type of ICT training for your staff?

.....

---

19. Do you experience any bureaucratic systems and rigid procedures? If yes, please give some examples.

.....

20. Did you apply any BPR? In what way?

.....

---

21. Does the top management have enough awareness about the new initiatives? And are they committed to the initiatives?

.....

22. Do you suffer from “brain drain” and losing staff members?

.....

<b>Environment</b>	
<b>Political</b>  <b>Cultural</b>  <b>Economic</b>  <b>Regulatory</b>	<b>Instability, politician support</b>  <b>Level of education, illiteracy, cultural issues</b>  <b>Poor economy, funding, ICT investment</b>  <b>Legal framework, PPP, policies</b>

23. Are you affected by the unstable political conditions in the country? If yes, please give examples.

.....

24. Do you receive enough support from politicians and authorities? If yes, please give examples.

.....

---

25. Do you receive enough funds from the government to support your initiatives? If no, do you have other resources? What are they?

.....

26. Do you have any experience of investing in ICT? If yes, please give examples.

.....



---

27. Do you suffer from problems like illiteracy, low level of education? Are there any other cultural issues that influence the initiatives in your organisation?

.....

28. Is the element of power used in any way to enforce the initiatives?

.....

29. What do you provide to your employees to improve their working environment?

.....

30. Do you risk introducing new ideas related to ICT even if there is no guarantee of success? If yes, please give examples.

.....

31. How long did the initiatives in your organisation take to reach this stage? Were you able to wait for long term processes?

.....

---

32. Do you work within a defined legal framework? How effective is it?

.....

33. Do you adopt the PPP policy and in what way? Are there other policies you adopt that impact your initiatives? Please name them.

.....

34. In your view, are there any other challenges or barriers your organisation faces to implement its e-government initiatives?

.....

35. Has your organisation carried out any assessment or cost benefit analysis for these initiatives?

.....

36. Finally, how do you imagine your organisation and the public sector of Sudan in general will appear in 5 years' time?

.....

*Thank you*

## Appendix E Sudan Organisations Initiatives – Technology, Organisation and Environment Factors Analysis

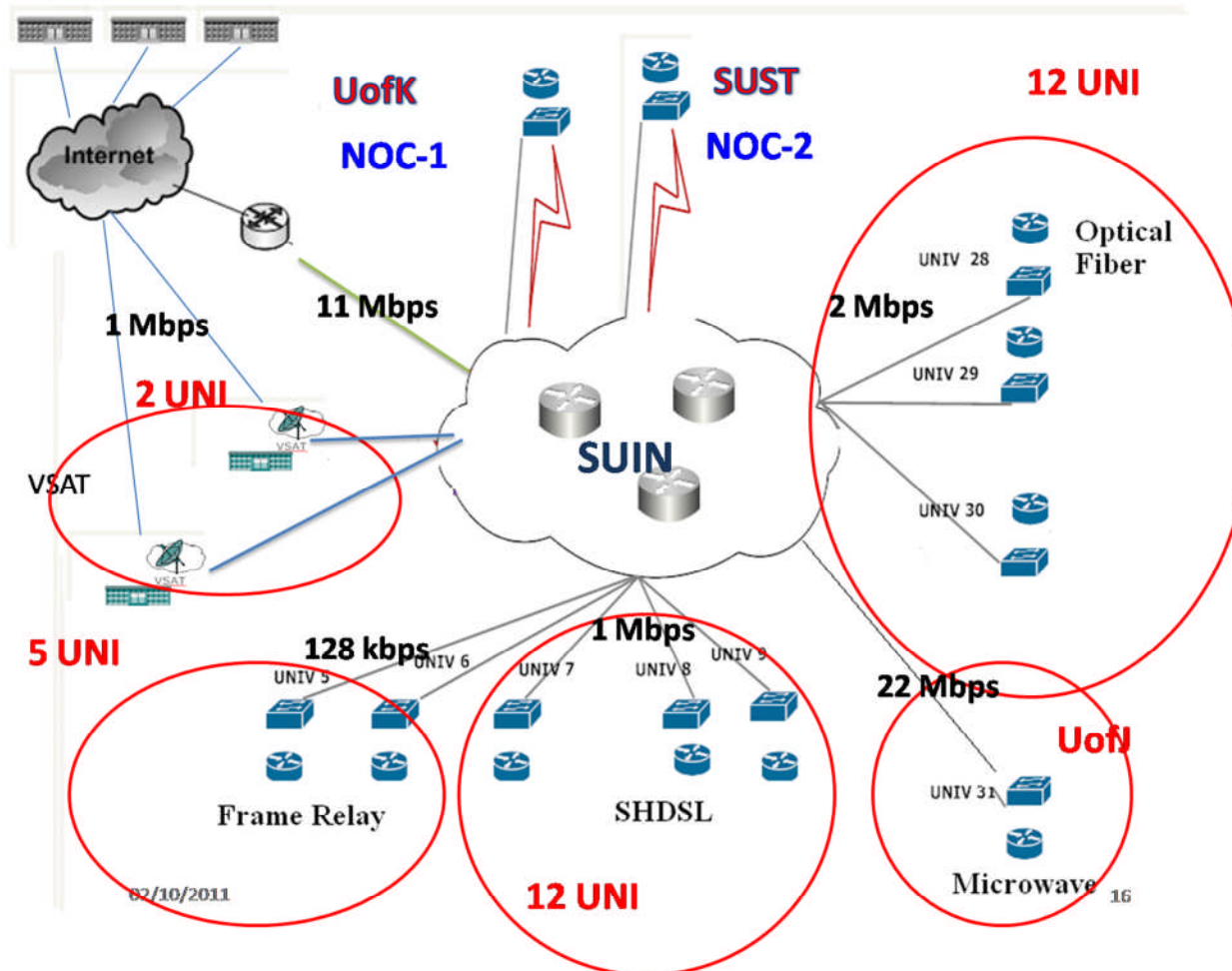
### E.1 HED Initiatives

#### Technology Factors

Factor	Sub-factor	Factor Analysis
ICT strategy	Vision	<p>The HED Ministry produced a clear vision for its ICT initiative, which included:</p> <ul style="list-style-type: none"><li>• Accessing information and contributing to building the knowledge-based society</li><li>• Delivering HED services electronically as one of the e-government projects</li><li>• Contributing to bridging the digital divide</li><li>• Providing scientific, technological and informatics awareness to facilitate access to the information age</li></ul> <p>However, each university has its own vision according to its unique needs and requirements. For example the SUST university vision was: “To move the university family to IT proficiency”</p>

