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**Information and Communication  
Technology for Development and  
Bridging the Digital Divide:  
- A Holistic Stepwise Approach to building  
Knowledge-based economies and technological  
artifact. -**

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이 논문을 공학박사학위 논문으로 제출함

2018 년 8 월

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오마르 압둘해미드 이브라힘 지브릴의

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## **Dedication**

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**Abstract**

**Information and Communication  
Technology for Development and  
Bridging the Digital Divide:  
A Holistic Stepwise Development Approach to  
building Knowledge-based economies and artifact.**

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This dissertation explores the development of knowledge-based economies and their technological artifacts using a holistic perspective that takes into account three interlinked aspects -- socioeconomic, technological and behavioral. The dissertation's primary objective is to provide a framework for developing information and communication technologies which provide more optimized policies and technological artifacts for countries that want to bridge the digital divide. It does this in two phases: the first phase deals with developing a holistic stepwise development framework called the Information and Communication Technology Development Framework. This explores all relative constraints and develops a conceptual framework based on these constraints. It then uses this conceptual framework to develop a conceptual hierarchical pyramid on the relative importance of each aspect and its constraints in developing an ICT policy or its artifacts in a state. In the second phase the dissertation empirically explores the framework in two areas of information and communication technology for development -- social commerce and e-government -- using both a panel data analysis and a factor analysis. My findings suggest that context is essential and critical in developing policies on information and

communication technology and technological artifacts. Further, the relative importance of the socioeconomic, technological and behavioral aspects differs across countries and on the basis of income levels. Hence, exploring the development of information and communication technology following a stepwise developmental approach is both critical and informative in understanding the criteria for developing optimized and efficient policies on information and communication technology and technological artifacts. These policies and artifacts can be used as tools for developing improved information and communication policies for a state or even for empowering a group of people.

**Keywords: Information and communication technology for development (ICT4D), social inclusion, e-inclusion, e-participation, social commerce, electronic government.**

**Student Number:201331309**

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# **Chapter 1. Introduction**

## **1.1 Introduction**

History shows that human beings have striven to improve the ways in which they acquire knowledge to better themselves. As societies transitioned from agricultural to industrial and now to knowledge-based economies, they experienced a shift in how each phase of the transition effected how they developed both tangible resources like natural resources and intangible resources like knowledge (Masuda, 1985). These transitions in development were characterized by several paradigm shifts. The transitions also came with their own repercussions. For example, the agricultural revolution was symbolized by and depended on natural resources like land, climate and an understanding of natural systems (Masuda, 1985). As societies transitioned from one phase of development to the next they also tried to form themselves into knowledge sharing centers, or what we today call universities. This method was first pioneered by one of the oldest and still functioning University of Al Quaraouiyine, founded in 859 AD in Fez, Morocco (Kenney & Moosa, 2013). One of its great social scientists was Ibn Khaldun, considered by some economists as the father of several modern day fields of study like historiography, sociology, economics and

demography thanks to his work in economics and sociology (Ibn-Khaldun, 1958; Oweiss, 1988).

As societies transitioned and new fields of studies emerged, they also perfected new means and methods of organization and exploration. In the industrial revolution, societies used natural science to develop what Masuda (1985) calls the “industrial productive power.” This led to a revolution in the form of mass production of many products used and consumed as a matter of routine on a daily basis and is symbolized by examples like assembly lines, first pioneered and introduced by Henry Ford of Ford Automobiles (Brinkley, 2004).

With the information-knowledge revolution, human beings were able to develop better ways of creating knowledge which ushered in the development of problem-solving methods and shifted interest from resource-based innovations to knowledge-based ones (Masuda, 1985). Nonetheless, the question of how these social and technological systems interacted around the world in coming up with innovations that were applicable and replicable at the local level needed to be explored.

This question gained importance in the late 1960s when in tandem with this concern the United Nations commissioned the University of Sussex (United Kingdom) to explore innovations in the developing world. The

resulting report, *The Sussex Manifesto: Science and Technology to Developing Countries During the Second Development Decade* (Singer et al., 1970) also known as the Sussex Manifesto, stressed the need for localized innovations in science and technology. It stated, “the world plan of action for the application of science and technology to development starts with the premise that developing countries must have their own scientific and technological capability. This indigenous capacity is necessary not only for increasing production but, what is more important, for improving the capacity to produce.” The Sussex Manifesto coincided with the notion that the paradigm shifts during the different phases of human development in the developing and the developed world led to gaps in knowledge, skills and resource allocations. These in turn led to major repercussions and inequalities in many areas around the world and also within individual countries. For example, a global repercussion of these paradigm shifts is related to an increase in inequalities between groups of people and how they use ICT (Unwin, 2017). Unwin articulates this concern as, “Over the last twenty years, rather than reducing poverty, ICTs have actually increased inequality, and if ‘development’ is seen as being about the relative differences between people and between communities, then it has had an

overwhelming negative impact on development” (Unwin, 2017).

On the other hand, at the local (micro) or regional level, the repercussions are in the form of unemployment called structural unemployment (Slabbert, 2006). An example of structural unemployment was explored early on in South Africa by Simkins and Clarke (1978) who while investigating the causes of structural unemployment stated:

“One possible explanation might lie in the fact that South Africa depends considerably on the importation of technologies developed in economies with different factor endowments from ours; in this case the communication failure is between domestic factor prices and techniques employed. Another might be sought in the difficulty that a section of the labour force (located in the rural areas) has in entering the labour market. Barriers to entry are administratively imposed and the age, sex and educational levels may make this section particularly unable to transmit the necessary signals for their absorption” (Simkins & Clarke, 1978).

One of the main reasons for structural unemployment, also known as a ‘skill gap,’ is the emergence of new technologies and business and economic models that are based on technological changes (Northrup, 2011). With the advent of globalization researchers also introduced a new term (Friedman, 1999), glocalization, that tries to tackle the mismatch between people, technologies, the economy and society. The notion of

glocalization combines global systems of trade with the local needs of individual countries.

A term that means both globalization and localization, glocalization was first used by sociologist Roland Robertson in his work, *Global Modernities* (Featherstone et al., 1995; Robertson, 1992, 1994). According to Sharma (2008), in the development and policy arena, “Glocalization seems to be a problematic term. However, this is the term that best captures the essence of the emerging worldwide phenomenon where globalization and localization are simultaneously transforming the development landscape.” As the world today is in the age of globalization and what Friedman (1999) calls the democratization of technology, finance and information a new field of study has emerged that combines information and communication technology with the notion of development; this is called the field of ‘information and communication technology for development’ (ICT4D).

ICT4D’s primary objective is developing, exploring and studying how ICT can be used for development around the world but principally in the global south (Ayanso et al., 2014; Heeks, 2008). However, the use of ICT4D has led to several issues like project failures (Unwin, 2009) and the inability to develop sustainable and scalable projects (Heeks, 2008).

Two main reasons for these failures are related to under-consideration of the local context (Bhatnagar & Bjørn-Andersen, 1990) and the mismatch between the actuality of the current situation and ICT or implication design that is to be implemented to address the local situation (Heeks, 2002b). There are also other issues like not having enough local technological, social or economical means to develop or sustain information and communication technologies (Heeks, 2002a).

Even though there was extensive research and a number of studies were done in the initial stages of ICT4D which explored why projects were not sustainable and failed to develop to their full potential Heeks (2002b) points out that there were three overarching issues -- lack of relevant research, lack of evaluation and a focus on case studies. This meant that rigorous and empirical research was lacking.

Unfortunately, after more than a decade and a half, studies still maintain that ICT4D projects still fail and “many if not most, ICT4D projects ultimately fail to achieve their stated development goals” (Walsham, 2017). Besides failures at the local level there is a global central issue in the diffusion of information and communication technology -- inequalities in the use of ICT4D among different groups of people within a society (Stiakakis et al., 2010; Unwin, 2017).

Inequalities in the use of ICT are visible in different fields and within many groups of people who use ICT technologies (DiMaggio & Hargittai, 2001). These groups range from e-governments (Bélanger & Carter, 2009; Dodel, 2016) to electronic commerce (Hoffman et al., 2000; Kshetri, 2018). Dodel (2016) explored the use of e-government services in Uruguay and points out how e-government differs across different groups within Uruguay, “the groups that already accumulate several socioeconomic and digital advantages are the ones with considerably higher chances to enjoy the benefits of online services.” His findings point out that socioeconomic issues such as educational levels and digital divide are significant predictors of using e-government’s services. From a sociological and political perspective, the notion of inequality and accumulation of wealth in favor of specific groups within a society, discipline or a group is not new particularly in the field of governance and public choice theory (Iqbal & Lewis, 2009). In this vein, Ibn Khaldun opines that a “combination of rent-seeking special-interest groups grows within a dynasty (or political regime or party). As time elapses and the dynasty gets more established and relaxed about the continuity of its hold on power, there begins the process by which the special interest groups transfer wealth in their favor from ordinary

citizenry” (Iqbal & Lewis, 2009).

However, there is hope that information and communication technology can be used for empowering those who are the most marginalized socially and economically impoverished. In his latest book, *Reclaiming information and communication technologies for development*, Unwin (2017) points out, “Yet, in the spirit of the Enlightenment, those who believe in ICT4D must believe that it is possible to use technology to improve the lives of the poorest and most marginalized in our local, national, regional, and indeed global societies.” Unwin stresses that there is a need to look at the use of ICT4D not from the perspective of economic growth, which is one aspect of development, but from the perspective of reducing inequalities, which is a more important aspect of development. He also elaborates on the dangers of using ICT for development as a means of testing specific technologies or methods and emphasizes that, “there are many different ways in which technology and development interact. I have previously championed the notion of ICT4D, but now fear that this has been subverted to a situation where many stakeholders are using the idea of ‘development’ as a means to promulgate and propagate their specific technologies, or what might be called ‘Development for ICT’ (D4ICT)” (Unwin, 2017).

Following Unwin's views on development, economic growth can be seen as a form of development defined as "the increase in the value of goods and services produced by an economy; traditionally this growth has been measured by the percentage rate of increase in a country's gross domestic product, or GDP" (Gupta, 2010). Inequality is defined as "the means through which an individual or groups of people are denied equal access to wealth, power, and prestige" (Chacon & Mendoza, 2017). It should also be noted that inequalities have different dimensions two main ones of which are related to ICT4D. My dissertation explores the inequalities that a digital divide leads to (Iriarte et al., 2015) -- access to the internet or computing power in general and structured inequalities like those in educational levels in particular (Thompson, 2017).

Digital divide in the context of inequalities can be defined as: "The term used to identify the social inequalities arising from unequal access to ICT, and more specifically to the use of computers and the Internet" (Iriarte et al., 2015). Structured inequalities can be defined as "a process in which groups or individuals with particular attributes are better able than those who lack or are denied these attributes to control or shape rights and opportunities for their own ends" (Thompson, 2017).

Considering these two two dimensions of inequalities, my dissertation's

primary objective is exploring holistically how socioeconomic aspects such as literacy or education levels, technological aspects such as technological infrastructure and behavioral aspects such as internet access within a household or the perceived ease of using technology influence users to engage in social commerce and e-government. A significant question that my dissertation addresses is: How can these three aspects, combined with the notion of glocalization, play a role in developing more equitable policies and technological artifacts in the area of ICT4D? Hence, it explores the notion of how the paradigm shift to knowledge-based economies and its repercussions increase inequalities both in the form of the digital divide and structured inequalities and how they are manifested in the use of ICT for both commerce and governance. To assess these inequalities and devise methods for addressing them, my dissertation proposes a holistic perspective that links the socioeconomic, technological and behavioral aspects of development. It further links these three aspects to underlying constraints such as literacy levels or internet access that might hinder access to information and communication technology for a more equitable form of development which is based on reducing inequalities and not only on improving economic growth.

The rest of the thesis is organized as follows. After the introductory chapter, Chapter 2 gives the literature review. Chapter 3 proposes a holistic perspective on information and communication technology for a development framework which is followed by two research studies in Chapters 4 and 5 that use the framework proposed in Chapter 3 as a lens to show the use of ICT in commerce and governance. This paves the way for the conclusions that follow in Chapter 6.

## **1.2 Problem description**

Over the years a number of informative propositions or frameworks for ICT4D have been developed like the Heeks Design (the actuality-design gaps model) (Heeks, 2002b). Intergovernmental organizations like the United Nations (UNCTD, 2014) too have developed different frameworks. Although they are all informative and highlight critical issues like a design gap in the utilization of ICT in development, it should be noted that during the time of the publication of the Heeks' actuality-design gaps model, it was difficult to collect quantitative data and pioneers in the field of ICT4D were not able to gather data easily from the developing world.

The lack of data availability is a significant factor that should be

considered a major hindrance in developing more rigorous and empirical research during the early years of ICT4D's development. Now, although the problem still persists, current and upcoming researchers can explore ICT4D at the macro level using data repositories that are publicly available like the United Nations and the World Bank. Due to the growth in ICT in the developing world and access to computing power in general, researchers can also explore ICT4D's micro-level aspects using internet-mediated questionnaires.

Given the limitations that existed in the earlier ICT4D design frameworks, my dissertation develops an updated framework for ICT4D that takes into account the constraints and perspective of inequalities which act as barriers to a more equitable use of ICT4D. There are several studies in other fields that are related to ICT4D including those on information systems and telecommunication policies that look at bridging the digital divide in the developing world from socioeconomic (Guillén & Suárez, 2005) and socio-technical perspectives (Avgerou, 2008). However, these are treated as competing aspects to a certain extent. Unlike socio-technical aspects which are facing a crisis in operationalizing their concepts into variables that can be explored, studied and developed (Baxter & Sommerville, 2011), there has been

extensive socioeconomic research in many ICT4D areas (Agarwal et al., 2005; Gibreel et al., 2013; Harris, 2016; Hilbert, 2010). Hence in this dissertation, I wish to explore socioeconomic aspect as one of our major aspect to explore and study.

Even though extensive research has been done covering the socioeconomic aspects of development a hierarchical model has not been developed using the socioeconomic or socio-technical aspects or even by using purely economical variables. Therefore, my dissertation proposes that there is a need to look at all aspects, not just social, economical or technological ones but also the behavioral ones in ICT4D and for this we need a hierarchical structure that ranks their importance. This dissertation proposes that although technology is essential, basic socioeconomic aspects of development form the central bedrock on which technological artifacts are developed. In this context this dissertation proposes a hierarchical model of how each element can be explored and at what step in Chapter 3.

This dissertation views resolving the inequality problem in the context of ICT4D as optimizing constraints (Goldratt, 1990). The theory of constraints (Goldratt, 1990) or ‘Engpasskonzentrierte Strategie’ (German for bottleneck – bottleneck-focused strategy) introduced by

Professor Wolfgang Mewes (2018) maintains that in any system there exist constraints that hinder development. In my dissertation, these constraints include poor literacy rates, non-availability of electricity and financial constraints for some segments of society which in some countries are considered ‘unbankable.’ This is an issue that Nobel Prize laureate Muhammad Yunus resolved using microfinance through Grameen Bank in Bangladesh. In his solution’s context optimization meant that a social, economic or technological system can improve with the given resources only if it improves its overall status from a previous state that is considered to be less optimized than the current improved or revised state.

Hence, in my study, the definition of ICT4D combines an understanding of the underlying constraints, be they institutional, socio-institutional, socio-behavioral, political, financial or linguistic in the form of language literacy, that are part of a state with policies that will help improve its overall use of ICT4D or lead to the development of better technological artifacts. Recognition of these constraints at the macro level will help countries implement more effective and efficient problem-solving solutions and policies. At the micro level, this will also help companies and entities eager to tap into the vast wealth of emerging

markets to understand the overall constraints and provide effective solutions. A recognition of the constraints is based on the novel framework (ICT4D Framework) that is introduced in Chapter 3. This is followed by two studies that explore the framework in the context of ICT for commerce and governance.

### **1.3 Research objective**

My dissertation's research objective is analyzing the socioeconomic, technological and behavioral aspects that promote or hinder the development of knowledge economies and technological artifacts. It proposes a holistic development framework approach in the use of ICT4D. It also explores these aspect in two areas: internet-mediated social commerce and internet-mediated electronic government.

### **1.4 Research questions**

The question that my research addresses is: How socioeconomic, technological and behavioral aspects contribute to or hinder the development of policies and technological artifacts and what developmental steps need to be taken before and during the development of knowledge-based economies and their technological artifacts?

In the context of internet-mediated social commerce (Chapter 4), the

second research question that my research explores is: What are the socioeconomic, technological and behavioral constraints in the development of social commerce in emerging markets?

The research explores the following constraints in the context of social commerce:

1. Socioeconomic constraints operationalized in the form of trust and familiarity.
2. Technological constraints operationalized in the form of governing form factors and technological utility.
3. Behavioral constraints operationalized in the form of perceived ease of use, perceived usefulness and word of mouth communication.

In the context of internet-mediated governance (also known as electronic government or e-government) (Chapter 5) my research explores another question: What are the socioeconomic, technological and behavioral constraints in the development of an electronic government in low-income, low middle-income, high middle-income and in OECD high income countries?

The research explores the following constraints in the context of electronic government:

1. Socioeconomic constraints operationalized in the form of literacy and educational levels.
2. Technological constraints operationalized in the form of telecommunication infrastructure development.
3. Behavioral constraints operationalized in the form of usage per household and usage per person.

## **1.5 Research contribution**

My research makes a two-fold contribution at the macro and micro levels. At the macro level, it provides comprehensive details on the information and communication technology framework which is used for recommending policies or developing technological artifacts that can be used by a state to accelerate desired outcomes and overcome constraints that hinder it from advancing towards a knowledge-based economy or for developing technological artifacts. The framework investigates the socioeconomic, technological and behavioral aspects and explores the field of ICT4D in social commerce and e-government for providing an overview of the constraints that are present in areas of ICT usage by doing a panel data analysis at the macro-level for e-government and at the micro-level using structural equation modeling analysis for social commerce.

## **1.6 Research methodology**

The methodology followed in this study covers the following steps:

Step 1: Literature research and review.

Step 2: Data collection from international agencies and open data sources such as the World Bank, UNDP and the International Telecommunication Union (ITU) in the case of e-government research and through survey instruments in the case of social commerce. This data collection incorporates three aspects: socioeconomic, technological and behavioral.

Step 3: A factor analysis for the study on social commerce (Chapter 4) and regression analysis for the e-government study (Chapter 5).

Step 4: Analysis of the results to detect significant variables in both Chapter 4 and 5.

Step 5: Proposition of a holistic or a stepwise development framework approach with policy or practical implications in both Chapters 4 and 5.

Step 6: Conclusion.

The study of social commerce (Chapter 4) explores the constructs or factors using structural equation modeling (SEM). This approach is different from other research methodologies such as regression in which “the exogenous constructs have only causal arrows leading out of them and are not predicted by any other constructs in the model” (Gefen et al.,

2000). Explaining the SEM approach Gefan et al., (2000) add, “Contrary to first generation statistical tools such as regression, SEM enables researchers to answer a set of interrelated research questions in a single, systematic, and comprehensive analysis.”

My dissertation employs structural equation modeling in the form of an exploratory factor analysis and a confirmatory factor analysis to explore the constructs. All measurement items are used on a Likert’s scale except for income, which is a continuous variable, and demographic questions, which are multiple choice or dichotomous. This is followed by an analysis of the results to identify the significant constructs. The analysis then moves to a discussion of the implications of the constructs for the framework. In the case of the e-government study (Chapter 5), I did a panel data analysis which helps in understanding variables that cannot be controlled, observed or measured over time. Using this method, the study determines what role factors like differences between countries and across time play in terms of technological diffusion and usage.

The panel data analysis uses the ordinary least squares (OLS) method to find the linear relationship between the independent and dependent variables.

This research also tests for multicollinearity and correlation for checking

for autocorrelation between the variables to omit variables that have high multicollinearity using the variance inflation factor (VIF). In analyzing the dataset, my study first finds out whether fixed effects or random effects estimates are appropriate and based on the estimates derived, the selection of a model is introduced, developed and explored. This is followed by an analysis and a discussion and its implications for developing a framework.

At the micro level, it provides general guidelines for companies and organizations, both private and public, that seek to develop systems, software or applications for a group of countries or a single country to aid them in developing better applications or artifacts.

## **1.7 Research outline**

The remainder of the dissertation is as follows. Chapter 2 provides a literature review, which leads to an introduction of the ICT4D framework. Chapter 3 discusses information and communication technology for formulating the development framework which is followed by an investigation of the development of social commerce in emerging markets through the lens of ICT4D framework in Chapter 4.

Chapter 5 examines the development of e-government systems through the lens of the ICT4D framework and provides policy implications for internet-mediated electronic government systems. Chapter 6 concludes the dissertation (Figure 1.1).

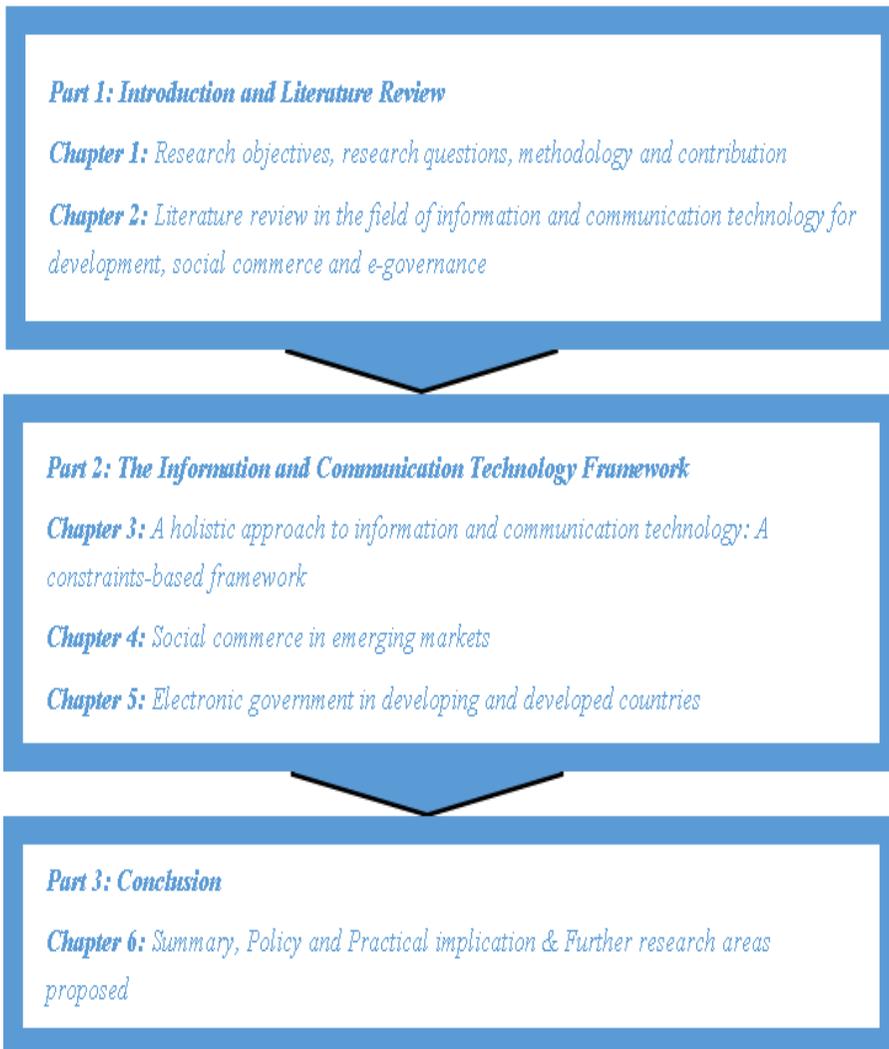


Figure 1.1: Structure of the dissertation

## **Chapter 2. Literature Review**

### **2.1 Introduction to the digital divide**

Bridging the digital divide is one of the main issues in ICT4D so that people can gain access to technology in particular and to information and communication technology in general (Agarwal et al., 2005; Ayanso et al., 2014; Compaine, 2001). Research on the use of information and communication technology dates back to 1988 when the first conference on ICT4D was held in India. Called the ‘Social Implications of IT in Developing Countries’ the conference’s theme was “context is important” (Walsham, 2017). Its proceedings were published as *Information Technology in Developing Countries* (Bhatnagar & Bjørn-Andersen, 1990).

