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The Impact of Mobile Telephony Services on Performance Outcomes of Micro-Businesses in Developing Economies

With Evidence from Micro-business Communities in Afghanistan and Cameroon.

A thesis submitted in partial fulfilment of the requirements for the degree of Doctor of Philosophy

Mfuh W. Fuaye Kenji

WARWICK BUSINESS SCHOOL

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FEBRUARY 2009

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Declaration of own work

I hereby declare that this thesis,

'The Impact of Mobile Telephony Services on the Performance Outcomes of Micro-Businesses in Developing Economies: With Evidence from Afghanistan and Cameroon'

to the best of my knowledge is entirely my own work and that where any material could be constructed as the work of others, it is fully cited and referenced with appropriate acknowledgement given.

Signature_____

Name of Student: Mfuh W. Fuaye Kenji

Name of Supervisors: Pr. Martin Cave, Dr Chris Doyle.

Abstract

This thesis reports on a study conducted to investigate the relationship between the integration of mobile telephony services into micro-business processes and perceived enhanced business performance in a developing economy context, with detailed evidence drawn from a sample of 210 micro-businesses in Afghanistan and Cameroon. The research conceptualises, operationalises, and empirically tests an eclectic research model which integrates theory from the literature on the adoption and use of information and communication technologies (ICTs), on information economics, on strategic management, on entrepreneurship, and on small business growth and business performance.

The research data was collected through a questionnaire, and call data extracted from the mobile phone activity-logs of micro-business owner-managers. This data was supplemented by the use of carefully-chosen photographs. The collected data was analysed using Structural Equation Modelling Techniques (SEM) with the help of AMOS 17 and SPSS statistical packages. The study also used Latent Visual Data Analysis (LVDA) to corroborate the statistical outcomes of this analysis.

The results of this study identified the 'integration of mobile telephony services into micro-business operations', the 'entrepreneurial competence of micro-business owner-managers' and the 'micro-business environment' as having a direct influence on perceived enhanced business performance because of their potential to enable substantial cost savings, provide greater integration of the internal and external environments of the business, increase operational flexibility and reduce information asymmetries. The results also identified that 'micro-business environments' in Afghanistan and Cameroon tend to have a negative relationship with enhanced business performance if not moderated by the use of mobile telephony services.

Finally, given the importance of micro-businesses in stimulating economic growth in developing economies and their relatively high failure rates, and because of the fact that many micro-businesses perceive that the cost of mobile telephony services are 'high-to-very high', this research provides greater opportunity for a discussion of the kinds of intervention strategies that could be used to improve the business integration of mobile telephony services and could therefore enhanced business performance.

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CHAPTER ONE: INTRODUCTION

1 Introduction

The rapid global diffusion of mobile telephony services and their potential to drive economic growth, especially within micro-businesses in developing economies, is very topical today (Donner, 2004, 2005, 2006, 2008; Sinha, 2005; Goodman 2005; Wavermann et al., 2005; Goodman & Walia, 2006; Lane et al., 2006; Abraham, 2007; Jensen, 2007; Aker, 2008; Morawczynski, 2008). Despite the phenomenal penetration achieved by mobile telephony in developing economies in the last decade, empirical studies on the nature and impact of their uses are not very common. Although there is quite a profusion of commercial information based on isolated case studies claiming potentially strong and significant relationships between the uptake of mobile telephony services and business growth, there is very little empirical evidence to corroborate these claimed relationships. This study seeks to address this problem by answering the following significant question:

> *How important are mobile telephony services in determining enhanced business performance outcomes of micro-businesses in Afghanistan and Cameroon?*

This study provides new evidence on the interaction between the use of mobile telephony services, entrepreneurship and business performance. It also captures the critical role and complexities of the integration of mobile telephony services as a determinant of enhanced business performance. As an introduction to the thesis, this Chapter explains the background to the research, and discusses the rationale for the research and for the research methodology, including the choice of the sample.

In developing economies, mobile telephony is the primary support system for access to operational, tactical and strategic information in a timely, cheap and flexible manner. This study examines micro-interactions between the use of mobile telephony services and business performance. The findings show that these services enable substantial cost savings, provide greater integration of the internal and external environments of businesses, increase operational flexibility, reduce information asymmetries and contribute to performance and general growth.