	<b>Action Plan</b>	<p>The HED Ministry designed the plan of action associated with named projects and initiatives in many areas including: IT infrastructure, software applications development, content development (websites, e-libraries), and human capacity building</p> <p>However, each university developed its own plan of action, but these plans are different in their level of sophistication. A senior member of staff commenting about his university plan of action said: "...the priorities are changed and reset at each regular meeting". Another staff member in a private university said: "Our plan of action is very clear and designed according to our capacity ... however, obstacles are due to external factors that are out of our control"</p>
<b>Information &amp; Data</b>	<b>Quality &amp; Accuracy</b>	<p>The HED Ministry classify the information they deal with into two types: "One that is related to the staff performance, student results and all academic work; this can be described as high quality information with a high level of accuracy. The other type of data deals with the managerial and administration issues; this type is mostly with less accuracy and the level of quality can be very poor, except for the data that is related to the payroll system or involves any financial transaction"</p>
	<b>Data Collection</b>	<p>The process of data collection used to be slow due to old and traditional ways; however this had been changed and redesigned in order to fit the new database systems. The universities that have advanced database systems usually apply powerful tools of data collection; while others which are not using powerful database systems are likely to be using dated and limited techniques for data collection</p> <p>Some initiatives, such as the Virtual Library face many obstacles in collecting data. Some data must be scanned from books and papers that are very old and need special handling; in addition there is a huge amount of data to be edited. Therefore, the process was not easy and required money and a large number of skilled editors for long periods of time</p>

<b>IT Infrastructure</b>	<b>Telecom. Networks</b>	<p>The HED Ministry has built a large network that connects 30 public universities, 10 private universities and 10 research centres. Although the rate of traffic is still relatively low, the connectivity is considered to be reliable and accessible. However, the internal networks for each university are not all with the same level of sophistication. Many universities do not have a complete network that connects all faculties and schools</p> <p>The HED Ministry relies on the backbone of the National Network. According to a senior IT professional: “The reason why we depend on the National Network is to guarantee the sustainability of the HED network”</p>
	<b>Websites</b>	<p>The HED Ministry, as well as many universities have made huge efforts to establish well designed websites. Most of the websites are characterised by having basic information and links, admission procedures, rules and forms. Some universities’ websites are effectively designed. The improvements in the University of Khartoum website led it rising in the rankings of African university websites, from 38<sup>th</sup> to the 14<sup>th</sup>. Nonetheless, there are still large numbers of universities’ websites with poor quality in terms of layout and web content.</p>
<b>Interoperability</b>	<b>Security</b>	<p>HED Ministry IT personnel claim that the level of security is high and that the confidentiality of data has not been compromised. However security threats began when some universities started a joint initiative with banks that allow students to pay through the banking system without the need for the process of handing the payment receipt. Some incidents of corruption and misuse of the system were recorded, indicating lack of security.</p>
	<b>Standards</b>	<p>Interviewees agreed that there are no well-defined standards and no clear policies for that. A senior member in the consultation committee suggested “... we need a unified standardized model ...”</p>



## Organisational Factors

Factor	Sub-factor	Factor Analysis
<b>Organisational Culture</b>	<b>Resistance to Change</b>	<p>Although the SUVL is unique opportunity for researchers and staff members, the initiative faced resistance from staff and much more from the employees as they would fear losing their jobs. Other initiatives such as the registration and online communication posed a great threat for large number of employees. Their resistance can be high because of their limited skills leading to fewer opportunities outside of public organisations.</p> <p>Each initiative in the HED Ministry faced some resistance to change. The reasons for resistance vary from one initiative to another. For example, employees were not motivated by the introduction of the ERP, payroll and finance systems as the incentives they used to be paid under the manual system disappeared.</p> <p>According to a senior manager: “The resistance to some initiatives was due to a lack of trust in technology, mainly among employees with a low level of education ... as a consequence, this lowered the level of collaboration and reduced the amount of information exchange”.</p>

	<b>Information Sharing</b>	<p>The SUVL and SUIN initiatives have created a suitable environment for sharing. The SUIN allowed the access and use of the many software applications developed by some universities and provided free in the SUIN with the open-source code. An IT manager stated: “There are dozens of developed software applications free to download from the hosting universities, such as the Time Table and Exams Results. However, few universities and research centres are utilising these services”.</p> <p>The SUVL offered the access for all electronic educational material, including e-books, references and periodicals. This has filled in the gap of many university libraries. This initiative not only helped in sharing information, but also in transferring knowledge between Sudanese academic institutes and with the outside world</p>
<b>Human Capacity</b>	<b>ICT in Education</b>	The SUVL has helped in the provision of online accessible information. The linking of Sudan universities and higher education through the SUIN institutes helped researchers and staff to acquire and transfer knowledge, use digitalized learning methods, and have easy access to information for university students and staff through long-distance education and direct free access to online lectures.
	<b>ICT Skills &amp; Training</b>	The HED has a clear policy of providing systematic training to its staff. The training programs are based on Total Quality Management (TQM) indicators. The trained personnel in HED hold the International Computer Driving Licence (ICDL) certificate as a minimum. Special training is offered for professionals, library staff, and training of trainers. However, the high cost of training is reducing the chances of providing high level training programs.
<b>Change Management</b>	<b>Bureaucracy and Inflexibility</b>	Universities’ administration systems are highly bureaucratic, although new and private universities have better management systems and enjoy high level of flexibility. This helped these universities to adopt new initiatives more quickly.

