THE “BI-DIRECTIONAL” INFLUENCE BETWEEN TECHNOLOGY AND SOCIETY: HOW M-PESA IS SHAPING AND BEING SHAPED BY SOCIETY IN KENYA

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Abbreviations

AML: Anti Money Laundering

AST: Adaptive Structuration Theory

ATM: Automatic Teller Machine

CBA: Commercial Bank of Africa

CBK: Central Bank of Kenya

CCK: Communication Commission of Kenya

CDMA: Code Division Multiples Access

DFID: Department for International Development

EFT: Electronic money transfer

GDSS: Group Decision Support System

GSM: Global System for Mobile Communications

ID: identity card

ITU: International Telecom Union

KES: Kenyan Shilling

KYC: Know Your Customer

MDG: millennium development goals

MFI: Microfinance Institute

NGO: Non-government organization

PDA: personal digital assistant

PEV: Post-election violence

PIN: Personal identification number

POS: Point of Sale

SIM: Subscriber Identification Module

SMS: Short Message System

TDMA**:** Time Division Multiple Access

UK: United Kingdom

USD: United States Dollar

ZAR: South African Rand

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Abstract

M-PESA (a mobile banking service in Kenya) was introduced to offer a person-to-person money transfer service. Its extensive adoption and appropriation for purposes other than person-to-person transfers has influenced the technology providers (Safaricom) to widen their services beyond their original intentions. M-PESA provides a wide range of financial services including services for people who were previously unbanked. Users of M-PESA can now pay different utilities, those without credit cards can purchase products online, others can repay loans to microfinance institutions, pay insurance premiums, withdraw money from ATMs, use it as Point of Sale Payment and open savings accounts.

This research examines the existence of “bi-directional” influences between technology and society by taking M-PESA business users as a case. It specifically investigates how M-PESA as a technology has influenced the business environment in Kenya and how the design of M-PESA has in turn been influenced by its adoption.

The research adopts the Adaptive Structuration Theory as the theoretical framework and interpretive case study research as a methodological approach. Interviews with different stakeholders in the industry were used to collect data. Data was analyzed using Diachronic Analysis.

The results of the research show that there is a “bi-directional” influence between technology and people as they affect each other over time. Mobile technologies shape the way businesses operate, allowing them to provide new services and improve existing ones. At the same time, usage and adoption trends affect the design of mobile technologies. Over time, technology is adapted to accommodate the new needs of businesses and other needs in the wider community. This research shows that the impact of technology depends not only on its functionality but also on its use and appropriation in society.

CHAPTER ONE: INTRODUCTION

1.1. Introduction

This chapter demarcates the content of the study, discussing the background, the problem statement and the main research question. The chapter commences by introducing the technology under investigation. Following that, the problem statement and the research question are presented. The conceptual framework, the research design and the contribution of the research to the related body of knowledge are then discussed. At the end of the chapter, a brief overview of the dissertation chapters constituting the rest of the study is presented.

The broad focus area of this research is to investigate the dynamic relationship between technology and its usage by people, be it by individuals or businesses. But as this is a very wide area to cover, the specific focus of the research is the relationship between M-PESA (the technology) and its different business users. It attempts to establish the existence of "bi-directional" influences between M-PESA and business users through time by adopting a *socio-technical* framework.

1.2. Background to m-banking and M-PESA

Internet and mobile phones hold central role in the understanding of information communications technologies (ICTs) as a modern electronic technology (Toyama & Dias, 2008). They are by far the two most prominent manifestations of ICT development in the last two decades (Barnes & Corbitt, 2003; Donner & Tellez, 2008). The use of mobile phones has spread remarkably fast in the world. In fact, mobile phone is the fastest spreading technology globally (Castells et al., 2006; Camner & Sjöblom 2009a; Jack & Suri, 2009). According to Corbett (2008), it took almost 20 years for mobile phones to reach the first one billion subscribers, four years for the next one billion, and only two years for the third one billion. By the year 2002, the total number of mobile (cellular) phones worldwide exceeded the number of landlines (Donner, 2008). According to ITU (2010), five billion people were expected to be users of mobile phones by the end of 2010. In addition to the wide pervasiveness, the role of mobile phones has diversified beyond making voice calls and sending short text messages (SMS). Additional services that can be delivered through mobile phone include m-banking, m-

voting, m-learning, m-agriculture and m-health among others (Sharples, 2000). M-banking, which forms part of these services, is the focus of this study.

M-banking is provision of financial service through mobile phones by electronically storing money and allowing payment for goods and services (Must & Ludewig, 2010). The services m-banking provides include person-to-person money transfers, long-distance remittance, micro-payments, loans and savings using mobile phones (Donner & Tellez, 2008).

One such m-banking application which has gained wide popularity is M-PESA in Kenya. M-PESA ("M"-stands for mobile and PESA for money) means mobile money in the national language Kiswahili. M-PESA was launched in March 2007 by Kenya's largest mobile telephone network operator Safaricom (Vaughan, 2007; Hughes & Lonie, 2009). When M-PESA was first launched, its main objective was to provide affordable banking service for the unbanked (Hughes & Lonie, 2009). Its functionality was limited to the depositing and withdrawing of money as well as transferring money and purchasing airtime (Safaricom, 2009). It has mainly been used as a person-to-person money transfer system.

M-PESA has gone through several changes since its inception. Its services and design have evolved to incorporate new needs in the mobile banking sector in the country. The two originators of M-PESA affirmed this by stating that "the product in Kenya now is so different to what we launched with" (Nick Hughes and Susie Lonie as cited in Graham, 2010). For instance, M-PESA was meant to serve as loan repayment method for microfinance institutions in the pilot project (Hughes & Lonie, 2009). But this was dropped on the launch for a person-to-person money transfer service (Hughes & Lonie, 2009). In addition to that change, a number of additional services have been introduced within the last four years.

After one year from its launch, M-PESA enabled bulk payment (business-to-consumer), for companies to pay salaries and for other benefits (Safaricom, 2009). At the same time, schools and utility companies were able to open organizational M-PESA accounts to collect school fees and utility bills respectively (AFI, 2010). ATM withdrawal using M-PESA was also made possible in September 2008 (AFI, 2010). At the end of 2008, M-

PESA launched an international money transfer, enabling people living in the UK to directly send money to M-PESA users in Kenya (Safaricom, 2009).

In 2010, M-PESA introduced two more services. The first one is M-KESHO, which was initiated in collaboration with Equity Bank (Safaricom, 2010a). M-KESHO extends the services of M-PESA by linking it to an actual bank account in Equity Bank (Mas, 2010; Safaricom, 2010a). It allows Equity Bank account holders to transfer money, to check their balances, withdraw money from ATMs and M-PESA agents, earn interest on their savings and obtain loans and insurance from the bank using their mobile phone (Safaricom, 2010a). M-KESHO subscribers benefit from having a bank account and the convenience of M-PESA (Mas, 2010). The second service introduced in 2010 is dubbed 'Buy Goods'. This is a point of sale (POS) payment application which enables users to make payment at the till point.

This study revolves around the growth of M-PESA spanning three years (from 2007-2010). It looks at the mutual ("bi-directional") influences between the technology and its adoption in two ways. Firstly, it investigates the influence of the environment on the subsequent design of M-PESA. Secondly, it studies how M-PESA has altered the environment in which it operates by changing the way business is done.

The study explains the situation by adopting an "*ensemble view*" of technology (Orlikowski & Iacono, 2001). According to the "*ensemble view*", there is a "bi-directional" influence between ICT and the social structure (organizational, social, economic, and political) that ICTs operate in. There is a dynamic interaction between people and technology starting from development to its deployment in organizations and society (Orlikowski & Iacono, 2001).

1.3. Statement of the problem

As a technology embedded in a complex social and economic context, M-PESA has evolved in a short period of time from a person-to-person money transfer endeavor targeting the unbanked, into mobile banking application which has widespread use. Its use has spread from person-to-person money transfer to payment of bills, providing insurance, credit services and international remittance services. This research proposes that the evolution of M-PESA has been shaped by the social, cultural and economic

environment in which it has been used, while at the same time, impacting its users. As such, M-PESA is neither solely an independent nor a dependent structure in its context but has a “bi-directional” influence with its socio-economic environment. The research examines and analyzes factors (including social, economic and adoption) that explain the evolution of M-PESA and how this application has in turn impacted a variety of entities, including companies, organizations and businesses. It attempts to study the “bi-directional” relationships between M-PESA and different businesses.

Three reasons necessitate this research. First, there is a need from different stakeholders (researchers, government, donors, mobile service providers, regulators, and banking sector) to understand the role of mobile telephony technologies in developing countries including the role of mobile banking (Duncombe & Boateng, 2009). However, academic research in the area of mobile telecommunications and its relationship with the environment is very limited (Maurer, 2008). Little attention has been given to the social, economic, and cultural context of mobile telecommunications technologies including research done on mobile phones (Donner & Tellez, 2008). On top of this, the bulk of the research on mobile telecommunications and their social interaction focuses on the developed world even though the number of mobile users in the developing world is quite significant, having surpassed one billion users (Donner, 2008).

Secondly, most of the existing research work around mobile phones and financial services has been done largely by practitioners rather than academic researchers (Donner & Tellez, 2008; Duncombe & Boateng, 2009). For this reason, researchers (Bangens & Soderberg, 2008; Donner & Tellez, 2008; Duncombe & Boateng, 2009) have suggested that more academic research is needed to study the impact of m-banking in and on the different social, economic and cultural contexts surrounding its use.

Lastly, although studies have been done on the use of mobile phones and their “bi-directional” effect on society focusing on text messaging (Ling, 2004), multimedia messaging (Ling & Julsrud, 2005) and intentional miss calling (Donner, 2007), there is no such study done on the use of mobile banking aspects. The only exception to this is the research done by Morawczynski focusing on the use, impact and adoption of M-

PESA in Kenya (Morawczynski & Miscione, 2008; Morawczynski, 2009). Morawczynski's study – the only detailed study so far on the subject – considers the socio-economic factors that have impacted the development of M-PESA. Her study focused on the individual-M-PESA relationship, excluding other users of the technology such as companies and organizations. Although she appears to acknowledge that M-PESA has been used in ways not initially contemplated by its original designers, she does not explore in any depth factors in society – social, economic and cultural – that have shaped M-PESA's evolution.

This research makes a modest attempt to address the issues raised above about m-banking and the social and economic contexts they operate in by taking M-PESA as an instance of m-banking. In order to achieve this objective, it first traces the historical evolution of M-PESA since 2007. Second, it enquires into the influences that M-PESA has had on the way business is done in Kenya. Finally, the study considers how the way M-PESA is used has impacted its technological design. To answer the research question and describe phenomena, the study applies different theories and research design from the field of informatics.

1.4. Conceptual framework

This research looks at the way technology influences businesses and how the adoption of technology influences the technology's future design or its diversification. In effect, it studies the interaction between people and technologies. Literature highlights three ontological assumptions for studying the relationship of people and technology, i.e. *technological determinism*, *social determinism* and *socio-technical determinism*.

According to *technological determinism*, technology is developed independent of social forces and that technology causes social changes (Wyatt, 2007). Technology is viewed as independent of its development and use in organizations or society (Orlikowsiki & Iacono, 2001). *Social determinists* on the other extreme argue that "*technology does not develop according to an inner technical logic but is instead a social product, patterned by the conditions of its creation and use*" (Williams & Edge, 1996: 857). *Social determinists* claim that technology does not possess any meaning by itself but users constantly redefine and give new meanings to it through their usage (Ling, 2004). Both *social*

determinists and *technological determinists* are critiqued for emphasizing the importance of one part of the equation while down playing the role of the other.

Socio-technical determinism is the middle ground between the two extremes. Proponents of *socio-technical determinism* claim that society and technology shape each other (Ling, 2004). According to *socio-technical determinism,* the relationship between technology and society should be looked at as a system of equally dependent entities interacting and shaping each other (Bostrom & Heinen, 1977). Scholars adopting the *socio-technical* approach study the "bi-directionality" of the influence that exists between technology and the society they are developed and operate in (Donner & Tellez, 2008).

Different theories apply the *socio-technical* conceptual framework to study the introduction of a technology in society. One such theory is the ensemble view of technology proposed by Orlikowsiki and Iacono (2001). The ensemble view focuses on "the dynamic interaction between people and technology – whether during construction, implementation, or use in organization, or during deployment of technology in society at large" (Orlikowski & Iacono, 2001: 27). According to the ensemble view, technology is conceptualized as *"an evolving system embedded in a complex and dynamic social context. Technology is neither an independent nor dependent variable, but instead, is seen to be enmeshed with the condition of its use"* (Orlikowski & Iacono, 2001: 28).

The research question raised in this research studies the deployment of a technology in society. The "ensemble view" of Orlikowski and Iacono (2001) seems suitable for studying the dynamic relationship that exists between technology and society because it enables the researcher to view the dynamic interaction between people and technology. There are four variants of the "ensemble view" (Orikowski & Iacono, 2001). One of the four variants is the Adaptive Structuration Theory (AST) of DeSanctis and Poole (1994) which views technology as structure.

AST developed by DeSanctis and Poole (1994) originated from the Structuration Theory of Giddens (1984) to study the deployment of group decision support system (GDSS) in an organizational environment. AST views "*technology as a structure*" and states that technology is one source of structure in the interaction between people and technology

(DeSanctis & Poole, 1994). Other structures emerge as the technology interacts with its environment (DeSanctis & Poole, 1994) and there is always a mutual interplay between technology and people as they interact (DeSanctis & Poole, 1994; Orlikowski & Iacono, 2001). Like other theories which adopt *socio-technical determinism*, AST asserts that technology does not only shape the people who use it, but it is also shaped by the way it is used (Markus & Robey, 1988). This element has made AST a suitable theory to adopt for this research as the research proposes that there is a "bi-directional" influence between M-PESA and the people who use it. AST, which is discussed in detail in Chapter three of this study, is used as a conceptual lens to guide the research, fieldwork and analysis of data.

1.5. Research objectives

In order to address the problem stated in the previous section (Section 1.3), the study will pursue the following research objectives. The study aims:

- to assess existing literature on the "bi-directional " influence between people and m-banking in developing context and determine limitations in the existing pool of knowledge;
- to study M-PESA as a technology and how it evolved between 2007 and 2010;
- to show how M-PESA as a technology has influenced/changed/affected the way business is done in Kenya;
- to explain how social, economic and cultural contexts have influenced the design of M-PESA;
- to apply the adaptive Structuration Theory (AST) advanced by DeSanctis and Poole (1994); and
- to explain the "bi-directional" influence between people and technology.

Against the backdrop of these objectives, Chapter two reviews the literature on m-banking and the social, economic and cultural contexts in which it operates. At the end of that chapter, the research questions that demarcate the study are presented.

1.6. Research contribution

This research contributes to the body of knowledge in three ways. First, as discussed in the statement of the problem (Section 1.3), very little research has been done on the relationship between m-banking and the economic, social and cultural context in which it

evolves. Thus, the need for more empirical research is recognized. This research, therefore, contributes to the growing debate and commentary on various aspects of m-banking and its operational environment. By studying M-PESA use in Kenya, the study advances knowledge in two ways. First, by examining the relationship between M-PESA and different users, the research considers the linkage between M-PESA and companies (businesses). By doing so, the research makes the contribution of expanding our understanding of how M-PESA has influenced and affected the way business is done in Kenya. Secondly the research investigates how the adoption of M-PESA influenced its design and evolution.

Secondly, the research makes a contribution by presenting an interpretive case study on the topic. As noted by Orlikowski and Baroudi (1991) and Chen and Hirschheim (2004), both Interpretivism and case study research are applied when in-depth understanding of a social phenomenon is sought. This research therefore demonstrates how interpretivism and case study research can be applied to study an m-banking application. In addition, the research shows how AST, a theoretical framework which was developed to study the introduction of GDSS, can be adopted to investigate other technological deployments in society.

Finally, the research contributes to the discipline of informatics by undertaking scholarly research within the scope of the field. In view of the fact that the primary focus of informatics is to study the application of ICT in organizations and society (Avison & Elliot, 2006), this research perfectly fits in the field as it studies the application of a specific mobile banking application (M-PESA) in a developing society. As noted by Lee (2001), informatics as a discipline investigates the phenomenon of the interaction between technology and people in different social contexts. This research does exactly this: considering the interaction between M-PESA and its different users in developing country context (Kenya).

1.7. Overview of research design

1.7.1. Research paradigm

As can be noted from the research problem, this research was initiated to investigate the relationship between technology and society. The result expected from the research is an in-deep understanding of how society and technology impact each other over time.

For this reason, interpretivism has been chosen as a research paradigm. Interpretive research is used to study the application of information technology in society through "an understanding of the context of the information systems, and the process whereby the information system influences and is influenced by its context" (Walsham, 1993: 4-5). Interpretivism as a research paradigm explores and explains a real life phenomenon and the relationship of different elements within the phenomenon (Walsham, 1995). The phenomenon in this research is the adoption of M-PESA. In interpretive research, multiple views (sometimes contradicting) of different participants and the researcher are incorporated.

Finding a deep understanding of a situation instead of looking for generalizations from the settings or testing hypothesis is the most important aspect of interpretive research (Orlikowski & Baroudi, 1991). The interpretive paradigm is therefore suitable to answer "what is?" and "how does?" types of research questions which are raised in this research (Chapter two, Section 2.11), (Roode, 2008). The questions explore and explain a real life phenomenon and the relationship of different elements within the phenomenon.

1.7.2. Research strategy

Although any research strategy can be used following the interpretive paradigm, most interpretive researches adopt research strategies which engage the researchers in the real social setting, for example field studies, ethnographic studies and case studies (Chen & Hirschheim, 2004; Weber, 2004). Case study research strategy seems appropriate for this research. The reason for this choice is twofold. Firstly, case study is suitable to gain in-depth understanding of a contemporary phenomenon in its natural environment (Benbasat, et al., 1987) which correlates with the research objective of this study. Secondly, case study is suitable for supporting the philosophical paradigm selected. Case study research strategy like any other research adopting an interpretive approach engages the participants and collects data from multiple sources (Yin, 1994).

1.7.3. Data collection method

As mentioned earlier, interpretive and case study researches lend themselves to data collection methods which engage the participants. They usually incorporate qualitative data collection methods. In case study research design, multiple sources of evidence are consulted such as interviews with different participants and document analysis

(Benbasat, et al., 1987; Yin, 1994). In this research formal interviews and observation will be used as data collection methods together with document analysis.

1.7.4. Research participants

As outlined above (Section 1.1), the research is limited to the effect of M-PESA on business users. The participants of the research are accordingly users of M-PESA for business purposes. A list of M-PESA business users have been published on Safaricom's website (www.safaricom.co.ke). This is used as a basis to choose individual participants. M-PESA as an operator of the technology is also included. The participants chosen are people who deal with M-PESA in their respective organizations. The detail of the research participants is presented in Chapter five (Section 5.4).

1.7.5. Data collected

As mentioned above (Section 1.5), AST is adopted as a theoretical framework for the research. The propositions advanced by AST are employed to elicit themes. These themes together with the research questions are in turn used to prepare interview questions. Qualitative type of data is collected using the interview questions in semi-structured interviews with different participants. The type of questions raised for M-PESA partners address the reasons why the target organizations decided to use M-PESA services, for what purpose they have been using it, how the use of M-PESA affected their business, what unintended consequence it has had on their business and in what ways they have influenced the design of M-PESA. For the providers of the technology, the interview questions enquired how Safaricom decided to introduce new services, how it elicited requirement from users, and how the usage affected the type of service they provide.

1.7.6. Data analysis

The qualitative data that was gathered from the interviews was analyzed using Diachronic Analysis which is utilized by DeSanctis and Poole (1994). This study followed the three steps of analysis proposed by DeSantis and Poole (1994). The first step in diachronic analysis is to state the inherent structure the technology brought to the interaction (DeSanctis & Poole, 1994). The second step is to list other structures and sources of structures resulting from the environment and the task during the interaction. The third step is to do text analysis on the data gathered and observe the relationship between the elements identified in step one and two.

1.7.7. Expected challenges and limitations

One of the challenges of undertaking case study research is that expected participants may not be willing to participant in the study (Darke, et al., 1998). For this study, some potential informants who were contacted for an interview declined to participate for various reasons ranging from company policies to lack of time. Such people were replaced with alternative informants with a view of bringing similar perspectives on board. This research therefore focused on participants that were willing and able to provide the most appropriate and useful data for answering the research questions. The second problem relates the over enthusiasm about the success of M-PESA in Kenya. This view appeared to be held by almost all users of the services. This tends to prevent participants from critically evaluating the technology in a manner that leads to the discovery of any shortcomings of M-PESA. Thirdly, undertaking interpretive case study limits the researcher to a small pool of informants as a source of information. This may lead to important perspectives from a broad spectrum of users being excluded from the research. Finally, although effort has been made to draw research participants from a pool of users as diverse as possible, they may not be representative of all the users. However, the aim of interpretivist case study research is in-depth inquiry into a situation rather than generalizability and therefore representativeness is not a major limitation (Walsham, 1995; Klein & Myers, 1999).