During the early years several studies on ICT4D concluded that social issues were more important than technological ones in the development of ICT4D. Technological issues were considered only a part of the development process of information and communication technology in the developing world (Bhatnagar & Bjørn-Andersen, 1990). One of the first long-term researches in ICT4D was undertaken by the United States Department of Commerce when Bill Clinton was the President. The main aim of the research was developing policies for bridging the digital

divide. Its results were published in the report *Falling through the Net: Defining the Digital Divide* that explored the existence of a gap in the use of the internet between population groups. It studied the development of telephone systems and access to electronic services. It also studied where people accessed the internet and concluded that how household accessed the internet varied across the country. The report also highlighted issues of concern including the fact that although there had been an increase in internet access and telephone services, the gap between those who had access to ICT and those who did not had increased. This is now referred to as the digital divide.

The report pointed out: “Despite these patterns of growth, the information ‘haves’ have dramatically outpaced the information ‘have-nots’ in their access to electronic services. As a result, the gap between these groups -- the digital divide -- has grown over time” (United States Department of Commerce, 1999).

President Clinton was among the first leaders in the world to talk of the critical importance of bridging the digital divide and hence reducing inequalities. In his speech at the Massachusetts Institute of Technology he stated:

“We know from hard experience that unequal education hardens into unequal prospects. We know the Information Age will accelerate this trend. The three fastest growing careers in America are all in computer-related fields, offering far more than average pay. Happily, the digital divide has begun to narrow, but it will not disappear of its own accord. History teaches us that even as new technologies create growth and new opportunity, they can heighten economic inequalities and sharpen social divisions. That is, after all, exactly what happened with the mechanization of agriculture and in the Industrial Revolution. As we move into the Information Age, we have it within our power to avoid these developments. We can reap the growth that comes from revolutionary technologies and use them to eliminate, not to widen, the disparities that exist “ (MIT News, 1998).

President Clinton signed the Telecommunications Act of 1996 both on paper and electronically, paving the way for the development of an e-rate policy which helped in bridging the digital divide and providing affordable telecommunication and internet access in many parts of the US (United States Department of Commerce, 1999). These policies resolved one of the socioeconomic constraints proposed in the ICT4D framework of my thesis, namely the high price of access to information and communication technologies evident in numerous areas of Africa at present (Taiwo, 2017).

Since then, more research has explored different aspects of ICT in the

developing world from both the supply side and the demand side (Agarwal et al., 2005; Al-Abdul-Gader, 1999; Compaine, 2001; Heeks, 2007; Unwin, 2009) both in e-government (Bélanger & Carter, 2009; Dodel, 2016) and electronic commerce (Hoffman et al., 2000; Kshetri, 2018).

As research exploring the use of ICT4D grew, concerns about the failure and sustainability of new projects also grew (Heeks, 2002b; Marais, 2015; Unwin, 2009, 2017; Walsham, 2017). Exploring this concern, Heeks (2002b) proposed a model (Figure 2.1) to help explain the high rate of failure of ICT projects in the developing world. His study points out that several projects did succeed in ICT4D, but many others also failed either entirely or partially. Further, Heeks' proposed a model to understand what would help prevent some of these failures and assist developers, designers and government agencies to detect problems in the early stages of developing ICT4D projects. Heeks called his framework the actuality-design gaps model.

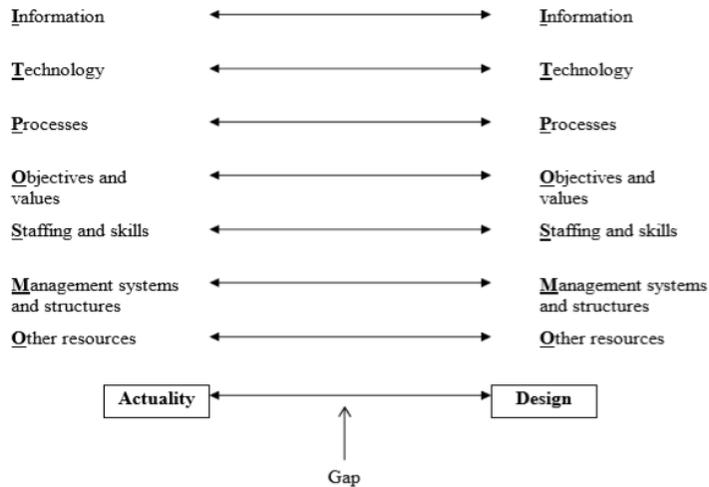


Figure 2.1 Heeks' design-actuality gaps model

Source: Heeks (2002b).

One of the major issues that Heeks faced while developing his actuality-design gaps model was his inability to access data from the developing world for further exploration or for doing a rigorous and quantitative analysis for his study. However, his study helped in understanding the underlying dynamics of technology, people and systems and postulated the need to understand how these systems interacted so as to develop better solutions for a given problem.

Since Heeks' model, information and communication technology and the internet have spread to many parts of the world, especially to many sub-Saharan African countries. For example, sub-Saharan African countries have been connected to the internet on a large scale through the

introduction of undersea fiber-optic cables (Figure 2.2); the development of the fiber-optic cables around sub-Saharan Africa started in 2000 and gained momentum in 2008 (Song, 2008).

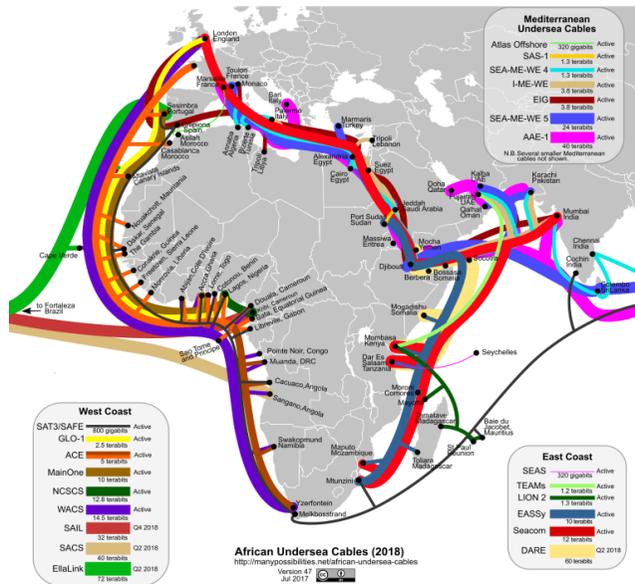


Figure 2.2: Fiber-optic cables in Africa and the Middle East, Source: manypossibilities.net

However, as in the case of the US and other parts of the world (United States Department of Commerce, 1999), just connecting countries to the internet does not promote the sharing and exchanging of knowledge or goods as there are other factors that play a role in the newly connected countries (Gibreel et al., 2013, 2018; Gibreel & Hong, 2017). These countries are not only inclined to develop physical infrastructure to

develop their industries but also to develop virtual infrastructure for their ‘knowledge’ industries.

Shifts in the needs for specific resources during transitions from agriculture to industrial to knowledge-led eras led to specific constraints.

In the current knowledge-based economies, there is a need to understand the resulting constraints that can hinder reducing the digital divide. There is also a need to look at all these aspects from a holistic perspective

(Figure 2.3).

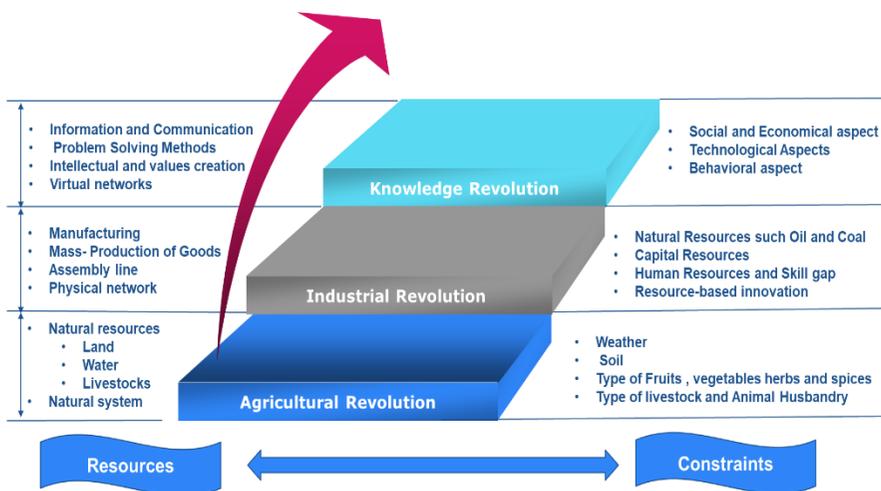


Figure 2.3: Resources and constraints during different phases of development, Source: Based on Gibreel et al., (2018, 2013a); Goldratt (1990); Masuda (1985).

As societies transition, their social and technological systems interact within a state or within regions and impact each other in different ways. They also help in extracting tangible and non-tangible resources and in addressing constraints that might hinder development or increase inequalities. Figure 2.3 gives the stages of development in the last three socioeconomic revolutions – agricultural, industrial and knowledge – and how each stage of development had specific resources and individual constraints which were vital as through their understanding researchers, policymakers and practitioners could strike a balance between socioeconomic norms and technological tools for developing better policies and technological artifacts.

## **2.2 ICT4D and electronic and social commerce**

As the internet grew, many novel methods of communication were developed in many systems to enhance user experience. These systems used a combination of mashups of API and sensor technologies in developing their applications. These new mashed-up desktop application and mobile apps were developed in the early years of the internet using methods like the tag system for online forms till they moved to the current fast and evolving Web 2.0 and Web 3.0. These

technologies have been developed and categorized into cohorts from the first static and one-way interaction of Web 1.0 to the latest interactive and two-way interaction of Web 2.0 and its consecutive generation of Web 3.0 with its different groupings such as Wikis, blogs, social networks, APIs and mashed-up technological artifacts.

Regarding technological aspects, Web 2.0 has been developed on the newly emerging technological form factor, which is known today as the mobile device. This is superior due to the mobility aspect of interaction between entities within a telecommunication system. Using this, Users can access applications and content anytime and anywhere in what could be called a post-desktop era of internet-mediated interaction. The tools and capabilities of Web 2.0 and 3.0 can be seen as “a collection of open-source, interactive and user-controlled online applications expanding the experiences, knowledge and market power of the users as participants in business and social processes.” Further, “[w]eb 2.0 applications support the creation of informal user networks facilitating the flow of ideas and knowledge by allowing the efficient generation, dissemination, sharing and editing/refining of informational content” (Constantinides & Fountain, 2008). These tools are categorized into five main categories: blogs, social networks, content communities, forums

and bulletin boards and content aggregators.

In the area of e-commerce and social commerce, the development of Web 2.0 and Web 3.0 interaction apps integrate in such a way so as to deliver a platform for buyers and sellers to be able to exchange merchandise. After electronic commerce, social commerce emerged with the introduction of social network sites and applications. This led to the advancement of social commerce and studies on its growth and expansion and how it is similar and different from e-commerce have been carried out widely (Lee, 2015; Ng, 2013; Turban et al., 2015).

Exploring the differences between social and electronic commerce, Huang and Benyoucef (2013) concluded that interactive social commerce involves four inter-related stages that formulate the structure of a social commerce platform. The first (individual) stage consists of “personal, context and activity profile,” which is followed by the conversation stage consisting of “content creation and information sharing activities” and the community stage consisting of “community support and connection stage” which in turn leads to the final outer layer consisting of “group purchase, participation, business function.”

Huang and Benyoucef (2013) opine that the difference between social and e-commerce is that e-commerce involves the inner stage of an

individual and only the outer layer of commerce. They also point out that there are two distinct types of social commerce: the first type is well-known and forms a part of many electronic commerce sites such as Amazon or Alibaba that are based on just getting access to comments and reviewer feedback on products or services. The second type has been developed on social media and social network application sites such as Twitter and Facebook. These social network sites act as a stage on which buyers access Facebook pages for companies such as Timberland, Columbia Sportswear or Starbucks to view price and product information. The drawbacks of these social network sites is that they do not provide price information and might not allow buyers to finalize payments online. This issue is currently being resolved by a “call to action” button on sites such as Facebook and Twitter(Gibreel et al., 2018). There is also the emergence of a new form of social commerce in emerging markets which though based on social network platforms like social commerce, does not have a mediating agents. This helps resolve the issue of money transactions using offline brick and mortar methods (Gibreel et al., 2018). Chapter 4 introduces this new emerging trend in social commerce in emerging markets and explores its growth and constraints using the ICT4D framework introduced in Chapter 3.

## **2.3 ICT4D and e-governance**

There has been a new paradigm shift in the field of governance and civil services. This shift is thanks to the use of internet-mediated tools and it is empowering citizens to access government-related services online through e-government. E-government has been defined as “the employment of the Internet and the world-wide-web for delivering government information and services to the citizens” (United Nations, 2014). During the early stages of e-government, development research focused mainly on its technological aspects. For example, Abramson and Means (2001) classified e-government services as government-to-citizens (G2C), government-to-business (G2B), government-to-employees (G2E) and government-to-government (G2G). Several studies proposed various multi-stage frameworks for the development of e-government services (Hiller & Bélanger, 2001; Layne & Lee, 2001). The model introduced by Hiller and Bélanger (2001) introduces five stages of technological development that e-government goes through: information provision, bilateral communication, transactions, interaction and participation. Governments can use these stages to provide services to citizens and businesses and facilitate interaction between governmental entities starting with providing information on a simple

website finally then moving to a stage where citizens play a vital and pivotal role in development processes (Hiller & Bélanger, 2001).

Research has also been carried out on the development of e-governments in both the developed and developing world. Countries in both these worlds are at different stages of development due to differences in the implementation of each stage based on internal and external factors. Development of e-governments has been extensively studied in the developed world (Hiller & Bélanger, 2001). In comparison there is little research on the development of e-governments in the developing world (Chen et al., 2008; Heeks, 2002a).

Research also focuses on what development means in different contexts. For example, Heeks (2007) points out that there is a crucial need that besides considering the technological applications of ICT, what is also needed is a theorized notion of what development is in the context of ICT4D. When it comes to e-governments, Heeks proposes a strategic response to Africa's e-governance divide (Figure 2.4).

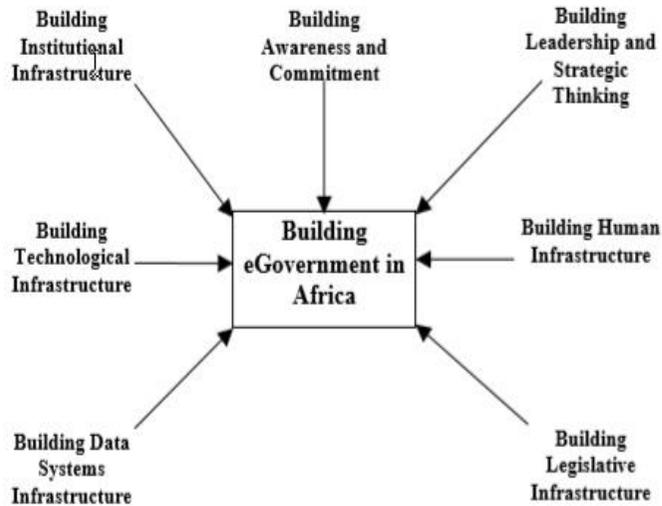


Figure 2.4: Strategic response to Africa's e-governance divide

Source: Heeks (2002).

As compared to the industrialized nations, emerging markets still lack the development of online internet-mediated services (Heeks, 2002a, 2007). Heeks (2002a) explored the development of e-governments in Africa and their connection to ICT4D and the digital divide and proposed that for e-government services to be developed in Africa, several e-readiness questions needed to be considered and addressed: “Is the data systems infrastructure ready?” for instance, highlights the need to consider whether a management system, database system or work

process exists through which e-government can be developed to provide internet-mediated systems for citizens. Another question, “is the legal infrastructure ready?” explores aspects such as public key infrastructure and digital signature laws or amendments and whether these have been enacted (Garfinkel, 2001). The question, “is institutional infrastructure ready?” addresses the institutional aspects of how a government’s functioning can be improved or developed using e-government services and technology. This question discusses having appropriate techniques and technologies as per specific needs (Korac-Kakabadse et al., 2000). Finally the question, is “human infrastructure ready?” deals with the notion of whether or not “people are able to use these systems by themselves and do they have the skills to do so.” This question addresses popular perceptions about the systems and their perceived ease of use and usefulness (Mundy et al., 1999).

Based on these questions e-government research studies can be divided into two segments: demand-side and supply-side. The demand side studies generally deal with users and their ability to use the system to gain maximum utility. These studies address issues like the costs incurred by the end users in using the system, how much time is saved or gained in using the system, how convenient is using the system for the end users,

how trustworthy do end users think the system is and what are the risk factors of using the system. These questions tend to emphasize maximizing the utility gained (utils) by using these systems for end users (Alzahrani et al., 2017; Bélanger & Carter, 2008; Carter & Bélanger, 2005; Rufin et al., 2014; Scott et al., 2016; Wirtz & Birkmeyer, 2017). These questions are similar to two questions raised by Heeks (2002a): “is the human infrastructure ready?” and “is the legal infrastructure ready?”

These studies operationalize these research questions into hypotheses using several psychometric constructs such as perceived ease of use and perceived usefulness (Horst et al., 2007) and risk and trust (Bélanger & Carter, 2008). Recent empirical studies on the demand side of e-government also include those by Scott et al., (2016) who proposed a “Net Benefits” construct that successfully explained the value that users of e-government systems gained in the US through aspects such as trust, cost, communication and personalization.

Studies on the supply-side of e-government (Almutairi, 2010; Azad et al., 2010; Carter & Bélanger, 2005; Elbahnasawy, 2014; Goldkuhl, 2009; Srivastava & Teo, 2007) use macroeconomic dimensions, including but not limited to aspects such as GDP, information and communication

technology infrastructure and good governance (Ciborra, 2005; Elbahnasawy, 2014). These studies answer two questions proposed by Heeks: “is the data system infrastructure ready?” and “is the institutional infrastructure ready?” (Heeks, 2002a).

My dissertation explores the supply-side of e-government by taking into account issues that I call constraints and their implications for the development of e-government services. These constraints include poor telecommunication infrastructure, poor literacy and educational levels and different types of communication methods such as mobile or broadband systems and the availability of the internet in a household. Several recent studies have explored supply-side aspects including GDP (Nam, 2018), democratic versus authoritarian governments (Stier, 2015), national cultural values (Khalil, 2011) and urbanization (Choudrie et al., 2017). Many of these studies use a regression analysis, but most of them use cross-sectional data with a few using time series data. However, none of them use literacy levels with other aspects such as an education index in a panel data analysis.

# **Chapter 3. A Holistic Approach to Information and Communication Technology For Development (ICT4D): A Constraints Based Framework**

## **3.1 Introduction**

In line with the notion of development as stated in Chapter 1 and the current innovations in ICT, ICT4D uses information and communication technology to accelerate development in a state or a segment of society. Due to the spread of ICT and of the internet in particular in the developing world (Song, 2008), several questions are being raised about the use of ICT4D. These include to what extent is ICT contributing to development, particularly that of the relatively poor members of society? How can the benefits of ICT be extended more widely in society and the negative effects of the rich/poor divide be mitigated? How can researchers theorize what is happening in a compelling way? (Walsham, 2017). In his recent book, *Reclaiming Information and Communication Technologies for Development*, Unwin (2017) proposed a more refined link between ICT, development and inequalities in ICT4D, arguing that although ICT has been developing at a fast speed and access to it is spreading in many parts of the world, “Over the last twenty years, rather than reducing poverty, ICTs have actually increased inequality, and if ‘development’ is seen as being about

the relative differences between people and between communities, then it has had an overwhelming negative impact on development.” However, Unwin also argues that “ICTs have been instrumental in the creation of greater inequality across the world in the twenty-first century. Yet, in the spirit of the Enlightenment, those who believe in ICT4D must believe that it is possible to use technology to improve the lives of the poorest and most marginalized in our local, national, regional, and indeed global societies.”

Thanks to the information revolution that is sweeping the world, many countries are setting up information and communication technology master plans to develop better information and communication technology-related policies to increase the speed at which ICT4D is spreading so that they can benefit from the increased wealth of information and knowledge that is readily accessible on the net.

Companies are also looking to capitalize on this new shift by providing new services and products that have been developed keeping in mind the new network-enabled information age, especially in emerging markets in Africa, Asia and South America (Facebook, 2015b; Project Loon, 2015). For example, the Facebook Zero project provides free access to its social network sites in emerging markets (Facebook, 2015a, 2015b) and Google’s Project Loon provides internet in hard to reach areas (Project Loon, 2015). A 2018 report by one of Korea’s investment firms Mirae Asset, *Consumption Growth: Investing in Today’s Emerging Markets* states that “in 2016, emerging economies generated over

\$11,000 of GDP per capita, a significant increase from \$6,500 and \$3,670, 10 and 20 years ago, respectively. GDP per capita in the emerging markets is expected to rise to around \$15,500 by 2022, according to estimates from the International Monetary Fund (IMF).” The report also notes that urban contribution to global consumption growth for 2015-30 is forecast to reach USD 14.1 trillion in emerging markets as compared to USD 8.8 trillion in developed markets. The report further points out that “the workforce in the emerging markets is not only large and young, they are also attaining higher levels of education than previous generations” and stresses the need to understand that “a younger, more educated workforce tends to be more innovative and is better at leveraging technology, both of which are vital in boosting productivity and generating growth for an economy. In addition to being a powerful force in the labor market, these younger populations will also play a significant role as consumers going forward.”

However, there are regions in the world where the internet was introduced only recently such as sub-Saharan Africa (Song, 2008). Further, connecting a region to the internet is not the only challenge that a newly connected region or country faces as it developing and using knowledge or information and communication systems and their artifacts need to be viewed from a holistic perspective that covers three interlinked aspects– socioeconomic, technological and behavioral – that are intertwined in the development of knowledge economies.

Just as in the agricultural revolution, where land was governed by constraints of soil type and climatic conditions, the internet and linking through it also comes with its own constraints and needs.

What this means is that understanding only the technological aspects of ICTs like developing undersea fiber-optic cable networks to promote knowledge economies is not enough both in the developed and developing world. What is also needed is an understanding of socioeconomic and behavioral factors. For example, when it comes to socioeconomic aspects, sub-Saharan Africa has an average a literacy rate of 59 percent (UNESCO Institute For Statistics, 2014), which begs the question that besides undersea fiber-optic cables what other tools can be developed that will help include all people from all walks of life thus leading to social inclusion.

My dissertation's primary objective is to explore aspects that contribute or hinder the development of knowledge-based economies and technological artifacts by providing a stepwise developmental framework to help resolve the factors that act as constraints and explore factors or technological artifacts that promote and propel the development of knowledge-based economies or technological artifacts in a state.

### **3.1.1 Problem description**

The word 'development' is part of ICT4D. Researchers use two definitions of development, one that is generic and the other that is

specific in defining the notion of development. The Merriam-Webster (2015) states the general meaning of development as “the act or process of growing or causing something to grow or become larger or more advanced.” The second definition, provided by Businessdictionary (2015) is more specific: “1. The systematic use of scientific and technical knowledge to meet specific objectives or requirements; 2. An extension of the theoretical or practical aspects of a concept, design, discovery, or invention; 3. The process of economic and social transformation that is based on complex cultural and environmental factors and their interactions.”

The second definition is more helpful in understanding that development is based on specified needs which are based on specific underlining issues or constraints in a society or an economic system that can be solved by developing better means for finding solutions to a given problem.

Development also includes economic development, which poses questions about what leads to growth being different in different nations. Studies investigating factors that lead to differential growth across nations have found that that the differences in economic growth are not the sole result of differences in the supply of capital and labor but are also caused by differences in the technologies that are used (Solow, 1957).

Fagerberg (1987) proposes a technology gap approach to find out why growth differs in countries. He confirms that there is a close correlation

between the level of economic development measured in GDP and technological development measured in local R&D. The critical word is local, which means having localized innovations and R&D.