1.1 Background to the Research

The diffusion of Information and Communication Technologies (ICTs) such as computer and computer networks, telecommunications – telephony, telex, facsimile - in the last three decades has been rapid. The diffusion of ICTs has seriously changed the way human beings live, work and interact with each other. Certain processes have evolved significantly, with computers taking over most of the processes that were traditionally performed by clerks, operators and specialists. The potential of information and communication technologies to change and improve processes particularly within the business environment have attracted much attention from within academia (Sanders, 1979; King and McAulay, 1989; Lincoln and Warberg, 1987; Strassmann, 1990) and practitioners. Computers and their networks seem to have received much more attention than any of the new information and communication technologies.

While computers are traditionally attributed with business and productivity, mobile telephony has not been viewed in the same manner, particularly in western economies, despite the fact that it is one of the most diffused of communication

technologies. In fact, the mobile phone is the only object being carried about by some 3.4 billion people across the whole world, with 8.6 million in Afghanistan and 6.1 million in Cameroon. This clouded view of the impact of mobile services on business performance in western economies may have stemmed from the supposition that fixed or wired line phone systems constitutes the main communication system interconnecting businesses; and because mobile telephony developed as an extension to this efficient system, it is viewed as a supplement rather than an essential business tool in its own right.

The number of fixed lines in a country compared to its population, known as teledensity, is usually employed as a measure of that country's level of economic development. Using the number of fixed line phones to measure the level of economic development did not come about by chance. A viable communication network is the breeding ground of economic activity, which often translates into economic growth (Saunders et al., 1983). While the growth of fixed line telephony in developing countries has remained relatively stunted, the technology has enjoyed quite some growth in developed countries, interconnecting businesses and residences. The absence of viable and reliable telephone networks is considered as a major hindrance to the growth of economic activity, especially in developing economies (Jipp, 1963; Hardy, 1980; Saunders et al. 1983).

As many as 372.4 million people in Africa, 1.73 billion in Asia and 452.72 million in Latin America now use mobile phones. Among those who have benefited from investments in mobile telephone networks are micro-entrepreneurs, whose businesses have been suffering not only from the lack of basic infrastructure such as road

networks and electricity, but also from lack of access to vital business-stimulants like telecommunication services, which have been credited with the success of modern businesses in developed economies. Prior to the widespread use of mobile telephony services in developing economies, businessmen exchanged information mainly by face-to-face contacts which entailed physical and costly travel. While early adoption was relatively elitist, access to mobile services particularly within business communities is fast becoming a 'must have'. Networks are growing bigger, interconnecting businesses and providing cost-effective and reliable communication.

In this era of globalisation and economic competiveness, the role of tools like mobile telephony which can enable businesses to become more productive and competitive cannot be overemphasised. Many micro-businesses in developing countries can be described as suffering from *Business 'information-poverty'*. This refers to lack of access to the vital business information necessary to make potentially successful business decisions, giving rise to information asymmetries, which has rendered many developing markets inefficient. Mobile telephony services have been credited with alleviating information poverty (Jensen, 2007, Aker, 2008).

It is generally agreed (Hallberg, 2000; Klein and Hadjimichael, 2003) that for developing countries, capital accumulation, development of academic and vocational education, foreign investments and entrepreneurial development particularly within micro-businesses are key ingredients of economic growth. As such, identifying factors that contribute to business growth is the priority of some international organisations and local governments. With mobile telephony services being hypothesised to be

important enablers of micro-business performance, spending time and resources to investigate the relationship is a worthwhile exercise.

The antecedents and determinants of micro-entrepreneurial growth have been the subject of extensive research (Liedholm and Mead, 1999; Davidsson, 2004, Burns, 2001; Steel, 1995; Storey, 1994; Davidsson & Wiklund, 2006; Acs and Kallas, 2007) in the last two decades. One important antecedent identified in the literature is information and communication technologies (ICTs), and more recently the development of new ICTs such as the Internet has received significant attention from international and local bodies in terms of funding and policy development. Particularly successful has been the development of policies that have led to the liberalisation of the provision of telecommunication services around the world. This was facilitated by the World Trade Organisation Agreements on Basic Telecommunications (WTO-ABT) in1997.