1.8. Overview of chapters

The rest of this research is organized as follows. Chapter two comprises the literature review. The purpose of the chapter is to set the foundation for subsequent chapters by exploring related literature and identifying knowledge gaps that might exist. It begins with a preliminary literature search that describes the procedure used in locating relevant works. The following five sections of that chapter examine general m-banking concepts such as definition, history, and advantages of mobile banking. M-PESA as a mobile banking application and its evolution are covered in the subsequent two sections. The research questions for this study are then presented before finalizing the section with a conclusion.

Chapter three presents a detailed discussion of the selected theoretical framework to investigate the relationship between people and technology. Three major frameworks which are widely used to study the interaction of people and technology are considered.

From the three frameworks, this chapter in particular considers the Adaptive Structuration Theory which is an instance of *socio-technological* determinism framework. In addition, the reason for choosing AST for this study and theoretical constraints are presented.

Chapter four is a detailed discussion on adapting the theoretical framework (AST) to the technology considered (M-PESA). Propositions suggested in Chapter three are utilized to discuss the features of M-PESA. The main objective of the chapter is to elicit themes from the propositions of AST and M-PESA which in turn guide the empirical research.

Chapter five provides a detailed discussion of the research methodology used in this research. The chapter covers research design concepts like research paradigm, research strategy, research participants, data collection and methods of analysis. Further, the chapter considers challenges faced during the research together with the biases and limitations of the research.

Chapter six presents the research results in detail. The findings of the research from the empirical data gathered are presented together with data obtained from documents and observation. The propositions suggested in Chapter three and themes developed in Chapter four are used to organize the results.

Chapter seven concludes the study by summarizing the main points discussed throughout the study. It presents the key results of the research and answers the main research question. The chapter ends by highlighting the contribution of the research and flags future areas of research.

1.9. Conclusion

This chapter presents a brief background to the study, the problem statement, and research question of the research. The conceptual framework, research contribution and research design are also laid out. Furthermore, a brief outline of the remaining chapters is provided. The next chapter is an extensive literature review exploring concepts which are central to the study.

CHAPTER TWO: LITERATURE REVIEW

2.1. Chapter overview

In Chapter one, the problem statement and the research questions this study attempts to answer were discussed. A general outline of the research was also presented. This chapter reviews existing literature on mobile banking and related concepts to provide background to the study and show gaps in the existing pool of knowledge.

The chapter sets the foundation for subsequent chapters by discussing the expansion of mobile phones, defining what mobile banking is, and explaining the role of m-banking in reaching people who were previously excluded from financial services. Further explored in this chapter is the mobile banking application under consideration. The history and different services M-PESA provides are investigated in detail.

At the end of the chapter, the research questions are articulated and partly answered from the literature review. The questions that remained unanswered are also laid out. The need for more empirical research and theoretical framework is recognized.

2.2. Preliminary literature search

The purpose of a literature review goes beyond summarizing who said what. Good literature reviews show gaps in the existing pool of knowledge and justifies the need to undertake the research (Roode, 2008). In view of this, this review attempts to set the context for this research from existing literature, indicate any gaps that exist in the literature and justifies the contribution made by this research.

The basic themes for the literature review are to:

1. gain an understanding of mobile banking and related studies.
2. determine studies done in mobile banking in various disciplines and discover any existing gaps.
3. review research done on the introduction of mobile banking to society and the reaction thereof.
4. outline and review the different theoretical frameworks used to study the relationship of mobile banking and people (Chapter three).

5. investigate the kind of research approaches used in the mobile banking in different fields (Chapter three).
6. determine how AST or other *socio-technical* theories have been used as frameworks in studies done on m-banking and other m-technology (Chapter three).

The first step taken to collect relevant literature was to gain insight into mobile banking by reading different non-academic sources like newspapers, blogs, and Wikipedia (www.wikipedia.com). After this, different methods were used to collect relevant academic literature. Academic databases which publish information systems research were searched using key terms related to mobile banking. These databases include ACM, Business Premier, ScienceDirect, Emerald Insight, EBSCOhost and Google Scholar. In addition to these databases, Mobile Business Literature (www.M-lit.org), a search engine dedicated to mobile technology related academic literature and run by University of Victoria Wellington was used. Conference Proceedings especially from the *International Conference on Mobile Business* from 2005-2009 were also considered.

In addition to the databases, two articles (Donner, 2008; Duncombe & Boateng, 2009) which review literature on mobile phone use and financial services were used to locate relevant articles. The article of Duncombe and Boateng (2009) was especially useful in classifying the articles into different themes. The references found in different articles were also used to find articles which are not included in the initial database search. ISI Web of Knowledge and Google Scholar were used to gauge the relevance of some of the articles. ISI Web of Knowledge was particularly useful when choosing the appropriate theoretical framework.

For current trends in mobile banking, some blogs and websites (www.valuablebits.com, www.mbanking.blogspot.com, http://mobilemoneyafrica.com/, www.cgap.org) which deal with mobile banking were followed throughout the study. Safaricom's (M-PESA's parent company) website has been used to gain more understanding about the technology. As noted in Chapter one (Section 1.3), academic literature on the use of mobile banking in the developing world is scarce (Donner, 2008).Thus, it was found necessary to use other sources of information. This included reports, newspapers and surveys from different sources. This is especially true for current statistical data.

Different key words are used to explain mobile banking. The key terms used to search through different sources have therefore included all of them. Some of the key terms used include mobile banking, m-banking, mobile payment, mobile transfer, mobile money, M-PESA, Kenya, and different combinations of these terms. The results of these literature searches are discussed in this and subsequent chapters.

2.3. Expansion of mobile phone technology

Since the introduction of mobile phones in the 1950s in Europe, Japan and the US (Dunnewijk & Hulten, 2006), the mobile phone has spread remarkably fast in the world becoming the fastest spreading technology in the history of humankind (Castells et al., 2007; Camner & Sjöblom, 2009a; Jack & Suri, 2009). By the year 2002, the total number of mobile (cellular) phones worldwide exceeded the number of landlines (Donner, 2008). The mobile phone penetration in some countries in Europe and China has surpassed the rate of 100%. It has been growing rapidly in the rest of the world as well.

There are various reasons for the rapid expansion of mobile telephone in the world. The first one is the liberalization of the market inviting new entrants to the market (Dunnewijk & Hulten, 2006). The rapid adoption of mobile telephony in the developing world can be attributed to "combination of low infrastructure costs, the rise of pre-paid service, the decrease in handset prices, and the privatization of mobile phone service" (Must & Ludewig, 2010:27).

Other reasons for rapid expansion of mobile technology include:

- Mobile phones enable people to stay with each other almost anywhere, anytime (Kumar, 2004). Mobile phones provide the ability to move with the person and provide service while on the move. As long as users are within the range of the network coverage, mobile phones are time and space independent (Suoranta, 2003).
- The freeing of the telecommunications industry from government monopolies through market liberalization. This has opened the door for competition and allowed multi-national companies to operate in different countries (Hamilton, 2003).
- The increased innovation in the industry which increased the speed of connection and lowered prices.

- Increased accessibility and affordability of the mobile communication. Broadband access and satellite communication which reduced the rate of connection have contributed to its widespread use (Ling, 2004).
- Low penetration of fixed line phones in the Africa and in the whole of the developing world. According to ITU (2007) only 3 people per 100 inhabitants have access to fixed lines in Africa. This has made mobile phone the only viable alternative available for communication hence, their quick adoption in the developing world.
- Pay as you go/prepaid schemas with no need for subscription and monthly payments have made managing money easier (Minges, 1999; Ling, 2004).
- Convenience of telecom operators who use a network of independent retailers to sell small denomination prepaid vouchers for small commission which can be used to recharge phones. This has made it easier to access the prepaid cards even in remote areas (Must & Ludewig, 2010).
- Decreased price of mobile handsets and the decrease in their size has contributed to the expansion of their use. Mobile handset manufacturers quickly realized there is a need for affordable, basic mobile handset in the developing world. The cost of a basic mobile handset now costs around KES 1600 (ZAR 160), (Ling, 2004; Must & Ludewig, 2010).

All these factors have significantly contributed to wide use of mobile phones. Most of mobile network operators provide their services on 2G and 2.5G networks while some of them also have 3G services. The easy accessibility of mobile networks has introduced mobile phones to first time phone users and the trend looks likely to continue. Mobile phones are becoming an integrated part of the daily life of more people each day (Duncombe & Boateng, 2009). As part of our day to day life, mobile phones have the potential to be used beyond their primary use of making voice calls.

2.4. Introduction to mobile technologies and m-banking

Once considered luxury items, mobile phones have now become an integral part of everyday life for many people. There have been wide spread uses of mobile phones in the last two decades making it the fastest spreading technology in human history (Castells et al., 2006; Camner & Sjöblom, 2009a;Jack & Suri, 2009). ITU (2010) predicted that by the end of 2010, there would be 5 billion mobile users in the world.

That is approximately 80% of the world's population. It is true there are huge regional imbalances. Until recently, the rate of mobile phones diffusion has been more rapid in the developed world and China. For example, the penetration rate of mobile phones has surpassed the rate of 100% in Europe. By contrast, only 1 in 3 people have access to mobile phone in South Asia while the figure is only 1 in 4 people in Africa (ITU, 2010). Although the number of people with access to mobile phones is still small, there has been a rapid growth in the mobile phone use in the developing countries in recent years as well (ITU, 2007).

According to the Nobel Prize winner and development economist Jeffrey Sachs, mobile phones have become "the single most transformative technology for development in the world" (Must & Ludewig, 2010: 27). Mobile phones facilitate social and economic development through increased access to information, people and services like health, education and market information (Must & Ludewig, 2010). For example in India and Niger, mobile connectivity has lowered the price variation in fishing and grain market respectively (Jenson, 2007; Must & Ludewig, 2010). In both cases, fishermen and farmers were able to gain appropriate information on where to sell and how much to sell their products enabling them to increase their profit while reducing prices for consumers.

As mentioned in Chapter one, mobile phones are being used to deliver value added services beyond voice call and SMS. One of these innovative services that can be delivered through mobile phones is mobile banking (M-banking). M-banking is provision of financial service through mobile phones by electronically storing money and allowing payment for goods and services (Must & Ludewig, 2010). M-Banking can provide affordable and secure financial services like transferring, depositing and withdrawing money especially for people who were formerly outside the formal banking (Bangens & Soderberg, 2008; Ghosh, 2010). There are more people with mobile connection than bank accounts in the developing world (Porteous, 2006; Mehdi et al., 2009; Ghosh, 2010). Thus, by using M-banking, more people can access banking and other financial services (Morawczynski & Miscione, 2008). These m-banking services include person-to-person transfers, long-distance remittance, micro-payments, loans and savings using mobile phones (Donner & Tellez, 2008).

The potential of m-banking to provide services for the poor has motivated governments, donors, banks and mobile network operators to create different mobile banking services throughout the world. As at 2009, there were about 120 mobile banking projects in the world (Heyer & Mas, 2009). It has taken root in Kenya (M-Pesa, AirTel Money, Orange Money and yuCash), South Africa (WIZZIT, MTN Money, and ABSA), India (Eko), and the Philippines (GCash and Smart Money), (Medhi et al., 2009; Ouma, 2010).

The main objective of most of these mobile banking initiatives is to provide affordable financial services for people who were formerly outside of the formal banking sector (the unbanked), (Porteous, 2006). In doing so, they are believed to contribute to the alleviation of poverty in poor countries as access to basic financial services is key to fighting poverty (Williams & Torma, 2007). In the process of providing financial services for the unbanked, other unforeseen occurrences are happening. In some cases, mobile banking is providing new ways of delivering services and new ways of doing business through providing alternative to cash payment methods, debit and credit cards.

As indicated in Chapter one, the purpose of this research is to look into a mobile banking application called M-PESA in Kenya and how it has evolved over a period of three years (2007-2010) from person-to-person money transfer method to a service with a wide range of applications such as bill payment, ATM withdrawal, bulk payment and others. The next section discusses the concept of mobile banking.

2.5. Definition of mobile banking

There are different terminologies used to describe m-banking. Some of these terms include m-money, m-payment, m-transfers, and m-finance. There are slight differences to what each one of them means, but most of the services overlap with others. In this paper, only the term m-banking is used. Different scholars have given fairly different definitions to what m-banking is:

Donner (2008) has defined m-banking as *"a set of applications that enable people to use their mobile telephones to manipulate their bank accounts, store value in an account linked to their handsets, transfer funds, or even access credit or insurance products."* (Donner, 2008:319-320).

Barnes and Corbitt (2003) define mobile banking as "*a channel whereby the customer interacts with a bank via a mobile device such as mobile phone or personal digital assistant (PDA).* " (Barnes & Corbitt, 2003:275). This definition mainly describes additive types of mobile banking.

Porteous (2006) has given a slightly different definition. He defines m-payment as: "*financial transactions undertaken using mobile device such as a mobile phone. Mobile banking (m-banking) includes m-payments but involves access by mobile device to the broader range of banking services, such as account-based savings or products offered by banks. M-payments and m-banking are themselves subsets of the broader domains of e-payments and e-banking respectively*." (Porteous, 2006: 3).

Morawczynski & Miscione (2008) on the other hand define m-banking as "*a platform to deliver financial services via the mobile phone. … M-banking facilitates branchless banking via the mobile phone. M-banking applications facilitates numerous financial services such as checking account balances, making deposits and withdrawals, transferring money and phone credit [air time] to other users" (*Morawczynski & Miscione, 2008: 288).

Dahlberg et al., (2008) note that mobile payments are "*payments for goods, services, and bills with a mobile device (such as a mobile phone, smart-phone, or personal digital assistant (PDA)) by taking advantage of wireless and other communication technologies*" (Dahlberg et al., 2008: 165).

Bangens and Söderberg (2008) describe m-banking *as "financial services delivered via mobile networks and performed on a mobile phone*" (Bangens & Soderberg, 2008:14).

Must and Ludewig (2010) conceive of M-banking as "*an innovative financial service delivered through mobile phones by electronically storing money and allowing paying for goods and services via SMS"* (Must & Ludewig, 2010: 27).

All the above definitions although slightly different in terminology have the combination of "mobile phone technology" with "financial services" in common. Based on the above

definitions, and for the purpose of this thesis, the following summary of m-banking is put forward:

- Provision of financial services that include:
    - Opening a real or virtual bank account
    - Depositing money into the account (changing cash to mobile or e-money/e-float)
    - Withdrawing money (changing e-money/e-float into cash)
    - Transferring money into other accounts
    - Making payments for bills
    - Getting additional financial services like loans and insurance
    - Checking balances
    - Other administrative tasks like changing PINs
- The service is primarily provided through mobile phones.

It has to be noted that not all m-banking applications provide all of the above services nor is the list exhaustive. Some m-banking applications such as M-PESA provided only three services when it was launched, i.e. depositing and withdrawal of money into and from an account, money transfer and purchasing of airtime (Hughes & Lonie, 2009). M-PESA has however evolved through time to encompass other services, including loans and insurance services (Safaricom, 2009). The next section will look at the different types of m-banking applications.

2.6. Types of mobile banking

2.6.1. Bank-led, telecom-led and independent initiatives

M-Banking initiatives can be championed by different parties like banks, mobile network operators or independent entrepreneurs. Some of the m-banking applications are provided solely by banks. In South Africa for example, First National Bank (FNB), ABSA and Nedbank provide m-banking services to their customers (Bangens & Soderberg, 2008). The second type of m-banking is telecom-led. This is primarily led by the mobile network operators (Bangens & Soderberg, 2008). Telecom-led m-banking usually partner with banks to provide liquidity and other expertise needed at the back-end (Hughes & Lonie, 2009). The telecom company also partners with agents to provide cash-in and cash-out points. M-PESA is an example of a telecom-led m-banking (Bangens & Soderberg, 2008). It is run by Safaricom (mobile network operator) in

partnership with tens of thousands of independent agents (Hughes & Lonie, 2009). Commercial Bank of Africa provides the banking service needed for the application. The third type of m-banking is provided by independent entrepreneurs (Bangens & Soderberg, 2008). They usually work with banks to provide the back-end financial facilities. WIZZIT in South Africa provides services in conjunction with all three mobile network operators (Vodacom, MTN and Cell C). The service is provided together with the Bank of Athens (Bangens & Soderberg, 2008).

2.6.2. Additive and transformational mobile banking

Based on the type of customer an m-banking application targets, Porteous (2006) divides m-banking into additive and transformational m-banking. As the name suggests, additive m-banking is an extension of the traditional branch-based banks (Luarn & Lin, 2009). Using additive banking, people can manipulate their existing accounts using their mobile phones. The main reason for the introduction of this kind of m-banking is to give customers the convenience of mobile phones (Donner, 2007). It targets people who already have bank accounts (Porteous, 2006). Additive m-banking applications were the first to be introduced and are very common in the developed world (Donner, 2007).

The other type of mobile banking is transformational mobile banking. The intention of transformational m-banking is to provide financial service for unbanked and under banked segment of the population (Porteous, 2006). Having an actual bank account is often not required to subscribe to this type of mobile banking (Mehdi et al., 2009). It is believed transformational m-banking can attract poorer segments of the population and people from rural areas (Bangens & Söderberg, 2008). Transformational m-banking is more appealing to people in developing countries as the need for mobile banking in these countries emanates from the lack of access to formal banking infrastructure rather than supplementing it. The appeal of mobile banking is its affordability and access (Porteous, 2006; Maurer, 2008). M-banking, in this case, replaces the formal banking system rather than convenience (Cracknell, 2004; Donner, 2007).

2.6.3. The value of transformational m-banking

Access to basic financial services like savings, credit, insurance and money transfer is a very crucial factor in the fight against poverty (Williams & Torma, 2007). Providing a range of financial services to the unbanked increases their involvement in the formal economy and, hence their inclusion in the process of economic development (Williams &

Torma, 2007). Traditional banks have been offering these services for a long time now. Their services, however, have been inaccessible for the poor in urban areas and people in the rural settings (Maurer, 2008). The reasons for this are manifold. First, most traditional banks are confined in cities and towns making them unreachable for the majority of the rural people (Williams & Torma, 2007). Second, traditional banks are unaffordable to people with lower incomes with their high transactional cost, and requirement for minimum balance (Maurer, 2008). This has forced many people to be left outside of the formal financial sector.

To address their financial needs, poor people depend on informal and semi-formal forms of financial services (Camner & Sjoblom, 2009b). Micro-finance institutions (MFI) are semi-formal entities which provide financial services for micro, small and medium sized enterprises and individuals (Williams & Torma, 2009). They play an important role in providing credit services for the poor who ca not be served by conventional banks, but their services are usually limited to providing credit and serve a small number of people (Williams & Torma, 2009). The main obstacle for the expansion of MFIs is the high interest rate they charge (Must & Ludewig, 2010).

In addition to MFIs, people also use their social networks to save money and get credit. Rotating savings (for example: *stokvel* in South Africa, and *chamas* in Kenya) are informal savings where members contribute money weekly or monthly and one of them takes the collected money (Vaughan, 2007). Here, trust and social relationships among members is vital to ensure there are no defaults. Home banks or “under the mattress” savings are also famous forms of depositing money (Mas & Morawczynski, 2009; Williams & Torma, 2009). These informal financial services have their own shortcomings. “Under the mattress” saving options are not safe. Default of contribution is also a very common in rotating savings.

Besides providing saving and credit facilities, banks also engage in money transfers. These money transfer services are very important for remittance purposes both locally and internationally. Lives of many people in rural areas entirely or partly depend on the money sent to them from their relatives working in cities (Morawczynski, 2009). Other than banks, money transfer services like Western Union and Money Gram also engage in transferring money (Mas & Morawczynski, 2009). The most popular forms of sending

money in the developing world however are thorough friends and family, public transport companies and the post office (Morawczynski, 2009). As most banks and money transfer services are situated in cities and towns, they are not easily accessible to rural people. Furthermore, they are very expensive, charging sometimes as much as 10% (Vaughan, 2007). Transport companies are not licensed to transfer money and people send the money disguising it as a parcel (Morawczynski, 2009). The risk of losing the money is therefore high. Sending through friends and family is also not a regular service, making sending money very difficult (Morawczynski, 2009).

M-banking and other electronic banking methods have been suggested as a way of tackling the numerous difficulties faced by traditional banking systems (Maurer, 2008). It is believed that m-banking has the potential to provide financial services to people who were formerly outside the formal banking sector, the unbanked (Bangens & Soderberg, 2008; Ghosh, 2010). M-Banking can provide affordable and secure financial services like transferring, depositing and withdrawing money. Mobile banking can reach those people who do not have access to the formal financial sector, branch based banks, and those who live mainly in the cash based economy. There are more people with mobile connections than bank accounts in the developing world (Porteous, 2006; Mehdi, et al., 2009; Ghosh, 2010). According to estimates, there are around 1 billion bank account holders in the world while there are more than 4.6 billion mobile phone subscribers (ITU, 2010). Some of these banking services that can be provided through mobile phones include person-to-person transfers, long-distance remittance, micro-payments, loans and savings among others (Donner & Tellez, 2008).