My research looks at development from the perspective of inequalities caused by the digital divide and structured inequalities and understanding how local innovations can help in reducing inequalities and bridging the digital divide.

### **3.1.2 Research objective**

The research objective of this chapter is to theoretically explore the socioeconomic, technological and behavioral aspects that promote or hinder the development of knowledge economies and information artifacts. Based on this it proposes a holistic development framework for the use of ICT in development.

### **3.1.3 Research questions**

The research questions that this chapter addresses are: What socioeconomic, technological and behavioral aspects contribute to or hinder the development of knowledge-based economies and what developmental steps are a must before and during the development of knowledge-based economies and their technological artifacts.

### **3.1.4 Findings and contribution**

The main contribution of this chapter is that it provides a holistic development framework which can be used by governmental agency to accelerate the pace of achieving the desired outcomes and help in overcoming constraints that hinder advancement towards a knowledge-based economy. This chapter also explores some of the current technological artifacts (devices and software) introduced by companies like Facebook and Google and by NGOs like Wikipedia to find solutions to some of the constraints in the development of knowledge-based economies.

## **3.2 Literature review**

### **3.2.1 Defining the digital divide**

At the core of ICT4D studies is the notion of the digital divide which I have briefly explored earlier. The definition of digital divide as given by the Collins English Dictionary (2018) is the “gap between those people who have Internet access and those who do not.” This is a widely used definition though there is a better definition that considers not just access but also the underlining problems. This definition is given by Compaine, a Senior Researcher at Massachusetts Institute of Technology in his book *The Digital Divide: Facing a Crisis or Creating a Myth?*. He defines the digital divide as “the critical divide between those who can read well and take full advantage of the treasures of information that will be so widely available, and those who are not fully

literate and cannot take advantage of easily accessible information resources” (Compaine, 2001). This definition suggests that there is more to the digital divide issue than an internet connection or computing power.

Beneath the digital divide of wires, fiber optics and technological connections lies an even greater divide that separates the illiterate from literate and a divide based on class, education and more importantly the services needed and provided. Hence, understanding the digital divide in a holistic perspective which considers all these aspects is important for the success of any government or organization that wants to develop policies or technological artifacts to bridge the digital divide.

### **3.2.2 Review of literature on the digital divide**

Various studies have explored underlying divides in ICT4D’s development and use. I selected studies which explored individual constraints and grouped them under socioeconomic, technological and behavioral aspects. I study each aspect’s constraints and briefly review one or two crucial studies that have investigated these constraints. The objective of this literature review is to examine and categorize significant constraints in the development of ICT4D and use these constraints as a lens for understanding the dynamics that might lead projects or policies to fail or conversely help in developing better plans and strategies for future endeavors.

### 3.2.2.1 Socioeconomic aspects

Table 3.1 gives the main socioeconomic constraints.

Table 3.1: Socioeconomic constraints

Constraint	Authors/Source	Main Conclusions
Institutional constraints	(Wilson, 2004)	Shows that there are many possibilities for development and innovations in the developing world, but there are structural, institutional and cultural constraints that hinder them.
Socio-Institutional constraints	(Wilson, 2004; Zhao et al., 2007)	Shows that socio-institutional constraints like the rule of law and educational systems have a significant influence on the diffusion of information and communication technologies like the internet.
Socio-behavioral constraints	(Agarwal et al., 2005)	Empirical results show that personal choice in the use of ICT is affected and influenced by geographic location and that the diffusion of internet usage within a group has a direct effect on a person's willingness to use the internet. These results are similar to the notion

		network externalities (Shapiro & Varian, 1999).
Political constraints	(Wilson, 2004)(Guillén & Suárez, 2005)	Discusses the political constraints that hinder the development of the internet and of ICT in general. Asserts that regimes that are democratic tend to enable the development and growth of the internet much faster than either totalitarian or authoritarian regimes.
Financial constraints	(Hilbert, 2010)	Studied the impact of access price and GDP on internet use in several countries and concluded that providing affordable internet services is one of the most important factors in its use.
Language literacy constraints	(Leino, 2014; Schmar-Dobler, 2003)	Studied the effect of literacy, specifically reading abilities, on internet usage. Leino defines information literacy as “The definition of information literacy originated among librarians and library studies. The skills and knowledge related to information

		management are as important in traditional literacy as they are among electronic texts. Essential in the definition of information literacy is an ability to recognize a need for information, and to search, retrieve, evaluate and use that information in everyday life.”
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### 3.2.2.2 Technological Aspects

Table 3.2 gives the technological constraints as discussed in relevant literature.

Table 3.2: Technological constraints

Constraint	Authors/Source	Main Conclusions
Physical infrastructure constraints	(Wilson, 2004)	Citizens should be able to access the basic building blocks that the internet uses like electricity and computers.
Software and design constraints	(Sri, 2006)	Explores the importance of design factors that affect the use of technologies by different countries and individuals. The study concludes that there is a need to look at technology use

		based on design features that are acceptable and understandable by those they are targeted at.
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### 3.2.2.3 Behavioral Aspects

Table 3.3 discusses the behavioral constraints as discussed in relevant literature.

Table 3.3: Behavioral constraints

Constraint	Authors/Source	Main Conclusions
Content constraints	(Graham et al., 2011)	Explores the availability of content for an area or region by Wikipedia. According to the authors “There is a clear and highly uneven geography of information in Wikipedia. Europe and North America are home to 84% of all articles” and “Almost all of Africa is poorly represented in the encyclopedia. There are more Wikipedia articles (7,800) written about Antarctica than any country in Africa or South America.”

Technological literacy constraints	(Markauskaite, 2006)	Suggests that an analytical framework should be used for understanding the effect of ICT literacy and how users can use it effectively. The study also notes that there are several inconsistencies in an understanding of ICT literacy across different levels of the educational system.
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### 3.2.3 Glocalization of artifacts in ICT4D

#### 3.2.3.1 Socioeconomic artifacts

Table 3.4 discusses the major constraints in the glocalization of socioeconomic artifacts in ICT4D.

Table 3.4: Constraints in the glocalization of socioeconomic artifacts

Constraint	Initiative/Source	Main Objective
Institutional constraints	M-Pesa (Safaricom-M-Pesa, 2015)	Banking the unbankable has been an objective of many organizations around the world ranging from the offline system of Grameen Bank to the online system of M-Pesa. M-Pesa overcomes the institutional

		<p>constraints that physical banks have in building a network of agents who exchange monetary currency in hard-to-reach areas. M-Pesa maintains, “Your wallet just got digital! Send, receive money, pay for bills and transact easily, safely and conveniently. M-PESA continues to lead the world in mobile money transfer. It has revolutionized the way Kenya does business.”</p>
Political constraints	Mosireen (Srinivasan, 2012)	<p>During the Arab Spring many Middle Eastern and international NGOs worked at stopping the censorship that was imposed by countries like Egypt which executed the kill switch which blocked the entire country’s internet. However, people used software and tools to bypass the blockade thus overcoming the censorship.</p>

Financial constraints	<p>1. Alliance for affordable internet / (“Alliance for Affordable Internet,” 2015)</p> <p>2. Google Free Zone / (Wagstaff, 2012)</p>	<p>1. The objective of the alliance for affordable internet is unlocking the power of technologies by lowering internet access and other ICT-related technologies’ costs. The alliance partners with governments, companies and not-for-profit companies and organizations to introduce policies and regulations for delivering better, open and faster broadband services. Supporters and members of the alliance include Google, CISCO, Facebook, UKAID, USAID, ERICSON, GSMA, Intel and Microsoft.</p> <p>2. Google Free Zone was launched in 2012 with the objective of providing free internet connections in the developing world along with</p>
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	3. Facebook Zero / (Hicks, 2010)	<p>services like search, email and its social network site Google Plus.</p> <p>3. Facebook Zero is an initiative lead by Facebook to provide free access to its social network and other tools for free in emerging markets. It started in 2010 with 50 mobile operators around the world providing free access to the Facebook social network.</p>
Language literacy constraints	QuestionBox / (QuestionBox, 2015)	<p>The main objective of QuestionBox is overcoming design constraints by providing illiterate people with the means to access information about crop prices and other services using methods like voice messaging and easy-to-use tools for information access. A farmer can access information on weather conditions at the click of a button using a voice-based information system.</p>

### 3.2.3.2 Technological artifacts

Table 3.5 discusses constraints in the globalization of technological artifacts.

Table 3.5: Constraints in the globalization of technological artifacts

Artifact Type	Initiative/Source	Main Objective
Physical (infrastructure) constraints	1) Google Project Loon (Project Loon, 2015)	1) The main objective of Google's Project Loon is using balloon-powered internet access technology to provide internet access to populations in hard-to-reach areas. "Project Loon began in June 2013 with an experimental pilot in New Zealand, where a small group of Project Loon pioneers tested Loon technology. The results of the pilot test, as well as subsequent tests in New Zealand, California's Central Valley and Northeast Brazil, are being used to improve the technology in preparation for

	<p>2) Facebook Connectivity Lab (Facebook, 2015a)</p>	<p>the next stages of the project” (Project Loon, 2015).</p> <p>2) Facebook Connectivity Lab is an initiative led by Facebook that uses unmanned air drones or Aquilas to help deliver the internet in some of the world’s hard to reach areas. “Soaring above 60,000 ft., the Aquila unmanned aircraft is taking a different approach to connecting the world. Its tailless design and enormous wingspan allow it to float almost effortlessly, while its solar cells and super-efficient motors let it stay airborne for months, delivering internet to some of the most remote areas on earth,” (Facebook, 2015a).</p>
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<p>Software/ Design constraints</p>	<p>Facebook Lite (Facebook, 2015b)</p>	<p>Facebook Lite is a app provided by Facebook to overcome design and software constraints faced by software users that require higher bandwidth and more megabits for setting up and using. This is a major constraint in places where bandwidth is not readily and cheaply available. Having software that is localized according to individual needs and consumption power helps address this constraint and increase access to information. Facebook stated on its newsroom sites (June, 2015) “Today we’re introducing Facebook Lite, a new version of Facebook for Android that uses less data and works well across all network conditions. Facebook Lite is</p>
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		<p>less than 1MB so it is fast to install and quick to load. It includes Facebook’s core experiences like News Feed, status updates, photos, notifications and more”(Facebook, 2015). “In 2016 Facebook Lite is growing faster than Facebook app itself and is being used by millions in the developing world” (mashable.com, 2016).</p>
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### 3.2.3.3 Behavioral Artifacts

Table 3.6 discusses the constraints in the glocalization of behavioral artifacts.

Table 3.6: Constraints in the glocalization of behavioral artifacts

Artifact	Initiative/Source	Main Objective
Content constraints	Wikipedia Zero / (Wikipedia, 2015)	Wikipedia Zero provides access to Wikipedia’s content free of charge. Wikipedia (2015) states, “Transparency and accountability are among our core values, and we invite you to take a look at the

		<p>Wikipedia Zero operating principles. So far we've launched Wikipedia Zero in 63 countries with 72 operators. We estimate that more than 400 million people can now access Wikipedia free of data charges. Our goal is to work with every mobile operator on the planet.”</p>
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### 3.3 Model and framework

Following the holistic developmental approach, Figure 3.1 shows the ICT4D framework covering its three aspects – socioeconomic, technological and behavioral.

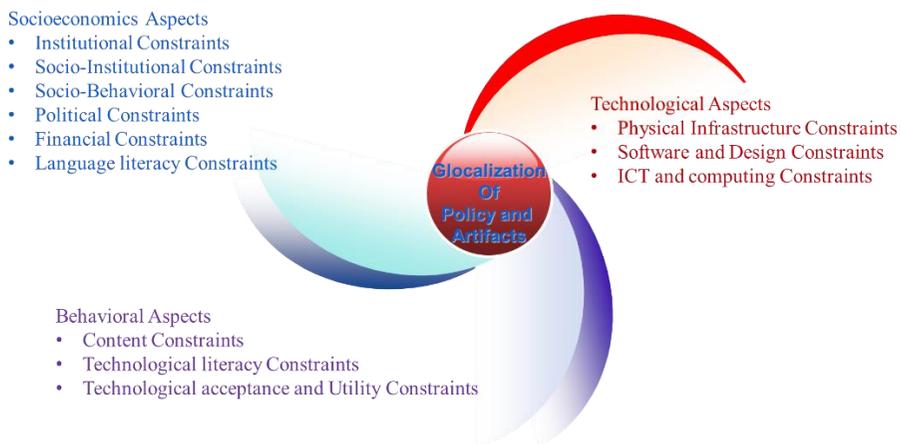


Figure 3.1: The ICT4D framework

Several studies point out the need to look at the local context, particularly the local socioeconomic aspects before proceeding further (Bhatnagar & Bjørn-Andersen, 1990; Heeks, 2002a; Marais, 2015). According to Marais (2015), the notion of development in ICT4D should consider, “development must start with human development since technology is only a multiplier of human intent and capacity and cannot substitute for it.”

Further, to understand the role that knowledge plays in developing and using ICT4D, it should be noted that there are two forms of knowledge, explicit and tacit. “Tacit knowledge is linked to 'know-how', as opposed to the 'know-what' of explicit knowledge” (Higgs et al., 2008). Explicit knowledge comes in the form of books and codified material and can be placed in technological artifacts whereas tacit knowledge is unwritten and is developed over time through experience, practice and education (Becerra-Fernandez & Sabherwal, 2015). In line with these definitions, my dissertation postulates that the aspects mentioned in the ICT4D framework in Figure 3.1 should not be viewed as being equally important but should instead be viewed from a hierarchal stepwise perspective which lead to a solution and not a technology. The hierarchal stepwise perspective is given in Figure 3.2. Starting from the first step which is an exploratory analysis/preliminary appraisal covering who, what, where, when and why, the second step tries to understand the socioeconomic constraints among the targeted group or country. Social constraints tend to have tacit knowledge embodied in them including acquired skills for

reading and also educational levels. The economic aspects deal with the affordability of the technology. The third step discusses technological constraints to find which technology can help resolve existing problems and provide solutions to them. This is based on explicit knowledge about the technological artifacts. It is only after these steps that the proposed solution is implemented. This leads to the last step, a behavioral understanding of how a solution to a third party's problems can help in resolving them. The last step is guided by behavioral aspects in which both tacit and explicit knowledge are used to understand how people use and perceive technological artifacts. The objective of this step is an understanding of whether the technological artifacts provide solutions that achieve their designed outcomes.

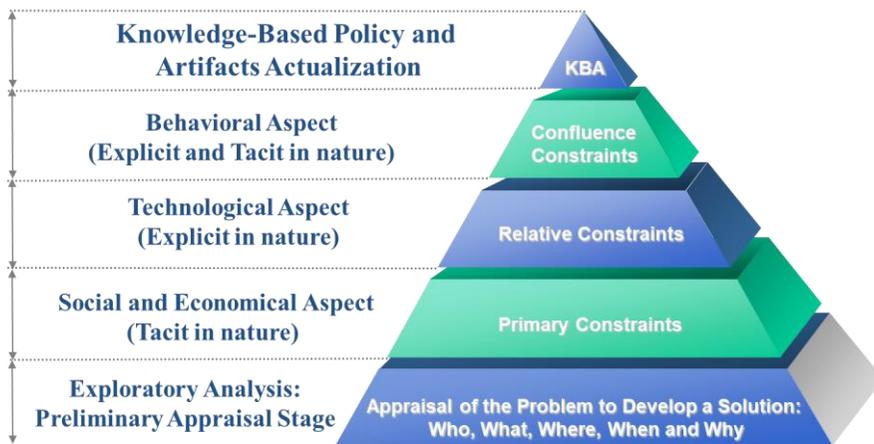


Figure 3.2: The ICT4D framework pyramid

An exploratory analysis (also known as a preliminary appraisal) is an essential first step to get an understanding of the target audience for the

intended service. It should provide answers to the questions: Is it targeted at people in rural or urban areas? What is the service/technology's main objective or what is the problem that it is trying to provide a solution for? Where will the service be provided – in a service center or using the mobile system? When will the people be able to access it and is it possible to access it anytime? Further, why do people need the service? As Lao Tzu says, "Go to the people. Live with them. Learn from them. Love them. Start with what they know. Build with what they have. But with the best leaders, when the work is done, the task accomplished, the people will say 'We have done this ourselves.'" The key issue here is to learn from the target audience and work out a solution with their participation.

Looking at this issue from another perspective, Professor Muhammad Yunus said in his Nobel Peace Prize acceptance speech, "Poverty is created because we built our theoretical framework on assumptions which under-estimates human capacity, by designing concepts, which are too narrow (such as concept of business, credit-worthiness, entrepreneurship, employment) or developing institutions, which remain half-done (such as financial institutions, where poor are left out). Poverty is caused by the failure at the conceptual level, rather than any lack of capability on the part of people" (Yunus, 2006). Hence, the scientists' job is to understand the farmer, the shepherd and the carpenter's problems from their perspective, gain knowledge from this and then build an understanding of how to resolve the problem with them as co-

partners. As President Bill Clinton (2007), said in his book *Giving: How Each of Us Can Change the World*, “In every corner of America and all over the world, intelligence and energy are evenly distributed, but opportunity, investment, and effective organizations aren’t. As a result, billions of people are denied the chance to live their lives to the fullest, and millions die needlessly every year.” According to the founder of Ashoka and the Father of Social Entrepreneurship Bill Drayton, “We need to teach empathy as we do literacy.” Moreover, Drayton also pointed out that “we has to have a revolution so that all young people grasp empathy and practice it. This is the most fundamental revolution that we have to get through.”

After understanding, the who, what, where, when and why can we can ask ‘How?’ To answer this we need to understand the underlying constraints of my three aspects. How also leads us to the next step in our pyramid after the preliminary appraisal step, which is the socioeconomic aspects. Some of the questions raised at this level are: What is the literacy level within the country or targeted group? What is the educational level within the country or targeted group? What is the price of internet access and is it affordable for the the targeted group that is going to be affected by an ICT4D policy or technological artifacts?

This is followed by exploring the technological aspects: Is internet available to the targeted group? If so, what are the means by which the group can access it (generic mobile devices or smartphones)? This aspect is considered after the socioeconomic aspect because if an illiterate group

of people is being targeted, then this issue can be resolved technologically by introducing voice-enabled services instead of text-based services thus overcoming language literacy constraints. Last is the behavioral aspect: Do the users of the service perceive it to be useful or needed in their daily lives? At this stage an answer can be found to this question through experimental research involving pre-tests and post-tests of the service. This can be explored using a simple method like a T-test or the highly advanced psychometrics method with instruments using structural equation modeling. This step is usually based on experimentation and experimental research.

### **3.4 Discussion and conclusion**

The main objective of the ICT4D framework is to help identify the constraints that can hinder the development of ICT. The framework can also help in understanding what constraints to consider when developing technological artifacts. Though it is a conceptual guideline that looks into the socioeconomic aspects of ICT4D (literacy and education levels), it can also help in understanding the technology needed for developing specific services or artifacts. In the behavioral aspects it can help in understanding the constraints faced by end users in creating and using content and whether the end users perceive it to be useful and easy to use.

After discussing the three aspects of the ICT4D framework and their constraints this chapter now discusses a simple example of how the

ICT4D framework can be used in Sudan. Sudan is in the stage of developing e-government services for its citizens (AllAfrica, 2016). Following the ICT4D nexus framework pyramid given in Figure 3.2, the first step is to ask the questions: Who in Sudan is going to use these e-government services? What specific e-government services are going to be provided as a solution to a problem? Where are people going to access e-government services or are they going to use their own devices for this? When will they be able to access it? Why do they need the service?

After answering these questions, we move on to the second step -- the socioeconomic aspects. Sudan is located at the cultural faultline separating North Africa and sub-Saharan Africa and is located among Egypt, Ethiopia, Chad, Libya, Uganda and South Sudan. Since it is not a landlocked country, maritime internet access is available. Sixty-six percent of Sudan's population is rural (UNESCO, 2016). The questions that need to be asked here are: Does this population have the financial means and know-how to access the internet or mobile services? Do they have computing devices? Do they use smartphones or simple generic phones?

It is estimated that in Sudanese rural areas, 3G coverage is below 50 percent (GSMA, 2017) and in most cases people living in rural areas face financial constraints and coverage problems in accessing the internet. This means that if e-government services have to target more than half of the country's population which needs these services the most, then access to internet or internet centers needs to be provided in rural areas.

Sudan's literacy rate is 54 percent (The WorldBank, 2018b) which means that there is a need to develop technological artifacts that cater to the half of the country's population. A detailed study of Sudan's socioeconomic realities will help in understanding the type of technologies that will be useful and effective. Next, technologies that address the constraints that are inherent in the socioeconomic aspects need to be developed. For example, service centers can be set up in rural areas based on biometric systems, graphic user interface and voice-enabled systems and not on text enabled systems so that they can be easily used by the people.

It is estimated that only 38.5 percent of Sudan has access to electricity (The World Bank, 2018a). Hence, technological centers should be developed using renewable energy like solar or wind energy to overcome the technological constraints because of shortage of electrical power. Sudan is endowed with renewable energy due to its location near the Equator and hence renewable energy options can be a solution.

In conclusion, it is important to understand that technology is the means and not the end; it is a means of providing services to the people. The key is not to provide technology but to provide a solution to a problem of which technology forms a small part.

## **Chapter 4: Social Commerce in Emerging Markets**

### **4.1 Introduction**

A fundamental demand for trade in goods and services in mankind's history led to the development of diverse methods for trading and exchanging goods and services. In the recent past the introduction of the web has enabled local and international businesses to increase their access and gain entry into newer markets which were previously not accessible using the pre-internet era infrastructure (Laudon & Traver, 2016). This shift in the exchange of goods and services has paved the way for the development of the prosumer era that is now also transforming the internet. The introduction of e-commerce (Becker, 2007; Wigand, 1997) is no longer a novelty in the information age.

The extent to which sociability and trust are critical in developing new online businesses has been explored and studied extensively from the perspective of trust (Ba & Pavlou, 2002; Corbitt et al., 2003; Gefen, 2000; Lee, 2016) and familiarity (Gefen, 2000) in different forms of electronic commerce and markets. Research has also studied the evolving phases of both electronic and social commerce. Studying the evolving role of electronic commerce on the net, Bakos (1998) points out that electronic marketplaces serve as outlets that address three issues: mediating

between buyers and sellers, enabling financial services to buy and sell products online and institutional infrastructure. Bakos (1997, 1998) also studied the decrease in search costs and its consequences for electronic markets. When it comes to marketplace types, Yoo et al., (2001), bifurcate electronic markets into natural or biased and evaluate both for their strengths and weaknesses in becoming successful. With the introduction of the social web and semantic technologies, internet users have seen the development of different ways of exchanging commodities and services. One of these approaches, called social commerce (Turban et al., 2017) is described as “an important platform in e-commerce, primarily due to the increased popularity of social networking sites such as Facebook, LinkedIn, and Twitter” (Liang & Turban, 2011). Further, “[r]efer[ing] to networks of sellers and networks of buyers, it is the evolution of E-commerce 1.0, which is based on one-to-one interactions, into a more social and interactive form of e-commerce” (Afrasiabi Rad & Benyoucef, 2011).

With Web 2.0 and Web 3.0 and the increase in social commerce, there has been extensive research on the social aspects of this trend. Influences and constructs such as trust and familiarity in e-commerce and social commerce have also been explored and studied (Ba & Pavlou, 2002;

Corbitt et al., 2003; Gefen, 2002; Gibreel et al., 2018; Lee, 2016; Pavlou & Gefen, 2004; Siau & Shen, 2003).

Technological utilities too have been studied. Wang et al., (2005) studied technological utilities and proposed a new construct by which they confirmed the significance of network externalities in increasing the gains and utilities that users acquire by using online internet-mediated systems. Preliminary exploratory studies also show that mobile systems are one of the primary technological systems used in the developing world to access the internet (Gibreel et al., 2013, 2015).

My dissertation proposes a governing form factor construct to explore the developmental aspects of mobile systems and compares them to other means of communication in the context of social commerce in emerging markets.