	<b>BPR</b>	As a result of the SUVL initiative, the universities libraries introduced important changes and new ways in accessing electronic books, references, transfer of information and data storage This also led to change in the role of library staff from following traditional methods to new forms of processes and assisting in accessing information using modern techniques of ICT.
	<b>Multiple Channels</b>	Technical know-how helped the universities make use of all types of channels. Also, the students are adept at dealing with new technology. For example results are sent to the students via e-mails, IVR or SMS.
<b>Top Management</b>	<b>Awareness &amp; Commitment</b>	Top managers are highly aware of, and committed to their universities' initiatives. Moreover, they are keen to make use of other experiences. However, technical top managers are not committed in the same and often prefer to move to the private sector.
	<b>Brain drain</b>	<p>This is a major challenge, especially in public universities. The low income and poor conditions cause a continuous loss of employees working in the IT field. The loss is to the private sector and abroad.</p> <p>More problematic is that the Ministry and university administrations provide costly training but continue to suffer from 'brain drain'.</p>



## Environmental Factors

Factor	Sub-factor	Factor Analysis
Political	Political Instability	As some universities are in war zones, network connectivity has not been successfully completed. In some areas the optical fibre was disconnected and requiring either more expensive solutions or lower levels of technology.
	Politician Support	Political support for HED initiatives is inadequate. Active members in the consultancy committee were moved by politicians and the project nearly stopped. However, more political support has been received after the establishment of the new ICT ministry which enhanced direct contact with the HED Ministry.
Cultural	Hofstede Dimensions	<b>Uncertainty Avoidance</b> is low in the HED Ministry due to the technical knowledge and know-how availability. <b>Long-term</b> planning is also common in HED due the high level of thinking and education, but these plans might not be executed for other internal or external factors. <b>Individualism</b> is generally weak in the HED but few examples can be seen in efforts made to create e-mail accounts for all staff, subscribe to their required journals, and simplify procedures such as the registration process for students. The new system uses developed software to enable completing the process in one day rather than over several days. <b>Power Distance</b> does not appear in the HED as a strong dimension; positions of university staff in the administration departments keep rotating, so university leaders build their initiatives based upon joint efforts.
	Illiteracy	Illiteracy may only exist among universities' ancillary workers. However, this is expected to end in the near future due to the high drop in the illiteracy percentage.
	Low Level of	Due to the nature of the HED Ministry, the level of education is high enough to help adopting innovation and new

	<b>Education</b>	technology. According to a senior manager there is a huge difference between the university staff members and administrative employees in terms of awareness and level of education, but with the help of good training the employees are able to better adopt the initiatives.
<b>Economic</b>	<b>Funding</b>	The IT Fund established by the government is not really solving the financial problem. This is because of the complex relationship between the HED and SUDATEL (owner of the national network) and the IT fund. Therefore, the fund is one of the major problems that restricts many of the HED initiatives
	<b>ICT Investment</b>	A number of universities have set plans to invest heavily in ICT, the available experience and knowledge provides good opportunities for the HED institutes. However, apart from the investment through consultation, many plans have not been executed due to the overall lack of fund.
<b>Regulatory</b>	<b>PPP Policy</b>	Adopting the PPP policy has helped the HED to improve its initiatives adoption. The establishment of the SUIN is allowing the HED to participate in the Arab League initiative (The Arab and International Universities Network).
	<b>Legal Framework</b>	There are no clear policies or standards to be followed. In fact there is no legal framework apart from what has been set within some universities. For example, one university took the decision to give students the right to make an online request to access their exam papers, instead of the traditional way of filling an application form.

## E.2 EBS Initiatives

### Technology Factors

Factor	Sub-factor	Factor Analysis
ICT strategy	Vision	The revolution in the banking sector was as a result of a newly formulated strategy entitled “Strategy Horizon”. To design this strategy the central bank established a new administration and employed an expert General Director. The vision of the strategy determined the main objectives as: Technology Architecture, Business process reengineering and organisational setup, Application and Implementation
	Action Plan	The planning was designed by a steering committee, with full details of cost, priorities and implementation phases. The plan was described as a road map, but a senior manager argued: “the plan is only clear for top managers”
Information & Data	Quality & Accuracy	<p>“The banking system deals with huge numbers of weekly and monthly reports. Therefore, the reporting system was all automated ... the applied S.W. was developed by specialised Arab companies. The systems took 1-1 ½ year to be customised and tested after which the required training was provided to staff ... the S.W. system produces 400 different types of reports”. Member of IT Department in CBOS</p> <p>In general the banks deals with highly sensitive data, thus a senior manager said: “dealing with the banking data is not a matter of business ... it is about credibility and efficiency”</p>
	Data Collection	The process of collecting data is based on the General Data Dissemination System (GDDS), which is approved by Sudan. The system follows the Disseminations Standards Bulletin Board (DSBB) and the process is implemented in two phases.

		<p>The first phase is educational and the second is collecting metadata</p> <p>The data is then managed through advanced data centres, controlled by professional staff. The high standard of the data centres allowed for international communication and exchange of information through the SWIF centre.</p>
<b>IT infrastructure</b>	<b>Telecom. Networks</b>	<p>The motto of the e-banking network is: “the best technology and best practice”. The Virtual Private Network (VPN) connects 30 banks and about 500 different branches. Although, the backbone of the network uses the latest Dark Fibre technology in connectivity and has high level of redundancy, a senior IT professional argued: “the networks did not yet reach the level of reliability, but it is highly dependable”</p> <p>The EBS has effectively utilised telecommunications in providing its electronic services; such as top-up services for mobile phone balance/airtime, through ATMs or by SMS.</p>
	<b>Websites</b>	<p>Websites are designed to high standards, and provide a complete English version. According to the ‘web presence criteria’ the central bank has satisfied most of the requirements at this stage. The type of services provided in e-banking categorises the level of maturity of the websites in ‘stage two’, as it allows one-way communication. Plans have been set to move to more mature stages, such as two-way communication. This is mainly related to e-payment service. The EBS already has plans to facilitate e-payment and other transactional services. According to the IT professionals, the delay is due to security preparations.</p>
<b>Interoperability</b>	<b>Security</b>	<p>IT professionals explained that all software are supported with full security systems that deal with intrusion, encryption and authentication. The systems apply a complete security protocol. In addition, a Data Recovery Centre has been established and full backup systems were installed.</p>

		However, the overall level of security is not the highest and authentication has been breached. A senior IT manger explained why the EBS is not installing the highest security systems: “These systems are extremely expensive; big international organisations do not apply these systems. Therefore, it is much cheaper to maintain the damage ... especially as the level of threat and the corruption percentage is relatively low. ...”
	<b>Standards</b>	The Central Bank of Sudan is responsible for setting all the required standards for the banking system in Sudan. Therefore, EBS is highly committed to those standards. The IT department in the Central Bank determines the technical specification and all banks are obliged to follow those standards.