There are a wide range of reasons to use mobile phones to deliver financial service for the previously unbanked. Branch based brick and mortar banks have failed to deliver banking services for the poor who live in rural places. There is a huge market gap in the financial sector in the developing world (Bangens & Soderber, 2008). The business model of most traditional banks targets a smaller number of high value transaction/ endeavors with high profit margin, while telecom services collect small profits from a lot of small value transaction with each transaction being profitable by itself (Hughes & Lonie, 2009). Thus, it is not profitable for banks to open up branches in rural or urban poor neighborhoods as most of the transactions are not of high value. Especially in rural areas, the population density is low which makes it expensive to open bank branches

(Bangens & Soderber, 2008). Mobile banking can reduce the cost of providing financial services for both the customer and the provider (Porteous, 2006) as mobile network operators already have a presence in these places and can easily serve the unbanked with the right m-banking application (FinAccess, 2007).

Mobile banking applications which are implemented in different countries are already impacting the lives of poor people (Must & Ludewig, 2010). For instance, G-cash a mobile banking application in the Philippines has enabled dwellers of remote islands to send and receive money using their mobile phones which has eliminated the need to travel long distances to a bank branch, in effect reducing the cost of accessing their money (Maurer, 2008) This is evidence that m-banking can promote economic development by making money exchange easier (Must & Ludewig, 2010).

2.7. History of mobile banking

The first mobile banking applications started in Finland as early as 1992 (Barnes & Corbitt, 2003). Using the application, mobile users could check their balance and pay bills using their mobile phones which were attached to their bank accounts. In Japan, the first formal mobile banking was launched in 2002 by NTT DoCoMo, a major mobile network operator (Kumar, 2004). The service allows users to deposit and withdraw cash from a convenience store or a supermarket using their mobile phones. M-payment, which allows person-to-person and person-to-business transfer of money using mobile phones, started in London in 2003 by Magex, a London based mobile payment technology company. In Europe, almost 60% of banks offer mobile banking services (Barnes & Corbitt, 2003). Most of these services are additive type of mobile banking which provide a new channel to manipulate an already existing bank account.

Before formal m-banking endeavors became widespread, there were some informal mobile banking applications in some parts of the world, especially in the developing world. For instance, people in Uganda were using prepaid airtime as a way to transfer money from cities and towns to villages in a system they called *Sente* (Chipchase & Tulusan, 2006). This system worked as follows: when someone in town wants to send money to their relatives in the country side, they buy the equivalent prepaid airtime credit with the money. Instead of recharging their phone with the airtime, they call a retailer in the village and read out the number. The retailer, usually a reseller of prepaid card who

runs a small shop recharges his phone and gives the money to the intended receiver minus some commission (Donner, 2007).

The system (*Sente*) has proven to be of great relevance in a country with little access to formal banks (Chipchase & Tulusan, 2006). Compared to other ways of sending money like formal banks and through people who are traveling, this system proved to be safer, faster and cheaper. The risk of theft is also reduced as money is not physically carried. Besides, the receiver only needs access to a retailer and not a formal bank. Similarly in Kenya and Tanzania, people were sending airtime as a way to send money to their relatives (Camner & Sjoblom, 2009b; Morawczynski, 2009). But *Sente* and similar systems were not without their own shortcomings. The system is purely built on trust between sender, retailer (corner shop or *kiosk* owner) and receiver (Donner, 2007). There is neither receipt nor confirmation if and when the money has been received. The transaction cost is also high. Some kiosk operators charge as much as 30% of the money sent (Chipchase & Tulusan, 2006). In the same way, in Nigeria mobile airtime was treated as quasi-currency which can be traded back into money, used as a form of saving for future use and bartered for other items (Porteous, 2006; Donner, 2007).

It is thus clear that the need for mobile banking/money existed way before the introduction of formal mobile banking services. This need has spurred different stakeholders to consider providing mobile banking services. As mentioned earlier, there are around 120 mobile money ventures in the world (Heyer & Mas, 2009). One of these mobile banking services is M-PESA. Section 2.9 will delve deeper into M-PESA solution.

2.8. Policy and regulatory framework

Even though mobile phones have huge potential to provide banking for unbanked people, providing financial services through mobile phones has its challenges. One of the major challenges faced by mobile banking is the policy and legal framework under which they operate. Regulation in m-banking is very important for all parties involved in the process for various reasons. Firstly, m-banking is a new and fast evolving phenomenon overlapping different sectors of the regulatory domains like telecom, banking, money transfer and customer protection, thus a clear policy is required to regulate its operation (Porteous, 2006). Secondly, the sector encompasses different stakeholders including mobile network operators, commercial banks, customers, agents,

mobile device manufacturers, other financial service providers, software developers and the regulator (government) (Au & Kauffman, 2008). Comprehensive regulations detailing their rights and responsibility are needed to make the interactions between these stakeholders smooth. Thirdly, m-banking as an application of financial services faces concerns like clearing, settlement, possibility of money laundering, electronic money making, and know-your-customer concerns (KYC) (Maurer, 2008). As any other financial services provider, m-banking is expected to control the movement of cash to avoid money laundering opportunities (Saji, 2008). M-banking services have to comply with their country and international anti-money laundering (AML) mechanisms (Bangens & Söderberg, 2008).

Countries have adopted different regulatory measures to tackle these problems. The different areas of concern span allowing telecoms to provide financial services, issuing electronic money, opening bank accounts, accepting deposits, limiting the amount of transactions through mobile phones and authorizing agents to do banking services, etc (Maurer,2008). The first issue faced by m-banking solutions is that telecoms are not licensed to provide financial services in many countries (Hughes & Lonie, 2009). Provision of financial services is restricted only to regulated banks and micro finance institutions. The other question concerning m-banking is issuing of electronic money. In South Africa, for example, only banks can issue electronic money. This has forced m-banking providers to work with traditional banks (Porteous, 2006). In Kenya, M-PESA can issue electronic money while storing the same amount of money in a bank in a trust account (Hughes & Lonie, 2009). This has reduced the need to work with traditional banks. In most countries, there is a limit to the amount of money that can be transferred through m-banking in one transaction or within a day in effort to control money laundering (Mas & Radcliffe, 2010). In the case of M-PESA, the maximum amount of money that can be transferred had been initially limited to KES 35,000 (around ZAR 3,500) per transaction and KES 70,000 (ZAR 7,000) per day. This was changed in early 2011 when transfers per transaction increased to a maximum KES 70,000 (around ZAR 7,000) and the daily cap of KES 140,000 (ZAR 14,000) was removed.

The fourth issue in regulating m-banking is the role of agents in mobile banking. In some countries like Brazil and India, it is only recently that non-bank agents could open bank accounts for users as a part of KYC schema (Must & Ludewig, 2010; Pickens et al.,

2009). This measure is meant to protect customers from any kind fraud and other criminal activities (Porteous, 2006) but it also makes it difficult for users to open accounts. Appropriate regulation is important for the smooth operation of m-banking services. The regulatory frameworks substantially differ from country to country (Must & Ludewig, 2010). There is no single solution for regulating mobile banking but the environment must be conducive enough for expansion of mobile banking and strict enough to prevent fraud, money laundering or any other crime that can be committed (Must & Ludewig, 2010). It has to be clear enough to avoid any confusion that may arise during m-banking processes. There should also be sufficient legal certainty and clarity to allow creativity and investment from the private sector (Porteous, 2006).

2.9. M-PESA in Kenya

M-PESA is the first mobile banking service in Kenya and is operated by Safaricom, the largest mobile network provider in the country (80% of the mobile telecommunications market). The M-PESA service was officially launched in 2007. Within three years of its rollout, M-PESA has reached 12 million active subscribers (Safaricom, 2010a). During the first year of its introduction over 9 billion KES (around ZAR 900 million) was transferred through the system (Morawczynski & Miscione, 2008). From its launch in 2007 to July 2010, M-PESA has been used to transfer money worth KES 525.84 billion (around ZAR 52.8 billion), (Safaricom, 2010a).

There are three other mobile banking solutions operated by mobile network providers in Kenya. The second entrant to the m-banking market, AirTel Money, provided by AirTel the second largest telecom provider. It has a subscriber base of 400,000 (Ouma, 2010). The third entrant to the market is Yucash provided by Yu (another mobile network operator (MNO)). Yucash now has a customer base of 300,000. The latest entrant to the market is Orange Cash which is operated by Orange MNO. M-PESA has by far the largest customer base and the most widespread use. The following sections will focus on M-PESA.

2.9.1. History of M-PESA

As mentioned in Chapter one, M-PESA was introduced in Kenya in March 2007 by Safaricom Ltd in collaboration with the Vodafone Group. Safaricom is in charge of handling the operation in Kenya while Vodafone owns the technology. The main objective of M-PESA is to provide banking service for the unbanked (Hughes & Lonie,

2009).The pilot project was public-private partnership co-funded by Vodafone and the UK Department for International Development (DFID). It appears that Vodafone was reluctant to fully invest in the product because of its novelty and the fact that it was not seen as profitable enough for the Vodafone Group (Porteous, 2006; Morawczynski & Miscione, 2008; Hughes & Lonie, 2009;). DFID's interest in financing M-PESA derived from the thinking that the product would help in achieving the twin goals of helping the poor get formal banking services as well as alleviate poverty.

The pilot project started in 2005 with eight agent stores which were also Safaricom airtime dealers and 500 clients (Hughes & Lonie, 2009). The eight agents are outlets where people can deposit and withdraw money from their accounts (Hughes & Lonie, 2009). The m-banking works on SMS based technology which is already supported on the GSM network Safaricom provides. An application accessible from the menu is built onto the SIM kit which enables users to manipulate their account from their mobile handset. The pilot system was mainly designed to enable users to repay their loans received from micro-finance institutions. The 500 clients who participated in the pilot project were all therefore customers of a micro-finance institution named Faulu. The system allowed those participants to receive and repay their loans to Faulu. M-PESA integrated its system with Faulu, so that Faulu could get paid its money through its M-PESA account. In addition to repaying their loans, users could also send money through person-to-person transfer between participants, buy Safaricom airtime for themselves and others, and withdraw and deposit money.

The pilot project faced some challenges. The first challenge related to agents. Agents found it difficult to trust the system in the beginning and refused to make payments to customers (Vauguhan, 2007; Hughes & Lonie, 2009). The second challenge was system-related. Many users found it difficult to manipulate the system even after repeated trainings (Hughes & Lonie, 2009). Although faced with these challenges, the pilot continued until May 2006. The main purpose of the pilot project was to enable people to repay their loans to the MFI. But it was discovered that people were using the M-PESA for purposes other than repaying their loan. People in the pilot project used M-PESA to (Hughes & Lonie, 2009:76):

- Make payments. Money in M-PESA account was transferred to businesses (owned by participants) in exchange for goods and services.

- Sell airtime to other users. People sold airtime from their M-PESA account to other users (Airtime bought through M-PESA were sold at 5% discount than scratch cards).

- As safe deposit when traveling. To reduce the probability of theft, people moving between pilot areas deposit money at one end and withdraw it at the other end instead of physically carrying the money.

- As an overnight safe. Business people in pilot project started using M-PESA to deposit money at night and withdraw the money in the morning. M-PESA agents were closed later than bank branches and provided services for longer hours than banks.

M-PESA provided a lot of convenience and security for the people involved in the pilot project to repay their loans. But it was not very good for the MFI-Faulu. The institution kept a manual record and reconciling that with M-PESA account was not easy (Hughes & Lonie, 2009). Besides, Faulu used to hold mandatory weekly meetings with its customers where social relationships were built among members and contributions were collected (Camner & Sjoblom, 2009b). Once people started paying their contribution through M-PESA, they found little motivation to attend the meetings and the number of participants in the meetings eventually reduced (Camner & Sjoblom, 2009b). These two reasons have finally forced M-PESA to abandon the loan repayment application and focus on person-to-person money transfer (Hughes & Lonie, 2009). Other than that, the pilot project proved to be successful providing individuals an opportunity to manage their personal finances (Hughes & Lonie, 2009).

In March 2007, M-PESA was launched nationwide as a money transfer method. The first catchphrase used to promote the service was "*Send Money Home*" (Camner & Sjoblom, 2009b). This appealed to many Kenyans as there are many immigrant workers in cities and towns who need money transfer services to send money to their family upcountry. Since its introduction in 2007, M-PESA has grown astronomically. Its level of penetration of 12 million is unseen in mobile based service outside of voice and text messaging (Mas & Morawczynski, 2009).

2.9.2. Description of M-PESA services

Most m-banking services enable users to basically do three things (Donner & Tellez, 2008: 320):

a. Open an m-banking account which can be manipulated from a mobile phone. Some of the m-banking services provide virtual bank accounts for users who do not have bank accounts while users with bank account link their bank accounts with their mobile phones.
b. Convert cash in and out of the account. Users can visit m-banking agents, usually retailers of mobile airtimes to withdraw and deposit money into their accounts. Some other m-banking services allow depositing of money in bank branches as well as withdrawal from ATMs.
c. Transfer money from one account into another. This can be person-to-person transfer, long distance remittance, person-to-business transfers or payments, and purchase of airtime.

In addition to these services, m-banking applications have administrative tools which allow users to manage their accounts like checking their balance, changing security measures, etc (Donner & Tellez, 2008). Some m-banking applications open doors to more financial services like savings, loans and insurance.

M-PESA provides all the above mentioned services of mobile banking. In order to get the services, customers must first be users of the Safaricom mobile network before registering for the M-PESA services. The only exception to this is receiving money through M-PESA. Users of other mobile networks and un-registered Safaricom users can receive and withdraw money sent to them from M-PESA account subscribers. Registration for M-PESA services can be done with the 19,000 authorized M-PESA agents located all over the country (Mas & Radcliffe, 2010). A new Safaricom SIM is provided when registering for M-PESA service if a user is a new subscriber to Safaricom. Registration is free of charge. Users are required to produce an ID or other forms of identification for registration. The details of the user are entered to the agent's phone instantaneously. After the registration, users are provided with an electronic money account which is accessible through their mobile phone by a SIM-resident application (Mas & Morawczynski, 2009; Mas & Radcliffe, 2010).

Upon registration, customers can deposit and withdraw money from their accounts by visiting a registered M-PESA agents and ATMs. Most of the M-PESA agents were previously resellers of Safaricom pre-paid vouchers and are spread throughout the country (Mas & Morawczynski, 2009). Depositing and withdrawing money is similar to topping up a mobile phone with pre-paid airtime (Vaughan, 2007). The user identifier is the mobile phone number and withdrawing and depositing money can be done through the numerous independent agents.

E-float is the term used to describe the electronic M-PESA balance stored in the user's account and is measured in the same units as the currency (Jack & Suri, 2009). The mobile accounts of users are managed by Safaricom, which deposits the equivalent real money in a pooled account in a regulated bank (Mas & Morawczynski, 2009). The money is deposited in Commercial Bank of Africa (CBA) and other commercial banks on behalf of its customers (Hughes & Lonie, 2009; Mas & Morawczynski, 2009). The CBA provides any conventional banking services required for M-PESA (Hughes & Lonie, 2009). The money deposited in M-PESA accounts does not earn any interest (Mas & Radcliffe, 2010).

Once users have registered and deposited money in their accounts, they can use their mobile phones to send money to anyone with a mobile phone in Kenya (Vaughan, 2007). The receiver is notified by an SMS about the money received which he/she can take to an agent to withdraw the money. This has made the person-to-person money transfer instantaneous over large areas (Vaughan, 2007). Other than the person-to-person money transfer, M-PESA allows users to pay bills like electricity, and university fees, buy Safaricom pre-paid airtime for their phone or others, pay for goods and check their balances. All of these M-PESA transactions are registered and authorized by Safaricom in real-time (Hughes & Lonie, 2009).

The regulatory framework M-PESA operates in seems more open to m-banking compared to other countries (Porteous, 2006). When M-PESA was launched, Safaricom had to negotiate a special deal with Central bank of Kenya to start operation (Hughes & Loine, 2009). M-PESA was launched as a non-banking institution providing money transfer services only (Jack & Suri, 2009). In spite of that, 20% of its users utilize M-

PESA as a saving account by keeping small sums of money in their accounts (Pickens, et al., 2009).

The regulator has given Safaricom the right to issue electronic money provided that Safaricom deposits the same amount of money in a regulated bank (Hughes & Loine, 2009). To control money laundering activities, the amount of money that can be transferred using M-PESA is limited to KES 70,000 (around ZAR 7,000) per transaction and KES 140,000 (ZAR 14,000) per day (Mas & Radcliffe, 2010). Since the launching of M-PESA, agents have been able to open accounts for users as long as they provide some kind of identification (Hughes & Loine, 2009). Safaricom has the right to certify its agents while in Brazil, agents must be certified by the central bank (Must & Ludewig, 2010; Pickens et al., 2009). There is a lot of uncertainty in the regulatory environment in which M-PESA operates as the service evolves at a faster rate than legal amendments (Porteous, 2006).

As mentioned before, M-PESA has a subscription base of about 12 million users. At its introduction, the application was limited to providing only three services: depositing and withdrawing money; person-to-person transfer and Safaricom airtime purchase. As the needs have grown, the technology has diversified to include numerous services such as customer-to-business transfer (Pay Bill, Buy Goods), business-to-consumer transfer (Bulk Payment), capability to withdraw from ATMs, micro-saving account among others. These services were not all introduced at the same time. The following section looks at the evolution of M-PESA showing how each service was introduced.

2.10. Evolution of M-PESA

As mentioned above (Section 1.2), M-PESA was first introduced to provide affordable banking service for the unbanked (Hughes & Lonie, 2009). The services provided in the beginning were limited to person-to-person money transfer and purchase of prepaid airtime. Since then, new services have been added, though it is still primarily utilized as person-to-person money transfer (Camner & Sjoblom, 2009b). This section discusses this evolution with the timelines.

The first two additional services M-PESA incorporated were Pay Bill (December, 2007) and Bulk Payment applications (March, 2008). Pay Bill is a customer-to-business

payment service. This application enabled organizations and businesses to open organizational M-PESA accounts and collect money from their customers (Safaricom, 2009). The capability to provide this service already existed before the launch of the application. The MFI in the pilot project was able to collect payment from the participants (Hughes & Lonie, 2009). Utility companies and schools were the main beneficiaries of this system for the collection of bills and school fees respectively (AFI, 2010). Bulk Payment, on the other hand, is a business-to-consumer payment system. It enabled organizations to open M-PESA accounts to make bulk payments or pay salaries. This was especially useful for companies with employees dispersed in the field who faced the challenges of traveling from their places of work to bank branches or main offices to collect their salary (Safaricom, 2009).

In September 2008, Safaricom together with PesaPoint (an ATM network company) launched a service that enabled M-PESA users to withdraw money from 110 ATMs (AFI, 2010). The introduction of this service made cash more accessible to M-PESA users. First, it enabled them – the majority who have no access to debit or credit cards – to withdraw money from ATMs. Secondly, it increased the number of cash-out points that had been offered solely by agents. In December 2008, M-PESA introduced international remittance from the UK in collaboration with Vodafone (UK) and Western Union (AFI, 2010). Using these services users in the UK can go to Western Union branches, deposit money and directly transfer it into an M-PESA account in Kenya (Safaricom, 2009).

Together with Equity Bank, Safaricom introduced M-KESHO (savings account) in May 2010. M-KESHO truly encompasses all banking applications on a mobile phone (Safaricom, 2010a). M-KESHO subscribers have an actual bank account which is linked to their M-PESA accounts. This enables them to transfer money, check their balances, withdraw money from ATMS and M-PESA agents, earn interest on their savings, and obtain micro loans and insurance from the bank using their mobile phone (Mas, 2010). M-KESHO users enjoy the benefits of both M-PESA and an actual bank account. Users of M-PESA can open an M-KESHO account in one of the 500 authorized agencies or Equity Bank branches countrywide.

In October 2010, Safaricom introduced an application called Buy Goods. Buy Goods is point of sale application (POS) which enables users to make payments from their M-

PESA account at the till point in supermarkets and other retailers (Safaricom, 2010b). Safaricom partnered with two supermarket chains: Uchumi and Naivas to provide this POS payment system (Safaricom, 2010b). Table 2.1 details the evolution of M-PESA.

Table 2.1 Evolution of M-PESA (From 2005 to 2010)

Date	New Service
2005 (Pilot)	Payment to MFI, person-to-person transfer, airtime purchase
March 2007-Launch	person-to-person transfer , airtime purchase
December 2007-	Customer-to-business payment (Pay Bill Application)
March 2008-	Business-to-Consumer Payment (Bulk Payment)
September 2008	ATM withdrawal started with PesaPoint
December 2008-	International money transfer from UK
May 2010-	M-KESHO Banking application in collaboration with Equity Bank
October 2010	Point of Sale Payment system (Buy goods),
Future Application	Online Payment, merchant account, Prepaid Safari card and M-Ticketing. Prepaid card and M-Ticketing are introduced in early 2011.