As for the behavioral aspects, most internet mediated systems and apps are developed through a set of technological applications that are combined with different objects and mashed-ups to be used as technological artifacts by the users. These services are used to attain specific objectives. The technology acceptance model (TAM) combines two constructs -- perceived ease of use and perceived usefulness -- to formulate an intent for the use of the online internet-mediated

applications. This approach is similar to the idea of utility gained in which user intent and acceptance of technological artifacts increase if users see the technological artifacts as being useful and easy to use (Davis, 1989). Gefen and Straub (2000) point out that both constructs are useful in exploring the growth and use of e-commerce.

On the other hand, the development of electronic commerce has given rise to the development of electronic word of mouth communication on e-commerce websites and marketplaces. This factor has been significant in circulating information among buyers and sending and receiving recommendations and referrals in a community (Cheung et al., 2008; Gauri et al., 2008). However, most of the internet-mediated marketplaces are characterized by mediating agents who facilitate financial services and reduce the risks inherent in the process.

Today there is a new trend of social commerce within social networks in which users of Instagram, for example, purchase products and services from other users selling them without arbitrating agents such as Amazon or eBay. This emerging trend in social commerce can be seen in many emerging markets: Kuwait (Greenfield, 2013), Saudi Arabia (Almashabi & Nereim, 2015), India (ExploreIndia, 2015), Egypt (ElSaady, 2016) and Thailand (Bivens, 2015). Gibreel et al., (2015) study this trend in

emerging markets briefly.

This chapter introduces and explores the advent of social commerce in emerging markets by exploring the growth of electronic commerce in its socioeconomic, technological and behavioral aspects.

#### **4.1.1 Definitions of electronic and social commerce**

Electronic commerce is the process by which companies or sellers and buyers exchange goods and services using internet-mediated platforms using both transmissions of internet-mediated data between the internet-mediated application and electronic financial systems (Wigand, 1997). Social commerce is a type of internet-mediated commerce that grew from e-commerce through the development of social network sites and the interactive features used within the social network. The main objective of social commerce is providing tailored service and product delivery based on consumer preferences, interest and exchange using the net. Social commerce builds on the use of e-commerce including the “delivery of e-commerce activities and transactions via the social media environment, mostly in social networks, and by using Web 2.0 tools and capabilities” (Liang & Turban, 2011). Laudon and Traver (2016) introduced another definition of social

commerce: “social e-commerce is e-commerce that is enabled by social networks and online social relationships. It is sometimes also referred to as Facebook commerce, but in actuality is a much larger phenomenon that extends beyond Facebook.” Social commerce is evolving from social network platforms to Web 2.0 and Web 3.0. My dissertation explores this trend by concentrating on social commerce in emerging markets where a third party is no longer needed to facilitate an interaction between buyers and sellers. This form of social commerce in emerging markets also does not use referral systems to reference a product using search engines (for example, Google, Yahoo, Bing), social networks (for example, Facebook, Twitter, Instagram) or social media (for example, YouTube) to another marketplace (for example, Amazon, eBay, Kickstarter). In this new phenomenon, the entire process from searching for a product to purchasing it takes place on the social network.

#### **4.1.2 Problem description and research questions**

As social commerce evolves in emerging markets, the world is seeing a change in how sellers and buyers interact. No longer is there a middleman or a broker in the form of market creation websites like Amazon or eBay that assure and promises product authenticity or buyer

reimbursement policies. Hence, consumers and vendors on these platforms have to be motivated enough to develop trust and understand the inherent risks in the mediated exchange of goods and services. Consequently, trust is arbitrated by the community of vendors and purchasers and constructed within their day-to-day interaction and transactions. Trust is no longer arbitrated by one single entity but by a community of buyers and sellers through means such as electronic word of mouth communication and person to person interactions. My dissertation explores the factors (constructs) of trust, familiarity, governing form factor, technological utility, perceived ease of use, perceived usefulness and word of mouth communication in social commerce in emerging markets. Thus far these factors have not been studied in detail in social commerce in emerging markets.

One of the purposes of my study is exploring the evolution of social commerce that is post desktop-based in nature, tends to be based on the mobile web and capitalizes on new easy to use features. A number of internet-based social commerce apps in emerging markets have been developed, several of which use the mobile web and easy to use mobiles by default coupled with low bandwidth connectivity. They also function jointly with a click-and-brick model and strategies.

My research explores the constructs that are inducing a shift from e-commerce to social commerce in emerging markets. I categorize the constructs under three aspects: socioeconomic (trust and familiarity); technological (governing form factor and technological utility) and behavioral (perceived ease of use, perceived usefulness and word of mouth communication). I investigate how these aspects have helped in the development of new social commerce marketplaces in emerging markets. My chief objective is exploring what facets could hinder or promote the development of social commerce marketplaces in emerging markets from a consumer's perspective.

## **4.2 Literature review**

### **4.2.1 Characteristics of the interaction between electronic and social commerce in emerging markets**

This section analyzes the existing internet-mediated marketplaces: electronic commerce (Figure 4.1) and social commerce (Figure 4.2) and emerging markets (Figure 4.3). In each, the marketplace interaction arrows indicate the steps that buyers go through to reach the sellers. Each step shows the value exchanged between the buyers, sellers, search engines (Google, Bing and Yahoo), digital advertising agencies (DoubleClick), e-commerce sites (Amazon or eBay) and social network

sites (Facebook, Twitter and Instagram). Figure 4.1 shows exchanges in traditional electronic commerce (Laudon & Traver, 2009), in which consumers go through mediators; they start by using a search engine site such as Google or Yahoo or following an advertisement that links them to an internet-mediated marketplace which in turn links them to the vendor of the product or service that they wish to purchase or consume.



Figure 4.1: Interaction in the electronic commerce marketplace Interaction, Source: Gibreel et al., (2018).

In social commerce (Figure 4.2), buyers access product information and sometimes price information from social network sites or apps. The first step is the social network site or app following which buyers move through various steps before reaching the last stage which could be Amazon or eBay or the seller's website.



Figure 4.2 Interaction in the social commerce marketplace, Source: Gibreel et al., (2018).

Figure 4.3 details the process that buyers go through when using social commerce sites or applications in emerging markets. They follow all the necessary steps to buy a product or service online, starting from searching for the product or its price to the last stage of buying the product. At each of these stages there is no mediating agent such as Google, Bing or Yahoo that helps buyers find products on the social network site. Further, market creation entities such as Amazon or eBay do not finalize the last stage of the transaction as they are not involved in a transaction between a consumer and a vendor. This type of social commerce needs internet service-based infrastructure that is different than the “public key infrastructure” and digital signature. It uses a click-

and-brick model and approach that blends transaction costs between online and offline person-to-person interactions. This form of social commerce in emerging markets is based on post-desktop mobile factors such as smartphones and tablets. Syndicating both the online networks of referrals and offline payment methods, this interaction's closest model is the brick and mortar model. This type of interaction is common in many emerging markets because many of them still lack fully-developed electronic banking systems. On the other hand, advanced markets allow buyers to look for a product online and also pay for it online. Development of financial services in these markets has resulted in many options ranging from online enabled financial services such as PayPal to credit card enabled systems.

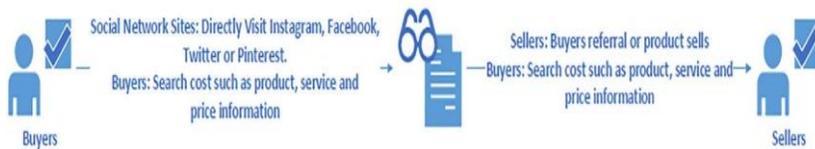


Figure 4.3: Interaction in social commerce in emerging markets, Source: Gibreel et al., (2018).

## 4.2.2 Preliminary framework development

Table 4.1 gives the different aspects and the factors assigned to each aspect that impact consumers while purchasing products in an

online setting.

<b>Aspect</b>	<b>Factor/ Construct</b>	<b>Research Objective</b>	<b>Source</b>
Socioeconomic	Trust	How does trust in the sellers help in the buying of goods and services online?	(Gefen, 2000; Pavlou & Gefen, 2004)
	Familiarity	How does familiarity with the system support the purchasing of goods and services online?	(Gefen, 2000; Luhmann, 2000)
Technological	Governing form factors	Are technological systems and methods available for using the system?	(Gibreel et al., 2013a, 2015)
	Technological utility	How does technology (network externalities) help in increasing a user's utility from the system that is being used?	(Chih-Chien et al., 2005; Kauffman et al., 2000)
Behavioral	Perceived ease of use	Is the system easy to use and can the buyer access information about the product or service easily?	(Davis, 1989a; Gefen & Straub, 2000)

	Perceived usefulness	Is the system useful for buyers in accessing information about a product or service online?	(Davis, 1989a; Gefen & Straub, 2000)
	Word of mouth	How valuable is the system in providing buyers the option of exchanging recommendations and opinions about a product or a service?	(Bailey & Pearson, 1983; Cheung et al., 2008; Gauri et al., 2008)

Table 4.1: Different aspects of purchasing online

Based on the ICT4D framework’s hierarchical pyramid, the ICT4D framework that is proposed in the context of social commerce in emerging markets is given in Figure 4.4.

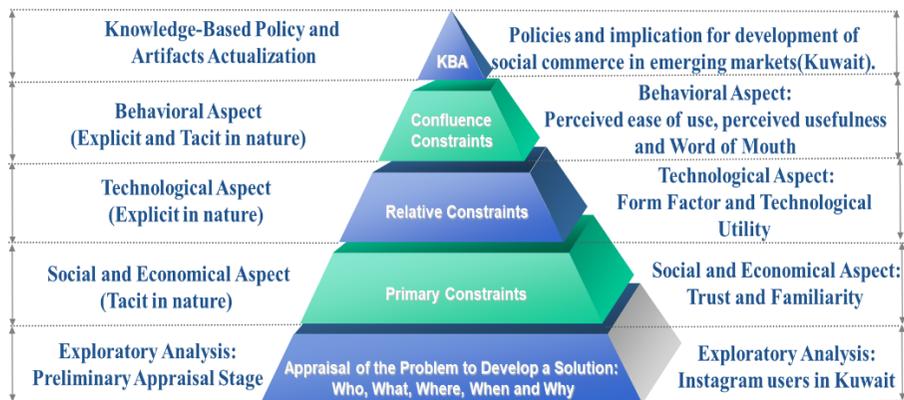


Figure 4.4: The ICT4D framework’s hierarchical pyramid in the

context of social commerce in emerging markets

The literature review showed some primary constraints about trust and familiarity, followed by technological utility and form factor for relative constraints followed by behavioral aspects of perceived ease of use and perceived usefulness.

### **4.3 Research framework and hypotheses**

#### **4.3.1 Hypotheses**

Knowing the difference between familiarity and trust, and which construct precedes the next is significant for understanding how buyers perceive electronic commerce platforms. Luhmann (1982, 2000), evaluated familiarity and how it precedes trust and explored the differences between the two constructs. Gefen (2000) explored Luhmann's concept in the context of electronic commerce and showed that familiarity with electronic marketplaces affects the decision to use the electronic marketplace. In line with Gefen's (2000) work, my dissertation explores this hypothesis in the setting of social commerce in emerging markets.

My study proposes the following hypotheses:

Hypothesis 1a: Buyer familiarity with a social network system (Instagram in this case) is positively connected to trust in internet vendors (sellers).

Studies on familiarity with the intent to purchase through social commerce point out that “the mediating role of trust in a social network community on the relationship between social interactions (regarding closeness and familiarity) and intention to purchase in social commerce environments” (Ng, 2013). In this setting, my dissertation studies the role of familiarity in buyers’ intentions to purchase products using social commerce apps in emerging markets.

Hypothesis 1b: Buyer familiarity with a social network system is positively connected to the intention to buy.

Gefen et al., (2003) did a study on experienced and inexperienced users of electronic commerce sites which showed that “repeat customers trusted the e-vendor more, perceived the website to be more useful and easier to use, and were more inclined to purchase from it.” Therefore, my dissertation postulates:

Hypothesis 1c: Buyer familiarity with a social network system is positively connected to perceived usefulness.

Electronic commerce has used word of mouth communication to increase sales (Bailey & Pearson, 1983; Cheung et al., 2008). The significance of word of mouth communication in electronic commerce has also been well articulated by the founder of Amazon, Jeff Bezos:

“word of mouth remains the most powerful customer acquisition tool we have, and we are grateful for the trust our customers have placed in us. Repeat purchases and word of mouth have combined to make Amazon.com the market leader in online bookselling” (Gauri et al., 2008). Hence, the next group of hypotheses that I propose study the use of electronic word of mouth communication and its effect on trust and how it mediates buyer intentions:

Hypothesis 2a: Word of mouth is positively connected to trust.

Hypothesis 2b: Word of mouth is positively connected with the intention to search.

As stated earlier, the technology acceptance model (TAM) has two core constructs that predict information systems or technology use in a given context: perceived ease of use and perceived usefulness (as proposed by Davis, 1989). There have been many variations of this model which has also been extended, but the core construct of the technology acceptance model is still perceived ease of use and perceived usefulness. Perceived usefulness is known as “the degree to which a person believes that using a particular system would enhance his or her job performance.” Perceived ease of use is defined as “the degree to which a person believes that using a particular system would be free of effort.”

Research has also been done on the effects of technological utility on perceived usefulness and intention to use (Wang et al., 2005). In my study buyers' perspectives on Instagram is a useful technology, a wonderful innovation and a valuable photo sharing/shopping/ messaging service provide their insights about the technological utility of Instagram. Hence, the following hypotheses are proposed:

Hypothesis 3a : Technological utility is positively connected to perceived usefulness.

Hypothesis 3b: Technological utility is positively connected to the intention to search.

Globally, in general and in many emerging markets in particular, the development of many applications and innovations that have been built on newly developed form factors such as mobile phones and post-desktop and post-laptop devices have shown great success and fast growth (Gibreel et al., 2013, 2018). In this context, form factor is a term used in design science that means the form or shape of the technology and its effect on usage: Is it easy to use and how do its interactive features help in using it? Hence, I explore this aspect using structural equation modeling as no study so far explores this aspect of design using this construct. Hence, I offer a new construct, the governing form factor, as

the subject of the next set of hypotheses. The use of different form factors affects the development and growth of many internet-mediated systems and technological artifacts and is a growing movement in many emerging markets. Mobile systems are a governing form factor that has shifted buyers from desktop-based electronic commerce sites such as eBay and Amazon, to internet-mediated online mobile based app systems such as Instagram for buying and selling products online. Hence, the following is postulated:

Hypothesis 4a: The governing form factor in the use of a mobile system is positively related to its perceived ease of use.

Hypothesis 4b: The governing form factor in the use of a mobile system is positively connected to the intention to buy in a social commerce setting.

The notion of trust in social commerce is vital for encouraging users to use the system (Corbitt et al., 2003; Gefen, 2000; Pavlou and Gefen, 2004). The effect that trust has on the intention to purchase has been well explored (Gefen et al., 2003). This supports the notion that trust affects intention to purchase among online store users. My next set of hypotheses considers the effect of trust on the correlation between intention to search and intention to buy. This is in line with the theory of

planned behavior and the theory of reasoned action (Fishbein and Ajzen, 1975, 2015). Hence, the following two hypotheses incorporate the concept of trust and its effect on the intention to search and buy:

Hypothesis 5a: Buyer intention to search and find products and services online is positively connected to trust in the sellers in the social market.

Hypothesis 5b: Buyer intention to buy online is positively connected to trust in the sellers in the social market.

TAM has two constructs as the main predictors of the acceptance and use of an information system or technology by end users: “perceived ease of use” and “perceived usefulness.” In e-commerce, perceived ease of use of electronic commerce websites increases users’ tendencies to perceive usefulness of the online electronic marketplace. Gefen and Straub (2000) explored this concept in electronic commerce, and their study indicates that perceived ease of use affected perceived usefulness in the electronic marketplace. They also explored the notion of reasoned action in electronic commerce and studied whether a buyer’s intent to search for a product and buying the product was mediated by perceived ease of use and perceived usefulness in electronic commerce. Hereafter, the hypotheses determine whether this same effect in electronic commerce also applies to social commerce in the context of emerging markets:

Hypothesis 6: Perceived ease of use of online social commerce on Instagram is positively connected to perceived usefulness.

Hypothesis 7a: Buyer intention to search for products via a social marketplace is positively connected to the social market's perceived ease of use.

Hypothesis 7b: Buyer intention to buy a product from a social marketplace is positively connected to perceived ease of use of the social market.

Hypothesis 8a: Buyer intention to search for a product via a social marketplace is positively connected to the perceived usefulness of that social market.

Hypothesis 8b: Buyer intention to buy a product from a social marketplace is positively connected to the perceived usefulness of that social marketplace.

Hypothesis 8c: Buyer intention to buy a product from a social marketplace is positively connected to the buyer's intention of searching for a product in that social marketplace.

Figure 4.5 gives the hypotheses in my proposed model.

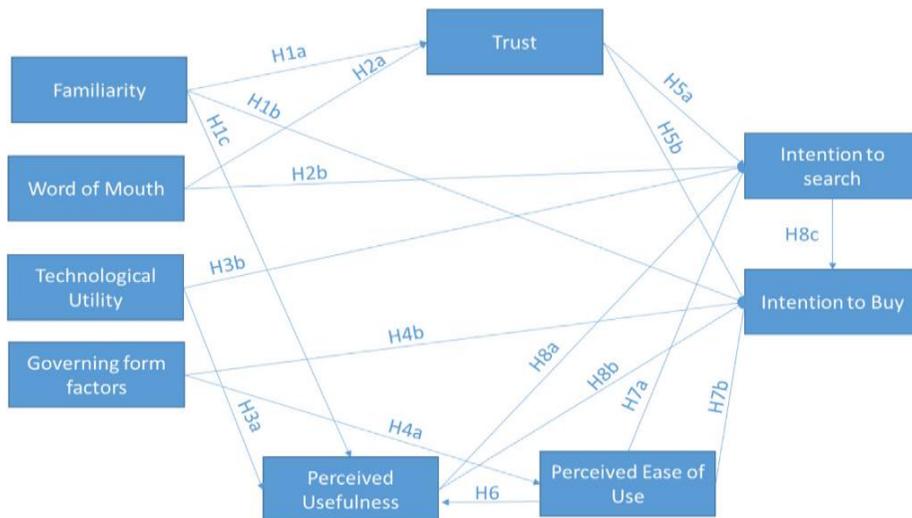


Figure 4.5: Research framework and hypotheses

### 4.3.2 Control variables

My dissertation uses two control variables: product’s price and buyer’s income. Researchers have studied how price effects consumer behavior (Lichtenstein et al., 1993, 1988; Zeithaml, 1988). Lichtenstein et al., (1993, 1988) were among the first to explore the notion of price and how consumers were disposed towards it. They posited, “To the degree consumers perceive price in its negative role, they seek to pay lower prices; to the degree consumers perceive price in its positive role, prices at lower levels are more likely to be unacceptable.” My dissertation explores how income and product price can mediate as control variables on other constructs such as trust in social commerce. Two final hypotheses are proposed for this:

Hypothesis 9: A product's price affects the level of trust.

Hypothesis 10: A buyer's income affects his/her intention to buy.

#### **4.4 Methodology**

My study uses both quantitative and qualitative methods or the mixed-method approach to study social commerce in emerging markets in the following steps:

Step 1: A study of quantitative research studies on electronic and social commerce to explore the development of electronic and social commerce in general.

Step 2: Examining social commerce in emerging markets using focus group discussions following which quantitative studies are explored to see whether certain factors could be introduced in the research.

Step 3: Developing a questionnaire based on constructs and supported by quantitative research for exploring social commerce in emerging markets.

Step 4: Exploring these constructs using structural equation modeling (SEM); in the study all measurement items are based on a Likert's scale except income and age, which are continuous variables, and demographic questions like education levels which are either multiple

choice or dichotomous.

Step 5: Analyzing the findings to identify the significant constructs.

## **4.4.1 Model development and structural equation modeling**

### **4.4.1.1 Data analysis methodology**

After developing the model shown in Figure 4.4, my study employed structural equation modeling techniques to analyze the data. A preliminary data analysis was conducted to check for normality using the skew index (Equation 4.1) and the Kurtosis index (Equation 4.2), where  $s^2, s^3$  and  $s^4$  are the second, third and fourth moment from the mean (Kline, 2015). (Equations 4.3, 4.4 and 4.5 respectively).

$$\hat{\gamma}_1 = \frac{s^3}{(s^2)^{3/2}}$$

Equation 4.1 Skew index

Source: Kline (2015).

The result of the skew index Equation 4.1 depends on its sign; if the sign is positive, then the distribution is positively skewed; if it is negative then the distribution is negatively skewed; if the sign is zero, it indicates a symmetrical distribution. If the absolute value of the skew index is  $> 3.0$ , then it is severely skewed (Kline, 2015).

$$\hat{\gamma}_2 = \frac{S^4}{(S^2)^2} - 3.0$$

Equation 4.2 Kurtosis index

Source: Kline (2015).

In the Kurtosis index, the value of the normal distribution should be zero. General guidelines for this value should be less or equal to 8; if they are above 8, it is considered to be severe Kurtosis (Kline, 2015).

$$S^2 = \frac{\sum(X - M)^2}{N}$$

Equation 4.3 Second moment from the mean

Source: Kline (2015).

$$S^3 = \frac{\sum(X - M)^3}{N}$$

Equation 4.4: Third moment from the mean

Source: Kline (2015).

$$S^4 = \frac{\sum(X - M)^4}{N}$$

Equation 4.5: Fourth moment from the mean

Source: Kline (2015).

Next, I introduce structural equation modeling and the main steps taken in analyzing the variables. Structural equation modeling is based on a factor analysis or the idea of covariance between the observed variables.

Hence, in the first stage of the structural equation modeling, a covariance matrix is produced for all the variables, which helps in identifying the factors for each variable. For this each observed variable in the factor analysis is explored to determine its covariance with other observed variables. After producing the matrix, the factors are extracted using the Eigenvalue criteria greater than 1 for the Kaiser-Meyer-Olkin (KMO) test. KMO tests to see whether data is suitable for a factor analysis. KMO is analyzed using the variables and is an illustration of the percentage of the squared correlation among the variables and the squared partial correlation among the variables. The results vary between zero and 1, where 1 is an indication that the sum of the partial correlations is larger than the sum of the correlations. In this case, a factor analysis is not possible as the primary objective of a factor analysis is to see the common covariance between variables (Kaiser & Rice, 1974). KMO is calculated using:

$$KMO_j = \frac{\sum_{i \neq j} r_{ij}^2}{\sum_{i \neq j} r_{ij}^2 + \sum_{i \neq j} u_{ij}^2}$$

Equation 4.6: The Kaiser-Meyer-Oklin test

Source: Kaiser and Rice (1974); Stephanie (2016).

where  $r_{ij}$  is the correlation matrix and  $u_{ij}$  is the partial covariance matrix (Kaiser & Rice, 1974; Stephanie, 2016). From KMO's results, the

following are cut-off criteria for sampling adequacy, the Kaiser criteria scale being: .90s: marvelous; .80s meritorious, .70s: middling; .60s mediocre; .50s: miserable, below .50 unacceptable (Kaiser & Rice, 1974).

#### 4.4.1.2 Model

#### 4.4.1.3 Confirmatory factor analysis

I use the LISREL notation to explore the steps in structural equation modeling, where  $\theta_{(k,j)}$ ,  $\delta_i$ ,  $X_i$ ,  $\lambda_{(k,j)}$ ,  $\xi_i$ ,  $\phi_{(k,j)}$  is the covariance of the error term, error terms, observed variables, factor loading, latent variables and covariance of latent variables.

Figure 4.6 gives the confirmatory factor analysis model that I use.