'This agreement combined binding commitments on market access from its participants with a statement of "pro-competitive regulatory principles"' (Klemenko and Cowhey, 2001). WTO-ABT has enabled market liberalisation especially in developing countries, unlocking the supply of telecommunication services which has suffered from decades of poor performance, low investment and inefficiency. The liberalisation wave which quickly rippled across developing economies brought with it strategic investors, particularly in the mobile telephony sector. In less than a decade, mobile telephony services have reached all corners of the world, providing access to affordable and timely communication to millions who could never dream that their voices could travel more than a few meters no matter how loud they shouted.

Micro and small businesses, generally grouped under the umbrella of 'Small and Medium Size Enterprises' (SMEs), have been heralded as the economic power cells of the global economy (Liedholm & Mead, 1999; Storey, 1994; Burns, 2001 p. 12). It is estimated that in 1999, SMEs contributed over a quarter to the UK's GDP, generating some 55 percent of employment, with micro and small businesses accounting for 44 percent of total employment. In the EU, the same source documents that SMEs account for 65 percent of EU turnover and generate 66 percent of total employment.

The continuous growth and development of SMEs depend on a series of business policies, technologies and business skills. The Global Entrepreneurship Monitor (GEM) is a leading research consortium in entrepreneurship, and in its 2007 *Global Report on High-Growth Entrepreneurship* (Bosma, 2008) reported seventeen issues that have to be addressed in order to promote entrepreneurship growth. The role of 'quality physical infrastructure relevant for new business activity [such as] roads, utilities and *communications infrastructure*' was considered by the consortium to be very significant. Mobile telephony is the most available of this relevant 'physical infrastructure' in many developing economies. It constitutes the principal channel through which businesses can exchange essential information and, as such, they form an interesting case study. Being able to establish the mechanisms behind the influence of mobile telephony services on micro/small business growth is a logical and worthwhile initiative.

This study seeks to show that although most micro-businessmen have adopted mobile telephony services for many and varied reasons, such as prestige and the sense of belonging, these services have been assimilated into working practices and are

contributing significantly in lowering operating costs and information asymmetries, and in increasing operational flexibility, productivity and quality. This has permitted these businessmen to positively respond to the increased requirements of their customers and other business partners such as suppliers, which has eventually enhanced the business performance and has increased profitability.

1.2 Research Problem and Hypotheses/Research Questions

The dearth of empirical evidence on the nature and impact of mobile telephony services on enhanced micro-business performance outcomes suggests that policy makers and practitioners in developing economies may not have the adequate information needed to enable them to develop better strategies that could boost micro-business performance and the demand and supply of mobile telephony services. This study was designed to provide new empirical evidence on the importance of mobile telephony to business performance and economic growth, which could contribute towards policy issues linked to the maximization of the benefits of new information and communication technologies in developing economies.

The problem addressed is as follows:

> *How important are mobile telephony services in determining the enhanced business performance outcomes of micro-businesses in Afghanistan and Cameroon?*

The following sub-questions were outlined to help answer the main question:

1. *What is the relationship between the integration of mobile telephony services into micro-business processes and perceived enhanced micro-business performance in Afghanistan and Cameroon?*

2. *How does mobile telephony compare to two traditional determinants of enhanced business performance: Entrepreneurial Competence, and the Micro-business Environment in terms of enhancing business performance?*
3. *What are the mechanisms through which micro-business integration of mobile telephony services contributes to performance enhancements?*
4. *How do micro-business owner-managers in Afghanistan and Cameroon use mobile telephony services for business?*
5. *How important is the mobile functionality of mobile telephony to the integration of its services into micro-business processes?*

The internal (managerial, entrepreneurial, internal operations/processes) and external environments (customers, suppliers, competitors, the legal and institutional frameworks) of the firm are crucial for its organic growth, and mobile telephony services are hypothesised to play an important role by ensuring that the much-needed exchange between these two environments is established and maintained. Entrepreneurs make business decisions based on available information, and such decisions can be either correct or incorrect. Incomplete information and uncertainty are disruptive in the decision making process of individual decision-makers such as micro-business owner-managers. This implies that the greater the extent to which communication can be used to reduce uncertainty, the greater the probability of correct decisions and the better the chance that owner managers will achieve enhanced business performance. Mobile telephony offers considerable business flexibility by 'removing former process and technology bottlenecks with a resulting increase in customer satisfaction, revenues and productivity, and cost reductions' (Liang et al. 2007).