As discussed above and as can be seen from the table, all the services which constitute M-PESA today were non existent during the initial launch. These services are a result of the interaction of M-PESA with the environment. After the person-to person money transfer proved successful, the desire to use M-PESA for various other services grew in the country. M-PESA responded by incorporating additional services over time. In doing so, M-PESA has altered the environment in which it operates by changing the way business is done while at the same time being influenced by the said environment. This is a recursive relationship between users, environment and technology (Donner, 2008). Technology shapes how business is done and users and environment influence the design of the technology.

2.11. Research questions

As mentioned in the preliminary literature search (Section 2.2), the purpose of the literature review is to understand the mobile banking concept and the environmental factors around its use. It specifically focused on M-PESA considering its history, describing its services and charting its evolution. From the literature search, it can be confirmed that M-PESA is embedded in a complex social and economic context and that

it has gone through various changes over the years. It was proposed in problem statement (Chapter one Section 1.3) that M-PESA as a technology does interact with its environment. During this interaction, M-PESA has affected and will continue to affect the environment in which it operates by changing the way things are done while simultaneously being impacted by environmental factors and its appropriation. As noted earlier (Section 1.3, and Section1.5), this study considers this "bi-directional" influence that exists between technology (M-PESA) and the environment that a technology operates in.

Based on the statement of the problem, and research objectives in Chapter one (Section 1.3, Section 1.5) and the literature review, this study pursues the following research question:
What are the "bi-directional" influences that exist between people and technology with specific reference to m-banking adoption in Kenya?

To answer this general question, the study responds to the following sub-questions:

- How has M-PESA evolved through its short history from being primarily used in person-to-person money transfers to its wide spread use in different sectors of the economy? The purpose of this question is to find out the factors that have contributed to the evolution of M-PESA over the years (refer to Table 2.1 to see the evolution of M-PESA).
- How has M-PESA influenced/ changed/ affected the way business is conducted in Kenya? The purpose of this question is to investigate the new capabilities, ideas and values that have evolved from the introduction of M-PESA in Kenya thus focusing on the way businesses is done.
- How has the usage and adoption of M-PESA influenced M-PESA's evolution and design? The purpose of this question is to determine how environmental (social, regulatory, economic and cultural) factors and usage patterns of M-PESA affected its subsequent design and evolution.

The literature review has partly answered the first question: "How has M-PESA evolved through its short history from being primarily used in person-to-person money transfers to its widespread use in different sectors of the economy?" The study has shown the original intent of M-PESA and the different services introduced by M-PESA over time.

However, existing literature does not show how and why the different services were introduced. The role of different usage patterns in shaping the evolution of the technology has largely gone unexamined. The different factors that may have influenced the introduction of new services are not discussed in the literature. There is also a gap in the literature relating to how different businesses have influenced the new services introduced in M-PESA. Thus, the research questions still remain unanswered. This necessitates empirical research. The following chapters attempt to answer the research questions stated above.

2.12. Chapter summary

This chapter examined different literature related to m-banking. The history, definition and expansion of m-banking have been discussed. It was noted that m-banking means the provision of financial services (depositing, withdrawing, transferring money, making payment) using mobile phones. It was also explained that the expansion of m-banking in the developing world is mainly attributed to the lack of formal financial services and the widespread of use of mobile phones.

Further, the chapter took a closer examination of M-PESA, a mobile banking application in Kenya. The original intention and services of M-PESA and its gradual change over the years were explored in an attempt to address the research objective raised in Chapter one (Section 1.5) about the mutual influence technology and environment have on each other. From the discussion, M-PESA has transformed from a person-to-person money transfer service to include other services like paying bills, bulk payments, and ATM withdrawals among others.

The literature partly answered the research question by outlining the evolution of the technology. Nevertheless, as noted, the literature neither shows if the technology has had any impact on its environment nor does it explain the influence of different usage patterns on the design of M-PESA. This research seeks to answer these questions by assessing how different uses by businesses have affected this evolution while at the same time being affected. To accomplish this objective, it is imperative to consider different theoretical frameworks which are used to study the relationship between technology and society. The next chapter discusses the three theoretical frameworks that have been deployed in this way.

CHAPTER THREE: THEORETICAL FRAMEWORK

3.1. Chapter overview

At the end of the previous chapter (Section 2.11), the research questions of this study were presented. Some aspects of the research questions have been answered and the need for more empirical research acknowledged. The purpose of this chapter is, therefore, to look into different theoretical frameworks to guide the rest of the research. The frameworks considered are used to study the relationship between technology and society in line with the objective of the research. This chapter outlines three different frameworks from which one is selected as appropriate for this research.

Technological determinism, *social determinism* and *socio-technical* determinism are the three frameworks which have been used to study the relationship between technology and society in various fields including informatics, organizational theory and sociology. This chapter investigates each theory by discussing their fundamental concepts, strengths and criticism. Upon close examination, and taking into account the objective of this research (Section 1.5) and research question (Section 2.11), *socio-technical determinism* is considered an appropriate framework for this study. From the various theories which apply a *socio-technologica*l framework, Adaptive Structuration Theory (AST) of DeSanctis and Poole (1994) is chosen for further consideration in this chapter. The description of this theory, reasons for its adoption, and its theoretical constraints are elaborated in detail.

3.2. Interaction between technology and society

The interaction between technology and society has attracted a wide range of studies adopting different approaches. There are the *technological determinists* who claim that technology shapes society while the *social determinists* argue that society shapes technology (Ling, 2004). There are also those who compromise between the two extremes settling for the position that technology and society influence, change and shape one another (Ling, 2004).

According to Wyatt (2007), *technology determinism* is based on the concept that technology is created and expanded without any influence from social forces and that technology is the source of social changes. According to techno-determinists, the

introduction of technology to organizations and society brings about change in structure, hierarchies, business processes and communications without being affected by the existing social relations (Orlikowsiki & Icon, 2001). Technology is seen as the prime mover in history (Chandler, 2002). *Techno-determinism* can best be described by Karl Marx's statement "the windmill gives you society with the feudal lord, the steam mill: the society with the industrial capitalist" (as cited Ling, 2004:23). The view conceives technology independent of the "social and organizational arrangements within which it is developed or used" (Orlikowsiki & Iacono, 2001: 22). *Technological determinism* has faced much criticism over the years as to its limitation in describing the interaction between technology and society. The major limitation of *technological determinism* that can be cited is its treatment of technology as independent of the society it was created and used in. It does not give sufficient explanation of how technology is created and used in specific social contexts (Ling, 2004).

The theory of *social determinism* is the extreme opposite of *technological determinism*. It argues that organizational, political, economic and cultural factors affect the design and implementation of technology (Williams & Edge, 1996). Proponents of *social determinism* argue that technology is constantly redefined by its users and given new meaning and use not anticipated by its creators (Ling, 2004). *Social determinism* tries to minimize the importance of the technical aspect of technology and puts emphasis on the social aspect of products. Its viewpoint is that "technology does not develop according to an inner technical logic but is instead a social product, patterned by the conditions of its creation and use" (Williams & Edge, 1996:857). *Social determinism* is thoroughly developed by the works of Bijker and Law (1992). The major criticism of *social determinism* is that it downplays the role of technology in shaping society. *Social determinism* treats technology as if it does not have any intrinsic value by itself (Ling, 2004). Both techno-determinism and socio-determinism are critiqued for being overly abstract (Ling, 2004).

In response to the two extremes, the *socio-technical* view was developed. It is a compromise between the two extremes. Its proponents assert that technology and society influence and shape each other over time (Ling, 2004). The *socio-technical* approach assumes that the interaction between technology and people is best understood by looking at it as two jointly interdependent systems that correlate and

interact with each other (Bostrom & Heinen, 1977). The “bi-directional” influence that exists between technology and society is the primary focus of *socio-technical* approach (Donner & Tellez, 2008). One of the *socio-technical* approaches which have been applied by many studies in the field of informatics is the “ensemble view” of Orlikowski and Iacono (2001).

The ensemble view has been used to study the dynamic interaction between people and technology. It concentrates on “the dynamic interaction between people and technology - whether during construction, implementation, or use in an organization, or during deployment of technology in society at large” (Orlikowski & Iacono, 2001:27). Technology is conceived as “an evolving system embedded in a complex and dynamic social context. Technology is neither an independent nor dependent variable, but instead, is seen to be enmeshed with the condition of its use*”* (Orlikowski & Iacono, 2001:28). Some theories which adopt the ensemble view that have been used to study communication technology include the domestication theory, the Structuration Model of Technology, the Adaptive Structuration Theory and the Affordances Theory (Ling, 2004; Donner & Tellez, 2008). The Adaptive Structuration Theory applies one of the four variants of the ensemble view which conceptualizes “*technology as structure*”. According to this view, different social influences shape the way a technology is used and different user groups interact with the technology in different ways (Orlikowski & Iacono, 2001).

3.3. Description of Adaptive Structuration Theory

Adaptive Structuration Theory (AST) is developed by DeSanctis and Poole (1994). Rooted in the Structuration Theory of Giddens (1984), AST posits that the effect of technology in society is not solely a consequence of the technology alone, but it is also the result of the way it is used in society (DeSanctis & Poole, 1994). According to AST, there is “duality of structure … whereby there is interplay between the type of structures that are inherent to advanced technologies and the structures that emerge as people interact with them” (DeSanctis & Poole, 1994:122). It proposes to extend other structuration models by including the mutual influence of technology and its social interaction (DeSanctis & Poole, 1994). It is in agreement with other theories in *socio-technical* determinism school which assert that the effect of technology on people is not only a function of the technology itself but also its use in society (Markus & Robey, 1988).

As mentioned earlier, the basic idea of AST is derived from the Structuration Theory of Anthony Giddens (Orikowski & Iacono, 2001). The Structuration Theory of Giddens (1984) explains how social structures determine what individuals and groups can do and become. According to Giddens (Giddens, 1984:31) “structure is regarded as rules and resources recursively implicated in social reproduction; institutionalized features of social systems have structural properties in the sense that relationships are stabilized across time and space”. Technology in AST is therefore considered as one source of social structure which brings resources and rules for interaction with people. The social structure in a technology is infused by the developers and appropriated by the interaction of users (Orlikowski & Iacono, 2001). The social structure brought by the technology can be described by its structural features and its spirit (DeSanctis & Poole, 1994).

The structural feature and spirit of the technology are the two manifestations of the social structure provided by technology. The structural feature is the capability provided by the technology as described by its rules and resources, while the spirit describes the intent or value underlying structural feature. Structural features bring meaning (signification) and control (domination) to the technology, while the spirit of the technology offers legitimation to the technology (DeSanctis & Poole, 1994). The social structures brought by the technology are appropriated to fit the task and environment. Besides, spirit and structural features of the new technology, other factors like the task being accomplished and environment of the technology serve as sources of structure. When these three interact with each other, they provide new sources of social structure.

AST provides a model that depicts the interaction of technology and other sources of social structure. According to AST, technology presents the structure for use in interaction between people. When these structures interact, they are “instantiated in social life” (DeSanctis & Poole, 1994:125). “There are structures in technology on one hand and technology in action on the other. The two are continually intertwined; there is a recursive relationship between technology and action, each iteratively shaping the other” (DeSanctis & Poole, 1984: 125). The social structure in technology guides, supports, enforces or inhibits action by people while people’s actions produce and reproduce the social structure of the technology (Burke & Chidambaram, 1999; Sun & Zhang, 2006).

The two main concepts of AST; structuration and appropriation, describe the way people incorporate technology in their work practices (DeSanctis & Poole, 1994). Structuration is the process of bringing the rules and resources from different sources including technology into action (DeSanctis & Poole, 1994). Social structures are produced and reproduced during the process of structuration. Appropriation is the "process of applying a specific technology based resource and rules in specific context and at specific point in time" (DeSanctis & Poole, 1994:128). Appropriation is the "immediate visible actions that evidence deeper Structuration processes" (DeSanctis & Poole, 1994:128).

During technology appropriation, people adjust technology in a way that fits their work. Technologies have been differentially appropriated, changed or ignored by the users (Orlikowski, 1992). Accordingly, DeSanctis and Poole (1994) have identified some types of appropriation. These include directly using technology structures, combining structures, substituting current structures with other structures, enlarging current structures, and contrasting the structure with other structures (DeSanctis & Poole, 1994; Sun & Zhang, 2006). Because of this, actual use of a technology is most of the time different from its intended use (DeSanctis & Poole, 1994).

AST was mainly proposed to describe the appropriation of group decision support system (GDSS) and other collaborative technologies in organizations. Based on their observation, DeSanctis and Poole (1994) provided seven propositions to study technology use in organizations (see Figure 3.1).

P1: The social structure provided by technology can be described by its features & spirit
P2: Use of Technology depends on the task, the environment and other sources of social structure
P3: New sources of structure emerge as the technology, task and environment are applied in specific social interaction.
P4: New social structures emerge as the technology is appropriated in a given context over time.
P5: "Group decision process will vary depending on the nature of appropriation" (DeSanctis & Poole, 1994, p.130).
P6: "The nature of technology appropriation will vary depending on the group's internal system" (DeSanctis & Poole, 1994: 131).

P7: “Given a technology and other sources of social structure, n1…nk, and ideal appropriation processes, and decision process that fit the task at hand then desired outcome of technology use will result” (DeSanctis & Poole, 1994: 131-132).

Figure 3.1: The seven propositions of AST (DeSanctis & Poole, 1994: 130-132)

Based on the above seven propositions, DeSanctis and Poole (1994) have come up with a diagram that shows the technology-people relationship. The AST model was developed to study the application of technology specifically to Group Decision Support System (GDSS) and how it affects decision making in organizational contexts. From the seven propositions given above, the last three (P5-P7) are particularly important in the application of GDSS in organizational situations. This research does not enquire into GDSS and decision making. Thus, only the first four propositions are found appropriate for this research. The AST model of DeSanctis and Poole (1994) is also modified to show how the social interaction between technology, task and the environment shapes each other. There is a multi-directional relationship that exists between technology, environment and task. The adapted AST is shown in the figure below

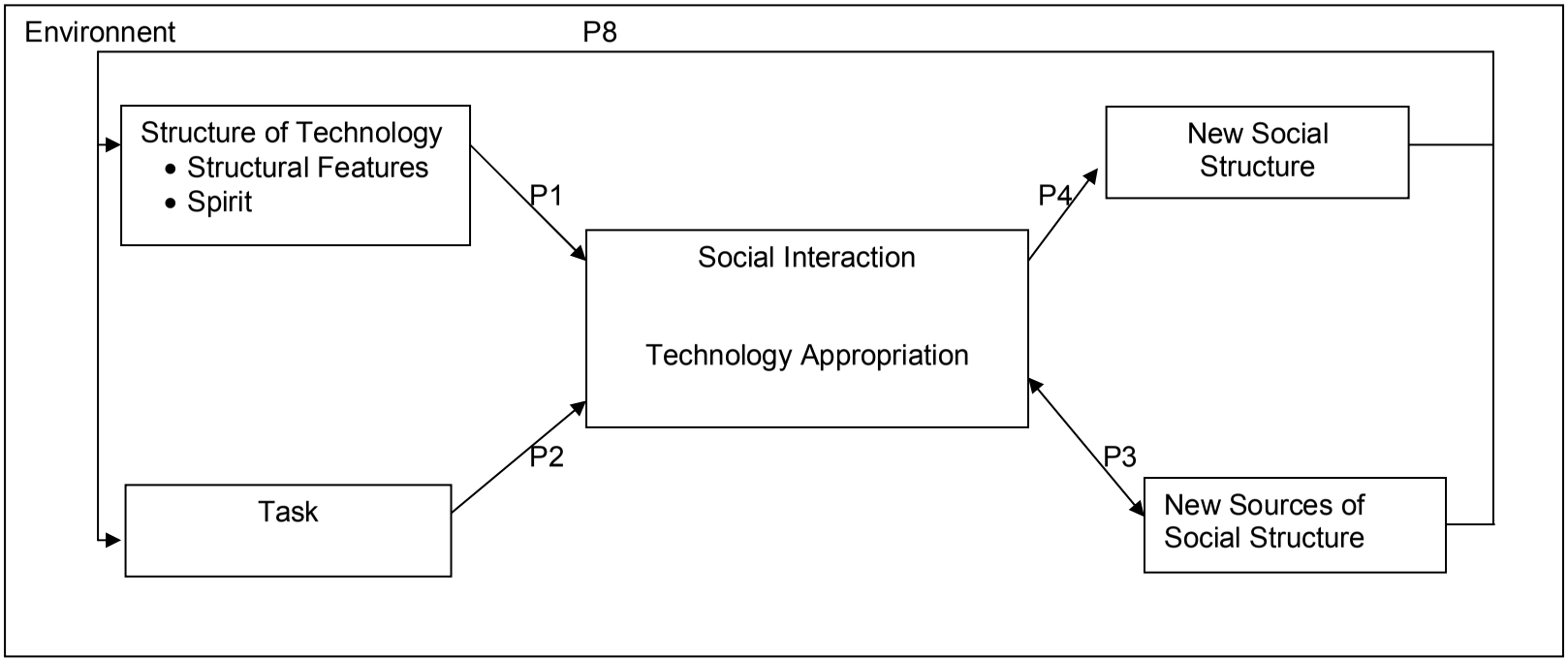


Figure 3.2 Proposed Model of Adaptive Structuration Model for Mobile Banking (Source: Adapted from DeSanctis & Poole, 1994)

From the model above, several things can be noted. First, when technology comes into a social interaction (use), it does so with its own structure described by its spirit and structural feature (P1). The task and the technology interact in an environment (P2). A task is a specific job that needs to be accomplished with or without the technology like transferring money in mobile banking (DeSanctis & Poole, 1994). The interaction of the technology and the task in an environment (a unique appropriation) will result in the emergence of both new structure (P4) and new sources of structure (P3). The source of the structure in return influences the social interaction between task and technology. What is not shown in the original AST model and is proposed in this research is that the new source of the structure and the new structure that emerge as task, technology and environment interact in return influence the technology and the task (P8).

P8: New sources of structure and new social structure that emerge as technology and task interact in an environment influence the technology and the task.

The model with the modification included (P8) shows that there is a perpetual cycle of new technology introduction, interaction with task and environment by users (appropriation and adoption), emergent sources of structure and change in the technology, task and environment (adaptation) (Mylonopoulos & Doukidis, 2003).

As will be discussed in the next section (Section 3.4), AST has been applied in a number of studies raising similar questions in appropriation of technology including mobile technologies (Carroll, 2004). It has also been used in many other studies focusing on communication (Donner, 2008) and it has showed how technology changes over time based on its appropriation (Mylonopoulos & Doukidis, 2003). This research shows that the same is happening with the M-PESA.

3.4. Why AST?

The main reason AST has been chosen as theoretical framework is that it treats technology as emergent phenomenon not as a deterministic factor (Sun & Zhang, 2006). According to AST, users are not passive consumers of technology; instead they purposefully choose, reproduce and reshape technology (Sun & Zhang, 2006). From casual observation of M-PESA, the technology is an emergent phenomenon which has

been shaped by its use. AST, therefore, seems to be an appropriate lens to look into the situation.

Secondly, AST has been used in a number of researches raising similar questions in appropriation of technology including mobile technologies (Carroll, 2004). Donner (2007), for example, applied AST to study exchanging of messages through intentional miscalling or beeping. The study explores how people appropriated beeping to send pre-negotiated messages among mobile phone users in Rwanda. It discusses how mobile users beep other users to send different messages like “call me back”, “I finished work, please pick me up” or “I am just thinking about you”. It suggests that enhanced technology structures (mobile phone capabilities, address books and call logs) coupled with environmental factors (widespread use of mobile phones) and preexisting socio-cultural factors have enabled people to exchange messages using beeping (intentional miscalling). The study further shows how different mobile network operators try to address this new adaptation of mobile phones through introduction of new features. For instance, some MNOs allow users who run out of airtime to send SMS to another user within their network to call them back. The study chose AST as a theoretical framework as AST can capture the “complex interplay between individual action, social structures, and information and communication technologies” (Donner, 2007:9). This research also proposes to do the same, therefore the appropriateness of the AST theory.

Besides being employed in mobile technologies, AST has also been used in other information systems researches. Olsson and Russo (2004), for instance, have adapted AST to study context aware applications. In their study, the authors used the propositions which apply to individual users and left out those which were applied for group users as their study focused on a technology used by individuals. In this study, those propositions (P5-P7) dealing with group behaviour are also not considered. Edgington and Chenoweth (2002), in a similar fashion, used AST to study data warehouse implementation. AST assisted the authors to “describe how new technological innovations (such as data warehouses) will both impact, and be impacted by, the social practices and norms of the adopting group” (Edgington & Chenoweth, 2002:13). Sedera and Zakaria (2008) adapted AST to study the implementation of knowledge management system for enterprise systems.