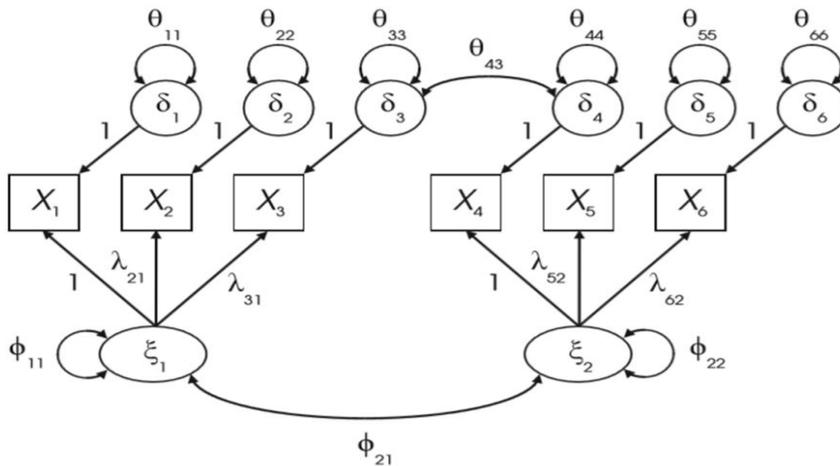


Figure 4.6: Basic model of the conformity factor analysis

Source: Kline (2015).

Next, I did a path analysis using the OLS regression analysis (Figure 4.7).

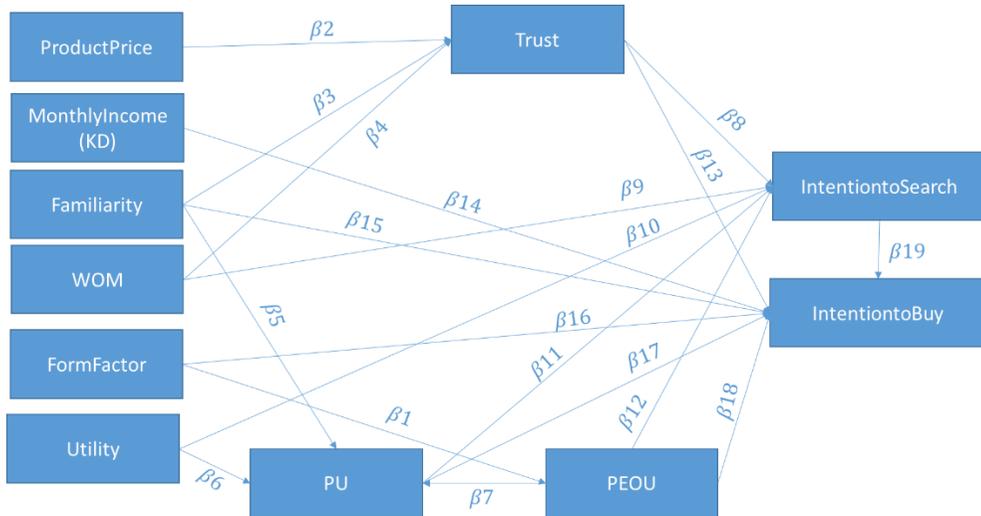


Figure 4.7: Path analysis of the model shown in Figure 4.4

For a path analysis, we need to use a regression analysis of the independent and dependent variables:

PercivedEaseOfUse (PEOU):

$$PEOU = \beta_0 + \beta_1 FormFactor + \zeta_1$$

Trust:

$$Trust = \beta_0 + \beta_2 ProductPrice + \beta_3 Familiarity + \beta_4 WOM + \zeta_1$$

Perceived usefulness (PU):

$$PU = \beta_0 + \beta_5 Familiarity + \beta_6 Utility + \beta_7 PEOU + \zeta_1$$

Intention to Search (IntentiontoSearch):

*IntentiontoSearch*

$$\begin{aligned} &= \beta_0 + \beta_8 \text{IntentiontoSearch} + \beta_9 \text{WOM} + \beta_{10} \text{Utility} \\ &+ \beta_{11} \text{PU} + \beta_{12} \text{PEOU} + \zeta_1 \end{aligned}$$

Intention to buy (*IntentiontoBuy*):

*IntentiontoBuy*

$$\begin{aligned} &= \beta_0 + \beta_{13} \text{Trust} + \beta_{14} \text{MonthlyIncome} \\ &+ \beta_{15} \text{Familiarity} + \beta_{16} \text{FormFactor} + \beta_{17} \text{PU} \\ &+ \beta_{18} \text{PEOU} + \beta_{19} \text{IntentiontoSearch} + \zeta_1 \end{aligned}$$

To estimate the parameters in the linear regression model stated earlier, the relationships between, for example, PercivedEaseOfUse (PEOU) and FormFactor are assumed to be linear in nature (one of the main assumptions of OLS is the linearity assumption). Using the first model PercivedEaseOfUse (PEOU) and FormFactor as an example:

$$\text{PEOU} = \beta_0 + \beta_1 \text{FormFactor} + \zeta_1$$

Here PEOU is the dependent variable (outcome variable) and is assumed to have a linear relationship with the independent variable FormFactor (predictor variable).

$\beta_0$  is the intercept of the regression line which is the value of PEOU when FormFactor = 0.

$\beta_1$  is the slope of the regression line which is the change in PEOU per

unit of change in FormFactor.

$\zeta_1$  is the random error or disturbance which lies outside this model's explanatory ability and needs to have another OLS assumption which is a normal disturbance with a mean of zero and constant variation.

From the sample size,  $b_0$  and  $b_1$  of the the population intercept  $\beta_0$ , the slope  $\beta_1$  is estimated first which leads to the estimation of the regression model:

$$\widehat{PEOU} = b_0 + b_1 \text{FormFactor}$$

After this the parameters are esimated using least squares model. The objective of the least squares model is minimizing the square vertical distances from the line and the observation point in the dataset. The least squares' estimate for the slope and intercept is:

$$\text{Estimate of the slope of Formfactor} = b_1 = \frac{SS_{\text{FormFactorPEOU}}}{SS_{\text{FormFactor}}}$$

$$\text{Estimate of the intercept } b_o = \overline{PEOU} - b_1 \overline{\text{FormFactor}}$$

The sums of square (SS) are used to estimate these parameters:

$$\begin{aligned}
SS_{FormFactorPEOU} &= \Sigma(FormFactor - \overline{FormFactor})(PEOU - \overline{PEOU}) \\
&= \Sigma FormFactorPEOU \\
&\quad - (\Sigma FormFactor)(\Sigma PEOU)/n \\
SS_{FormFactor} &= \Sigma(FormFactor - \overline{FormFactor})^2 \\
&= \Sigma(FormFactor^2) - (\Sigma FormFactor)^2/n \\
SS_{PEOU} &= \Sigma(PEOU - \overline{PEOU})^2 = \Sigma(PEOU^2) - (\Sigma PEOU)^2/n
\end{aligned}$$

#### 4.4.1.4 Fit indices

Several fit indices are used to assess the fitness of a model as compared to the data; two major ones are the Root Mean Square Error of Approximation (RMSEA) and the Comparative Fit Index (CFI) which are based on the CMIN/DF fit:

CMIN/Df which is  $\frac{x^2}{df}$  (Kenny, 2015). CIMIN/df is acceptable if it is between 1 and 3 (Hu & Bentler, 1999).

Comparative Fit Index (CFI) compares the null model and the proposed model that Kline (2015) proposes in his study. Let  $d = x^2 - df$  of the model where CFI of 1 is the best result (Kline, 2015):

$$CFI = \frac{d(Null Model) - d(Proposed Model)}{d(Null Model)}$$

Equation 4.7 Comparative Fit Index

Source: Kline (2015).

Root Mean Square Error of Approximation (RMSEA) is scaled as a badness-of-fit statistic where the value of zero is considered a good result for the fitness of the model (Kline, 2015):

$$RMSEA = \frac{\sqrt{(x^2 - df)}}{\sqrt{[df(N - 1)]}}$$

Equation 4.8 Root Mean Square Error of Approximation (RMSEA)

Source: Kline (2015).

where  $N$  is the sample size and  $df$  is the degree of freedom of the model. In this case if  $x^2$  is less than the degree of freedom, RMSEA should be zero.

## 4.5 Data collection

I did an online web survey using two social media sites, Twitter and WhatsApp. The questionnaire was sent out in Kuwait and analyzed using SPSS and AMOS. Due to the current development of social commerce in emerging markets via Instagram and due to the unavailability of known population indices, my study uses convenience sampling based on the snowball sampling method. The snowball

sampling method deals with both hidden and hard to reach populations. Faugier and Sargeant (1977) explain the need to use snowball sampling as: “in attempting to study hidden populations for whom adequate lists and consequently sampling frames are not readily available, snowball sampling methodologies may be the only feasible methods available. Developed as an original solution to overcome problems of data sampling in the study of hidden populations, they can be used both as an informal way to reach a population and as a more formal method intended to make inferences with regard to a population of individuals.” My study’s sample was gathered using the convenience sampling method, which can be used as an alternative to a simple random sample in hard to reach areas (Bhattacharjee, 2012; Burns & Burns, 2008; Creswell, 2014).

My questionnaire had 137 respondents out of which 17 had missing data points and were removed. When the income control variable was not available, I introduced average income. Table 4.2 gives the measurements of my study’s constructs.

Table 4.2 Measurements of the study’s constructs: Information and type

Name	Type	Measurement	Basic Description
------	------	-------------	-------------------

Familiarity	Numeric	Ordinal	Likert scale from 1 to 5
Trust	Numeric	Ordinal	Likert scale from 1 to 5
Governing Form Factor	Numeric	Ordinal	Likert scale from 1 to 5
Perceived Ease of Use (PEOU)	Numeric	Ordinal	Likert scale from 1 to 5
Perceived Usefulness (PU)	Numeric	Ordinal	Likert scale from 1 to 5
Technological Utility	Numeric	Ordinal	Likert scale from 1 to 5
Word of Mouth (WOM)	Numeric	Ordinal	Likert scale from 1 to 5
Intention to Search	Numeric	Ordinal	Likert scale from 1 to 5
Intention to Buy	Numeric	Ordinal	Likert scale from 1 to 5
Income	Numeric	interval	From 200 to 5900
Product Price (bought)	Numeric	interval	From 5 to 1100

Of the sample, 41 percent were male and 59 percent were female; 62 percent had a bachelor's degree, 21 percent had a college degree, 13 percent had a master's degree, 2 percent had at most high school education and 2 percent had a doctoral degree (Table 4.3).

Table 4.3: Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation

Income	120	200.00	5900.00	1642.7714	1071.55830
ProductPrice	120	5.00	1100.00	52.3750	109.35910
IntentionToSearch	120	1.26	4.66	3.3799	.71614
Familiarity	120	.64	2.74	2.0678	.37816
IntentionToBuy	120	1.61	5.48	3.8287	.78070
Trust	120	1.19	4.41	2.6617	.55971
Utility	120	2.24	5.00	4.1919	.65390
FormFactor	120	1.85	5.55	4.6515	.71463
Word of Mouth	120	.86	4.83	3.1056	.82792
PEOU	120	2.56	4.04	3.5317	.39679
PU	120	1.14	4.22	3.0656	.67713
Efficacy	120	1.26	3.85	3.0251	.59702
Valid N (listwise)	120				

The average monthly salary of the respondents was 1,642 Kuwaiti dinars (USD 5,376). This is more than the average Kuwaiti monthly salary, signifying high-income jobs such as professors, pilots and doctors. Therefore, it can be posulated that Instagram was not only used by the low-income segment of the society but also by the high-income segment (WorldSalaries, 2005) for buying services or products online.

## **4.6 Analysis and the framework's implications**

### **4.6.1 Preliminary data analysis**

I did an investigation and assessment of the preliminary data in various stages. The first stage evaluated normality using several tests to test skewness and Kurtosis. Hair et al., (2013) and Byrne (2013) suggest that an item is normal if the skewness is between -2 and +2 and Kurtosis is between -7 and +7. For skewness, all items satisfied the -2 to +2 range; for Kurtosis, all items were within the range of -7 to +7 (Kline, 2015). The second phase consisted of Kaiser-Meyer-Olkin (KMO) and Bartlett's tests. The KMO measure of sampling adequacy was 0.74 and any value above 0.60 is considered acceptable (Allen & Bennett, 2010). For Bartlett's test, the results were significant (.000) as Bartlett results less than <.001 are considered significant. I assessed and analyzed the measurement model for convergent and discriminant validity in the third step.

For convergent validity, items that had a factor loading of less than 0.5 were excluded. All the other items were above 0.5. Most of the item factor loadings exceeded the 0.6 level (Hair et al., 2013). In discriminant validity, there was no cross-loading between items and all factor correlation matrices were below 0.7. For reliability, I used the Cronbach's

alpha, a technique used for measuring the internal consistency of a construct and the results were all above .70: Familiarity was .72; trust was .83; form factor was .84; perceived ease of use was .88; perceived usefulness was .92; utility was .86; word of mouth was .90; intention to search was .79; and intention to buy was .77 (Kline, 2015).

#### **4.6.2. Model assessment**

In the case of model fit, CMIN/DF was 1.501, which is within the acceptable range between 1 and 3 (Hu & Bentler, 1999). RMSEA was 0.065 and was also acceptable. CFI was 0.977 and SRMR was 0.058 (all within the appropriate thresholds). Figure 4.8 and Table 4.4 present the model's results for the hypotheses using a confirmatory factor analysis. The estimated p-value and status of the hypotheses are noted as either supported or rejected.

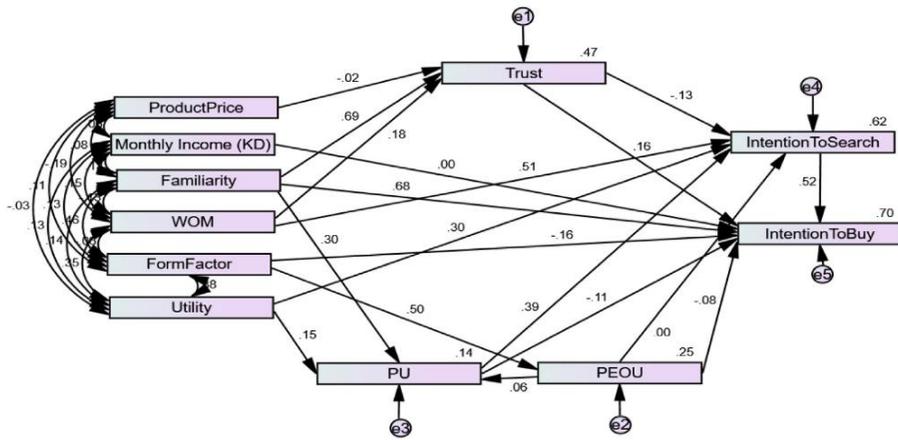


Figure 4.8: Model's results

Table 4.4: Hypotheses' results

Independent	Hypothesis	Dependent	Estimate	P	Status
Familiarity	H1a →	Trust	1.015	***	Supported
Familiarity	H1b →	IntentionToBuy	1.422	***	Supported
Familiarity	H1c →	PU	.531	***	Supported
WOM	H2a →	Trust	.121	**	Supported
WOM	H2b →	IntentionToSearch	.429	***	Supported
Utility	H3a →	PU	.159	.077	Rejected
Utility	H3b →	IntentionToSearch	.318	***	Supported
FormFactor	H4a →	PEOU	.278	***	Supported

Form Factor	H4b →	IntentionToBuy	-.182	**	Supported
Trust	H5a →	IntentionToSearch	-.159	*	Supported
Trust	H5b →	IntentionToBuy	.221	*	Supported
PEOU	H6 →	PU	.099	.512	Rejected
PEOU	H7a →	IntentionToSearch	-.006	.951	Rejected
PEOU	H7b →	IntentionToBuy	-.151	.188	Rejected
PU	H8a →	IntentionToSearch	.400	***	Supported
PU	H8b →	IntentionToBuy	-.131	.059	Rejected
IntentionToSearch	H8c →	IntentionToBuy	.583	***	Supported
ProductPrice	H9 →	Trust	.000	.822	Rejected
Income	H10 →	IntentionToBuy	.000	.942	Rejected

Note: Estimate p-value: \*p< 0.05 , \*\*p< 0.01 , \*\*\*p< 0.001.

## 4.7 Results

This chapter's objective was exploring and studying the constructs that promote the growth of social commerce in emerging markets. This section gives the results of the various hypotheses discussed earlier.

In H1, buyer familiarity with the social network system was positively related to trust; the hypothesis was supported, confirming that familiarity

helped in building trust in sellers among social commerce users in emerging markets (H1a confirmed). Buyer familiarity with the social network system was positively related to the intention to buy. Notably, user access to Instagram facilitated their online purchases (H1b confirmed). Buyer familiarity with the social network system was positively related to perceived usefulness. It was observed that an understanding of the system helped users to assess its value in purchasing products and services even if there was no mediating agent to support return or refund policies (H1c confirmed).

H2a posited that word of mouth was positively related to trust (H2a confirmed). Previous studies have shown that information shared through word of mouth impacts buyers' decisions in online communities and on e-commerce sites (Cheung et al., 2008). Further, word of mouth was positively related to intention to search (H2b confirmed).

In the case of H3, the hypothesis that technology utility was positively related to perceived usefulness was rejected (H3a rejected) which is contrary to Chih-Chien et al.'s (2005) results on the positive effect that network utility had on perceived usefulness. On the other hand, technology utility was positively related to intention to search (H3b confirmed), confirming Chih-Chien et al.'s (2005) results.

The governing form factor in the use of mobile systems was positively related to perceived ease of use (H4a confirmed). This is a new area explored by my research and shows the importance of mobile systems as a form factor for users in emerging markets to access the internet. In the case of H4b, the governing form factor in the use of mobile systems was positively related to the intention to buy (H4b confirmed) but had an inverse relationship that needs further research.

In the case of H5a, buyer intention to search online was positively affected by trust in the social market (H5a confirmed). In the case of H5b, buyer intention to buy online was positively affected by trust in the social market (H5b confirmed).

Perceived ease of use of online social commerce on Instagram positively related to perceived usefulness was rejected (H6 rejected). This result is contrary to previous research on electronic commerce that shows that perceived ease of use significantly affected perceived usefulness (Gefen & Straub, 2000). Further research should be carried out to explore this relationship in the context of social commerce in emerging markets.

In the case of H7a, buyer intention to search for products via a social marketplace was positively affected by the social market's perceived ease of use (H7a rejected). This result is contrary to Gefen and Straub's

(2000) result that showed a significant effect of perceived ease of use on buyer intention to search. In the case of H7b, buyer intention to purchase a product from a social marketplace was positively affected by the perceived ease of use of the social market (H7b rejected), supporting previous research by Gefen and Straub (2000).

In the case of H8a, buyer intention to search for a product via a social marketplace was positively affected by the perceived usefulness of that social market (H8a confirmed); this is in alignment with Gefen and Straub's (2000) results. In the case of H8b, buyer intention to purchase a product from a social marketplace was positively affected by the perceived usefulness of that social market was rejected. This result is contrary to Gefen and Straub's (2000) results, which showed that perceived usefulness impacted buyer purchasing inclinations. In the case of H8c, buyer intention to buy a product from a social marketplace was positively affected by a buyer's intention to search for products in that social marketplace (H8c confirmed). This is in alignment with the theory of reasoned planned behavior and the distinction between intention and actual behavior (Fishbein & Ajzen 2015).

Product price affected the level of trust was rejected (H9 rejected). In the case of H10, income level affected intention to buy was also rejected.

## **4.8 Conclusion and discussion**

The development of internet-mediated services in the form of electronic commerce in emerging markets is proposed to be one of the main internet-mediated services that will help in the development of a state's economy (Humphrey et al., 2003). Research on the barriers to e-commerce in these emerging markets has shown that lack of telecommunication infrastructure, high access costs and lack of access to computer equipment are major technological barriers in the development of e-commerce in emerging markets (Lawrence et al., 2010). Hence, issues such as internet based technical infrastructure like fibre-optics and software and digital signature hinder the development of internet-mediated services in emerging markets (Lawrence et al., 2010). Gibreel et al.'s (2013) research on internet access shows that mobile phones are playing a major role in helping people in the developing world access the internet leading to the use of click-brick models and strategies. Examples of click-brick models include M-Pisa in Kenya and Talabat in Kuwait. Instagram enabled social commerce in Kuwait is following the same click-brick model. This model deals with the infrastructure and software barriers in e-commerce use through mobile systems and click-and-brick

strategies. This supports my hypothesis that form factor in the form of mobile phones using mobile systems is positively related to perceived ease of use.

When it comes to buying products online, consumer rights' policies that are found on well established e-commerce sites such as Amazon like "you can return anything, at any time, for any reason" (Warrington et al., 2000) are not available in social commerce based on Instagram. My research explored trust in Instagram sellers from the buyers' perspective and the results support the suggestion that trust in the sellers plays a role in the intention to buy as it reduces the risks of not being able to return the product.

On the basis of the findings of this chapter I draw a number of conclusions. First, form factor (mobile systems, cell phones) are playing a major role in allowing users to access information and services in emerging markets. Mobile phones play a crucial role in individuals' perceptions about perceived ease of use when using Instagram. Further, familiarity has a significant effect on building trust among users in social commerce in emerging markets (Instagram) even when there are no return policies governing online sellers on Instagram. Moreover, word-of-mouth communication and technological utility factors within social

network sites prompt an increased use of search tools by users, which facilitates user intention to search for products on social network sites (intention to search). Finally, the intention to search supports the intention to buy on social commerce sites in emerging markets.

#### **4.9 Implications**

The implications of my findings can be discussed at the micro and macro levels. At the micro-level, due to a shift in the form factor (mobile phones), ease of use helps users in accessing products and services easily and quickly. This in turn facilitates price comparisons across sellers on both electronic and social commerce sites, empowering users with more information and reducing information asymmetry that sellers tend to use against buyers. Hence, social network sites are encouraged to set up one-stop access points in emerging markets where users can merge online buying with offline interactions. Offline interactions that are based on paying for the products can be merged online with easy to use features that bypass the lack of internet-mediated financial systems in emerging markets.

At the macro-level, buyer and seller trust places government officials in a difficult situation. From the government's perspective tracking the

economic flow of products or services online is difficult. Hence, these are not taxed or regulated to ensure consumer rights and protection (product return policies).

Hence, governments should create policies that are more “internet friendly,” that is, policies which promote social commerce in emerging markets and give incentives to sellers and buyers to report their incomes for tax purposes in exchange for consumer rights for buyers and ease of use in establishing their businesses online for sellers.

Second, governments could promote more regulations for establishing businesses online and accelerating the process of business registrations using online tools. Some of the major emerging markets where social commerce is growing have regulations which mean that it takes a long time to establish a business and the costs of establishing or registering a business are also very high. For example, in the Middle East and North Africa, where Kuwait is located, it takes 20 days to register a business and 26 percent of per capita income as the registration cost. In sub-Saharan Africa, it takes 27 days to start a business and 54 percent of per capita income to register it. Comparing these numbers to Europe and Central Asia, it takes 10 days and only 4 percent of per capita income for setting up a business. Even high-income OECD countries take eight days

to establish a business and only 3 percent of per capita income (The World Bank Group, 2016). Hence, governments in emerging markets should facilitate business registration and lowering registration costs by using online systems by forming public-private partnerships and framing appropriate policies for these.

The new policies need to reflect the changing landscape of today's consumer and producer/seller markets. The more these emerging markets become connected through the internet the more the chances of frictionless communication for exploring, developing and exchange goods and services, thereby paving the way for the prosumer era in emerging markets.

#### **4.10 Limitations and future research**

The limitations of this chapter lie in the context of the social network explored – Instagram. Future research can extend the study of social commerce to other social network sites such as Facebook, Pinterest and Twitter. Studies can also investigate the context of gender and social status in the development of social commerce behavior in emerging markets.

However, the chapter does shed light on emerging trends that are shaping commerce in emerging markets. The notion of online sellers bypassing

large and well-known companies in electronic commerce such as Amazon, eBay and Alibaba or large e-commerce sites in their own local markets is now growing in emerging markets. Hence, looking at other aspects of how these markets are manifesting new types of social commerce would lead to a better understanding of how and why they are developing their own marketplaces and not joining existing well known ones like Amazon, eBay or Alibaba or local marketplaces such as Blink in Kuwait. Future research which focuses on this new trend and how it is shaping commerce around the world is recommended, especially the notions of trust and risk among both buyers and sellers. As these emerging markets move further in the mobile/post-desktop era, we are witnessing innovation streaming from countries like Kuwait, Sudan, India, Malaysia, Saudi Arabia and Thailand that could at some point shape how these emerging markets buy and sell products online.