This study hypothesises that the adoption and integration of mobile telephony services into business processes is an important enabler of micro-businesses, as it provides the owner-manager with more and essential information in a sustained, cheap and timely manner enabling him/her to increase the proclivity to make the right business decisions. It also has the potential of enabling substantial cost savings, increased sales, geographic expansion of business activities, increased knowledge sharing and transfer and, eventually, growth.

In particular, the following hypotheses have been put forward to guide the study:

> **Hypothesis 1:** *The integration of mobile telephony services into business processes can positively predict the enhanced operational performance of micro- businesses.*
>
> **Hypothesis 2:** *The level of integration of mobile telephony services into business processes is influenced by the micro-business environment including the supply of telephony services.*
>
> **Hypothesis 3:** *The rate of Integration of Mobile Telephony Services into Business Processes will depend on the Entrepreneurial Competence of micro-business owner-managers.*
>
> **Hypothesis 4:** *The Entrepreneurial Competence of micro-business owner-managers can directly predict the Perceived Enhanced Business Performance Outcome of micro-businesses.*
>
> **Hypothesis 5:** *The Micro-business Environment can directly and positively predict the Perceived Enhanced Business Performance Outcome of Micro-Businesses.*

In order to better explore these hypotheses, the following objectives have been put forward:

Main Objective:

- To ascertain the impact of mobile telephone use by micro-entrepreneurs on enhanced business performance by investigating how micro-business owner-managers in Afghanistan and Cameroon perceive the business enhancement potential of mobile telephony services.

Sub-objectives:

1. To explore the usage patterns of mobile telephony services by micro-business owners in Cameroon and Afghanistan, to show that the contribution of mobile telephony services to enhanced business performance depends on their innovative integration into the production apparatus of micro-businesses.
2. To develop a set of indicators that can be used to evaluate the impact of mobile telephony on enhanced business performance in a developing economy context.
3. To explore the relationship between the factors that contributes to the Integration of Mobile Telephony Services into Business Processes.
4. To demonstrate that the integration of mobile telephony services into business processes enhances small business performance in localities across Afghanistan and Cameroon.

Questions regarding the role which the integration of mobile telephony services into business processes plays in the growth of businesses and trade provide a structure to the conceptual framework and to the objectives of this research. The study combines the strengths of field and desktop research strategies. The field research employed questionnaires and structured interviews, and observation across several urban and

rural localities in Afghanistan and Cameroon. A random sample of 210 micro-business owner-managers took part in the study. The collected data was analysed using structural equation modelling techniques with *AMOS* and *SPSS* statistical software packages, and the results reported were based on the individual country samples and on the combined sample.

The overriding theory of the study suggests that the interaction between three constructs - *Entrepreneurial Competence (EC),* the *Micro-business Environment (ME)*, and the *Integration of mobile telephony services into Business processes (IB)* - can effectively enhance the business performance outcomes of micro-businesses. The thesis attempts to measure how much variance each of these constructs shares with *Perceived Enhanced business Performance (PEP)*, which is conceived as the outcome variable. From the amount of variance shared, the impact of mobile telephony was isolated and reported.

The findings suggest that the integration of mobile telephony services into business processes is significantly and positively related to perceived enhanced micro-business performance. It also suggests that the micro-business environment in Afghanistan depresses micro-business performance a little more than the Cameroon environment, and that, the integration of mobile telephony services into business processes and entrepreneurial competence of the owner-managers are major determinants of successful micro-business ventures in both countries.