3.5. Theoretical constraints

AST like any other theory is not beyond criticism. Being an adaptation of the general Structuration theory, which is based on a high level, complex and general concept, it is difficult to apply AST in empirical research (Pozzebon & Pinsonneault, 2005; Sun & Zhang, 2006). To make it easier to do empirical research using AST, the next chapter will adapt the different propositions of AST to the features and environment of M-PESA. Secondly, AST was developed to study the use of collaborative technologies in organizations (DeSanctis & Poole, 1994; Sun & Zhang, 2006). M-PESA is not a collaborative technology and applying AST might prove difficult. To curtail this shortcoming, the propositions from AST which deal with group and collaborative technologies have been excluded from consideration. AST does not show how subsequent services in a technology incorporate the changes noticed (Carroll, 2004). To address this problem, a new proposition (P8) has been added to the existing list of propositions.

3.6. Chapter summary

This chapter discussed the theoretical framework which is appropriate for the research. AST is proposed by DeSanctis and Poole (1994) and has been used to study how technology as one source of structure affects the way a decision is made and business is carried out. AST states that technology has inherent structure built into it and brings the structure to society through its features and spirit. The structural feature (capability with rules and resources) and the spirit are used to accomplish a task in an environment. The technology is then adapted and appropriated in society in ways that may be different from the intention of the technology developers. The effect of technology is not only shaped by structure in the technology but also by its use in society. When technology interacts with a task in an environment, new sources of structure emerge from their interaction. People use/appropriate technology in such a way as to fit their needs. By doing so, they change the structural features of the technology and the spirit put in the technology by the designers.

M-PESA as a technology has created structural features to be used by the society in Kenya. In the beginning, its features were mainly limited to person-to-person money transfer method. Through time it has added other services and brought in additional

structures to be used in the society. These structures created by M-PESA in society are discussed in the next chapter. In addition to the structures of M-PESA, the propositions of AST are adapted to M-PESA and the research question for the purpose of eliciting themes. The themes are used later on in preparing interview questions in Chapter five.

CHAPTER FOUR: ADAPTING ADAPTIVE STRUCTURATION THEORY TO M-PESA

4.1. Chapter overview

At the end of Chapter two, research questions were presented. In Chapter three, AST, the theoretical framework advanced by DeSanctis and Poole (1994) was discussed. This chapter attempts to adapt this framework to M-PESA through the five propositions laid out in Chapter three. The main objective of the chapter is to ground the abstract theory (AST) to the research question and elicit themes which guide the empirical research. In order to achieve this, the chapter begins with discussions of the structural features and spirit of the technology using the first proposition (P1) of AST. It then continues by describing the task and the environment M-PESA operates in using the second proposition (P2). Thirdly, additional themes are elicited from the remaining propositions. At the end the chapter a summary of themes elicited in the different sections are presented.

By discussing M-PESA using the theoretical framework, this chapter integrates the different topics discussed in previous chapters. It also generates a set of themes from which the interview questions in Chapter five are formulated.

4.2. Structure of M-PESA

P1: The social structure brought by a technology can be described by its feature and spirit.

In this section, the different structures of M-PESA as a technology will be discussed in detail. As explained in Chapter three, according to AST, the structure of a technology can be described by its structural feature and the spirit offered by the technology. The structural feature is the capability that is provided by the technology together with the rules and resources while the spirit describes the intent or value underlying the structural feature.

4.2.1. Structural features of M-PESA

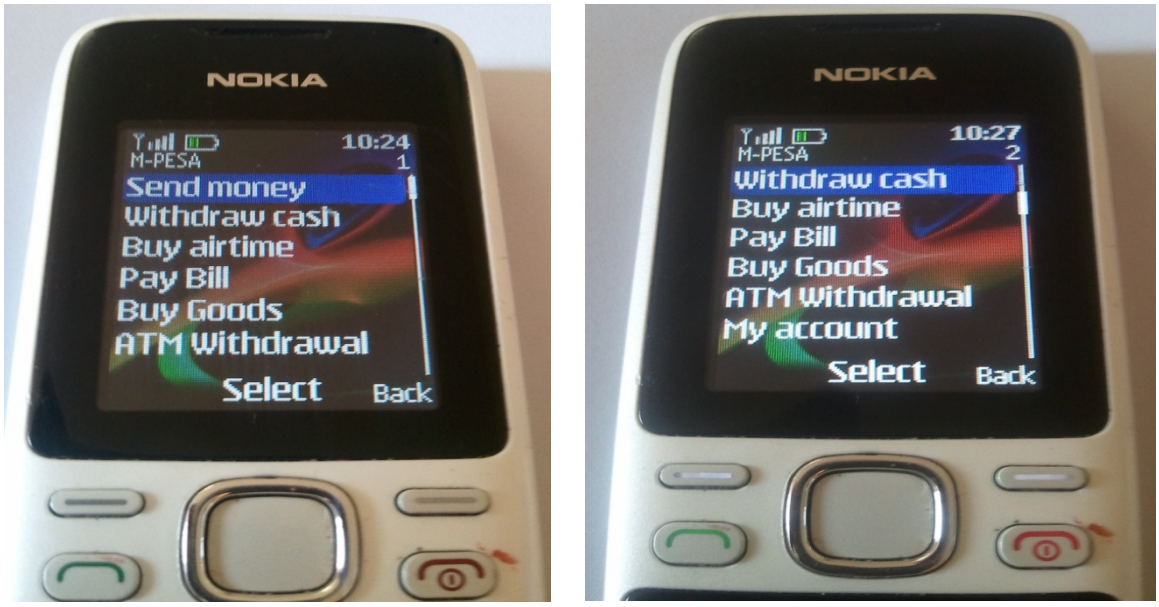
Structural features of a technology relate to the capability it provides described by the rules and resources. The structural features of the technology can be obtained from

manuals, interviews with the designers and from the views of the technology users (DeSanctis & Poole, 1994). The information about the structural features of M-PESA has accordingly been gathered by using the system, reading the manuals, websites and from interviews with different people including developers, partners and users.

Structural features of M-PESA can be explained by the different services it provides. Currently, there are twelve services provided by M-PESA. Some of these services are accessible from the mobile phone of individual users. The services that can be accessed from a user's phone are displayed in the user's phone menu. Figure 4.1 shows the services that are available for individual users as seen from their mobile phones. Some applications like depositing money are operated by agents from their (agents') mobile phones which have different menus from those of users.

Most of the services provided by M-PESA have been described in Section 2.9.2. The M-PESA application is SIM-resident. This means that the application can work on all makes of mobile phones. It secures all transactions by encrypting the message sent. Some of the services provided like depositing money are not displayed from the user's mobile phone as they are operated from an agent's phone.

In the following sections the services of M-PESA will be discussed in detail.



a) the first menu b) when scrolled down

Figure 4.1 M-PESA Menu

a) Registration

Before starting to use the services offered by M-PESA, a user has to register. Registration can be done at the premises of all accredited M-PESA agents throughout the country. Registration is not, however, required to withdraw money. Mobile phone subscribers of all network operators can withdraw money sent through M-PESA. To register for M-PESA, users must first be Safaricom subscribers. Registration is free of charge. Users are required to produce a national ID or other forms of identification (passport or driving license) for registration. The details of the user are entered into the agent's phone immediately. After registration, users are provided with an electronic money account which is accessible through their mobile phone (Mas & Morawczynski, 2009; Mas & Radcliffe, 2010).

b) Depositing money

When users want to deposit money, they go to one of the agents and request to make deposits. The users, with the help of the agents, fill out a form. The forms have details of the transaction such as the transaction number, amount of deposit, depositor's name and ID number, date and signature. The form is mainly used by the agents to track their transactions. The agent then receives the cash and deposits the equivalent amount of e-money (e-float) into the account of the users. Depositing is done from the agent's phone and is not displayed from a user's menu. Depositing money is free of charge. Both the user and the agent receive SMS notification of the transaction.

c) Sending money (person-to-person)

This is the most popular service offered by M-PESA. It is used to transfer money from one person to another. When the users select this option, they will be asked to enter the phone number of the person they want to send money to. After that, a request for the amount of money to be transferred is made. Then, the users are requested to enter a secret PIN number. Finally, the system displays all the information entered by the user and asks for confirmation. Once the user confirms the information and she/he has the money in his/her account, the money will be sent to the number specified. An SMS notification relating to the transaction and stating the identity of the recipient, the amount transferred, the remaining balance and unique transaction code is then received from M-PESA. The receiver will also obtain an SMS notification stating the amount of money

and the sender. There is a service charge for sending money. The charge is graduated depending on the amount sent but the minimum charge is KES 30 (around ZAR 3).

d) Withdrawing cash

This service is used when users want to convert the e-float (balance) in their account into cash. When users choose to use this option, they will first be asked to enter the agent number. The agent number is a unique number used to identify agents. Agents clearly display their agent numbers in their shops. The second thing the users have to input is the amount of money they wish to withdraw. The third input is the secret PIN. After that, the users are expected to confirm the transaction. After the transaction goes through, the users and the agents will each receive an SMS confirming the transaction. The users will then collect the cash from the agent. There is a graduated charge for withdrawal service.

e) Buying airtime

Using this service, an M-PESA user can buy Safaricom airtime credit for their phone or other people's phones from their balance in the M-PESA account. The first input required from this service is whether the user wants to buy credit for themselves or for another user. If the users choose their phone, they are required to input the amount of airtime and their PIN. If they want to buy airtime for other people, they have to input the phone number of the other person in addition to the amount and their PIN. SMSs notifications are sent to both users and their prepaid credit balance will be updated accordingly. There is no service charge for this service.

The above four services (depositing money, withdrawing cash, sending money and buying airtime) were introduced when M-PESA was launched in early 2007. Subsequently, a number of other services were added to satisfy the different financial needs of its customers.

f) Paying bills (customer-to-business)

This service was introduced at the end of 2007. It allows customers to make payments to companies. To use this service, the organizations first need to enter into partnership with M-PESA and receive M-PESA accounts. The organizations are then given unique business numbers which their customers use to identify them. In addition to the business

number, customers also enter their account numbers (issued by the business organization) which are used to uniquely identify them. For example to pay an electricity bill, users enter their electricity account number while making payment using the pay bill application. They then input the amount they want to pay to the organization. In 2009, there were about 300 organizations which used this service. Businesses which register for the pay bill service are given an online access to M-PESA's pay bill system to monitor their transactions. The money collected through the pay bill application is paid into an M-PESA business account which is only released into the organization's bank account and no other. The main users of this service are utility companies, schools and financial institutes including banks, micro-finance institutions and insurance companies. The service charge for this service is shared between the business and its customer.

g) Buying goods (customer-to-business)

This service is similar to the pay bill application but it is specifically used for supermarkets and other retailers to accept money through M-PESA at their till points. It is designed as a payment method for Point of Sale. The users are required to enter the till number, the amount to pay and their PIN number. The customer gets SMS notification of the transaction. As in pay bill applications, businesses also have to register to be able to use this service. The buy goods service was launched in October 2010 and currently has three corporate customers. The service charge for this service is shared between the corporate and its customer.

h) ATM withdrawal

This service was launched in September 2008 in partnership with PesaPoint, an independent ATM network that provides ATM services for over 30 banks operating in Kenya. In addition to PesaPoint, this service was later extended to include the ATMs run by Equity Bank and Diamond Trust Bank. M-PESA users can now withdraw cash amounts ranging between KES 200 (ZAR 20) and KES 20,000 (ZAR 2000) from 650 ATMs located around the country without the need for a debit/credit card. The system works in a slightly different way from withdrawal from agents. The users choose ATM withdrawal from the M-PESA menu, and then enter the agent's (ATM's) codes and their PINs. Then the users receive 6-digit authorization numbers via SMS. They then choose M-PESA from the ATM's menu, enter the authorization number, their phone numbers and the amount of cash they want to withdraw. The ATM then releases the money and a

receipt. An SMS notification of the transaction will also be received. There is a service charge for this service.

i) M-KESHO

In May 2010, M-PESA signed an agreement with Equity Bank to provide banking services for M-PESA users. M-KESHO, the main service introduced by this agreement, is a bank account which provides a service similar to savings which earn interest as well as micro-credit and insurance facilities. M-KESHO users must first be M-PESA users before applying for M-KESHO in 500 accredited M-PESA agents and all Equity Bank branches. M-KESHO customers can transfer money from their Equity Bank accounts to their M-PESA accounts. They can also deposit money into their Equity Bank account using their M-PESA accounts on their mobile phones.

j) Bulk payments (business-to-consumers)

In March 2008, M-PESA introduced a service which enables businesses to make bulk payments. This service has enabled organizations to send money to many people throughout the country and to pay salaries to their employees working in the field. Previously, these employees had to travel long distances to bank branches to get their salaries. Other uses of this application include promotional payments, dividend payments, and social payments. Bulk payment has been especially useful for organizations to make monetary donations for internally displaced people after the 2008 post election violence that displaced up to 600,000 people from different parts of the country. There were about 22 partner companies which used this service in 2009. When organizations apply for bulk payment services, they are given an online M-PESA account that they can use to make the payments.

k) International Money Transfer

M-PESA started providing international money transfer services in December 2008. The services are provided by Safaricom in partnership with Vodafone (U.K.) and Western Union. Using this cross border money transfer service, people in the U.K. can go to a Western Union branch and send money to M-PESA account holders in Kenya via their mobile phones. The money is received instantly and any delay is similar to delays in SMS messaging. Both the receiver and sender get SMS notification of the transaction. The money received can be used like any other money in an M-PESA account.

l) My account

This is an administration application where users can change their PIN numbers or secret words, language, requests for balance, call the customer center, and download new menus. When M-PESA introduces new applications, users are required to download the new menu which is sent to them using SMS.

As is clear from the description above, the services offered by M-PESA were not introduced at the same time. The first four services ("deposit", "send money", withdrawal and "buy airtime") were introduced at the launch while the rest were introduced at different times in years spanning from 2007 to 2010 to respond to different users' requests. The following section considers the spirit of the technology which is the other manifestation of M-PESA's structure.

4.2.2. Spirit of M-PESA

The spirit of a technology is an expression of the structure of the technology presented to users. As conceptualized by DeSanctis & Poole (1994: 126), "spirit is the general intent with regard to values and goals underlying a given set of structural features". Spirit of a technology provides legitimation and signification to the technology. Thus, it provides the framework for appropriate action when using the technology and it also helps users understand and interpret the meaning of the technology. When a technology is introduced, the developers put forth the spirit through advertisements and manuals. As organizations/society adopts that technology, they add more definition to the spirit of the technology. If a technology needs to be sustainable, new innovative use of the technology should be encouraged (Ali & Bailur, 2007).

When M-PESA was launched in 2007, the spirit of the technology was expressed by the catch phrase "*Send Money Home*" which featured in all advertisements for the service (Vaughan, 2007). This appealed to the majority of Kenyans who work in cities and need to send money to support their family in their rural home villages. Many Kenyans live in cities and maintain a very strong bond to their rural origins as evident in their sending money to their relatives (Vaughan, 2007). The spirit of the technology was to provide an affordable and fast money transfer method for people with no access to banks. M-PESA

is still largely used for this purpose as intended by developers. Over time however, it has grown to include other services as needs evolved.

The first group of themes developed investigates these changes in structural features and spirit. The purpose of the first two themes is to apply AST to the first sub-question raised in Chapter two (Section 2.11). The question states thus: “How has M-PESA evolved through its short history from being primarily used in person-to-person money transfers to its wide spread use in different sectors of the economy? The evolution of M-PESA has been discussed in Chapter two (Section 2.10). In that section, it was stated that different services have been added to the original services to accommodate changing customer needs. These services have been described through their structural features and spirit in the sections above (Sections 4.2.1 and 4.2.2). The following themes enquire how these structural features and spirit were developed and how they have changed over time.

Theme 1: How did the various structural features of M-PESA develop over time?
Theme 2: How has the spirit of M-PESA changed over the years as new services are introduced?

The purpose of the third theme is to relate AST to the second sub question in Chapter two (Section 2.11). The question inquires how M-PESA influenced/ changed/ affected the way business is done in Kenya. The structural features and spirit that M-PESA brought have been discussed in this chapter addressing the first part of the question. The second part of the question which tries to ascertain how the structures affected business is not addressed leading to the development of theme 3.

Theme 3: How have these structural features and spirit (theme 1 and 2) of M-PESA influenced the way people run their businesses?

4.3. Task and environment of M-PESA as source of structure

P2: Use of Technology depends on the task, the environment and other sources of social structure

In the interaction between technology and people, technology is only one source of structure (DeSanctis & Poole, 1994). Other sources of structure are tasks, the

environment and new sources of structure that emerge during the interaction. The following section outlines the tasks M-PESA is used for and the environment that M-PESA operates in.

4.3.1. Task

According to DeSancits and Poole (1994), tasks are the different activities that can be accomplished with or without technology. When technologies are employed to accomplish these tasks, they are considered to have accomplished them in a better way. The main tasks for which M-PESA is used are: depositing and withdrawing of money; person-to-person money transfer; customer-to-business money transfer; business-to-consumer transfer. These tasks used to be accomplished in different ways before the introduction of M-PESA. As discussed in Chapter two (Section2.6), people used to send money to other people through banks, postal services, buses, friends and sometimes carrying the money physically. For other financial services like savings and credit, people used to rely on banks, MFIs and, more commonly their informal social networks.

For customer-to-business transfer as a method of payment for businesses, cash has been mainly used. Cash, checks and bank transfers have been used for business-to-consumer transfer. M-PESA has provided capabilities to accomplish these tasks by converting cash into electronic money and transferring the money from one account into another using SMS based technologies. The structural features of M-PESA which are used to accomplish these tasks have been discussed in Section 4.2.

4.3.2. The environment of M-PESA

The environment M-PESA operates in can be described by different factors. Some of the factors that influence the use of M-PESA are access to financial services, access to mobile phones, and regulatory framework.

a) Access to financial services

According to a survey done by FinAccess (2010) in 2009, from the estimated 39 million of Kenyan population, 18.7 million are above the age of 18 years and considered adult. From this adult population, 22.6% is formally included in the financial service sector. Formal financial services include use of bank accounts and/or insurance services. Another 17.9% get financial services from non-bank institutions including MFIs and M-PESA. The number of people in the second category was only 7.5% of the adult

population in 2006 (FinAccess, 2007). The huge increase in the percentage of the population in the formal financial sector between 2006 and 2009 is mainly attributed to the use of M-PESA (FinAccess, 2010). 26.8% of the population depends on the informal sector for its financial needs. The remaining 32.7% is completely excluded from the financial sector.

b) Access to mobile phone

The first mobile phone company in Kenya was state owned. It started operating in the late 1990's. When the mobile market was liberalized in 2000, Safaricom became the first privately owned operator providing mobile services. Besides Safaricom, there are three other mobile operators: AirTel, Orange and Yu. In the last ten years, the number of mobile subscribers has increased to 18 million (Jack & Suri, 2009). This translates to almost 83% of the population above the age of 15 (Jack & Suri, 2009). This number, however, ca not be translated as 18 million users as most people in urban areas have more than one SIM (ITU, 2010). FinAccess (2010) estimates that almost half of adult Kenyans (47.5) had access to mobile phone by the end of 2009. Safaricom has 80% of the market share while the rest share the remaining 20% (Jack & Suri, 2009).

c) Regulatory framework

As a mobile telecom operator, Safaricom is mainly regulated by Communication Commission of Kenya (CCK). M-PESA is considered as a value added service which Safaricom is licensed to offer. The provision of financial services, however, led CCK to pass the regulation of M-PESA to Central Bank of Kenya (CBK) (AFI, 2010). When M-PESA was launched in 2007, Safaricom had to negotiate a special deal with CBK to start its operations (Hughes & Loine, 2009). The agreement allowed M-PESA to start its operations as a non-bank, person-to-person money transfer service (Hughes & Loine, 2009). Since then, M-PESA has always sought approval from the CBK to introduce new services (AFI, 2010). Each month, M-PESA submits a report of the transactions showing the volume and usage of the system to CBK. The regulatory environment M-PESA operates in has enabled it to expand very fast. The regulatory framework in Kenya seems more open to m-banking than in many other countries (Porteous, 2006).

The second proposition of AST, as described above, expresses the point that the use of technology depends on the task it is used to accomplish and the environment it works in.

The purpose of these themes is to investigate how the task and the environment influenced the way M-PESA is adopted. The themes are mainly used to relate AST to the third research sub-question raised in Chapter two (Section 2.11) which states thus: "how has the usage/adoption of M-PESA influenced MPESA's evolution/ design?" Theme 4 and theme 5 focus on how M-PESA is appropriated to accomplish a certain task within the environment. Later in this chapter (Section 4.4), theme 8 and theme 9 will investigate the way the appropriation influenced the design of M-PESA. Based on the description of the tasks and the environment in which M-PESA operates, the themes below have been elicited:

Theme 4: How have the different tasks affected the way M-PESA is used/appropriated?
Theme 5: How have the different environmental factors affected the way M-PESA is used/appropriated?