# **Chapter 5. E-governments in Developing and Developed Countries**

## **5.1 Introduction**

As human beings moved from agricultural to industrial and now knowledge-based societies (Masuda, 1985), there was a shift in how technology was used in governance. In the move to the knowledge-based era, this is paving the way for new means that citizens can use to access government services. With the development of the internet, the notion of electronic governments has also emerged. E-government, short for electronic government, is variously defined as “the provision of government information and services through the World Wide Web at the local, state, or national level” (Jaeger & Bowman, 2005), as “the employment of the Internet and the world-wide-web for delivering government information and services to the citizens” (United Nations, 2014) and as the use of information and communication technologies, particularly the internet, as a tool to achieve a better government (OECD & ITU, 2011). As states and societies transition into information and knowledge-based societies, citizens are now empowered to communicate with their governments and their representatives using

tools and methods that were not available earlier. Many government started shifting services like taxation to cyberspace and the digitization of personal identification documents. Such examples can be seen across the world including in the Republic of Korea (National Information Society Agency, 2017) where people are able to “access all tax-related services such as tax reporting, issuance of certificates, queries on cash receipt usage, issuance of and query on electronic tax statements, and queries about the year-end tax settlement with a single login” (National Information Society Agency, 2017).

However, governments are hindered by constraints like literacy levels and different types of information and communication technologies; these aspects have not been thoroughly explored. This chapter seeks to understand the effect of these constraints on the development of e-governments and how different countries are affected differently by them. It uses a panel dataset spanning over a decade across 174 countries. The research focus of this chapter is on how socioeconomic, technological and behavioral aspects can hinder or promote the development of e-governments. The research focus is on how socioeconomic constraints like literacy levels; technological constraints like poor telecommunication infrastructure; and behavioral constraints like the

lack of availability of the means by which internet-enabled technologies (e-governments) can be accessed affect the development of e-government systems.

### **5.1.1 Problem description and research objectives**

The principal objective of this chapter is understanding the development of e-government systems from a holistic perspective under three interlinked aspects: socioeconomic, technological and behavioral. The socioeconomic aspects investigate some of Heeks' questions like "Is human infrastructure ready?" Infrastructure readiness like literacy and educational levels. The technological aspects look at Heeks' questions like "Is technological infrastructure ready?" Infrastructure aspects like the availability of telecommunication infrastructure in a state. The behavioral aspects consider whether the data system's infrastructure is ready by considering variables like use of the internet and mobile systems and not just the availability of infrastructure (technological aspects).

Following the World Bank study of infrastructure these three aspects are explored using different national incomes -- low, low-middle, high-middle and high constraints 1-year period in 174 countries.

The research objective is studying aspects that promote or hinder the development of e-government in a country. The premise is that looking at e-government from a holistic perspective will help in understanding the constraints that might hinder its development. The implications of this chapter are two-fold. First, it looks at the so far unexplored constraints addressing which can help in the development of e-governments. Second, it provides policy suggestions that administrative agencies and policymakers can take into consideration while developing e-government master plans.

To meet this objective the research started by retrieving panel data from the World Bank, ITU and the United Nations data repositories for 174 countries in both the developed and the developing world from 2000 to 2013. Second, the countries were grouped into four income groups: high, high-middle, low-middle and low income (The World Bank, 2015). Third, I did descriptive statistics and multicollinearity tests after which the panel data was analyzed for fixed and random effects. I used the Hausman test to assess the fitness of the model to decide whether to follow random effects or fixed effects estimates. Finally, I reviewed the implications of how the selected variables affected different income levels based on which I give policy suggestions for developing an e-

government.

## **5.2 Background and literature review**

### **5.2.1 Introduction to the developmental aspects of governance, e-governance and e-government**

Understanding e-government requires understanding the context on which it is built. E-government, which is built on e-governance has three aspects: “(1) e-administration: improving government processes; (2) e-citizens and e-services: connecting citizens to the government; and (3) e-society: building interactions with and within the civil society” (Heeks, 2001). Kettani and Moulin (2014) posit that “e-governance has two complementary aspects: a political aspect, which focuses on enabling democratic, participatory processes by engaging citizens, and a technical aspect, which focuses on government operations and processes.” According to them in its technical part e-government should be “a subset of e-governance.” They define e-government as “a process of reform in the way governments work, share information and deliver services to external and internal clients.”

The advent of e-government and its positive ramifications have been well studied and expressed by Fountain (2005):

“The significance and depth of the effects of the Internet in governance stem from the fact that information and communication technologies have the potential to affect production (or capacity) as well as coordination, communication, and control. Their effects interact fundamentally with the circulatory, nervous, and skeletal system of institutions. Information technologies affect not simply production processes in and across organizations and supply chains. They also deeply affect coordination, communication and control—in short, the fundamental nature of organizations.”

E-government is not merely a group of tools that help citizens interact with their government but these tools also help in preparing and receiving online content or services when this interaction takes place.

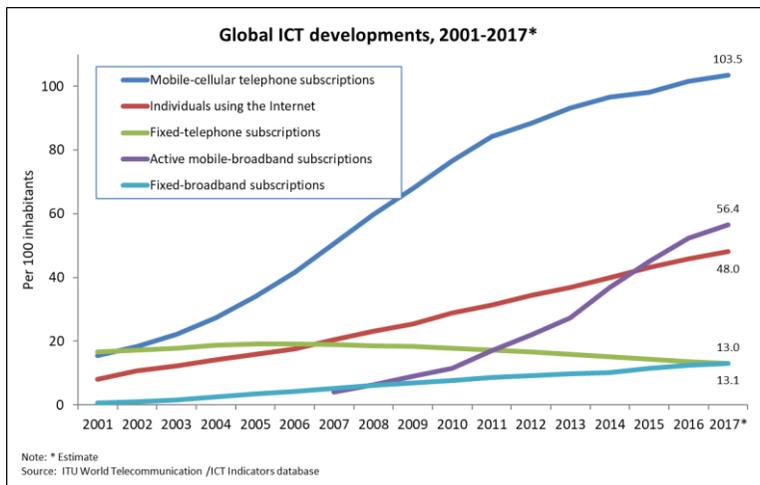


Figure 5.1: Computing power and internet access,

Source:ITU(<https://www.itu.int/en/ITU/Statistics>)

Hence, citizens can play a significant role in developing new services or content. With the introduction of more computing powers (Figure 5.1), we are seeing a new way by which citizens can communicate with each other and also with their government.

With the development of computing power and connectivity, the internet has emerged as an empowering tool that has been explored in literature in the context of e-government. Various researchers (for example, Abramson & Means, 2001; Hiller & Bélanger, 2001) have categorized e-government and its services depending on the e-government's interaction with the citizens and a country's social sectors. Hiller & Bélanger (2001) propose several stages in the development of e-government through detailed phases of interaction between the citizens and the government, the government and businesses and government to government, starting in the early stages where information is available and moving up to the final stage of internet-mediated political participation. They propose a 5-stage model (Figure 5.2): information, 2-way communication, transactions, integration and participation. Figure 5.2 shows a progression in the interaction between citizens and the government with its attendant development in interactive tools such as mobile systems, high speed internet and legal statutes that support the

development of public key infrastructure (PKI) for authenticating legal electronic documents.

	STAGES OF E-GOVERNMENT				
	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
Type of government	Information	Two-way communication	Transaction	Integration	Political participation
Government to Individual — Services	Description of medical benefits	Request and receive individual benefit information	Pay taxes online	All services and entitlements	N/A
Government to Individual — Political	Dates of elections	Receive election forms	Receive election funds and disbursements	Register and vote. Federal, state and local (file)	Voting online
Government to Business — Citizen	Regulations online	SEC filings	Pay taxes online Receive program funds (SBA, etc.) Agricultural allotments	All regulatory information on one site	Filing comments online
Government to Business — Marketplace	Posting Request for Proposals (RFP's)	Request clarifications or specs	Online vouchers and payments	Marketplace for vendors	N/A
Government to Employees	Pay dates, holiday information	Requests for employment benefit statements	Electronic paychecks	One-stop job, grade, vacation time, retirement information, etc.	N/A
Government to Government	Agency filing requirements	Requests from local governments	Electronic funds transfers		N/A

Figure 5.2: Stages of e-government, Source: Hiller & Bélanger (2001).

Following Hiller and Belanger's (2001) developmental stages of e-government, another version has been proposed by the United Nations which looks at the internet aspect of e-government (Figure 5.3). The UN model measures web access based on e-government tools and technology; each stage is characterized by different levels of access. Following these stages there is an improvement in connectivity in a state which moves from a simple web-enabled one-way interaction to highly advanced and connected systems where the interaction is seamless and interactive.

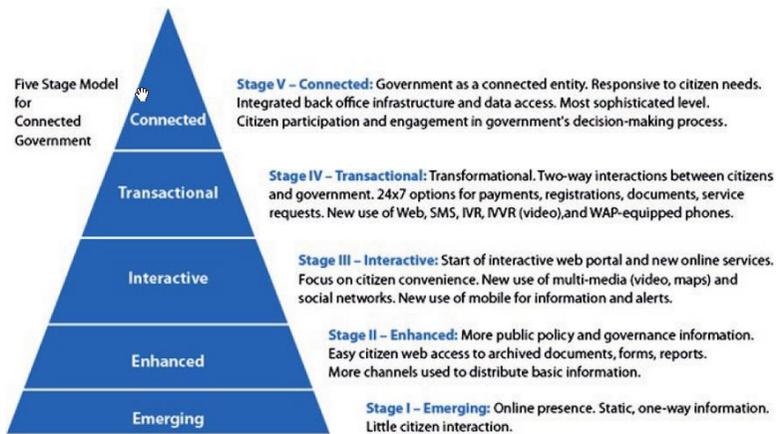


Figure 5.3: Phases of the Web Measure Index, Source:DESA (2010); OECD & ITU (2011).

With the advent of mobile systems and an increased expansion of their use around the world, the notion of m-government, defined as “an extension or evolution of e-government through utilization of mobile technologies for public service delivery” (OECD & ITU, 2011), has also been introduced. Hence, government services have moved from desktop-based systems to post desktop-based systems like mobile systems. Figure 5.4 illustrates the development of governmental services from offline to desktop-based e-government systems to post desktop based m-government systems. As countries move through these developmental stages, citizens are being empowered to access services anytime and anywhere, paving the way for the notion of services being accessible

24/7/365. More ubiquitous technologies and interactive systems have helped in doing the groundwork on which these mobile-enabled systems can be used by governments to deliver services to citizens.

Item	C-Government	E-Government	M-Government
Principles	• Bureaucratic Process (phone, fax)	• Process reengineering using IT (PC, Internet)	• Seamless integration and linkage wireless devices
Service time	• 8 hours a day, 5 days a week	• 24 hours a day, 7 days a week	• 24 hours a day, 365 days non-stop
Service space	• In-person visit, fax, phone	• Customer's home and office using the Internet	• Customer's location and physical place
Service form	• Several visits to offices	• Multi-clicks to web portals	• One time access to needed service

Figure 5.4: Different phases in a government's development from offline to online systems, Source: OECD & ITU (2011); Uhm (2010).

### 5.2.2 SWOT analysis

To further explore e-government systems and their development, this chapter did a preliminary SWOT (strengths, weaknesses, opportunities and threats) analysis to explore e-government systems. A SWOT analysis is defined as a multidimensional tool for strategic analysis: It identifies an organization's internal factors (strengths and weaknesses) and its external factors linked to its environment (weaknesses and threats); it also allows organizations to prioritize factors in terms of expected impact, whether they are positive (strengths and opportunities) or negative (weaknesses and threats) (Seth, 2015). My study uses the SWOT

analysis to explore the current status of e-government from the perspective of government agencies and for investigating the two axes of the SWOT analysis -- internal (strengths and weaknesses) and external (opportunities and threats) (Figure 5.5).

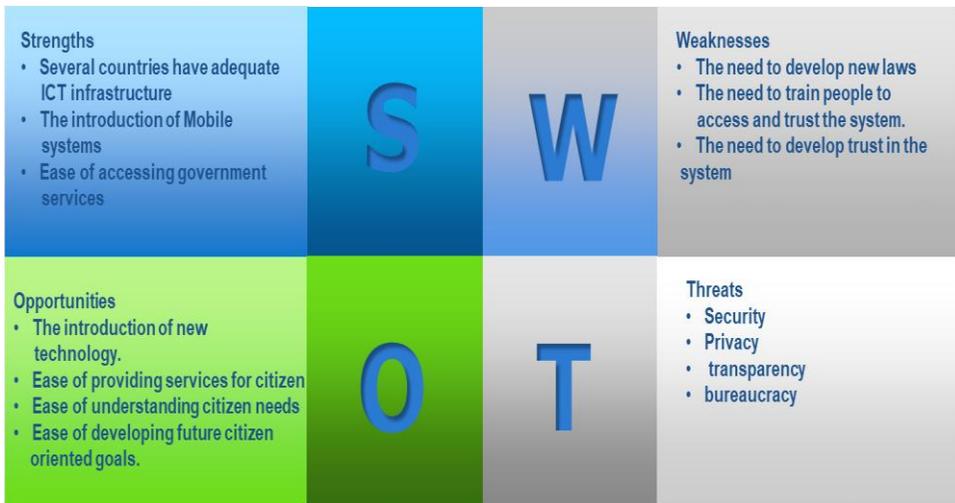


Figure 5.5: SWOT analysis of e-government

### 5.2.2.1 Strengths (internal aspects)

One of the factors that reinforces the growth of e-government is acceptable ICT infrastructure in both developed and emerging markets, particularly in sub-Saharan Africa (“ICT Initiatives - African Development Bank,” n.d.; Song, 2008). Also notable is the development of e-government services through mobile systems (m-government), leading to easy access to government services in rural and otherwise

relatively inaccessible areas (Kushchu & Kuscu, 2003). Mobile governments are now not only found in countries that lead in e-government like Korea, Norway and Singapore, but also in developing countries (Cisco, 2017). Mengistu et al., (2009) studied the development of mobile governments in Korea, Norway, Singapore, Kenya, Rwanda and Uganda. Figure 5.6 gives the four levels of mobile government interactions that they studied.

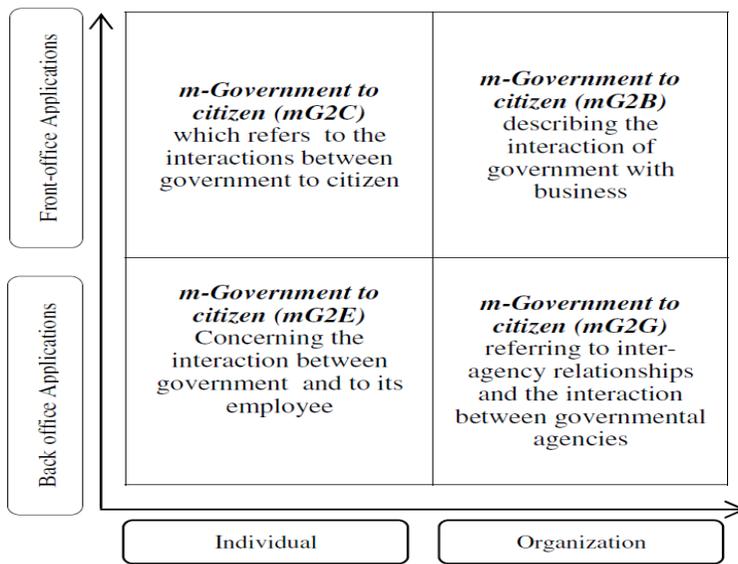


Figure 5.6: M-government's interactions, Source: Mengistu et al., (2009).

Currently, there is a surge in mobile governments a surge in due to improved mobile systems and the infrastructure that they provide especially in Africa (Figure 5.7).

### Africa, examples of mobile government projects

Country	Project	Type	Notes
Rwanda	TRACnet	G2C	A national program supporting those living with HIV
Kenya	NAFIS/NALEP	G2B	Agricultural information service (farmers call in for recorded information)
Tanzania	Agricultural Marketing Systems	G2B	Development Program Commodity price service by SMS, administered by Vodacom and Ministry of Industry and Trade
Uganda	The Question and Answer Service (QAS) Voucher System (VS)	G2B	Voucher system enables personalized advice for farmers, run by the Rural Empowerment Network
Tunisia	Mobile Gov	G2C	Information service, run by central government and delivered by SMS, providing information on travel, weather and schools
Egypt	Government e-Procurement Portal	G2C	SMS-delivered service on government employment opportunities and health; the Ministry of State for Administrative Development worked in partnership with Vodafone Egypt
Egypt	Free SIMs for farmers	G2B	1 million free SIMs for farmers subsidized by central government
South Africa	ID Track and Trace	G2G	Tracking of ID document application via SMS
Uganda	National Water and Sewerage Corp Payments	G2C	Allows consumers to pay water utility bills via MTN Mobile Money

Source: Infarma Telecoms & Media

Figure 5.7: Mobile government projects in Africa, Source: Middleton (2011).

#### 5.2.2.2 Weaknesses (internal aspects)

Mobile governments require new legal frameworks to promote the development of new channels for exchanging information and documents between the government and citizens and among intra-government entities to ensure the legality of digital signature systems and public key infrastructure that build trust and reliability (Nash et al., 2001). New laws and amendments that help in the development and acceptance of electronic documents is a strong pre-requisite of a good m-government and can be achieved through reforms and legal

developments.

### 5.2.2.3 Opportunities (external aspects)

The diffusion of the internet and fiber-optic cables has enabled many countries to join the internet superhighway. Regions that did not have access to the internet earlier like sub-Saharan Africa are now getting high-speed fiber-optic cables in major cities across the continent (Figure 5.8). This provides an excellent opportunity for government agencies to provide services to relatively inaccessible areas at lower costs and with greater ease.

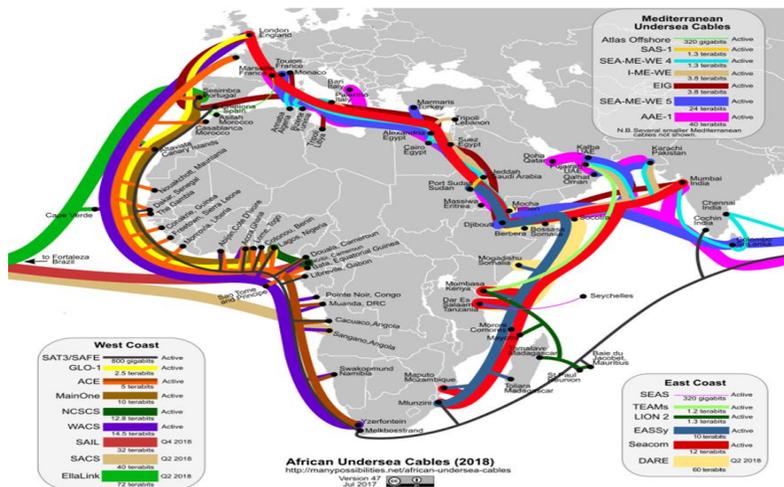


Figure 5.8: African undersea cables(2018),Source: [manypossibilities.net/african-undersea-cables](http://manypossibilities.net/african-undersea-cables).

Besides the fiber-optic cables, the introduction of mobile and internet-mediated systems in the developing world (“How The Future of Mobile Lies in the Developing World | TechCrunch,” 2012) has facilitated and encouraged the delivery of government services through e-government or mobile government systems. This, in turn, has helped in delivering services to citizens more efficiently by understanding their local requirements and evolving future-oriented goals based on the data collected by these sensor networks and government systems throughout the process of service delivery. The growth in mobile phones can be seen in the growth in mobile traffic in developing countries such as those in the Middle East and Africa (Figure 5.9).

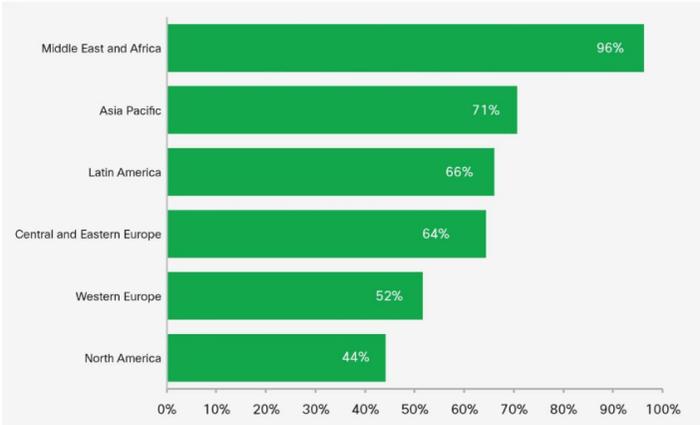


Figure 5.9: Mobile data traffic growth (2016), Source: Cisco (2017).

The mobile penetration rate in the Middle East and Africa is forecast to

reach 71 percent in 2021 from its current 19 percent (Figure 5.10). This growth in mobile systems and mobile use can be seen across many emerging markets. Many countries in emerging markets are experiencing tremendous growth in the use of mobile systems which is helping in the development of legacy systems. The implementation of these systems is providing an opportunity to reach hard to reach segments in these emerging markets, significantly reducing transaction costs and also helping in bridging the digital divide.

Region	2016	2021
North America	81%	99%
Western Europe	69%	92%
Central and Eastern Europe	57%	92%
Asia Pacific	46%	81%
Latin America	44%	80%
Middle East and Africa	19%	71%

Figure 5.10: Regional share of smart devices and connections (percent of the regional total), Source: Cisco (2017).

#### 5.2.2.4 Threats (external aspects)

Heeks (2001) argues that building secure and sound systems is of utmost importance in building trust in and continuity of e-government systems. Some significant aspects of security look at confidence, integrity, availability and non-repudiation. In line with Heeks (2001), Alfawaz et al., (2008) proposed a framework (Figure 5.11) for the development of

e-governments that considers factors affecting the development of secure e-government systems in the developing world:

“Although the technology itself is essentially the same globally, environmental factors influence its application and, hence, impact on the resulting degrees of success of e-government implementations. Potential key factors are security culture, security and privacy legislation, management commitment, management style, senior management and user awareness, skills and training, management change and information security infrastructure.” Alfawaz et al., (2008).

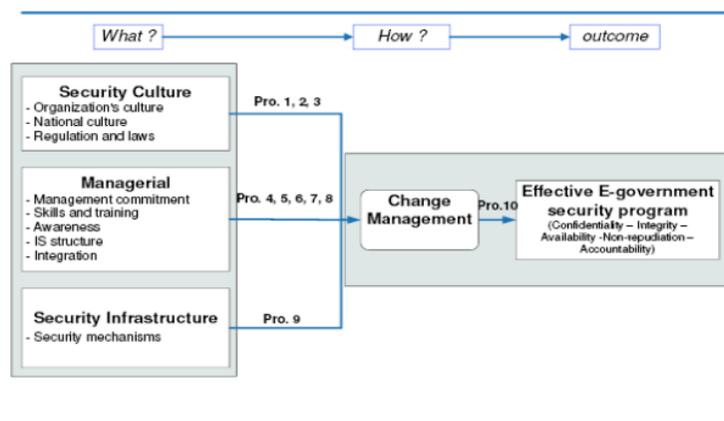


Figure 5.11: Framework of information security management

Source: Alfawaz et al., (2008).

They stress the need to look at local factors such as culture and local regulations to understand how security can be compromised or may not

be able to function in the way it is supposed to. Their proposed framework takes into account the security culture, managerial aspects and security infrastructure as a starting point for developing effective e-government security programs.

### **5.2.2.5 MAXI-MAXI and MINI-MINI extended analyses**

I extended the SWOT analysis to include MAXI-MAXI and MINI-MIN analyses. MAXI-MAXI uses strategies that maximizes internal aspects of strengths to maximize external opportunities (Figure 5.12). As several countries are now adopting novel technologies and moving from telephony systems to mobile and internet systems, they are at the threshold of a new phase in which users own the medium (device) by which they can interact with their government'd representatives and with the government in general. Hence, the necessity of finding easy to use methods for developing content and interacting with citizens is becoming stronger. Here service delivery plays a vital role in tapping into this advantage by having adequate infrastructure that can reach hard to reach citizens through their mobile systems. Hence, opportunities (external aspects) for providing services to citizens easily need to be developed using the current strengths (internal aspects) that many

countries, especially those in emerging markets, possess like current advantages of mobile technology and its use.