### Organisational Factors

Factor	Sub-factor	Factor Analysis
<b>Organisational Culture</b>	<b>Resistance to Change</b>	To successfully introduce the initiative the new EBS Company hired its cadre with particular care; as a result there has been no resistance at this level. However, the initiative faced opposition in other banks, where there was high resistance among employees, due to their low level of education and unwillingness to learn new skills. This resistance started to reduce when more training on the new systems was provided. The other type of resistance among leaders was more critical and threatened the whole concept of the initiative. The bank leaders favoured their old systems and preferred to automate them without replacing and reengineering the existing transactional processes.

	<b>Information Sharing</b>	Without high levels of sharing and collaboration e-banking initiatives will be meaningless. There is a clear policy that all financial information has to be shared between relative organisations. This policy is enforced by the Ministry of Finance and the entire banking sector is obliged to comply. However, the feeling of competition between banks reduces the level of sharing. A senior manager named two issues: “ ...professional jealousy, that creates the feeling of competition between banks and prevents them from sharing information ... and the professional tribe ... where bankers have a problem of communication and collaboration with IT people ”
<b>Human Capacity</b>	<b>ICT in Education</b>	The e-banking system is benefiting from the Sudan Academy for Banking & Financial Sciences, where educational programs offer higher degrees, including Diplomas, Masters and PhDs. The academy teaches the new online banking system's concepts and methods.
	<b>ICT Skills &amp; Training</b>	The training is provided through specialised companies and based on a detailed plan that includes internal and external training for both the long term and short term. Inside the Central Bank the percentage of ICT skilled employees is 100%.
<b>Change management</b>	<b>Bureaucracy and Inflexibility</b>	Two strategies helped to reduce the level of bureaucracy and inflexibility in the banking sector. Firstly, the privatisation policy; thirty banks were transferred to the private sector, apart from the Central Bank and a few other specialised banks. The management style was then altered to cope with private sector procedures. Secondly, the out-sourcing policy; the adoption of this policy helped the banking sector to get rid of many bureaucratic procedures.
	<b>BPR</b>	The check clearance process is totally changed and re-engineered. There are more than 20,000 checks transferred every day between the different banks. By using the Image Check Clearance system the check is cleared in ½– 1½ hour instead of three days as before. Moreover, the whole process is done online, unlike the manual system where representatives from

		<p>all banks met every day for very long hours and over midnight.</p> <p>This process enabled the banking sector to monitor the transaction process, reduced chances of corruption and helped to analyse the money transactions and transfer. This offered great support to the decision-making process.</p> <p>There are many examples of re-engineering processes. Citizens can pay their bills through the POS instead of queuing inline in front of organisations' offices. The online payment of wages by the Ministry of Finance will mean more money transactions, which will boost the economy.</p>
	<b>Multiple Channels</b>	<p>Many of the money transaction processes were previously made in cash or at the bank's headquarters. The modern e-banking system has managed to introduce ATM services and Point of Sale (POS). Citizens without bank accounts are able to benefit from the POS and pay bills, transfer money and purchase services.</p> <p>For the first time in Sudan the bills can be paid through the mobile phone. This service is not available in many other countries in the Arab World or Africa. "This service has saved a lot of money and time for the government as well as for the citizens".</p>
<b>Top management</b>	<b>Awareness &amp; Commitment</b>	<p>"Many senior managers and bankers are 'old style' and still not sufficiently aware of the new concept of e-banking. For example, in modern banking the core of the processes are decentralised and transactions are carried out in banks' branches; yet senior bankers are against such change".</p>
	<b>Brain Drain</b>	<p>The people working in IT are offered one of the best environments in the country with a very high salary. Therefore, the banking sector enjoys stability and sustainable progress in its ICT initiatives.</p>

		An IT professional who formerly worked abroad gave the comment: “the offers were quite attractive, the technology is highly sophisticated and the whole environment is conducive ... that is why we preferred coming back”. Bankers also receive high salaries and enjoy good working conditions.
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## Environmental Factors

Factor	Sub-factor	Factor Analysis
Political	Political Instability	<p>In the areas of political conflict, fibre optic cables are often destroyed and the network frequently loses connectivity. This forced IT engineers to employ expensive solutions, such as the use of satellites for connectivity.</p> <p>Internal politics influence decisions related to hiring and tenders. This can threaten the successful progress and adoption of the initiatives.</p> <p>The sanctions against Sudan forced the EBS to make deals through third parties, causing the progress of initiatives to be delayed.</p> <p>Many interviewees in the EBS pointed to the resettlement of technical experts as one of the potential solutions to counter the problem of political boycott and sanctions.</p>