4.4. More theme elicitation from the other AST propositions

The remaining three propositions of the AST have been used to elicit more themes. The intention of the themes is to examine what new services and social relations the interaction of technology (M-PESA), task and environment have generated (theme 6 and theme 7) and further examine how these services and social interactions have affected the design of the technology (theme 8 and theme 9). The themes are used to study the perpetual cycle that exists between M-PESA, its use in the environment and its further design. The themes reinforce themes 3, 4 and 5 and further explore the dependence between M-PESA and its environment.

P3: New sources of structure emerge as the technology, task and environment are applied in specific social interaction.

The main sources of structure when a technology interacts with people are the technologies themselves, the task at hand and the environment they operate in. When these three sources of structure interact with each other, other sources of structure emerge (DeSanctis & Poole, 1994). One of these sources of structure can be information generated by their interaction or other technological capability built on top of the technology. These emergent sources of rules and resources can be used by people to advance their social interaction (DeSanctis & Poole, 1994).

Theme 6: What new sources of structure emerge as M-PESA interacts with the different tasks and environmental factors?

P4: New social structures emerge as the technology is appropriated in a given context over time.

When a technology is appropriated within a group of users, it can be directly used (reproduced), related or blended with other structures over time. New social structures may emerge in the interaction of the technology which represents the reproduction of technology structure, or blending of the technology with other structures (DeSanctis & Poole, 1994).

Theme 7: What new social structures have emerged as M-PESA is used?

P8: New source of structure and social structures that emerge as technology and task interact in an environment influence the technology and the task.

This proposition is not part of the original AST. It is proposed in this research to establish whether the new sources of structure and new structures (rules and resources) that emerge during interaction of technology and task in an environment influence the design of subsequent technology. As mentioned earlier in this chapter, the purpose of the following two themes is to investigate how interaction of task and environment with M-PESA influenced the introduction of new services. According to AST, the interaction of technology, task and environment results in new structure and new source of structure (DeSanctis & Poole, 1994). The themes try to analyze how these new structures and sources of structure influence the subsequent design of M-PESA.

Theme 8: How did the new source of structure that emerged during the interaction of technology and task in an environment affect subsequent services that M-PESA introduced?

Theme 9: How did the new structure that emerged during the interaction of technology and task within an environment affect subsequent services that M-PESA introduced?

4.5. Summary of themes

The following table summarizes of themes developed in this chapter. The main function of eliciting the themes is to adapt the theoretical framework (AST) to the research questions. The broad research questions stated in Chapter two (Section 2.11) are described with the terminology from AST and reduced to smaller manageable units. Besides, the themes are used as a guide to prepare the interview questions in the next chapter.

Table 4.1: Summary of Themes

Proposition	Theme No	Theme description
P1	Theme 1	How did the different M-PESA features developed over time?
P1	Theme 2	How has the spirit of M-PESA changed over the years as new services are introduced?
P1	Theme 3	How have these structural features and spirit of M-PESA influenced the way people run their business?
P2	Theme 4	How have the different tasks affected the way M-PESA is used/ appropriated?
P2	Theme 5	How have the different environmental factors affected the way M-PESA is used/appropriated?
P3	Theme 6	What new sources of structure emerge as M-PESA interacts with the different tasks and environmental factors?
P4	Theme 7	What new social structures have emerged as M-PESA is used?
P8	Theme 8	How did the new source of structure that emerge during the interaction of technology and task in an environment affect subsequent services M-PESA introduced?
P8	Theme 9	How did the new structure that emerged during the interaction of technology and task within an environment affect subsequent services M-PESA introduced?

4.6. Chapter summary

In this chapter, the theoretical framework chosen in Chapter three has been adapted to the research question raised in Chapter two. Themes which will be used as a guide to prepare interview questions in the next chapter are also elicited. The structure of M-PESA has been described using its structural features and spirit. Further, other sources of structure in the interaction (task and environment) have been discussed. Additional themes have been obtained from the other propositions. The following chapter discusses the research method followed in the research.

CHAPTER FIVE: RESEARCH METHODOLOGY

5.1. Chapter overview

This chapter describes the research method adopted in the study in the search for answers to the research questions presented in Chapter two. It describes in detail the way the research has been designed and carried out by discussing the research paradigm, research strategy, research participants, data collection methods and data analysis. At the end of the chapter, the challenges and limitations encountered in the research are pointed out.

5.2. Research paradigm

The paradigm of a research is a set of believes about the nature of reality (Shanks & Parr, 2003). It answers the ontological, the epistemological and the methodological questions raised in a research (Guba & Lincoln, 1994 as cited in Shanks & Parr, 2003). Guba and Lincoln (1994, as cited in Shanks & Parr, 2003), further argue that a paradigm is a set of assumptions that ca not be proven as right or wrong.

The aim of this research is to gain in-depth understanding of the interaction between people and information technology and how they influence each other. The expected result from the study is an expanded insight into how information technology and society mutually shape each other over time. The technology considered is M-PESA which is fairly new with different stakeholders interested in its use. These stakeholders have their own understanding of the system based on their experiences and interests. For this reason, an interpretive research paradigm has been adopted. Interpretive research is used to study the application of information technology in society through “an understanding of the context of the information systems, and the process whereby the information system influences and is influenced by its context” (Walsham, 1993: 4-5)

Interpretive researches try to explore and explain a real life phenomenon and the relationship of different elements within the phenomenon (Walsham, 1995). Multiple views of the different participants and the researcher are incorporated into the research. It looks into the situation as understood by users rather than trying to be objective and giving generalized ideas (Orlikowski & Baroudi, 1991).

As set out by Walsham (1995) and Nandhakumar and Jones (1997), the underlying ontology of interpretive research assumes that reality is subjectively constructed in two ways. The first one is internal realism which regards reality as an "inter-subjective construction shared between individuals" while the second one is subjective idealism which considers reality as a personal construction of each individual (Nandhakumar & Jones, 1997: 110). These inter-subjective and subjective realities are created when people interact with the world around them (Orlikowski & Baroudi, 1991). Reality in interpretive research is not "given" but it is constructed and reconstructed through the interaction of human and social factors with their surroundings (Orlikowski & Baroudi, 1991; Chen & Hirschhiem, 2004).

The epistemology of interpretive research assumes that reality is a subjective social product which can only be understood through the meaning attached to it by the participants including the researcher (Nandhakumar & Jones, 1997). Understanding the phenomenon under investigation can only be gained through social construction such as language and the shared meanings attached to the reality (Trauth & Jessup, 2000). Therefore, a researcher conducting interpretive research can only gain scientific knowledge "through understanding of human and social interaction by which the subjective meaning of reality is constructed" (Chen & Hirschheim, 2004: 202).

To understand the meaning embedded in human and social interaction, researchers need to understand the interaction from the different participants' perspective and get into the work of those who created it (Orlikowski & Baroudi, 1991). The role of the researcher in interpretive research is therefore to understand the reality/phenomenon through the meanings participants attach to them within the cultural and contextual settings (Orlikowski & Baroudi, 1991; Walsham, 1995; Neuman, 1997). The researcher is subjectively involved in understanding the phenomena through the lens of others (Nandhakumar & Jones, 1997). Multiple views (sometimes contradicting) of the researcher and the participant(s) should be entertained in the research.

5.3. Research strategy

Given that the objective of this research is to study the "bi-directional" influence between technology and people in addition to the fact that the research paradigm chosen is interpretive, it is appropriate to follow the case study research strategy. According to

Benbasat et al. (1987) and Flyvbjerg (2004), a case study is a research method which examines a phenomenon in its natural environment where the boundary between phenomenon and the environment is blurred. Case study research can be used to provide description of a case, develop theory or test a theory (Darke, et al., 1998). Case studies are employed when there is a need to answer "how?" type of questions and when there is little or no research done in the area (Benbasat, et al., 1987). As noted in Chapter one, not much research has been done in this field since the phenomenon (M-PESA) is new (barely four years) and the relationship between the application and society remains largely unexplored. This justifies case study as an appropriate strategy for this research.

The choice of case study as a research strategy has two advantages. Firstly, case study is used to gain in-depth understanding of a contemporary phenomenon in its natural environment (Benbasat, et al., 1987) which correlates with the research objective of this study. Secondly, case study is suitable for the paradigm selected. Most interpretive researches adopt research strategies which engage the researcher in the real social setting like field studies, ethnographic studies and case studies (Chen & Hirschheim, 2004; Weber, 2004). Case study research strategy like any other research adopting interpretive approach engages the participants and collects data from multiple sources (Yin, 1994).

5.4. Research participants

The participants in this study were purposefully chosen as the researcher believed that they would provide valuable information to answer the research questions raised in Chapter two. As the research scope focuses on appropriation of M-PESA by people who adopt it for the purpose of conducting businesses, only representatives from across the business spectrum were selected. Individual users of M-PESA were not included in the study.

Participants were selected to provide different perspectives on the structural features of M-PESA based on the following criteria: the participant needed to be a user of M-PESA for business purposes; they appropriated the M-PESA in a unique way; they were early adopters; they were large users of the services and; they were providers of the technology or partners in the provision of certain services. Other considerations were

that they represented the technology providers, partners and users of different kinds. The information about the participating organizations and individuals was accessed by studying a variety of documents (brochures, advertisements, business cards, and newspapers), company websites, and the interviews held with them.

To establish who the different partner companies are, the list of M-PESA partners as published on the M-PESA website was consulted (http://www.safaricom.co.ke/index.php?id=265). The list contains M-PESA's business partners as of June 2010. From the list comprising about 300 companies, those believed to provide different perspectives were chosen.

The first participant, Safaricom, was included as the provider of the technology. From the 300 business users of the technology, 10 were included in the research. The first group of participants selected included users that have appropriated M-PESA in a unique way to provide special services. Online payment provider (Participant B) and ATM Company (Participant G) were included for this reason. Participant B appropriated mobile banking including M-PESA to offer an online payment system. Participant G, on the other hand, offers an ATM withdrawal service from M-PESA account.

The next criterion used in the selection of participants was early adoption of technology. Representatives of early adopters of the technology were specifically targeted. This was to establish whether these participants have in any way influenced the technological design. A medical aid institution and a utility company (Participant E and Participant F respectively) are included for this reason. The third group of participants is that of representatives of the largest users of M-PESA services. These include schools (Participant H), microfinance Institution (Participant D) and utility company (Participant F).

The fourth group of participants is that of organizations that use the bulk payment application. A media house (Participant J) and an NGO (Participant K) represent this group. A merchant (Participant C) and an e-commerce company (Participant I) are not partners of M-PESA but use the personal M-PESA account to do business. In addition, Participant C uses the system developed by participant B. At least one user from each service M-PESA provides has been included.

Around 60 phone calls were made to request prospective participants to participate. Some of them wanted a formal request either through email or snail mail. Most of the companies were willing to participate. For this study, some potential informants contacted for an interview declined to participate for various reasons ranging from company policies to lack of time. Such people were replaced with alternative informants with a view of bringing similar perspectives on board. Unfortunately, the only bank that provides M-KESHO service in partnership with M-PESA refused to participate. The lack of an appropriate replacement means that this perspective has not been included.

5.4.1 Safaricom (Participant A)

As the provider of the technology, the participation of Safaricom in the research was vital. It is Safaricom that puts the structural features and spirit into the technology (M-PESA) as deemed fit to be used in the market. Safaricom's perspective on the technology helps one to understand what the technology is built for and how it should be used. Further, the developers are the ones who determine what new features and services should be added into the technology while observing changes in the technology. To understand how a technology has been shaped by society, the service provider was a key informant. The research participant that spoke on behalf of Safaricom is a senior manager in the business and operation section of M-PESA. She has worked for M-PESA since its launch in 2007 in different positions. Prior to joining M-PESA, she worked in other departments at Safaricom.

5.4.2 Online payment provider (Participant B)

Participant B is the proprietor of small IT organization which mainly develops e-commerce websites. At the beginning of 2010, the company introduced an online payment service which integrates all mobile banking services in Kenya (M-PESA, AirTel Money, Orange and Yucash). Customers can use the application to make payments online using one of the mobile banking services in Kenya. Business users of the system are able collect money online from all mobile banking service providers. The businesses that subscribe to their services do not need to be users of any of the mobile banking applications to benefit from the service. The money collected through the application is directly transferred to the bank accounts of the businesses. The organizations which collect money using the system pay for the services while it is free for the individuals making the payments. Most of their customers are e-commerce websites in Kenya.

Recently, the company has adapted the system to enable schools to accept school fee online. It also plans to integrate credit card payments into their system.

This participant was chosen to participate in the research because his company provides a new service that appropriates the M-PESA application in a unique way. Although there are a few other companies which have rolled out similar services, this company was the first to provide such a service Kenya.

5.4.3 Small business / merchant (Participant C)

Participant C is the director of a small business which provides affordable, modern house ware for apartments, lofts and homes in Kenya. The company operates in a physical store located in Nairobi. The company has been collecting part of its payments through M-PESA. Its customers use person-to-person money transfer (send money) option of M-PESA to make payments. The company has a static website to promote its products and new stock. It wanted to sell products through a dynamic e-commerce website but could not do so for lack of a secure online payment system. Now the company offers its products online and buyers can pay using the online payment system developed by Participant B.

This participant was chosen to provide the perspective of small businesses which use the personal M-PESA account for business purposes. The participant also utilizes the services of Participant B (Section 5.4.2) as an online payment system which appropriates M-PESA.

5.4.4 Microfinance institution (Participant D)

The fourth participant is a Nairobi branch manager of an international financial services institution that provides loan services to employees working in the public and private sectors. The organization, which is headquartered in South Africa, provides services in 14 African countries. It has eight branches in Kenya and a clientele of almost 10,000 customers. It has subscribed to use M-PESA's pay bill service and uses it to collect repayments of loans from people scattered throughout the country. MFIs are one of the biggest users of M-PESA application and this participant was chosen to give the perspective of micro-finance institution into the research.

5.4.5 Medical aid institution (Participant E)

This participant is a financial manager of a state corporation which provides medical aid services to Kenyans who are employed in the formal and informal sectors. Members pay monthly contributions either directly or through their employers. The corporation pays medical expenses for both in-patients and out-patients. Its main customers are employers in the formal sector and individual members who are either employed informally or retired. The company collects premiums by cheque, cash, electric fund transfer (EFT) and M-PESA. M-PESA is currently used by self employed members who pay their contributions directly to the corporation.

The company is one of the first adopters of M-PESA's pay bill applications. As a government owned medical aid organization, it brings a unique and key perspective to the research.

5.4.6 Utility company (Participant F)

This participant is in charge of ICT systems development for bill collection using third party system of a key utility company. The third party collection system for the company includes payments through mobile banking, traditional banks, post office and supermarket chains. The participant is responsible for handling M-PESA transactions as a third party payment. The utility company is one M-PESA's largest partners whose monthly collection amounts to more than KES 400 million (ZAR 40 million) per month.

As the largest user of the pay bill application and a utility company providing service to 1.5 million customers, the participation of this organization provides a different perspective. This participant was chosen to provide the perspective of a public company that provides services.

5.4.7 ATM company (Participant G)

This participant is the head of operations in an independent ATM company which provides ATM services for banks and other financial institutions operating in Kenya. He has worked at the company for the five years in different capacities. The company has more than 110 ATMs scattered around the country. This ATM operator was the first partner to work with M-PESA to provide ATM withdrawal services. Currently, there are other banks which also provide the ATM withdrawal service in partnership with M-PESA.

ATM withdrawal is another appropriation of the technology which was meant to work only through human agents. This participant is chosen to be part of the study because he provides a different perspective as an M-PESA partner. His view enriches our understanding of how the ATM withdrawal service came into operation.

5.4.8 Educational company (Participant H)

This participant is the financial manager of a primary school which uses M-PESA's pay bill service to collect school fees. The school, which is located in Nairobi and has 1300 students, started using M-PESA in 2009 to collect money from parents.

The choice of this participant was inspired by research by M-PESA which has shown that M-PESA's send money service (person-to-person transfer) is used extensively during January, May and September, which are the months during which school terms commence. It was established that most parents use M-PESA to send money for payment of school fees. Previously, the money would be sent through M-PESA to the student, a teacher or an employee of the school who would then make the payment to the school. When some schools learnt of this technology, they adopted the pay bill application to enable parents pay the fees directly to the school account.

5.4.9 E-commerce company (Participant I)

This participant is the owner/director of an e-commerce website which uses M-PESA to collect money online. The company is a leading online retailer which sells books, music, DVDs, electronics, toys and games. The company operates exclusively online with no physical store. It delivers products through door to door delivery service in Nairobi and by courier service outside Nairobi. It has a number of payment options for its services. For customers from organizations, it accepts payment through bank deposits, cheque and electronic fund transfer (EFT). For individual customers, the company accepts cash-on-delivery and M-PESA's send money application.

As a company that has appropriated the send money application for an online payment system, this participant provides a unique perspective. The use of M-PESA for online payment by the company has enabled many Kenyans to shop online.

5.4.10 Media house (Participant J)

This participant is the treasurer of a media house which operates a TV station, radio station and a daily newspaper. In addition to this, the media house also imports different magazines from abroad and distributes them in Kenya. The participant has worked with the company for nine years in the finance department. He is also in charge of the partnership with M-PESA. The company collects income from advertisements, and distribution of magazines and newspapers. M-PESA is mainly used for collecting money from the circulation of newspapers through the different outlets like vendors, agents and distributors. The media company has used M-PESA's pay bill application since November 2009. In addition to the pay bill application, the company also uses the bulk payment application to pay people who win money through promotions.

This media house was included in the research to represent the views of businesses which collect money from their partners located throughout the country and pay money using the bulk payment application.

5.4.11 NGO (Participant K)

The organization is an international NGO which operates in 32 developing countries in Africa, Asia and the Caribbean regions. It undertakes humanitarian work in different focus areas including HIV/AIDS, education, livelihood and health. It started using M-PESA's bulk payment application to provide financial assistance to people who were affected by the post election violence (PEV) in 2008. It is the first organization to use M-PESA's bulk payment for humanitarian assistance. Currently, the organization uses M-PESA for other purposes including payment for casual workers, compensation for community health workers, and payment for daily allowances.

The participant who represented this NGO is a project officer in one of the programs which makes payment to beneficiaries through M-PESA. She is in charge of making the payments using the bulk payment application. The program, which started in October 2009, provides assistance for the urban poor for social protection and sustainable livelihood. It operates in a slum called Korogocho in Nairobi. Currently, the NGO assists 2000 households by paying them KES1500 (ZAR150) per month. Other programs in the organization also use M-PESA.

This organization brings a unique perspective into the research as a user of bulk payment to make social payments. When the bulk payment was developed, its objective was to facilitate payments to field staff in a manner that is convenient for both the organization and employee. As is evident, this organization has appropriated the technology for a different purpose.

5.5. Data collection method

Both the interpretive research approach and the case study approach lend themselves to qualitative data collection methods (Baskerville, 1999; Chen & Hirschheim, 2004). Qualitative data collection methods engage the participants and allow them to express themselves. In this research, semi-structured formal interviews were used to collect the data. Interviews which lasted from half an hour to one hour took place with the participants listed in Section 5.4 above. The interview questions were designed based on the themes elicited in Chapter four (the interview questions are discussed in Section 5.5.1). The interview questions were emailed to some of the participants before the actual interview at their request. During the interviews, some of the questions elicited spontaneous discussions on topics which were not first included in the interview. Most of the interviews were voice recorded after consent was obtained from participants and transcribed within 48 hours as suggested by Webb and Young (2005). In cases where participants refused voice recording, notes were taken during the interviews. After the interviews, questions which were not clear and not discussed fully were raised in the follow up interviews with some participants or emailed back to participants who were unavailable for follow up interviews, for further clarification.

As can be expected from interpretive research, contradicting data was collected from different stakeholders as each one of them presented their own version of the truth. This has been especially prevalent on the technology developer side on the one hand and on the pay bill partners on the other hand. Such contradicting data were notified to the participants and explanations sought from both sides. The interview questions and the fieldwork protocol are discussed below.

5.5.1. Interview questions

As discussed above, the interview questions raised for the participants were developed based on the themes elicited in Chapter four and summarised in Table 4.1. These questions guided the discussion between the researcher and the participants.