In the same vein, it can also be deduced that from the diffusion of interconnected mobile systems, governments can understand the needs of their citizens even better from the data gathered and the feedback loop introduced within these mobile systems. This will help governments in making plans that are tailored to each country or a segment of society in a country.



Figure 5.12: MAXI-MAXI SWOT analysis of e-government systems,

Source: (Gibreel & Hong, 2017)

I extend the analysis further by using the MINI-MINI method (Figure 5.13), which minimizes the weaknesses and tries to avoid threats. In this

case, one weakness of e-governments is that they come with specific prerequisites, particularly the formation of appropriate “equities, legal systems. Laws and amendments that enable the development of public key infrastructure and digital signature are vital in the initial phases of any e-government’- implementation. One constraint in approving new laws is bureaucratic inertia, which deters the creation of new methods for authenticating identification for those who use online government service systems. Accessing these systems necessitates the protection of citizenst privacy through enhanced security; this also helps in promoting trust in the systems. These intertwined elements must be in place to ensure an adequate level of security for all citizens. This is not only the task of the government but also requires citizens to be regularly educated about the safe and secure use of online entities and personal information.

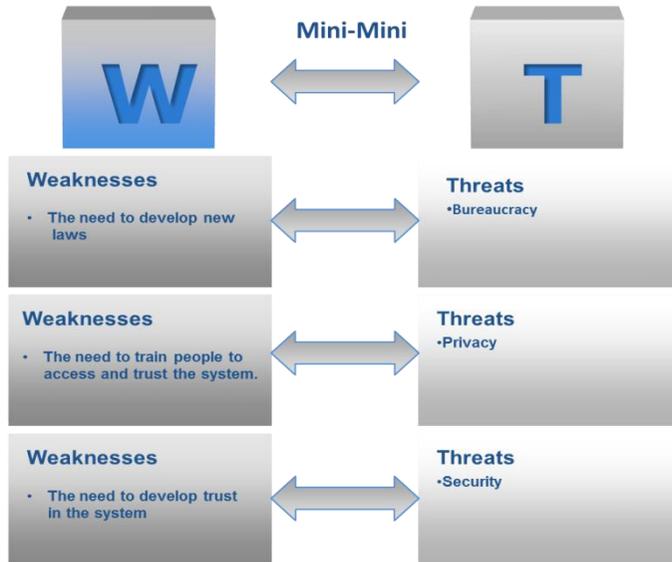


Figure 5.13: MINI-MINI SWOT analysis of e-government systems,

Source: (Gibreel & Hong, 2017)

### 5.2.3 E-government research and development

Due to the nature of governance and how it affects many dimensions of a person’s daily life through the laws enacted or the taxes imposed, there is a need to look at the development of these systems from a holistic perspective so that both accessibility and inclusion of all social segments can be ensured. An examination of the social aspects (the education index and literacy levels), technological aspects (technology infrastructure) and behavioral aspects (level of internet use in a household) is essential for understanding the stages that an e-government’s development has to

follow. Several approaches like the dynamic system approach by the father of system dynamics, Jay Forrester have been developed to understand how systems interact mutually. Singer et al., (1970) highlighted the need to investigate the underlying factors in innovations like e-governments in their Sussex Manifesto. They argued that in the developing world, innovation “starts with the premise that the developing countries must have their own scientific and technological capability. This indigenous capacity is necessary not only for increasing production but, what is more important, for improving the capacity to produce” (Singer et al., 1970).

Research has also focused on the impact of newer technologies in both the developed and developing world. Chen et al., (2008), for example, researched the development of e-governments both in the developed and developing world, which are at different stages of growth because of the different speeds at which they are using technologies.

My proposed framework for e-government is given in Figure 5.14. It gives the three aspects which form the basis of my research – socioeconomic, technological and behavioral. The figure also gives the constraints faced in each of these aspects.

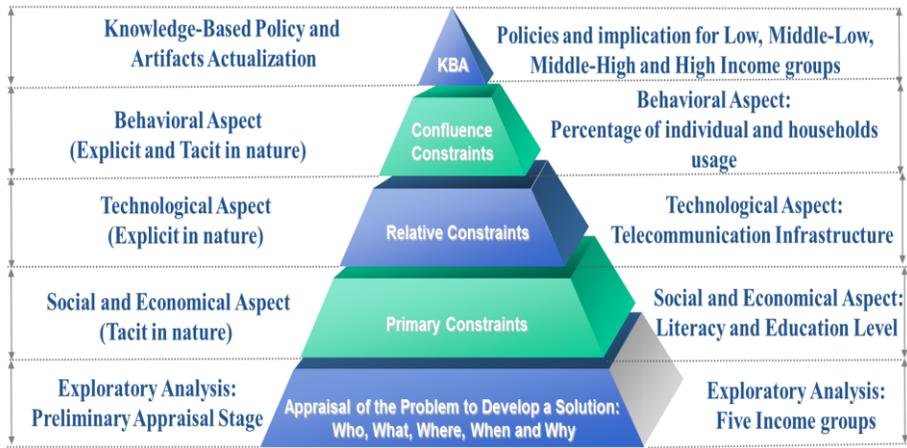


Figure 5.14: E-government and ICT’s research framework

My study explored five income groups by gathering data from international agencies for proposing policies. These policies should start by considering the primary constraints of literacy and education levels, followed by relative constraints of availability of telecommunication infrastructure and finally behavioral constraints.

### 5.2.3.1 Socioeconomic aspects

The effect of GDP on an e-government’- development has been explored by Ingrams et al., (2018). They indicate that a higher GDP tends to support the development of e-government across countries with different sizes and characteristics. Elbahnasawy (2014) investigated the impact of e-government on curbing corruption in a state due to increased transparency: “The human capacity component of e-government does

not seem to impact corruption under any specification, which is also a robust result. Therefore, e-government reduces corruption by expanding the access to information and raising the level of corruption awareness, which increases transparency and improves accountability.”

Introduction of digital means in organizations increases participation rates in digital technologies and systems. For example, internet access and computing power in communal spaces such as administrative institutes, public libraries and universities helps in the development and use of these digital systems and encourages citizens to acquire the skills needed to use them so that they can benefit from their use (Wilson, 2004). This enhances the growth of e-government services for those citizens who possess the tools and capabilities to use government services through online mediated systems. This is also highlighted by Layne and Lee (2001) who studied the first stage of internet development and e-government. They call it cataloguing that is, “governments create a ‘overnments cre mostly due to a great deal of pressure from the media, technology-literate employees, demanding citizens, and other stakeholders to get on the net.”

Financial constraints include transaction and search costs. ICTs and internet usage should be affordable (within an average

citizen willingness to pay for these services) so that people can be empowered to use digital services and information and communication technologies (Hilbert, 2010). IT services and products being bought and sold at reasonable prices not only allow the development of new markets and sectors but also the provision of tools by which citizens can interact with their governments. Research on the cost aspects of e-government has shown that the cost of accessing e-government services plays an essential role in citizens using the services. Verdegem and Verleye (2009) maintain that effective cost plays a significant role in allowing users to pay for access to e-government services.

Political constraints also need to be considered. In their research on the global digital divide, Guilleir research o(2005) postulate that democratic political regimes enable faster growth of the internet than authoritarian or totalitarian regimes.

Further, internet strategies enacted and executed to hinder specific initiatives by citizens have generally backfired and led to large growth in internet use through other means such as proxy or virtual private networks. The Arab Spring offers a good example. During that time the internet was blocked in Egypt but the Egyptians found other means of accessing the internet (Hopkins, 2011).

Socio-demographic constraints too are known to affect the level of ICT access. In certain countries, class determines access to technology. Further, some countries also suffer from pervasive digital exclusion and can benefit from policies designed to mitigate their concomitant adverse effects.

### **5.2.3.2 Technological aspects**

Discussing public access, Bertot et al., (2006) point out:

“By meeting the information needs of their patrons, there is an evolving role for public libraries as the central public Internet and computing access point within their communities for a wide range of government services and resources. As the 2006 Public Libraries and the Internet study shows, public libraries are often the only public access Internet and computer point within their communities. Also, as federal, state, and local government agencies migrate their services and resources to e-government applications, they do so without offering any community-based access points to these services. Increasingly, government agencies refer individuals to their local public libraries for assistance and technology to complete their interactions and meet their government services’ needs.”

### **5.2.3.3 Behavioral aspects**

Constraints of software design are one of the behavioral aspects that impact how people interact with systems. In their simplest form, behavioral aspects look at models such as TAM (Davis, 1989b) to explore the constraints that citizens might face. This issue has been extensively explored by Taherdoost (2018) in his study of the effect of ease of use and usefulness on the development and use of e-government services. Software and software design also play a vital role in bridging the digital divide. QuestionBox, a US-registered non-profit organization that started operations in India and now also operates in Africa and other areas around the globe attempted to resolve illiterary constraints that "1.4 billion people in the world are illiterate, one fifth of the world's population, let alone the other 20 percent who can only read in their local language. let alone the asked usage. let alone the other 20 percent who can only read in their local (QuestionBox, 2015). Farmers in India use QuestionBox by speaking their questions to get answers on subjects like health, farming and commercial endeavors. deavorsalming subjects like on (QuestionBox, 2015).

Considering that the socioeconomic, technological and behavioral

aspects are connected to the development of e-government is crucial in understanding both early stage and evolutionary stage fundamentals for the expansion of e-governments.

### **5.3 Research question and hypotheses**

Building on this chapter's research question, the following hypotheses are drawn:

Hypothesis 1: Social aspects have a positive relationship with e-government use.

This is operationalized as: Illiteracy constraints and limited indigenous content in digital systems hinder the dispersion and use of ICT technologies. Likewise, comparatively high literacy in some world languages such as English can quicken ICT diffusion. Further, many sub-Saharan Africa states suffer from high illiteracy levels that can become a hindrance in the widespread access and use of information. Hence, providing software systems that are customized to suit all categories of citizens irrespective of their literacy levels will boost e-government services' use and distribution. The availability of content can also narrow the digital divide as content about local issues and in native

languages facilitates the provision of information that citizens require and can understand. Graham et al., (2011) studied the development of content on Wikipedia and state that state 11) studied the development of content on Wikipediarily stage and evolutionary stage fundamentals for the ex percent of all articles”of all articlestudied the dis poorly represented in the encyclopedia. There are more Wikipedia articles (7,800) written about Antarctica than any country in Africa or South America. Even China, which is home to the world)" largest population of Internet users and is the fourth largest geographical jurisdiction, contains fewer than 1 percent of all geo-tagged articles.arStudies on illiteracy have emphasized that literacy is a necessary condition for the use of e-government services; however, these studies are qualitative in nature; some of them are quantitative as they are cross-sectional (Elaswad & Jensen, 2016; Sarrayrih & Sriram, 2015; Taoufik et al., 2007). My study explores this aspect using a panel dataset across time and space.

Hypothesis 1 is proposed and operationalized through the predictions:

Prediction 1.1: Literacy rates impact social development and readiness for use of e-government enabled systems.

Prediction 1.2: The education index impacts social development and

readiness for use of e-government enabled systems.

Hypothesis 2: Technological aspects have a positive relationship with e-government use. Citizens must have access to the basic components of a computing service and what powers it (electrical gridlines, wired or wireless internet connections and the primary medium of interaction, the computer itself). Linked aspects like adequate aspects medium of interaction, the compu (Wilson, 2004) also need to be considered. These constraints must be explored and mitigated by developing countries as numerous citizens have inadequate access to computing power at home and have to gain access to internet services in internet cafes. Gibreel et al., (2013b) point out that in the developing world, internet access is categorized by mobile systems.

Hypothesis 2 is proposed and operationalized through the predictions:

Prediction 2.1: Telecommunication infrastructure is positively related to the development and use of e-government enabled systems.

Hypothesis 3: Behavioral aspects have a positive relationship with e-government use. Studies on the behavioral aspects of e-government systems are based on maximizing the utility gained (utils) by using these systems (Alzahrani et al., 2017; B, ie systems ) by s008; Carter & B the developing worl et al., 2014; Scott et al., 2016; Wirtz & Birkmeyer,

2017), and generally address Heeks'eks gener questions: (1) (1) tions human infrastructure ready?" man (2) (2) infrastructure ready, 2017), t?" These studies operationalize these research questions into hypotheses using several psychometric constructs like perceived ease of use and perceived usefulness (Horst et al., 2007) and risk and trust (Bsk and trust of use and Proximity of mobile systems to the users and within households have not yet been explored.

Hypothesis 3 is operationalized through the following prediction:

Prediction 3.1: Technology use in a household is positively related to the development and use of e-government enabled systems.

#### **5.4 Research methodology**

To study these hypotheses, I collected data from ITU, the World Bank and the United Nations. I chose a panel dataset as it provides multiple observations of the same units thus allowing controlling for certain unobserved characteristics of individuals, firms, etc. (Wooldridge, 2016). The panel data collected was divided into socioeconomic, technological and behavioral aspects. The method used for this division was year, country and observed variables. Next, I analyzed the dataset as per the method and tests used in my research. To fully assess the viability of using panel data using either random and fixed effects, I tested for

multicollinearity which checks for autocorrelation between variables to omit variables that have high multicollinearity using the variance inflation factor (VIF). In analyzing the dataset and to compare the fixed effects model and the random effects model I also used the Hausman test as it gives a better understanding in that it allows comparisons between random-effect and fixed-effect estimators.

## **5.5 Exploring the panel data**

### **5.5.1 Exploring data trends**

First, I obtained the percentage of individuals using the internet and the mean for each percentage. This showed that the mean was increasing, which is to be expected as internet development started increasing globally from 2001, especially in relatively inaccessible areas such as in the Middle East and Africa (Cisco, 2017). Figure 5.15 gives the expansion of the internet from 2000 to 2013.

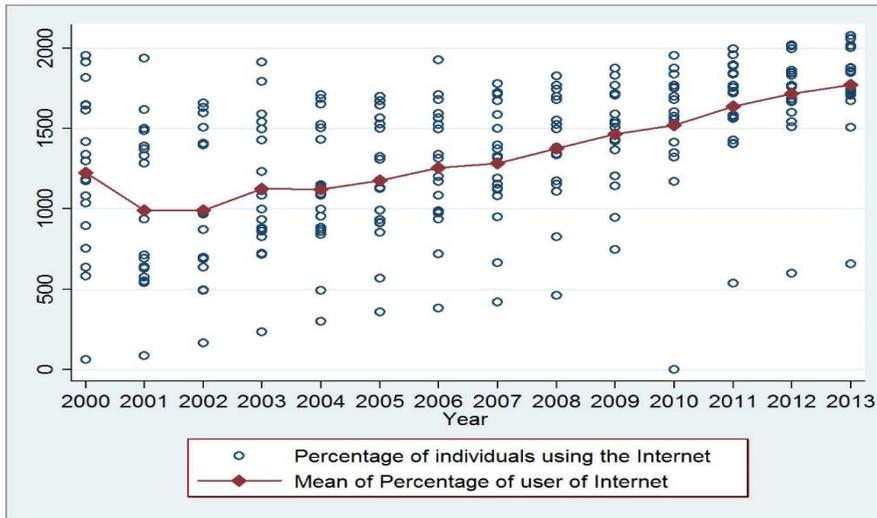


Figure 5.15: Internet spread

I then studied internet00 to 2013. itationID" different groups of countries -- low-income countries, low-middle income countries, upper middle-income countries, high income OECD countries and high-income non-OECD countries. As can be seen in Figure 5.16, in 2010 low income countries leapfrogged to the wired system which is based on internet access through dial-up internet and mobile internet.

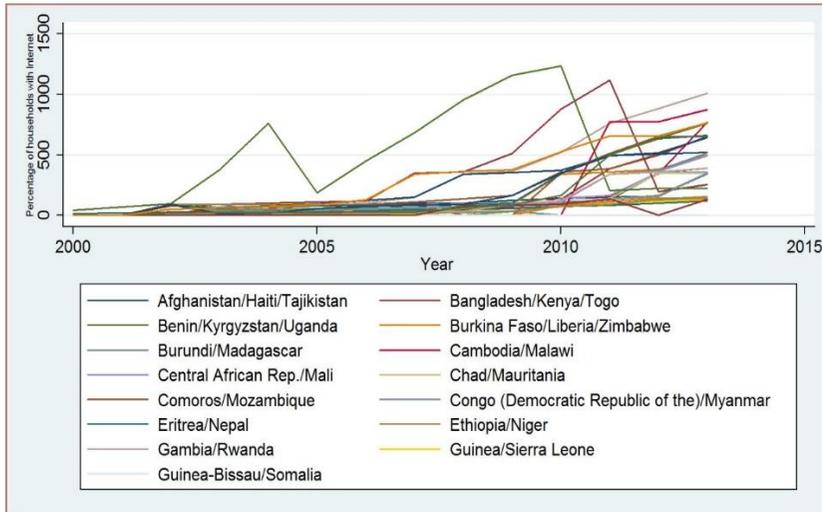


Figure 5.16: Households using the internet in low-income countries

Figure 5.17 shows the development of the internet in low and middle-income countries when internet services took off in 2000-05. At that time, countries like Sudan started being connected through the newly developed fiber-optic cables in the African continent (Song, 2008).

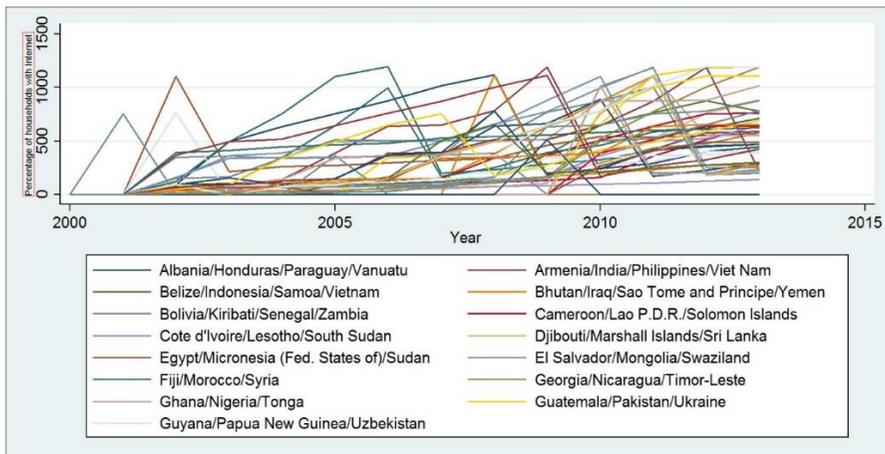


Figure 5.17: Households using the internet in low and middle-income

countries

As can be seen in Figure 5.18, several middle-income countries had already developed internet systems making household access to e-government services possible.

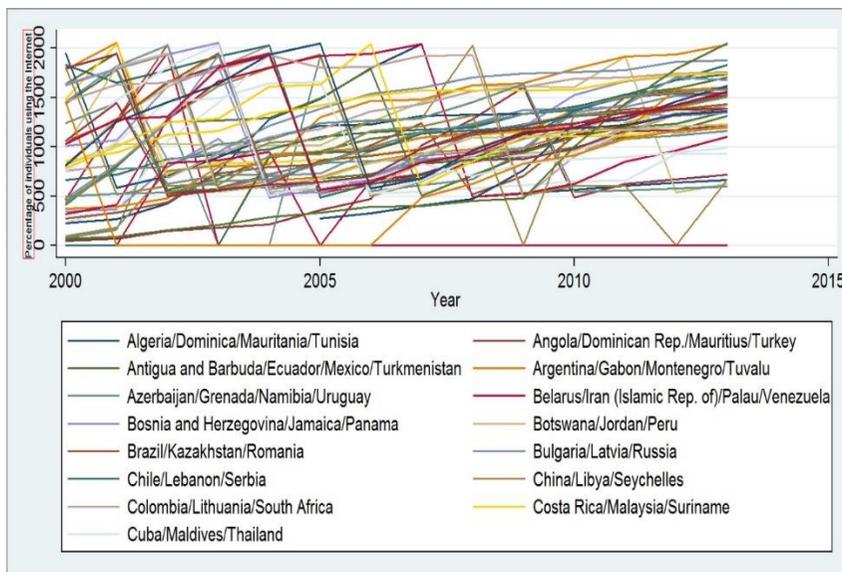


Figure 5.18: Individuals using internet (upper middle-income countries)

As for high-income countries (Figure 5.19), the internet has spread wide along with internet-based e-government services. However, there is a need for laws and procedures to accept digital documents.

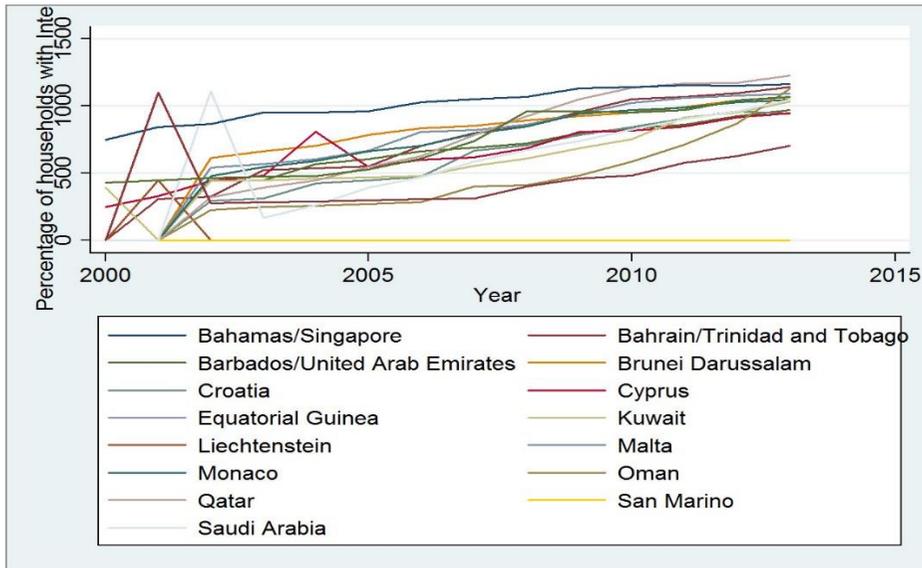


Figure 5.19: Individuals using the internet in high income OECD countries

### 5.5.2 Multicollinearity and correlation

This section checks for autocorrelation between variables and also checks for observed variables that could (perhaps even should) be omitted due to high multicollinearity using the variance inflation factor (VIF). VIF is used for assessing whether the independent variables have high linear relationships with other independent variables. When an independent variable's VIF is greater than 10, the variable should be reconsidered and even dropped (Bowerman & O'connell, 1990).

The VIF results are shown in Table 5.1 which indicate acceptable VIF

ranges for all variables (Bowerman & O'connell, 1990).

Table 5.1: Variance inflation factor

Variable	VIF	1/VIF
TII	1.83	0.5479
FTS	1.09	0.921227
PHE	1.33	0.750176
PHI	1.5	0.668755
PHFP	2.03	0.493318
R1	2.32	0.430469
S1	1.27	0.787415
SBS	1.29	0.772566
X1	1.29	0.774343
L	1.34	0.745483
E	1.18	0.845714
Mean VIF	1.5	

## 5.6 Panel data analysis model

$$y_{it} = a_0 + \sum_{j=1}^J \beta_j x_{jit} + \varepsilon_{it}$$

Equation 5.1

where  $y_{it}$  is EGI of country  $i$  where ( $i = 1, 2, 3, \dots, N$ ) in the time period  $t$  ( $t = 1, 2, 3, \dots, T$ ) and  $x_{it}$  is a vector of  $J$  where ( $j = 1, 2, \dots, J$ ) variables. The variables are the telecommunication infrastructure index (TII), fixed-telephone subscriptions (FTS), percentage of households with electricity (PHE), percentage of households with fixed-telephone (PHFP) lines, percentage of households with internet (PHI), percentage of individuals using mobile cellular telephones (R1), percentage of individuals using the internet (S1), satellite broadband subscriptions (SBS), wireless-broadband subscriptions per 100 inhabitants (X1), literacy rate adult total (percent of people aged 15 years and above) (L) and the education index (E).  $\beta$  is the vector of unknown parameters for the variables to be estimated. The error term is:

$$\varepsilon_{it} = \mu_i + \lambda_t + \nu_{it}$$

when  $\mu_i$  is based on an individual or entity effect of a given unit of analysis, be it a country or organization. In the case of country  $i$ , it could be government type, in the case of organization  $i$ , it could be management type. This effect is also termed the entity effect.

when  $\lambda_t$  is effect across time, such as infrastructure development or policy implementation is also called the between entity effect.

when  $v_{it}$  is the common effect that is not explained by the model but it should be accounted for in the model.