	<b>Politician Support</b>	The political decision to introduce online wages payment in the public sector was significant for whole of e-banking, making it more attractive for further political support, leading to enlargement of the banking sector. It is also important for achieving progress and development for the whole economy as money transactions will increase.
<b>Cultural</b>	<b>Hofstede Dimensions</b>	<p>The project took about ten years to reach its current state, illustrating the <b>Long-term</b> orientation in the planning and implementation phases. Initiatives such as the ATM and POS were surrounded with uncertainty, due to the low level of education and the small percentage of people dealing with banks (less than 25%) and there was little experience available to the bankers at that time. Nonetheless, the CBOS proceeded and key executives in the banking system took the risk of <b>Uncertainty Avoidance</b>. As a result, the success of the initiatives encouraged more people to participate and choose dealing through the new e-banking system. This is true in the Central Bank, but many Bank leaders and top managers did not take the risk and adopt the new concept of online banking, preferring their old systems. So, they may accept automating the system, but without any change of the process or procedures.</p> <p>The CBOS established a Human Resource department, to provide the basic services for employees. There are 1200 employees, each supported with a telephone, PC, e-mail and full activated account. This indicates the relatively high level in <b>Individualism</b></p> <p>The new ways of money transaction, check clearance, and paying bills are all enforced by the Central Bank's decisions, showing a high degree of <b>Power Distance</b>. There is a level of <b>Power Distance</b> existing amongst clerics and Sharia Law solicitors, as the EBS initiative could not proceed in introducing a credit card system as it is against Islamic principles. Thus the CBOS has a Sharia Law department, where financial decisions have to be approved from an Islamic point of view.</p>

	<b>Illiteracy</b>	There is no illiteracy among the employees in the central bank or EBS company. However, some banks or their branches in rural areas may have little numbers of illiterate people.
	<b>Low Level of Education</b>	The banking sector still has high percentage of people with a low level of education. Some employees have only primary and secondary school certificates.
<b>Economic</b>	<b>Funding</b>	Despite the fact that the banking sector is considered one of the rich sectors, the poor economic conditions over the country does affect the e-banking initiatives and funding issues remains a challenge for the whole sector.
	<b>ICT Investment</b>	According to a senior manager in the EBS Company “there is no investment know-how available in the banking sector”. Therefore, the ICT investment is still limited.
<b>Regulatory</b>	<b>PPP Policy</b>	The advanced systems and technologies used in e-banking are implemented as a result of partnerships with national, regional and international organisations. These include the ERP systems and SIMPLEST an international system for financial transactions and the Electronic Banking Returns. The applied versions of these systems were jointly customised and tailored to suit the needs of the Sudanese banking sector and achieve the aim of adopting the technological experiences.
	<b>Legal Framework</b>	A comprehensive document regarding polices and acts in the e-banking system has been developed by the Central Bank. This includes the recognition of the digital signature, the policies related to the e-banking crimes and all legislation related to online transactions. All banks are obliged to follow the regulations issued by the Central Bank of Sudan.

## E.3 NEC Initiatives

### Technology Factors

Factor	Sub-factor	Factor Analysis
ICT strategy	Vision	<p>The NEC shaped a clear vision focusing on three main issues:</p> <ol style="list-style-type: none"> <li>1. Satisfying the NEC customers</li> <li>2. Providing ideal services to citizens and customers; highest efficiency and lowest cost</li> <li>3. Providing a sustainable electricity services</li> </ol>
	Action Plan	<p>The action plan design aimed at building an Integrated Information System. Therefore, the implementation phase involved the building of Information System in each department in the NEC. The systems were connected and integrated later into one unified system.</p> <p>The design plan followed a long-term approach and was designed up to the year 2030. The plan was also based on the TQM criteria, and it is regularly reviewed.</p> <p>The e-government initiatives in the NEC included several projects and e-government initiatives such as: long term power system planning, organisation restructuring, business performance, building of electricity sector database, building telecommunication network, online electricity payment, establishing grid stations network.</p>
Information & Data	Quality & Accuracy	<p>The displaying of information and data is based on a comprehensive study for the required reports. As a result a full reporting system was developed to produce monthly and annual reports. In addition, the top managers' offices are equipped with Decision Support Systems (DSS), which views the information related to the business performance and the</p>

		<p>monitoring purposes.</p> <p>Although the reporting system has greatly improved the level of data quality, according to a senior manager there are still some concerns about the level of accuracy due to the manual transfer of data in some transactions, the senior manager believe that this is because “quality is not part of the citizen culture, this also applies for our employees in the NEC ... this is more clear with the data that is collected from the field”.</p>
	<b>Data Collection</b>	<p>As a part of the outsourcing policy adopted by the NEC, the process of collecting data was designed by external private companies. The company produced a clear plan to collect data across NEC office sites distributed all over the country, and large database centres were established.</p>
<b>IT infrastructure</b>	<b>Telecom. Networks</b>	<p>The telecommunications network was developed to be parallel to the electricity network.</p> <p>The NEC network was first established using the National Network, but numerous problems drove the NEC to establish its own network. The new Private Network (PNW) uses Dark Fibre, and YOUR CARD technology. This technology allows transmission of electricity and data at the same time which enhances data accuracy, speed in the transfer of data and enables more control of information.</p> <p>The prepaid service was previously delivered through three main offices in the capital, but as more citizens adopted, the NEC established a further 34 fully connected offices.</p> <p>The NEC developed and installed over 58 software applications in the PNW. However, as these systems were developed locally, the overall effect remains limited.</p>

	<b>Websites</b>	<p>To build the NEC website a special committee was established. The committee included an Editorial Board responsible for the website content.</p> <p>The website is in the one-way stage. Currently the number of 'website hits' is limited. The NEC attributed this to the absence of online payment services.</p>
<b>Interoperability</b>	<b>Security</b>	<p>The use of Dark Fibre technology increased the level of security, especially in data transmission. The threat of hacking, intruding and modification of data was reduced to a minimum.</p> <p>Other significant actions regarding security issues implemented are: establishing a Data Recovery Centre; introducing advanced systems for backup; and dealing with digital storage equipment as well as hardware waste.</p> <p>There are many concerns regarding applications and websites security. Recent plans relating to security issues focus on applying filtering systems and firewalls.</p>
	<b>Standards</b>	<p>The IT head department explained that the standards used in the prepaid system are according to the international standards for similar system, but he also mentioned that the standards for other systems used in the NES especially the ones developed by the IT department programmers might not be following specific standards.</p>