Table 5.1: Interview Questions

No	Interview Question	Purpose of the Question	Theme	Research Question relate to
1	Please describe what your organization does; and your role is in the organization.	The purpose of this question to find out more about the organization, the role of the participant in the organization and see how they are related to M-PESA.	N/A	N/A
2	When and Why did your organization start using M-PESA? How is M-PESA used in your organization?	This question aims to determine the reason the organizations in the research choose to use M-PESA, how they use it and for how long they have been using it.	N/A	N/A
3	How would you describe the changes in M-PESA services in the last three years?	The aim of the question is to determine how the research participants view the evolution of M-PESA	1	1
4	M-PESA started its service with the slogan “Send Money Home”. How do you evaluate this change in the intention of M-PESA from providing service for person-to-person transfer to different services now?	The purpose of this question is to determine the change of spirit of M-PESA.	2	1
5	Please describe the way the introduction/adoption of M-PESA services changed/affected the way your organization delivers its services for its customers?	The aim of this question is to see how M-PESA has changed the way people run their businesses in relation to their customers,	3	2
6	Explain changes (if there are any) your organization have made to incorporate M-PESA into the organization	This is to determine how organizations have adjusted their businesses/process to accommodate M-PESA into their organization. To see if there is any change that was brought by M-PESA to the businesses	3	2
7	Describe for what purposes your organizations uses M-PESA? Describe how you use M-PESA to accomplish this purpose? Is it changed from its original intention?	This is to determine the purposes M-PESA is used for (tasks) affected or influenced the way it is used? To investigate how M-PESA has been adapted to accomplish tasks	4	3
8	Describe how environmental factors like regulatory, financial, mobile phone coverage and others affected the way M-PESA is used?	This question aims is to determine how participants think environmental factors affect the adoption of M-PESA	5	3
9	What kind of new services have your	The purpose of this question is to	6	2,3

	organization introduced in relation with M-PESA?	determine if the organizations have introduced new services (sources of structure) because of M-PESA		
10	Explain how the introduction of M-PESA altered the social relations the organizations has with its customers, employees?	This is to see how M-PESA has brought new social structure to the organization	7	2,3
11	How did your organization participate in the design of new M-PESA services (if it has)?	To find out if and how the participants have influenced the design of new services introduced by M-PESA	8	3
12	How do you evaluate the way the introduction of new services (products) related with M-PESA affected the design of subsequent M-PESA services?	This is to see how new services (new source of structure) that emerge during the interaction of technology and task in an environment affect subsequent services M-PESA introduced?	8	3
13	How do you evaluate the way the new social relations that emerge during the use of M-PESA affected its subsequent design?	This is to see how new social structure that emerged during the interaction of technology and task within an environment affect subsequent services M-PESA introduced	9	3

5.5.2. Fieldwork protocol (adapted from Krauss, 2007)

As mentioned above (Section 5.4), the list of M-PESA's partners published on its website was used as a guide to choose participants for the research. Once participants were chosen, the following steps were taken to set appointments and undertake the interviews:

i) Use of informal relations to set up appointments with the people who are willing and able to participate in the research (Webb & Young, 2006). Where this was not possible, phone calls were made to the organizations, to explain the purpose of the research and to make contact with the person in charge of M-PESA transactions.

ii) Once the potential participant was identified, phone calls were made to them or email send to them, to explain the research objective and ask them about their willingness to participate.

iii) Schedules for interview with the participants were made. Some requested the interview questions to be sent ahead of the interview. This was sometimes required to get permission from their superiors to participate in the research.

iv) Before starting the interview, the researcher introduced herself to explain the purpose of the research, to explain that their responses would be used for the purpose of an

academic research and would be held with utmost confidentiality; and they could withdraw from the research at any time.

v) The participants were requested if they were willing to be voice-recorded. If they did not mind, a recorder was used. Some participants did want to be voice-recorded; so notes were taken instead.

vi) Effort was made to make sure the participants were at ease throughout the interview.

5.6. Data analysis

After the interviews were conducted with the 11 participants and some follow up interviews were made, the researcher was left with 500 MB of digital voice recorded interviews, 30 pages of transcription and notes from participants whose interviews were not recorded. To analyse the data obtained, the diachronic analysis method used by DeSanctis and Poole (1994) were utilized.

Diachronic analysis is used to study the contrasts of earlier and later moments of a technology's use which fits well with the objective of the research (Szulanski, 2000). It has been applied in studies to examine the "developmental path of a specific technology's use" (Barley, 1990:223). In diachronic analysis of a technology, each discrete move of a user made to appropriate the technology is reported (Miller, et al., 2000). Diachronic analysis has especially been found useful in understanding the "the adaptive process by which technology structure is incorporated into interaction" (DeSanctis & Poole, 1994: 132-133). DeSanctis and Poole (1994) have developed a schema for categorizations of the appropriations and linking those appropriations to the structural features of the technology and other sources of structure.

In diachronic analysis, the first step that needs to be taken is to understand the structural features and spirit of a technology and elicit them. The structural features of the technology can be obtained from manuals, observing the technology, interviews with the designers and from the comments on the technology by users (DeSanctis & Poole, 1994). The structural features of M-PESA have been identified and stated in the previous chapter (Chapter four Section 4.2).

The second step is to describe other available sources of structures. These structures include task and environment. These sources of structure affect the way the technology

is appropriated or used (DeSanctis & Poole, 1994). The task and environment can also be obtained the same way structural features are found. These tasks and the environment M-PESA is used for have been described in previous chapters (Chapter two, Section 2.6, 2.9.2, and Chapter four, Section 4.3). By organizing these sources of social structure (technology, task and environment), some kind of understanding about the use of the technology can be obtained.

The third step taken in the data analysis stage is to use the propositions of AST (discussed in Chapter three) and the themes (developed in Chapter four) as the basis to categorize and organize the sources of structure (technology, task and environment) and appropriation in a table format (DeSantics & Poole, 1994: 132). After that, the contents of the table and the themes were used as a guide to do text analysis on data gathered from literature and empirical research (Miller et al., 2000). The result obtained by following these steps on M-PESA using diachronic analysis is presented in Chapter six.

5.7. Challenges in the research

As with most case study researches, the first challenge faced in this research is ensuring representativeness of the research participants (Darke, et al., 1998). Only ten from possible 300 business users of M-PESA took part in it. To circumvent this issue, effort was made to draw participants with varying perspectives; at least one user from each service M-PESA delivers were included. Additional participants were included for services with several users (pay bill applications).

In interpretive case study researches, ensuring participation of potentially useful informants is usually a challenge (Nandhakumar & Matthews, 1997; Darke, et al., 1998). As mentioned in Section 5.4, some expected participants declined to participate for various reasons. One such potential participant was Equity Bank which offers M-KESHO in partnership with M-PESA. The researcher believes the perspective of this informant would have been useful for the research if it was included.

The third challenge in the research relates to the research paradigm adopted. Making generalization from the result of an interpretive research is difficult and mostly unnecessary. In fact, the purpose of interpretive research is to gain an in-depth understanding instead of looking for generalized results (Orlikowski & Baroudi, 1991;

Klein & Myers, 1999). The result obtained in this research is therefore made from specific implications and rich insight. The purpose of this research is to gain a deep understanding of the phenomenon in order to inform other related situations rather than to make generalizations (Orlikowski, & Baroudi, 1991; Walsham, 1995).

The fourth challenge is that M-PESA continues to evolves at a fast pace especially during the course of this research. New services were introduced by M-PESA and facts changed very fast. For instance, M-KESHO was introduced in May 2010 while the buy goods service was introduced in October 2010 after empirical data gathering had come to an end. In 2011, Safaricom introduced two new services Prepaid Safari-card and M-ticketing. The last three services were therefore not included in the empirical research.

5.8. Research limitations and bias

Interpretive case study research method allows the investigation of a phenomenon in its natural environment where there are multiple views of reality by the researcher and participants (Benbasat, et al. 1987; Orlikowski & Baroudi, 1991). By adopting an interpretive case study approach, the result of this research is constrained by challenges inherent in interpretivism and case study.

The first limitation of interpretive case study is the researcher's bias. Although the researcher participated in the research as an outside observer where only formal interviews were carried out to collect data with no direct involvement in action, this does not guarantee absence of bias (Walsham, 1995). Everyone, including the participants and the researcher, are biased by their own background, knowledge, and prejudice (Walsham, 2003). Thus, preconceived ideas and values of the researcher will influence what data is collected and the way it is interpreted (Poggenpoel & Myburgh, 2003). The data analysis and interpretation heavily depends on the researcher (Darke et al., 1998). The research result will therefore be biased as the result of these factors.

In addition to the research approach, qualitative data collection and analysis technique adopted in this research suffer certain imperfections. Interview as a research instrument is limited only to those who are accessible (Myers & Newman, 2007). Besides, during interviews, both interviewer and interviewee are constructing knowledge which adds to the issue of bias mentioned above (Fontana & Fey, 2000 as cited in Myers & Newman,

2007). On top of this, interviews are subject to lack of time, lack of trust, artificiality of setting, and ambiguity of language (Myers & Newman, 2007). This research has suffered from at least some of these limitations of interview as a data collection method.

Diachronic analysis as a data analysis tool is usually adopted in longitudinal studies where researchers observe the change of the technology and its influence on the social structure over time (Szulanski, 2000). However in this research, the different participants were interviewed to report the change they observed over time which has its own limitation as participants build differing realities. The research is limited by the shortcomings of the research paradigm, research strategy, data collection method, data analyses techniques and research bias.

5.9. Conclusion

This chapter considered the different aspects of the research design adopted in this study. In general, it covered the research paradigm which includes the ontology and epistemology of interpretive research; the research strategy which described case study as a strategy to conduct this study; and the different participants who took part in the research representing different stakeholders in M-PESA adoption. Furthermore, interview as a data collection method, and diachronic analysis as data analysis method have been discussed. Finally, the challenges faced during the research and the limitations of the research were outlined. The following chapter provides insight into the data analysis and research results.

CHAPTER SIX: RESEARCH RESULTS

6.1. Chapter overview

This chapter focuses on examining the data collection process and presents the results obtained from analyzing the data using diachronic analysis. Themes developed from the propositions of AST in Chapter four (Section 4.2-4.4) are used as the basis to analyse the data gathering through interviews. The themes are used to categorize, organize and present the information collected from literature review and interview in table format. The structural features of M-PESA which were discussed in Chapter four (Section 4.2.1) is used as units of analysis. The results of the analysis are presented in seven tables. Answers to the research questions from the data analysis are provided in the next chapter.

6.2. Summary of data collection and analysis technique

As discussed in Chapter five (Section 5.5), data was gathered adopting qualitative data collection method using semi-structured interviews with 11 participants. Participants were selected from the list of entities that partner with M-PESA. Once potential participants were identified, initial contact was made with the prospective participants to inform them about the objective of the research and inquire about their willingness to participate. Meetings were then set up and interviews carried out. The interviews took approximately 30-60 minutes each. Most of the interviews were voice recorded after consent was obtained from the participants. For participants who refused to be voice recorded, notes were taken during the interview. The recorded interviews were then transcribed.

The transcription of interviews was done using a combination of naturalized and denaturalized methods. At first, the transcription was done adopting naturalization method where every utterance in the conversation was recorded in detail (Oliver et al., 2005). Then, meaning and perception were constructed from the conversations using denaturalization method (Oliver et al., 2005). Utilizing both methods enables the exploitation of the strength of each method. Naturalized methods enable the capturing of each detail in each conversation while denaturalization method makes sense of the conversation by taking into account the context of the conversation (Oliver, et al, 2005).

After the transcription, data was analyzed using diachronic analysis based on the propositions of AST and themes developed in Chapter four (Section 4.2-4.4). The different services that M-PESA delivers were used as structural features to organize the data collected through the interviews. The result from the analysis is presented below.

6.3. Result from diachronic analysis

6.3.1. *P1: The social structure brought by a technology can be described by its feature and spirit.*

The social structure and spirit of M-PESA are described using its features and spirit in Chapter four. A number of themes were developed in Section 4.2 from these propositions. The research result is organized along these themes.

Theme 1: How did the different M-PESA features developed over time?

Structural Feature	Responses
Pay Bill Application	"We had the technical capability to provide the service. It is basically what we did at the pilot project…but we wanted to start simple and did not know the market existed" (Participant A). "We saw how M-PESA is used in the market. It was all over the place. So we thought we may use this service if they develop something like this for us… We went to them 8 months before its (pay bill) launch and ask them to develop a system for us" (Participant E). "We have been using other third party bill collectors for some time. So we asked them to develop a system. They came up with the Pay Bill application. We are the second adopters of M-PESA bill payment service" (Participant F) "Some parents were sending money through M-PESA to their children, teachers and other employees to pay school fees. Sometimes the money gets lost somewhere and payment is not made. We were looking to directly accept this money into the school's account" (Participant H).
ATM withdrawal	"Most agents close at 6PM and they usually run out of money or e-float. But our ATMs work 24hours and rarely run out of money…. We saw a gap there. We approached M-PESA with this idea but surprisingly they had already thought about it too. So it [ATM withdrawal] was a mutual thing". (Participant G)
M-KESHO	"We gather usage of M-PESA through different ways. Through our call centre, research surveys done by us and others. From one of the research done by FinAccess, we found out that 21% of M-PESA users store money in it, even if it is not a savings account… So we come up with M-KESHO- a savings account that earns interest" (Participant A).
Buy Goods	"We were using M-PESA send money application to sell our goods. Our customers prefer it to carrying large amount of money. We were looking for a better way. The customer transfers the money into personal M-PESA account and it is not very safe for our company" (Participant C). "We knew some people are using M-PESA's send money application as method of payment for different reasons for example safe keeping. Some of them are contract taxis and hotels" (Participant A).

Table 6.1: Development of structural features of M-PESA over time

From the different responses above, it is evident that the services M-PESA provide were designed in response to different demands or requests. In pay bill application, prospective users requested Safaricom to design a system that fits their needs. In M-KESHO application, M-PESA studied the use of the deposit money application as a savings account. The ATM withdrawal service was conceptualized by both Safaricom and the ATM network operator.

The main determinant in the introduction of a service is not technological capability, but the need for that service in the market. As seen from M-PESA, the technological capability to provide pay bill (customer-to-business payment system as in the pilot project) existed before the introduction of the service. The service only became available once it was evident that there was a need in the market.

Theme 2: How has the spirit of M-PESA changed over the years as new services are introduced?

Structural Feature	M-PESA spirit	Responses
Initial M-PESA plan. Person-to-Person money transfer	To bank the unbanked	"We built the system to be piloted by MFI… I do not know how many MFI exist in Kenya but let's say there are 3million customers. If the system is used for that, it will only be used by them. But we build a system that can be used by anyone with mobile phone that is 16 million people." (Participant A) "The first adopter of M-PESA were actually banked people who wanted to send money in a convenient way… these people influenced the unbanked people who receive the money, usually people who live in rural areas to have M-PESA account" (Participant A)
person-to-person money transfer	Customer-to-Business	"M-PESA was meant to provide person-to-person money transfer but now providing customer-to-business (pay bill) and other services" (Participant B)

Table 6.2: Change of Sprit in M-PESA

The main intention/spirit of M-PESA was to provide banking services for the unbanked, but even the first adopters of the technology were banked people who needed a convenient way of sending money. These people then influenced the unbanked people to subscribe to M-PESA. The spirit of the technology has also changed in another dimension. What was once thought to provide person-to-person money transfer is now used for customer-to-business payment (pay bill, buy goods) and business-to-consumers (bulk payment) transactions.

Theme 3: How have the structural features and spirit of M-PESA influenced the way people run their business?

M-PESA features	Responses
Pay Bill	"We [online payment system] would not have existed if it was not for M-PESA. The whole idea came from watching M-PESA and seeing a gap in the market" (Participant B). "There is less physical contact with our customers. I think this may have some consequence in the future to ensure there is no default" (Participant D). "Members now have no reason to delay or not make payment. We are collecting money 24/7, on weekends and on holidays even if our offices are closed. " (Participant E). "We have to buy a system (software) to integrate M-PESA with our database" (Participant E). "We are collecting more money in time than before. The cost of collection is reasonable" (Participant H). "We can see who has paid from where and when. We can see who has defaulted. Everything is documented on the application " (Participant J)
Send Money (person - to-person money transfer)	"Other than accepting money on M-PESA transfer as payment. There is no change in our business" (Participant C) "Before M-PESA, we were using cash on delivery as a form of payment. Our services were, therefore, limited to Nairobi and surrounding areas … But with M-PESA, we provide service countrywide, collect money through M-PESA and sending the books through courier service". (Participant I).
Bulk Payment	"It has brought a lot of changes to our operation. The total cost for transaction is KES 55 .It is very cost effective. Banks require minimum balance –a lot of other requirements to do these kinds of transactions. No requirement for minimum balance with it [M-PESA]. It [M-PESA] keeps log of every transaction (what happened, who did it, when did it happen). It leaves trail. This is very good for accountability. It takes two people to complete a transaction. One person initiates the transaction another one approves it" (Participant K).
ATM withdrawal	"We have made changes to accommodate M-PESA. One is the call centre. There are also changes in the back-end. Sometimes we need to do transaction reversal, SMS notifications, report line changes…" (Participant G)

Table 6.3: Changes made in business processes to accommodate M-PESA

M-PESA has greatly impacted the way business is done in Kenya. For some organizations like the online payment system provider, M-PESA is the sole reason they exist in the first place. For many users of pay bill applications, it has provided new and better ways of collecting money. Some of these users have had to change their internal operations to accommodate M-PESA. For example, the ATM provider restructured its internal system to accommodate the changes brought by M-PESA. Some other users are concerned that M-PESA will have some impact on their business in the future. M-PESA led to some unintended consequences for some organizations. Some users are able to expand their services throughout the country because of M-PESA.

In addition to the proposition (themes) of AST that technology directly influences business processes in organizations, there is an interesting chain of influences brought

by M-PESA. M-PESA is indirectly influencing the way some businesses are carried out. One such example is the way the online payment system developed by participant B influenced the business of participant C and other e-commerce sites. Participant C uses the online payment system developed by participant B to sale products online. As discussed above, the online payment system is purely built on top of mobile banking services (primarily M-PESA). In this way, M-PESA has indirectly influenced the way Participant C's business operates.

6.3.2. *P2: Use of technology depends on the task, the environment and other sources of social structure.*

Theme 4: How have the different tasks affected the way M-PESA is used/appropriated?

Theme 5: How have the different environmental factors affected the way M-PESA is used/appropriated?

M-PESA Feature	Task	Environment	Explanation
Send Money	Money transfer	Wide spread use of mobile phone, Lack of affordable alternative ways of sending money	Only 22.6% of Kenyans have access to formal banking services. Almost 47.5% of the population has access to mobile phones. These two environmental factors were the main factors which contributed to expansion of M-PESA. "People used to send money by buses disguising it as parcel. If the parcel is lost, they ca not claim their money as it is assumed they only sent parcel not cash" (Participant A).
Deposit Money	Saving Money	Lack of access to saving account/access to financial services	Only 22.6% of Kenyans have access to formal banking. 21% of M-PESA users store money in M-PESA. But it has never meant to be used as saving account.
Bulk Payment	Social Payment	Post election violence security problems, Banks were closed, M-PESA agents were opened	Bulk payment which was meant to be used to make payment for employees in the field is appropriated by NGOs to make social payment for beneficiaries
Send Money	POS payment	Security reasons to carry cash by both customers and store owners. Low level of debit/credit card penetration	Person-to-person money transfer appropriated to make payment to stores.
Send Money/ Pay bill Application	Online shopping payment	Lack of access to credit card or other alternative payment methods.	Person-to-person transfer and pay bill applications are appropriated for payment for online shopping
All		Favorable regulatory environment	"M-PESA has to negotiate special deal with CCK to provide the services. Every time we introduced new services we have to let know CCK and get approval. We also have to submit monthly audit report" (Participant A)

Table 6.4: Impact of task and environment on M-PESA

Based on the environmental factors and the task at hand, M-PESA is appropriated in different ways. The send money (person-to-person money transfer), which is the most popular feature of M-PESA, is appropriated to be used as POS payment system and online payment method. This appropriation was facilitated by the lack of financial services (saving account, credit/debit card) and the widespread usage of mobile phones (18 million subscribers). The deposit money feature which is used to load e-money/e-float into M-PESA accounts is appropriated to save (store) money in M-PESA accounts.

6.3.3. *P3: New sources of structure emerge as the technology, task and environment are applied in specific social interaction.*

Theme 6: What new sources of structure emerge as M-PESA interacts with the different tasks and environmental factors?