In fixed effects:

$\mu_i$  and  $\lambda_t$  are the intercepts

In random effects we need to check for the assumption of heteroskedasticity versus homoscedasticity:

$$\mu_i \sim (0, \sigma_\mu^2)$$

$$\lambda_t \sim (0, \sigma_\lambda^2)$$

$$v_{it} \sim (0, \sigma_v^2)$$

### 5.3.5 Hausman Test

The Hausman test allows a comparison between random effects and fixed effects estimator results and helps in evaluating which method best fits a particular model. It also supports the research's statistical model with respect to its dataset. The Hausman test also provides the best model between random effects and fixed effects. I tested the null hypothesis which indicated that random effects did not exist. Accordingly, after conducting the test, the null hypothesis was rejected; hence, the fixed-effects model best fit the panel data (Baltagi, 2005).

## 5.7 Analysis and results

This chapter used panel data which was categorized according to socioeconomic, technological and behavioral aspects and organized according to year, country and observed variables (Table 5.2).

Table 5.2: Description of the variables

Abbreviations	Category	Variables Label	Data Source	Year
EGI	Behavioral	E-Government Development Index	UNPACS	2000-14
TII	Technological	Telecommunicatio n Infrastructure Index	UNPACS	2000-14
FTS	Behavioral	Fixed-telephone subscriptions	ITU	2000-14
PHE	Behavioral	Percentage of households with electricity	ITU	2000-14

PHFP	Behavioral	Percentage of households with fixed-telephone	ITU	2000-14
PHI	Behavioral	Percentage of households with internet	ITU	2000-14
R1	Behavioral	Percentage of individuals using a mobile cellular telephone	ITU	2000-14
S1	Behavioral	Percentage of individuals using the internet	ITU	2000-14
SBS	Behavioral	Satellite broadband subscriptions	ITU	2000-14
X1	Behavioral	Wireless-broadband subscriptions per 100 inhabitants	ITU	2000-14

L	Socioeconomic	Literacy rate, adult total (percent of people aged 15 and above)	World Bank	2000-14
E	Socioeconomic	Education Index	UNDP	2000-14

Table 5.3 gives the descriptive statistics of the panel data variables with their mean and standard deviations.

Table 5.3: Descriptive statistics

Variable	Observations	Mean	Std. Dev.	Min	Max
EGI	2547	0.490469	0.214763	0	0.92832
TII	2547	0.325369	0.254385	0	1
FTS	2548	1151.516	710.1924	1	2386
PHE	2548	12.21939	39.58713	1	221
PHFP	2548	41.86578	100.9849	1	434
PHI	2548	404.3936	390.5425	1	1232
R1	2548	11.70016	39.39027	1	234

S1	2548	1024.427	614.6802	1	2085
SBS	2548	11.1405	36.05778	1	208
X1	2548	120.4027	211.6883	1	763
L	511	235.0783	143.8551	1	486
E	1872	625.3819	402.0458	1	1359

I selected the period 2000-14 for my study as during this time e-government was introduced in many parts of the world. Data sources included ITU, the World Bank and UN. Socioeconomic data included the adult literacy rate and the education index for understanding the underlining development of social interaction and educational levels in a state. The behavioral aspects covered the level of technology use in a household, percentage of use and internet penetration in a household. It combined both the ability to use technology and its availability in a household. The technological aspects included the level of technological infrastructure in a country (scoring high on the telecommunication infrastructure index). Table 5.4 presents the correlation matrix showing acceptable levels of correlation results for the fixed and random effects analyses.

Table 5.4: Correlation matrix

Variables	EGI	TII	FTS	PHE	PHFP	PHI	R1	S1	SBS	X1	L
EGI	1.00										
TII	0.91	1.00									
FTS	-0.12	-0.10	1.00								
PHE	0.09	-0.01	-0.08	1.00							
PHFP	0.29	0.24	-0.11	0.32	1.00						
PHI	0.55	0.55	-0.04	0.03	0.21	1.00					
R1	0.30	0.33	-0.01	0.04	0.34	0.34	1.00				
S1	0.53	0.55	-0.03	0.02	0.14	0.48	0.28	1.00			
SBS	0.40	0.39	-0.04	0.11	0.10	0.27	0.32	0.28	1.00		
X1	0.30	0.26	-0.08	0.06	0.17	0.42	0.30	0.32	0.36	1.00	
L	0.36	0.30	0.11	0.11	0.16	0.30	0.19	0.22	0.15	0.26	1.00
E	0.34	0.38	0.09	0.01	0.03	0.21	0.12	0.28	0.13	0.06	0.01

Table 5.5 gives the results of the regression analysis. The income group categorization approach in this research used the method followed by the World Bank (2015) which defines the groups and their corresponding levels of income as:

Low-income economies are defined as those with a GNI per capita, calculated using theme as: ankcategorization of \$1,045 or less in 2014;

middle-income economies are those with a GNI per capita of more than \$1,045 but less than \$12,736; high-income economies are those with a GNI per capita of \$12,736 or more. Lower-middle-income and upper-middle-income economies are separated at a GNI per capita of \$4,125.

Table 5.5. Regression results (all income groups)

Variable	All Groups	Low	Low-Middle	High-Middle	High
FTS	-0.00839	-0.00443	-0.00285	-0.0026	-0.0432
PHE	0.000442*	0.000493	0.000572	0.0000076	0.0242
PHFP	0.000163	0.00019	0.00053	0.0000432	0.0001
PHI	0.0000335	0.000126*	0.0000266	-0.0000157	0.000191**
RI	-0.0000905	0.000551	-0.00047	0.0000107	-0.00004
SI	0.00000855	0.0000249	0.0000169	-0.00000799	-0.00005
SBS	0.000494*	0.0000849	0.0000214	0.000520*	-0.00008
X1	-0.0000172	-0.0000169	-0.00000479	-0.00000657	-0.000006
L	0.000113	-0.0000558	0.000310*	0.000101	-0.0001
E	0.0000319	0.0000208	0.0000586	-0.0000391	0.000009
TII	0.698***	0.0866	0.613**	0.496***	0.614***
Constant	0.231***	0.173***	0.127	0.371***	0.574**

R-sq	0.801	0.4961	0.6115	0.5825	0.9364
N	174	38	49	57	30

Note: Results for fixed effect: \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

### 5.7.1 Hypothesis 1: Socioeconomic aspects

I examined the education index and literacy level variables. Both social aspects were lagged two years to assess their effect on the use of e-government systems. The results obtained from all countries combined do not show a significant impact of either the education index or the literacy rate. On the other hand, when the countries were compared as low, low-middle, high-middle and high-income groups, the results indicate that literacy levels were significant for low-middle income countries -- (0.000310) at the 90 percent significance level. Earlier studies on the effect of education and literacy on internet usage (Leino, 2014; Schmar-Dobler, 2003) point out the importance of literacy when accessing computing systems. Leino (2014) defines the difference between literacy (the ability to read) and information literacy as “an ability to recognize a need for information, and to search, retrieve, evaluate and use that information in everyday life. An information literate person is able to determine the amount of information needed,

find information effectively, evaluate information and its source critically (a skill that is included in critical literacy) and accommodate new information to prior knowledge.”n

Generally speaking all countries require a certain level of literacy to enable the use of e-government systems. This is important as the main purpose of an e-government is providing information that citizens can use and the medium of passing information is language and its understanding.

In the case of low-income countries, the results reveal no statistical significance of the literacy rate or how it plays a role in gaining from the benefits of e-government. This result could be an indication that in the initial phases of an e-government’- development the needs of a large proportion of literate citizens is not as noticeable as demand for the system might be in its infancy and the use of these systems is not high. What this implies is that in its early stages an e-government is used by a few literate individuals who are early adopters of new innovations and are educated. This flows into the s curve introduced by Rogers (2003) about early adopters.

### **5.7.2 Hypothesis 2: Technological aspects**

My research examined two variables: telecommunication infrastructure (development of 2G and 3G) and LTE telecommunication infrastructure which measures the level of ICT development in a state. For most countries, the results indicate a significance level of 99 percent (0.698). As countries start developing their e-government systems, the importance of ICT development is crucial in the initial stages. A comparison of income groups of countries suggests that, developing countries need to consider developing basic infrastructure such as telephony, internet and internet mediated systems in the early stages. This process must be continuous as improved ICT levels can lead to better e-government systems such as mobile governments and subsequently the Internet of Things (IoT) like tracking citizensr energy use and consumption. Several studies have pointed out the importance of infrastructure in the development of the internet (Gibreel et al., 2013b; Wilson, 2004). Generally speaking, for successfully developing an e-government there is a need to first build the general infrastructure on which an e-government system can be built. Accordingly, technical development is a pre-requisite for countries at all income levels (low, low-middle, high-middle and high).

### **5.7.3 Hypothesis 3: Behavioral aspects**

My research examined the following for behavioral aspects: (1) fixed (landline) telephone subscriptions, (2) households with electricity, (3) households with fixed-telephone lines, (4) household internet users, (5) individuals using mobiles, (6) individuals using the internet, (7) satellite broadband and (8) wireless subscriptions. Regarding all behavioral aspects, all relevant variables were lagged by one year to see their effect on the use of e-government systems.

The results for all countries (0.000442) at the 95 percent significance level show that the availability of electricity is a pre-requisite for e-government. In the case of low, low-middle, and high middle-income countries, the results show that internet use is not significant whereas for high-income countries it is statistically significant (0.000191) at the 95 percent level. Satellite broadband subscriptions are significant: (0.000520) at the 90 percent significance level. My results also show that in the early stages of development basic technologies such as mobile telephony are needed but in the later stages the need for electricity grows due to the expansion of electrically powered devices. My results also show that electricity plays a vital role in building a network that promotes the use of e-governments. This in turn results in indirect mediated effects

on other factors that support the development of e-governments.

## **5.8 Conclusion and discussion**

My research analyzed a panel dataset that included over 200 countries over a decade to understand the socioeconomic, technological and behavioral aspects of e-government development. I developed four major hypotheses, three of which examined the short-term development of the three major (socioeconomic, technological and behavioral) aspects. The fourth hypothesis examined the development of ICT infrastructure over the long term among different groups of countries.

My results show that literacy levels had a positive and significant effect on the development of e-governments in low middle-income countries. However, governments in these countries should consider their levels of literacy and provide systems and services that overcome barriers of illiteracy. Such systems and services could be voice-enabled systems or graphical user interfaces that assist the illiterate population in accessing information and government services online.

In the case of low-middle and high-middle income countries, my results show that the development internet use is not significant in low-middle income countries, this is statistically significant (0.000126) at the 90

percent concentration) at the 10 percent significance level. This suggests that in the earlier stages of a country's development, internet access within a household promotes the development of e-government. On the other hand, in high-income countries this is statistically significant (0.000191) at the 95 percent confidence level. Satellite broadband subscriptions, however, are important: (0.000520) at the 90 percent confidence level at the 10 percent significance level.

This chapter also examined the external factors that could promote readiness for e-governments thus highlighting the need to investigate the development of e-governments using a more holistic perspective that moves beyond the technological needs of a country for developing e-governments to socioeconomic and behavioral factors. Hence, as governments continue to develop their internet-mediated systems, there is a need to localize these services by considering their socioeconomic aspects such as illiteracy rates. Technological aspects such as the need to invest in infrastructure for the public to access e-government services too cannot be ignored.

## **5.9 Limitations and future research**

One limitation of this chapter is that it could have analyzed more factors reof this technological and behavioral aspects to explain how they can help in developing e-government policies and systems.

Hence, future research can develop a more nuanced e-government readiness index by integrating all three aspects and developing a more holistic e-government readiness index. Developing an e-government master plan that incorporates the technological, socioeconomic and behavioral aspects will assist in promoting the development of an effective and efectivel assist in promoting the d

Another limitation of this chapter is that it does not test some fundamental assumptions like individual and group heterogeneity though it tests for multicollinearity using the variance inflation factor (VIF). Hence, future research should test for these assumptions to strengthen the validity of the research and its replicability.

My research identified some significant issues faced by emerging countries that have been recently connected to the web and proposed some methods by which the lack of literacy can be overcome. Future research could also take into account other measurable socioeconomic or technological constraints that could hinder the development of e-

governments.

## **Chapter 6. Conclusion**

The main aim of this thesis was providing a framework for developing information and communication technologies so that countries, particularly emerging economies, can develop more optimized policies and technological artifacts. These optimized policies and technological artifacts will not only help these countries to move on the path of development in an era of knowledge based societies and economies but also help them bridge the digital divide.

Using a holistic perspective the study discussed three interlinked aspects of development – socioeconomic, technological and behavioral. On the basis of this research the study developed a framework, the Information and Communication Technology for Development Framework.

The first part of the thesis discussed the steps taken for developing this framework to explore the constraints faced in the three interlinked aspects. It then developed a conceptual framework based on the constraints that it identified. In the first part the thesis also developed a conceptual hierarchical pyramid on the relative importance of the socioeconomic, technological and behavioral aspects and their various constraints in developing an ICT policy or its artifacts.

The second part of the research empirically explored the framework in two areas of information and communication technology for development -- social commerce and e-government -- using both a panel data analysis and a factor analysis.

My ICT4D framework that led to a hierarchical pyramid shows that socioeconomic aspects are highly significant for both social commerce and e-government in low middle-income countries and these are more significant than technological and behavioral aspects.

In Chapter 4, the thesis explored social commerce in emerging markets using the ICT4D framework. What is well-known is that development of internet-mediated services in the form of e-commerce in emerging markets is one of the main internet-mediated services that could further the development of an economy (Humphrey et al., 2003). Research on the barriers to e-commerce in these emerging markets has shown that lack of telecommunication infrastructure, high access costs and lack of access to computer equipment are major technological barriers in the development of e-commerce (Lawrence et al., 2010). Hence, issues such as internet-based technical infrastructure like fiber-optic cables and software like public key infrastructure and digital signature hinder the development of these systems (Lawrence et al., 2010).

Chapter 4 of my thesis shows that the newly emerging methods of buying and selling products and services using online social networks are helping in addressing the basic financial infrastructure constraints. These new means of selling and buying products online are also leading to the development of new means of assessing buyers' risks in the emerging markets. Trust in online sellers increases with the use and growth of the new social network sites in emerging markets. When it comes to the technological aspects, the development of mobile technology with its mobility and easy access form factors serves as an enabler in searching for products online. As for the behavioral aspects, perceived usefulness affects the intention to buy and helps overcome the constraints associated with this issue.

Chapter 4 also shows that importance of developing social commerce in emerging markets as in these countries it takes a very long time and very high costs for establishing or registering a business as compared to Central Asia, let alone the high-income OECD countries.

Chapter 4 proposes that countries should facilitate business registration facilities online. This can be achieved via lowering registration costs using online systems that social commerce in emerging markets is built upon by forming, for example, public-private partnerships. Hence,

these emerging economies need policies to reflect the changing landscape of today's consumers and producers/sellers' markets. The more these emerging markets are connected through the internet, the more frictionless the information systems will become thus providing the means to communicate, explore, develop and exchange goods and services. All this will pave the way for the prosumer era in emerging markets.

The framework and hierarchical pyramid developed in the first part of the thesis is used for discussing e-government systems in Chapter 5. The results of this chapter show that literacy levels have a positive and significant socioeconomic effect on the readiness for e-governments in low and middle-income countries, but these governments should take steps for the development and provision of e-government services. Governments should consider literacy levels in their countries and provide systems and services that overcome the barriers posed by low literacy levels.

Other social factors hindering access to e-government services that Chapter 5 discusses are poor social inclusion of all segments of society. Hence, governments need to ensure the social inclusion of all marginalized groups which need government services more. Second, the results of the telecommunication infrastructure index show a positive

coefficient on e-tickets that Chapter 5 discusses are poor social inclusion of 1 percent and a 1 percent significant difference. This shows that there is a need for investment in ICT infrastructure at all stages of development but the investments will vary across technologies, from basic ICT development like 2G and 3G to their long-term evolution (LTE).

Chapter 5 comes to a significant conclusion regarding behavioral aspects about the percentage of households using the internet in low-income countries which shows that not only is infrastructure development essential but its availability in a household or in close proximity to households is also significant in the use of e-government systems.

The thesis also discussed how users of internet-mediated technologies are using these technologies in many parts of the world. It showed that some technological innovations in emerging markets rival those from the developed countries. For example, Kenya's M-Pesa is a system of interlinked accounts that transfers money using some of the most fundamental features of a generic phone like short messaging service (SMS) and combining it with a click and brick strategy. M-Pesa runs on simple generic phones with minimal use of electricity and no internet connection. Through the M-Pesa platform, users can pay their utility bills and make bank deposits for pre-paid cards, fuel cards and debit cards

(Safaricom, 2018). These innovations take into account the availability of electricity, ease of use and the availability of specific devices and a click and brick business model which combines both online and offline technological and social systems. M-Pesa'sah onlihas been replicated in many other African, Middle Eastern and Asian countries such as Sudan, Iraq and India.

On the other hand, an application that uses the internet is Facebook Lite, a low internet usage version of Facebook, which is growing at a very rapid pace in emerging markets. Pew Research (2014) found that Facebook was overwhelmingly the most popular social media site in emerging markets. Globally, Facebook is also the most popular media site with over a billion and a half users as of April 2016 (Chaffey, 2017). The anomaly is that Facebook Lite, a version of Facebook designed to work with low data connections and low-end mobile phones, has currently become the fastest growing interface for Facebook itself, growing faster than even Facebook mobile.

Given these two differing trends and also on the basis of the other findings of my research one significant aspect that emerges is that a holistic perspective is needed when developing policies and artifacts. What needs to be kept in mind when developing these policies and

artifacts is that existence of technology does not solve social issues, and technology itself is not the solution to the problem. Instead, it is only a part of the larger solution. Therefore, an understanding of all aspects of the problem holistically helps in developing optimized solutions. With this in mind, more refined and streamlined policies and technological artifacts can be designed and enacted to become tools for more social inclusion rather developing tools which are technologically superior but which lead to increasing economic inequalities and social divisions.

## Appendix 1: Questionnaire

Construct/ Source	Questionnaire (Likert scale: strongly disagree, agree, neutral, disagree, strongly disagree)
Familiarity:  (Gefen, 2000)	<ol style="list-style-type: none"> <li>1. I am familiar with Instagram.</li> <li>2. I am familiar with searching for products on Instagram.</li> <li>3. I am familiar with buying products on Instagram.</li> </ol>
Trust:  (Pavlou & Gefen, 2004)	<ol style="list-style-type: none"> <li>1. Sellers on Instagram are in general reliable.</li> <li>2. Sellers in Instagram auctions are in general honest.</li> <li>3. Sellers in Instagram auctions are in general trustworthy.</li> </ol>
Governing form factor:  ( Gibreel et al., 2013a, 2015;  (Proposed by this paper)	<ol style="list-style-type: none"> <li>1. Mobile devices have encouraged me to buy from Instagram more than other devices (desktops or laptops).</li> <li>2. Mobile devices are widely used to buy products on Instagram more than other devices (desktops or laptops).</li> <li>3. Mobile systems have helped a lot of people in accessing products online more than other devices such as desktops or laptops.</li> </ol>

	<p>4. Mobile systems have supported many people in sharing product costs and information online more than other devices such as desktops or laptops.</p>
<p>Perceived ease of use:  (Gefen &amp; Straub, 2000)</p>	<ol style="list-style-type: none"> <li>1. Instagram is easy-to-use.</li> <li>2. It is easy to become skilled at using Instagram.</li> <li>3. Learning to operate Instagram is easy.</li> <li>4. Instagram is flexible to interact with.</li> <li>5. My interaction with Instagram is clear and understandable.</li> <li>6. It is easy to interact with Instagram.</li> </ol>
<p>Perceived usefulness:  (Gefen &amp; Straub, 2000)</p>	<ol style="list-style-type: none"> <li>1. Instagram improves my performance in product / service searching and buying.</li> <li>2. Instagram enables me to search and buy products / services faster.</li> <li>3. Instagram enhances my effectiveness in searching and buying products/ services.</li> <li>4. Instagram makes it easier to search for and purchase products / services.</li> </ol>

	<p>5. Instagram increases my productivity in searching and purchasing products / services.</p>
<p>Network Utility: technology utility: (Chih-Chien et al., 2005)</p>	<ol style="list-style-type: none"> <li>1. From a technical viewpoint, Instagram is a useful technology.</li> <li>2. From a technical viewpoint, Instagram is a wonderful innovation.</li> <li>3. From a technical viewpoint, Instagram is a valuable photo sharing/shopping/ messaging service.</li> </ol>
<p>Word of mouth/ Information usefulness:  (Bailey &amp; Pearson, 1983; Cheung et al., 2008)</p>	<ol style="list-style-type: none"> <li>1. The comments on Instagram are valuable.</li> <li>2. The comments on Instagram are informative.</li> <li>3. The comments on Instagram are helpful.</li> </ol>
<p>Intention to search for a product:  (Gefen &amp; Straub, 2000)</p>	<ol style="list-style-type: none"> <li>1. I would use Instagram to find out about the producer of the product or its maker.</li> <li>2. I would use Instagram to inquire about products reviews and comments.</li> </ol>

<p>Intention to buy product: (Gefen &amp; Straub, 2000)</p>	<ol style="list-style-type: none"><li>1. I would use my money to purchase from sellers on Instagram.</li><li>2. I would not hesitate to provide information to sellers on Instagram.</li><li>3. I am very likely to buy products from sellers on Instagram.</li></ol>
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## 초 록

이 논문은 지식기반경제와 동반 기술적 가공물의 발전과정을 사회경제적·기술적·행동적, 세 가지 연결된 측면을 고려한 전체론적인 관점을 통해 조사한다.

이 논문의 주된 목적은 정보 격차를 줄이고자 하는 국가들이 최적화된 정책과 기술적 가공물을 낳을 수 있도록 정보통신기술(이하 ICT [Information and Communication Technology]) 개발에 대한 프레임워크를 제공하는 것이다.

목적 달성은 두 단계를 거쳐 실행한다: 첫 단계는 ‘정보통신기술 개발 프레임워크(Information and Communication Technology Development Framework)’로 일컬을 전체론적 계단식 개발 프레임워크를 다룬다. 이 단계에서는 모든 상대적 제한점을 분석한 후 이 제한점들을 기반으로 개념적인 프레임워크를 수립한다. 그 다음, 이 개념적인 프레임워크를 이용하여 국가의 ICT 정책이나 가공물 개발에 있어 각 측면의 상대적 중요성과 제한점을 반영한 개념적인 계층형 피라미드를 형성한다.

둘째 단계에서 논문은 패널 분석과 인자 분석 기법을 이용해 프레임워크를 경제개발형 ICT의 대표적인 두 가지 분야인 소셜 커머스 및 전자 정부의 실례를 통해 실증적으로 분석한다.

필자의 분석 결과는 ICT 정책 수립과 기술적 가공물 개발에 있어 환경의 본질성과 필수성을 시사한다. 더불어 사회경제적·기술적·행동적 측면의 상대적인 중요성이 국가와 소득수준에 따라 달라짐을 독자는 결과를 통해 볼 수 있다.

이런 이유로, 계단식 개발방식에 의거한 ICT 개발계획검토는 최적화되고 효율적인 ICT 정책과 기술적 가공물을 형성하는 기준을 이해함에 있어 필수적이고 유익한 역할을 한다. 이런 과정을 통해 형성된 정책과 가공물은 향상된 국가 ICT 정책을 수립하거나 심지어 특정 인구층에게까지 힘을 실어주는 수단으로 활용될 수 있다.

**주요어:** 사회적 수용, 전자적 수용, 전자 참여, 소셜 커머스, 전자 정부

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