## Organisational Factors

Factor	Sub-factor	Factor Analysis
<b>Organisational culture</b>	<b>Resistance to Change</b>	<p>The organisation witnessed two types of resistance:</p> <ol style="list-style-type: none"> <li>1. Among employees: due to lack of education, skills and low level of knowledge. The significance is that employees are deeply opposed to any change.</li> <li>2. Among senior officers and managers: because they fear losing their power and authority. As this was delaying the initiative too much, the NEC replaced these executive managers with more aware and willing managers.</li> </ol>
	<b>Information Sharing</b>	<p>“The automated reporting system, the paperless policy created an environment that encouraged information sharing between departments”. Moreover, the NEC provides high level of information that is significant for other organisations and sectors ... According to a senior manager “the NEC is willing to offer these information ... however, there are no systematic channels that facilitates the sharing of information between organisations”.</p>
<b>Human Capacity</b>	<b>ICT in Education</b>	<p>The NEC provides monthly and weekly seminars on the use of ICT in electricity services. These seminars are open and interested professionals participate from different areas in the country.</p> <p>The available technical staff has a high level of ICT education. According to a senior engineer: “the young generation is with broad knowledge and experience in ICT technology, this has greatly helped in boosting the NEC initiatives in terms of adoption and progress”</p>
	<b>ICT Skills &amp; Training</b>	<p>The NEC has established a centre which provides training at all levels up to advanced and professional. The training programs are planned and systematically provided. As a result the percentage of trained people with ICT skills is 100%.</p>

		There are opportunities of training programs abroad; professionals are to attend at least 3 months training abroad.
<b>Change Management</b>	<b>Bureaucracy and Inflexibility</b>	The paperless policy was announced by the top manager, Unlike other public organisations the NEC was fully committed to the policy, so the mailing and communication were all through the NEC intranet.
	<b>BPR</b>	<p>A senior manager mentioned four pillars for allowing the reengineering process in the NEC:</p> <ol style="list-style-type: none"> <li>1. Computerisation of all organisation work.</li> <li>2. Use of ICT in all the NEC functions: electricity generation, transmission and distribution</li> <li>3. Outsourcing of NEC services</li> <li>4. Replacing the old traditional system to a new system based on TQM</li> </ol> <p>The NEC has a joint project for performance improvement with international organisations. The project aims at restructuring and introducing business performance improvement measures including improvement of the applied information systems.</p> <p>“The NEC witnessed a full restructuring in its hierarchy and administration system ... as a result the number of employees was reduced from 20,000 to only 7,000 In addition, the use of new policies such as the paperless led to the dispense of 600 correspondents”.</p>
	<b>Multiple Channels</b>	The prepaid service is delivered through mobiles, POS and the Unified Communication Network (UCN) - a new system to replace the old methods of payment. The UCN is attached with a call centre and GPS system. This was very useful in

		<p>the delivery of maintenance services, where engineers can easily find the areas in which malfunction.</p> <p>Future plans are set to deliver the service online. A senior IT manager said: “the e-payment has to be coordinated with the e-banking system ... however, as soon as the service is provided the electricity prepaid will be available online via the NEC website”.</p>
<b>Top management</b>	<b>Awareness &amp; Commitment</b>	<p>The top leadership in the NEC was behind the introduction of the new initiative. Many interviewees in the NEC pointed to the fact that the awareness and full commitment of the General Director is the key factor that facilitated this change. A senior member of staff said: “the top leaderships had a broad understanding and strategic thinking that can be seen through the approach of introducing the new initiative ... the systematic training ... the flexibility in decision making ... and the adherence to the designed plans” Another senior official said: “the top leader’s awareness, dedication and know-how is what distinguishes the NEC organisation ... it is the main reason that put the NEC e-government initiative on top of all other initiatives and the reason for it achieving international recognition”.</p> <p>In order to raise the awareness at all levels of management, the NEC conducts regular workshops and monthly seminars regarding the new initiatives, plans and the new applications and systems about to be introduced and installed.</p>
	<b>Brain Drain</b>	<p>The NEC General Director had a different style of management and behaviour towards top managers and key executives, giving them more authority and flexibility in decision-making. According to a senior manager: “this attitude helped to reach high levels of satisfaction among top managers and improved the relation with the organisation top leader. As a result it eliminated the problem of brain drain in the NEC”.</p> <p>The NEC top managers were keen to satisfy the employees’ needs. As a result the working conditions of engineers and IT</p>



		<p>professionals in NEC are considered as one of the best compared to other organisations and sectors.</p> <p>It is rare to hear complaints amongst NEC employees; in fact some engineers preferred to work in the NEC and rejected offers from the private sector and other countries.</p>
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### Environmental Factors

Factor	Sub-factor	Factor Analysis
Political	Political Instability	Political instability curtailed foreign investment in the Sudanese power sector. However, this situation improved after the peace agreement seeing foreign investment increase. Various international organisations have now invested in NEC projects with huge amounts of money.
	Politician Support	Political support is not always positive, as explained by a senior manager: “Politicians interfere directly and apply pressure in appointing or replacing managers, which can negatively affect the initiatives. Moreover, politicians sometimes intervene to reduce the cost for some customers, introducing corruption.”
Cultural	Hofstede Dimensions	<p>Leader used <b>Power Distance</b> in the early stages of the initiatives due to the high resistance. Some senior managers in the NEC believe that this was a positive use of <b>Power Distance</b> and that it helped in accelerating the adoption process of the NEC prepaid initiative.</p> <p>In establishing e-mail, employees preferred the ‘web base email system’, according to the NEC survey. However, the IT</p>