M-PESA Feature	New Sources of Structure	Explanation of new sources of structure	Response
Pay bill	Online Payment System	Some companies including Participant B developed an online payment system based on M-PESA and other mobile banking application in Kenya which can be used to shop online. People with M-PESA and other mobile banking accounts can shop from e-commerce websites without credit cards. E-commerce websites can also collect payment from the different mobile banking services into their bank account. This has become a technology and source of structure for people to shop online.	"We saw a gap in the market. There are people who use mobile banking. If you give these people something that can be used on the internet, they will be able to use it… We also have plans to introduce credit card on our system" (Participant B).
	SMS notification	SMS notification: A lot of organizations which use pay bill application of M-PESA started using SMS services to let their customers know the amount of the bill.	"When we start using pay bill application, we have to let people know their bill, so we started telling people their bill through SMS notification… They send their account number to a certain number and then the bill amount is sent to them. Even people who pay with other means use this service" (Participant F).
ATM withdrawal	Money transfer from bank accounts to M-PESA	The company which provides ATM services for M-PESA is designing a system which enables people to transfer money from their bank accounts to M-PESA account using ATMs. This technology is introduced,	"Currently we are only doing dispensing part of the M-PESA transaction… Now we are designing a system that enable people to transfer money from their other bank account to M-PESA account using

		once withdrawal from M-PESA using ATM proved successful	our ATMs" (Participants G).
Deposit Money	M-KESHO	People store money in their M-PESA account. But M-PESA was not licensed to provide this service. The account does not also earn interest. M-KESHO was the answer for this need	"From research done by FinAccess, we found out 21% of M-PESA users actually store money in it. So we decided to give them a saving account in which they can earn interest " (Participant A)
Send Money	Buy Goods (POS Payment)	People used send money application to make different kinds of payments. Participant C has been collecting money through it. But this it is not safe as money is transferred to personal account. Buy Goods was introduced for this purpose.	"We know small merchants, taxi drivers and others accept payment through send money application. This money is stored in personal M-PESA account. We are testing an application which can be used as POS payment to transfer money into a bank account " Participant A. Buy Goods was eventually introduced to two supermarket chains after the interview was conducted

Table 6.5: New sources of Structure that are brought by M-PESA

New sources of structure (rules and resources) have emerged as the technology interacts with the task and environment. Some of the new sources of structure (online payment system, SMS notification and transfer at ATMs) were developed by outsiders taking M-PESA services as an established source of structure and building their system on top of M-PESA. Some other sources of structure are developed by M-PESA by expanding its services in response to the different appropriations of the technology by users.

6.3.4. *P4: New social structures emerge as the technology is appropriated in a given context over time.*

When a technology is appropriated within a group of users, it can be directly used (reproduced), related or blended with other structure over time (DeSanctis & Poole, 1994). New social structures may emerge in the interaction of the technology which represents the reproduction of technology structure, or blending of the technology with other structure (DeSanctis & Poole, 1994).

Theme 7: What new social structures have emerged as M-PESA is used?

M-PESA feature	Type of Appropriation	New Social structure	Responses
Send Money	The technology is	Social	"If a girl gives you her first name and her

	reproduced directly but with a different intention (spirit). The capability was meant to be used for confirmation	Interaction (flirtation)	number, the only thing you need to do to know her last name is send her money through M-PESA " (Participant B). The SMS notification sent after a successful money transfer contains the full name and phone number of the recipient
Pay Bill	Directly reproduced	Better Internal Control	"When money lies in the office, employees are tempted to take money. Now it directly goes to the bank account and those funny acts (deceit, theft) are reduced " (Participant D)
		Better External Control	"Some people were impersonating as our employees and deceiving people to make payment to them. Now the number of people deceived has reduced as they directly pay to our account." (Participant F)
ATM Withdrawal	Make money accessible to people 24/7. Directly reproduced but the spirit was appropriated unfaithfully	Security concern	"Now people who lost their ID prefer to withdraw money from ATM as it does not require the person to hold an ID. Only the PIN is used as a security measure. People without ID prefer to use ATM than agents to withdraw money. This also opens a door for theft as people only need PIN of a victim. They can force his PIN and phone out of him." (Participant G)
Bulk Payment	Directly reproduced	Accountability	"The M-PESA pay bill and bulk payment applications track every transaction. It is easier to see who has done what."(Participant K) This has increased accountability within organizations.

Table 6.6: New social structures that emerge as businesses use M-PESA

6.3.5. *P8: New structures that emerge as technology and task interact in an environment influence the technology and the task.*

Theme 8: How did the new source of structure that emerged during the interaction of technology and task in an environment affect subsequent services M-PESA introduced?

Theme 9: How did the new structure that emerged during the interaction of technology and task within an environment affect subsequent services M-PESA introduced?

The new sources of structure that emerged when M-PESA is used are identified in Section 6.2.2. These new sources of structure are online payment system, SMS notification, transferring money from other accounts to M-PESA using ATMs, M-KESHO, and the buy goods applications. New social structures that emerged as M-PESA was used have been identified in Section 6.2.3. These social structures include new ways of social interaction (flirtation), internal control, external control, security concerns, and

accountability.

M-PESA feature	New Sources of Structure/ New Structure	Impact on M-PESA further design
Pay bill/ send money	Online payment system	After considering the use of M-PESA as an online payment, M-PESA is considering to introduce its own online payment system. The applications built by others have influenced further services of M-PESA.
Deposit money	Saving money/ M-KESO	M-KESHO was introduced as a solution to the situation that people were using M-PESA account as a saving account. M-KESHO is a saving account where users earn interest in their savings. In addition, it plans to give users micro-credit (upto KES 5000 (ZAR 500)) and insurance services
Send money	Buy goods (POS payment)	Send money which is used mainly as person-to-person money transfer is used as a new source of structure to make payment for purchases and services. Realizing this, M-PESA introduced buy goods which is used as POS payment method. Buy goods is better for collecting money than using send money options as the money directly goes into the business's bank account instead of personal M-PESA account.
ATM withdrawal	Money transfer from other accounts using ATM	ATM withdrawal provides only the dispensing part. People can only withdraw money from their M-PESA account. Depositing to M-PESA account is not possible using ATMs. Now, the ATM providers want to introduce a new system that allows users to deposit money into their M-PESA from their bank accounts using ATMs. The existing source of structure (ATM withdrawal services and bank account) enabled for this new service to emerge.

Table 6.7: Effect of New sources of structure and new structure on further design of features of M-PESA

6.4. Conclusion

This chapter considered the data analysis and the results of the research. Data gathered through interviews and literature was analyzed using diachronic analysis. The themes and propositions of AST were used as a guide to organize the data. The research results obtained from empirical data gathering using themes developed in Chapter four, propositions of AST suggested in Chapter three and the data analysis method discussed in Chapter five were presented in seven tables. From the tables and the short discussions that followed, an answer is provided for the research question raised in Chapter two. The next chapter uses the outcome of this chapter to answer the research question and reach conclusion.

CHAPTER SEVEN: CONCLUSION AND RECOMMENDATION

7.1. Chapter overview

This chapter concludes the study by highlighting the critical issues discussed throughout the dissertation. It starts with summarizing the m-banking concept, the research question, the theoretical framework and the research methodology. It then outlines the key research results and provides answers to the research question. At the end, the chapter outlines the contribution made by the study and some reflection on future areas of research is proposed.

7.2. Summary of the dissertation

The study noted that the use of mobile phone has been growing remarkably fast in the last two decades. In addition to voice call and SMS, mobile phones have also been very pivotal for the provision of value added services like mobile banking. With respect to Kenya, the study conducted a detailed discussion of M-PESA, a mobile banking application in Kenya which was introduced in 2007 and has been growing very fast since then. In addition to the growth in its user base, the study also explored how M-PESA has diversified its services in the last four years. Although it was introduced as person-to-person money transfer service, the application has grown beyond this primary service of transferring money and has been appropriated by users and used for purposes different from the original intent of the developers. The study discussed in detail how its extensive adoption and appropriation for purposes other than person-to-person transfers has in turn influenced the technology providers to widen their services beyond the money transfer service function. It was noted that M-PESA users can now pay different utilities, purchase products online without access to credit cards, repay loans to microfinance institutions, pay insurance premiums, withdraw money from ATMs, make payment at point of sale and open savings accounts using their mobile phones.

The research problem this study addressed revolves around the way the use of mobile phones as an information technology affects society. It also inquired how the design of the technology is in turn affected by its adoption. To address this research problem, the

research started by studying existing literature and laying out a research question on the "bi-directional" influence that exists between M-PESA and its users. The research question stated:

What are the "bi-directional" influences that exist between people and technology in m-banking adoption in Kenya? To answer this general question, the study responded to the following sub-questions:

- How has M-PESA evolved through its short history from being primarily used in person-to-person money transfers to its wide spread use in different sectors of the economy?
- How has M-PESA influenced/ changed/ affected the way business is conducted in Kenya?
- How has the usage and adoption of M-PESA influenced M-PESA's evolution and design?

A study of the literature showed that the existing pool of knowledge can only answer the question partially, which called for empirical research. To undertake the empirical research, the *Socio-technical determinism* framework was chosen from among three frameworks that are usually used to study the relationship between technology and people. *Socio-technical determinism,* which states that society and technology are interdependent and shape each other over time, was found appropriate for this research. AST adopts *Socio-technical approach* to study how technology is appropriated by people and brings unintended consequences on the environment while also being influenced by its environment. The propositions of AST were utilized to develop themes which guided the empirical research. The following themes were developed in Chapter four (Section 4.2-4.4) from the propositions suggested in AST.

Proposition 1: The social structure brought by a technology can be described by its feature and spirit. The structural features and spirit of M-PESA were described in Chapter four (Section 4.2) with the services it provides and the original intention of the developers. The following three themes explore how these have changed over time. The first two themes are used to address how M-PESA evolved over time answering the first sub question.

- Theme 1: How did the different M-PESA features develop over time?

- Theme 2: How has the spirit of M-PESA changed over the years as new services are introduced?

The third theme attempted to answer the second sub question:

- Theme 3: How have these structural features and spirit of M-PESA influenced the way people run their business?

Proposition 2: Use of Technology depends on the task, the environment and other sources of social structure. The tasks M-PESA is used for, the financial, regulatory and the technological environment it operates in were discussed in Section 4.3. It was stated that the adoption of the technology is influenced by tasks and its environment. The following themes inquired how these tasks affect the adoption of M-PESA in an attempt to answer the third sub question.

- Theme 4: How have the different tasks affected the way M-PESA is used/ appropriated?
- Theme 5: How have the different environmental factors affected the way M-PESA is used/appropriated?

Proposition 3: New sources of structure emerge as the technology, task and environment are applied in specific social interaction. According to AST, new sources of structure and new social structures emerge as technology interacts with task and environment. The themes in proposition 3 and proposition 4 inquired into this phenomenon. The purpose of themes 6 and 7 was to identify new social structures and sources of structures which may have impacted the design of M-PESA.

- Theme 6: What new sources of structure emerge as M-PESA interacts with the different tasks and environmental factors?

Proposition 4: New social structures emerge as the technology is appropriated in a given context over time.

- Theme 7: What new social structures have emerged as M-PESA is used?

Proposition 8: New source of structure and social structures that emerge as technology and task interact in an environment influence the technology and the task. The themes from this proposition suggest that new sources of structure and social structures affect the design of technology. The purpose of these two themes is to

investigate how the environment of M-PESA influenced its design and answer research question 3.

- Theme 8: How did the new source of structure that emerged during the interaction of technology and the task in an environment affect subsequent services introduced by M-PESA?
- Theme 9: How did the new structure that emerged during the interaction of technology and task within an environment affect subsequent services that M-PESA introduced?

Subsequent to choosing a theoretical framework and adapting the framework to M-PESA, empirical research was undertaken using interpretive case study research strategy. Both case study and interpretivism helped the researcher to gain deep understanding of the situation under investigation. Semi-structured interviews were held with the developers and business users to collect data. The data gathered from the interviews was analyzed using the diachronic analysis method which was advanced by DeSanctis and Poole (1994).

7.3. Key results of the research

An analysis of the data disclosed the existence of bi-directional influence between M-PESA and its environment. It is shown that M-PESA as a technology has brought features which enabled the Kenyan society including businesses to do more with the technology and to go beyond person-to-person money transfer, the original intention of the developers. It was shown that M-PESA introduced new ways of making payments and undertaking other transactions. It has also been used as an infrastructure to build new services. The study demonstrated that the subsequent design of the technology has been heavily influenced by its adoption. Users of M-PESA have influenced its design through direct involvement and indirectly through their appropriation. All this could not, however, been achieved without the conducive regulatory environment in which M-PESA operates in. The following sections provide detailed answers to the research question raised in Chapter two.

7.3.1. M-PESA's evolution

M-PESA, which was introduced in March 2007 in Kenya to provide person-to-person money transfer, now provides a wide range of financial services. These services include bill payment to different businesses, payment from business-to-consumers (bulk

payment), saving account, POS payment method among others. Sections 2.9 and Section 4.2 detailed how M-PESA has evolved over the last three years. As mentioned earlier in this chapter, theme 1 (which is discussed in Section 6.3.1 and Table 4.1) was used to investigate the reason behind the evolution of M-PESA.

From the discussion in Section 6.3.1, the reasons that explain M-PESA's introduction of new services were set out. The way the technology is adopted by users was one of the major factors which influenced the introduction of new services. Users influenced the new services introduced directly (through direct requests) and indirectly (through their usage patterns and appropriation). For instance, the pay bill application was introduced after business users directly requested M-PESA to provide them with a system that could enable them to collect money from their customers. M-KESHO, for its part, was introduced after M-PESA realized people were using the deposit money feature in M-PESA as a savings account. A scrutiny of the application disclosed that the technical capability to provide most of the new services existed within M-PESA before the services were introduced. In spite of this, it was shown that the technical capability of the technology was not a decisive factor in the introduction of these new services.

7.3.2. M-PESA has influenced/ changed/ affected the manner business is conducted

The second sub question explored how M-PESA influenced the way business is conducted. The study shows that M-PESA has influenced the way business is done in different ways. Some organizations started with M-PESA as their foundation. An example of such companies is Participant B (the company which provides online payment system using mobile banking application). Theme 3, Theme 6 and Theme 7 (discussed in Section 6.3.1, and Section 6.3.2) were used to look for an answer to this question. From the discussion in these sections, it has been shown that M-PESA's impact on businesses includes:

- Provision of third party services

  This is the most interesting appropriation of M-PESA of all others. These are the new services provided by third parties by using M-PESA as an underlying infrastructure. The

existence of M-PESA is the main reason these services exist. These are online payment systems and ATM withdrawal.

- New service provision

  Some companies are now able to provide services they could not provide before the introduction of M-PESA. For instance, Participant C is able to sell its commodities online using M-PESA which it could not do before. Other e-commerce firms are now providing their services to a wider market than they did before. Participant I whose services were limited to Nairobi has expanded its services outside of Nairobi.

- Change in internal operations

  Most of the companies which participated in the research had to make changes within their organizations to accommodate M-PESA. The changes included introducing bill notification using SMS; adjustment of their call centers to handle M-PESA enquires; and purchasing software to integrate M-PESA into the already existing systems.

- Fighting fraudulent activities

  M-PESA has helped organizations fight fraudulent activity. These fraudulent activities were sometimes committed by employees while others were committed by outsiders.

- Decrease in personal interaction

  As people pay their contribution/ fees/ premium using M-PESA, face to face interaction between customers and service providers has reduced.

In addition to the changes M-PESA directly brought to businesses, it also indirectly affected businesses through the third party applications. Some e-commerce companies and schools use the applications developed by participant B to collect payments online. M-PESA has also engendered other effects on the social interaction of individuals, new ways of money theft and increased accountability.

7.3.3. The usage and adoption of M-PESA influenced its evolution/ design

Different factors have influenced the way M-PESA introduced its services. The environmental factors have been very conducive for the expansion of mobile banking.

The low penetration of financial services coupled with high penetration of mobile phones facilitated the adoption of mobile banking (M-PESA). The regulatory bodies, CBK and CCK, allowed Safaricom (mobile telecom operator) to provide financial services in a market dominated by traditional financial institutions (banks).

Theme 4 and theme 5 (discussed in Section 6.3.2) were used to investigate this question. From the discussion, it can be deduced that the environmental factors (lack of financial access, wide spread use of mobile phone and suitable regulatory framework) and the tasks (money transfer, saving money, and POS payment) of M-PESA have affected the way M-PESA is used. The way it is used has in turn affected the subsequent design of M-PESA as the service providers introduced new services to satisfy the needs of their users.

As discussed in Section 7.2.1, users have directly or indirectly influenced the design of M-PESA. Some users directly went to Safaricom and requested Safaricom to develop an enhanced system for them. Others appropriated the existing services to fit their needs. In response to the way users appropriated technology, M-PESA introduced a number of new services that meet users' requirements. In doing so, users have indirectly impacted the design of the technology.

As discussed in Section 6.4.2, use of M-PESA has brought new social structures (saving/depositing money, new social interaction (flirtation), internal control, and accountability) and new sources of structure (online payment systems, M-KESHO, SMS notification, POS payment, ATM withdrawal and transfer). These new social structures and new sources of structures have influenced the subsequent services introduced by M-PESA.

Themes 8 and 9 (Section 6.3.5) were used to investigate this phenomenon. For example, people use their M-PESA accounts to save/deposit money (new social structure) which was not intended by the technology providers. In response, M-PESA introduced M-KESHO as a savings account. This shows that the new social structure which was brought by M-PESA (saving money in a technology which was meant to be used for transferring money) has in turn affected the subsequent design of the technology.

Secondly, after observing how an ATM withdrawal service (source of structure) has been used, the ATM company surveyed in this study is planning, in collaboration with Safaricom, to introduce new services which will enable users to transfer money from other bank accounts to M-PESA using ATMs. Thirdly, M-PESA is planning to introduce an online payment system after observing how online payment systems (sources of structure) introduced by third parties are used. From these instances, it can be observed that new sources of structure and new social structures that emerged during the interaction of M-PESA with its environment have influenced the design of the technology.

The appropriation of M-PESA differently than originally designed has not only changed the subsequent services introduced but has also changed the intention/spirit of the technology. The initial intention of M-PESA was to provide affordable banking solutions to people without access to financial services. Since then, this has changed to providing mobile banking application with a wide range of services to all Kenyans with access to mobile phones. This is the result of M-PESA being found convenient even among banked people for sending money, paying their bills and buying goods. Adoption of M-PESA by banked and relatively well off people has forced unbanked people who usually receive money to become users of the technology. As a result of this, the intention of M-PESA changed from serving the unbanked to providing mobile banking application to whoever wanted to use it.

7.4. Over all research question: The "bi-directional" influence between people and technology in m-banking usage in Kenya

From the discussion above, it can be observed that M-PESA has impacted the way business is done in Kenya while at the same time being influenced by the adoption. M-PESA has made it possible for some businesses to build their own applications using it as a foundation; it has allowed others to expand their businesses, and fight fraudulent activities.

Users have also (through their appropriation or by direct requests) influenced the design of the technology. The adoption of M-PESA has also changed the spirit of the

technology. From M-PESA evolution in the last four years, it can be seen that there is a "bi-directional" influences between people and technology.

From the themes developed by the research, it can be concluded that it is difficult to come up with a clear-cut prediction of how the structure of a technology is appropriated and what the consequences of such appropriations are. The technology shapes business but businesses and other people also control their use (interaction) and appropriation. The appropriation in turn shapes future design of the technology.

7.5. Contribution of the research to the field of informatics

The contribution of this study to the field of informatics can be explained on multiple levels. Firstly, the research adds on our understanding of the interaction between information technology and society which is the primary concern of the discipline. Through interviews and literature review, the findings of the research have shown that information technology and its users shape each other leading to the evolution of both the technology and the way people undertake their day to day businesses. M-PESA has changed the way people do business by providing new ways of making payments while the way people use M-PESA in turn impacted its consequent services.

Secondly, the research, by adopting Adaptive Structuration Theory as a framework, demonstrated how theories developed in the field can be applied in practical research. AST as a theory explains how technologies introduced into organizations bring unintended consequences and change the social norm. M-PESA as a technology brought features into the economic environment of Kenya. These features brought new ways of doing things, and interactions (social norms) which were not envisaged by the designers of the technology. The adoption and appropriation of the technology by different users have in turn impacted the design of M-PESA. Lastly, by undertaking an interpretive case study, this research illustrates the importance of these methods as a research approach to the field of informatics. Both intepretivism and case study approaches have been utilized in the research to gain deep understanding of M-PESA's adoption and its impact on business users. The research has provided rich insight on how M-PESA and its environment have influenced each other.

7.6. Future research

Further future research focusing on the mutual interaction of people and information technology should be done on the ever evolving mobile banking and its impacts on society. As indicated in this research, the mobile banking application is still new and evolving, which calls for more research. To begin with, M-PESA introduced the Buy Goods service in late 2010 after the data gathering for this research was completed. The service was discussed in Section 4.2.1. In 2011, two more additional services have been introduced. The first one is Safari-card: a prepaid card which can be used as a debit or credit card. M-ticketing is the second application which subscribers can use to book and pay for tickets for different events.

In addition, there is a suggestion from commentators that M-PESA could ultimately replace cash and magnetic cards (debit and credit cards) and that it could be used as an m-wallet. Studies which investigate this phenomenon and its effect on society will be relevant in the future.

Lastly, there are comments from different individuals that M-PESA is altering personal behaviour when it comes to dealing with money. Some say, it has made people spend more money by making their money easily accessible because there is no need to go to a bank branch or ATM to withdraw money. M-PESA agents are located everywhere, including residential areas. There is also a suggestion that more people are now visiting their rural home less often as they can send money easily through M-PESA. These and other changes brought by M-PESA into the social life of individuals can be investigated in further researches.

This research was limited to a few participants. Increasing the number of participants using questionnaire and focus group discussions model to cover a wider range of users would have enriched the research outcome. Future researches can adopt other theories from the field of informatics to validate the result of this and similar research.

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