		<p>managers did not recommend this for technical reasons - the need to increase the bandwidth as well as to avoid the security threats. <b>Power Distance</b> was practiced again to put restrictions on the use of the Internet and the ‘web base e-mail system’.</p> <p>The NEC is a good model in showing the positive impact of the <b>Individualism</b> dimension. Many observers agree that the NEC has made huge efforts in order to improve the working environment for its employees, through the establishment of a powerful Intranet system, the ICT skills training, the high level of flexibility and the regular surveys for assessing the employees’ performance.</p> <p>The way the plans are set and designed in the NEC emphasises the <b>Long-term</b> orientation. For instance, the plan for the electricity corporation for the next 30 years and the ten years plan of building the Information System are some examples of this trend. These plans were supported with the <b>Uncertainty Avoidance</b> among top managers and professionals. The NEC keeps updating its systems until they managed to build their own communication network.</p> <p>A senior engineer pointed to cultural problems such as inconsistency: “there are no constants, and decisions can easily be changed even if they were based on scientific research and studies. The NEC has frequently experienced purchasing equipment and making preparations for specific projects, only to find out that the whole plan has changed.”</p>
	<b>Illiteracy</b>	The NEC claims that it has no illiterate people among its workers, as the organisation has taken major steps to replace illiterate personnel. Further, the NES ensures that there is no ICT illiteracy either.
	<b>Low level of Education</b>	The NEC employees must have degree above the secondary; however, the general level of education can be low in some departments and among employees in some electricity offices. This is expected to be reduced as the level of education

		among younger generations improves.
<b>Economic</b>	<b>Funding</b>	The NEC may be affected by the general poor economy in the country. However, according to NES managers, this is a self-funded organisation and capable of sponsoring most of its projects.
	<b>ICT Investment</b>	<p>It has been reported that the prepaid electricity meters have resulted in positive cash flow for the NEC and it recouped its initial capital investment in about nine months.</p> <p>The success of the prepaid initiative has resulted in good cash flow, returns for business and consumers (up to 35%). The ROI helped the NEC to build more power stations.</p>
<b>Regulatory</b>	<b>PPP Policy</b>	Adopting partnership policy and to involving a third party was to overcome the political/technical boycott of Sudan, as well as to learn lessons and exchange experience. As a result the NEC had a two year twinning program with the French IFC electricity organisation, as well as partnerships with international companies in Europe and Asia (particularly China). The partnerships involved: electricity, telecommunications, software applications, training and service delivery systems.
	<b>Legal Framework</b>	<p>There are many policies developed within the NEC relating to technical issues, such as: the Internet and data policies. An IT professional complained that these policies should have been set at the national level: “there is a need for the Domain Internet Policy and the Data security Policy including the digital signature.”</p> <p>However, there is no comprehensive legal framework. A senior manager said: “There is no legal framework or clear state policy ... the NEC initiatives either collide with some of the state policies or suffer from the complete absence of other policies”.</p>

## E.4 IM Initiatives

### Technology Factors

Factor	Sub-factor	Factor Analysis
ICT strategy	Vision	<p>The Kushite Company’s vision portrays the fastest speed and efficiency in executing government dealings by using an integrated information technology solution.</p> <p>The vision is to adopt the latest IT technologies available to fulfil and produce the most modern CRS.</p>
	Action Plan	<p>Each initiative was initiated according to a well-designed plan. The action plan for the CRS included four main phases:</p> <p>Phase One: 1998 -2005. The legislation phase.</p> <p>Phase Two: 2002 – 2006. The Infrastructure phase. This includes: the establishment of the general administration of civil rolls; composition of the advisory council of the civil rolls; building the operational structure; registration of the committees.</p> <p>Phase Three: 2005 – 2010. Development of the implementation plan and registration of 20 million citizens. Building main databases. Establishment of permanent centres across the country, (25 state and 7 local government level)</p> <p>Phase Four: 2010 – 2015. Integration updates. Expansion of the issuance of ID cards and providing a means of identification of citizens. Registration of 80% of citizens. Establishment of other 127 at local government level.</p>
Information & Data	Quality & Accuracy	<p>“As the organisation’s services deal with very sensitive data, such as criminal records and car licences, the level of</p>

		<p>accuracy and quality is also high”.</p> <p>The data quality still needs improvement. For example, similar names cause problems as some people can be prevented from travelling when the systems linked with the airports show restrictions for this name.</p>
	<b>Data Collection</b>	<p>The IM deals with huge amounts of data related to all citizens. There are more than 30 million records in the archives that need to be edited into the databases. The main challenge was to find people trained in data entry. The IM established an editing training programme which is regularly training the national service recruits. The training programme has been going for more than two years.</p> <p>Both the e-passport and the CRS systems require citizens to register, fill in forms and update their records. This is causing delays in the data collection process; however, the plan is to complete 80% of citizens’ registrations by 2015.</p>
<b>IT infrastructure</b>	<b>Telecom. Networks</b>	<p>The IM executed the “Tetra” communication network system. The network facilitated the link between the “personalisation offices” established in the capital and other provinces. The reliability of the network is considered high because it combines both the fibre optic and wireless connection.</p>
	<b>Websites</b>	<p>The websites have adequate content and the information is regularly updated. The provided services are one-way communication and no interactive services yet. According to a senior manager: “a full online transaction services is part of the plan in the next phase, but this is related to the provision of an e-payment system”.</p> <p>However, as the websites include links to many applications and systems they are intensively accessed. The developed applications include: driving and vehicle licence, electronic insurance, and accident and complains.</p>

<b>Interoperability</b>	<b>Security</b>	<p>The new e-passport uses advanced systems for saving personal information, such as the use of the fingerprint. This allows high levels of security and reduces the chances of forgery in probative papers.</p> <p>The IM also declared that the new national ID card would be forgery-proof, using various biometric authentication methods, including laser-printed names and iris recognition.</p>
	<b>Standards</b>	In order for the e-passport initiative to be internationally recognised, it follows the standards of the International Civil Aviation Organisation, ICAO. The universally accepted standards are known by Standards and Recommended Practices SARPs.

### Organisational Factors

<b>Factor</b>	<b>Sub-factor</b>	<b>Factor Analysis</b>
<b>Organisational culture</b>	<b>Resistance to Change</b>	<p>According to a senior manager the percentage of resistance among employees is high due to several reasons:</p> <ul style="list-style-type: none"> <li>• Low level of education and capabilities amongst a large number of recruiters</li> <li>• No more bursaries or overtime in the new automated system</li> <li>• The normal biases and prejudice of the traditional staff against the technology staff</li> </ul>
	<b>Information Sharing</b>	<p>According to a senior manager: “the information available in the IM systems and databases is integrated and open for sharing and exchange at any time between the different departments”. An IT professional explained further that the information available in the database centres is related to: Nationality, ID card, CRS, crimes, e-passport in addition to the</p>

		developed 999 and GPS systems. These databases are linked with the airport systems, call centres, ambulances and police cars. Also, the vehicle licence system is linked with the national insurance company.
<b>Human Capacity</b>	<b>ICT in Education</b>	The IM granted scholarships for more than 250 officers to receive higher degrees and advanced training in ICT. In addition the IM established a new university which includes schools of computer science, computer engineering and IT/IS departments.
	<b>ICT skills &amp; Training</b>	The ministry has established training institutions in all police departments, resulting in 1000 employees being trained. High level training is provided internally along with opportunities for training abroad.
<b>Change management</b>	<b>Bureaucracy and Inflexibility</b>	Due to the high bureaucracy existing in the traditional management style in the IM, the ministry created the Kushite company in order to execute the IM initiatives. Although the new company is designed according to new management forms, a senior manager pointed out that they still suffer from the high inflexibility and complexity because of the strong power of the old system.
	<b>BPR</b>	One of the goals of the e-passport and the CRS initiatives is to simplify procedures and processes. This has been achieved through integrating all databases and combining operations to be processed via one office; unlike the old system, where the citizen had to deal with many offices in different locations in order to complete forms. The ultimate goal of the initiative is to deliver the service to citizens in their own places.
	<b>Multiple Channels</b>	The new initiatives have replaced the centralised system in processing citizens' probative papers with a decentralised system, which offers offices across the country and in residential areas, to ease the process of registration for the CRS. The citizens in rural areas do not have to make any visits to the capital; in fact the local governments of each province

		<p>compete to finish registration of its citizens first.</p> <p>A senior officer explained in a press interview: “to speed the process of citizen registration the IM has built “moving centres”, these centres are fully equipped to carry out the process in rural and far-flung areas”.</p>
<b>Top management</b>	<b>Awareness &amp; Commitment</b>	<p>Commitment to the IM is by default for most recruits as they are in non-civilian positions. Recruits cannot easily quit from the organisation, which helps the sustainability of the IM initiatives. A problem exists though as top managers can change frequently. The General Director of Kushite stated: “Sometimes every six months a senior manager or even IT professional can be replaced. This is badly affecting the progress of the initiatives and its sustainability”.</p>
	<b>Brain Drain</b>	<p>Technical staff from the IM company often leave as they receive better offers from telecommunication companies.</p>





### Environmental Factors

Factor	Sub-factor	Factor Analysis
Political	<b>Political Instability</b>	Political instability increased the number of refugees and led to large movements of the population across the long, open borders. This made the introduction of the CRS system a priority.
	<b>Politician Support</b>	<p>According to a senior manager: “The IM initiative is receiving great political support. In fact, the initiatives are under the supervision of the highest authority”. The manager further explained that this is due to the importance of the initiatives and also due to the awareness and commitment from the high level politicians.</p> <p>However, the researcher argues that this attention towards the IM initiatives is mainly because many of these politicians belong to the IM.</p>

<b>Cultural</b>	<b>Hofstede Dimensions</b>	<p>The <b>Power Distance</b> dimension exists strongly in the IM. It is part of the cultural behaviour of its staff members. For example, in the implementation phase of the Biometric Finance System (BFS), the re-engineering processes have been changed multiple times due to the power influence of the new managers. This caused delay and corruption in the data of 200 records.</p> <p>The planning of the IM initiatives and the understanding of the length of time needed to implement these initiatives before any actual results can be seen, show the orientation of <b>Long-term</b> planning. For example, it was found that the e-passport system will only be successfully implemented if the electronic passports are produced locally. As a result the IM took the decision and built an e-passport factory. The low <b>Uncertainty Avoidance</b> helped to introduce the e-passport and CRS initiatives, which both deals with high percentage of illiterate citizen. However, the focus on <b>Individualism</b> is still very little.</p>
	<b>Illiteracy</b>	The high rate of illiteracy amongst IM employees has changed and the percentage is expected to be reduced to the minimum.
	<b>Low Level of Education</b>	There are many people who apply to the IM because they have low level of education and less skills; it is difficult for these people to compete in other organisations and sectors.
<b>Economic</b>	<b>Funding</b>	Although the IM initiatives enjoy great support from politicians, it has been reported that the finance is one of the limiting factors in implementing a project successfully and on time. This is due to the overall condition of the country's economy.
	<b>ICT Investment</b>	Although the Kashite company was established recently (2006) and its goal is to provide services for the local market in terms of ICT business, but the company has expanded and launched new branches outside the country and it has been

		involved in ICT business in the regional market. However, other factors affected the work of the company, such as the political and economic conditions.
<b>Regulatory</b>	<b>PPP Policy</b>	<p>Managers in the IM have different views about PPP. In Kushite Company, the top manager said: “it is very difficult to apply the PPP policy in the IM due to the political conditions and the embargo against Sudan ... this has discouraged many companies and organisations in the region or internationally establishing any partnership with a governmental body like the IM in Sudan.”</p> <p>Other senior manager in the IM expressed an opposite opinion: “the embargo against Sudan is not affecting the IM plans and policies ... the IM have managed to establish partnerships with many equivalent ministries in other countries, including IMs in European countries. In fact, due to the nature of the organisation the only option is to make partnerships with similar organisations ... through our initiatives we have learned many lessons and viewed best practices in other countries, especially in the Arab World and Asian countries.</p>
	<b>Legal Framework</b>	<p>The IM formulated a legal body consisting of three different committees. The committees are responsible for setting:</p> <ol style="list-style-type: none"> <li>1. ICT policies and technical standards</li> <li>2. Consultation legal policies</li> <li>3. Information and library policies</li> </ol> <p>So far, there are three approved legislations in the CRS regarding:</p> <ul style="list-style-type: none"> <li>• The civil rolls law, 2001</li> <li>• Regulations of civil rolls, 2005</li> <li>• Guides and orders for civil rolls</li> </ul>