1.3 Justification for the Research

Efficient trade and industry based on a strong private sector, especially SMEs, is the foundation of modern economic growth. As such, factors capable of enhancing SME growth are of decisive importance for poverty reduction in developing economies, especially in this era of globalisation and economic slowdown. Many of the traditional sources such as raw materials, petroleum and other natural resources that have sustained governments in developing economies in the past have been depleted significantly making the requirement to identify and nurture new sources of growth more urgent than never before. Part of the solution involves market penetration and diffusion of new technologies and their assimilation and integration into local production processes. Central to this is the adoption of new information and communications technologies which are catalytic in the economic growth equation of successful economies (Kwaku et al., 2006).

While information and communication technologies have been pivotal in creating wealth for developed economies, developing countries have been largely excluded from the benefits offered by these technologies due to lack of adequate infrastructure and policy. Mobile telephony has emerged as the leading technology which may reverse the inability of poorer countries to reap the benefits of the digital revolution. It is therefore important that aspects of the technology that encourage business growth should be identified and managed appropriately to maximize its benefits. If the high proportion of micro/small firms and the crucial role they play in the Afghan and Cameroonian economies are considered, then further clarification of mobile telephony as a determinant of business performance and growth should make a useful contribution to practice in the small business and mobile sectors.

While the study of the determinants of enhanced business performance is a long-established tradition, mobile telephony has rarely been included in the list despite the vital role which it plays in business transformations, particularly in developing economies following the phenomenal diffusion of the technology in the last decade. If we consider the case of *Ndohsi,* a palm oil trader from *Mundemba* town in the South West province of Cameroon, who used to travel through muddy and dusty roads for at least three days at the cost of $US29 (one way) just to have information on the availability of a spare part for his boiler until early 2007, when mobile telephony services arrived in his town and enabled him to acquire the same piece of information within seconds at the cost $US 0.5, saving a total of $US28.5 in a single transaction, then exploiting further the potential of mobile telephony in business performance is a worthwhile exercise.

This study contributes to and deepens our understanding, and further builds theory on how the integration of mobile telephony services into business processes can enhance business performance. This relationship can be moderated by the entrepreneurial competence of owner-managers, and the micro-business environment. Entrepreneurship can only thrive in a pro-entrepreneurial environment (Autios, 2005). The creation of a business environment which increases access to growth-enabling resources such as mobile telephony, roads and electricity, as well as easy access to markets, guided by sound policies that encourage private sector development, is an incumbent duty of governments and non-governmental organizations. Studies like this one which is designed to quantitatively show the importance of these business-enabling factors and at the same time highlight where such factors are in short or over

supply can be a starting point for governments and their peers in business development to build pro-entrepreneurial environments.

Despite the fact that few micro-level studies have examined the impact of mobile telephony services on business performance, the few available ones (Donner, 2005, 2006; Sinha, 2005; Jensen, 2007; Aker, 2008; Morawczynski, 2008) have each drawn their evidence from a single country, which makes it difficult to examine the impact of cross-country or local effects on the variables employed in the studies. Apart from a few studies such as Souter et al. (2005) which has examined the impact of telecommunications on rural livelihood from a three-country angle at a micro-level, this work stands out as having a two-country perspective.

Businesses with five or fewer employees support households in developing nations, and are a critical part of their economies (Leidholm & Mead, 1999; Santos, 1979). A multi-dimensional model of the impact of mobile telephony diffusion at the micro-level has not been explicitly studied before. By developing a generalised model founded on firm theoretical grounds, this study could be used to resolve some of the anecdotal findings which have been published so far.

Although there is growing evidence that mobile telephony services contribute to business and socio-economic growth, there are some small business owners who do not yet have access to this important tool, either because the services are not available or they are simply ignorant of the benefits. While governments in emerging economies are looking for ‘quick fixes’ to economic growth and poverty reduction, the option of mobile telephones as an enabler of small businesses has not been

considered seriously. This project highlights the importance of mobile telephony services in the economy and seeks to draw attention within government and business circles to the need to focus on the uptake and use of these services in business operations so as to reap the benefits offered by this technology. The 'ripple effect' of mobile telephony penetration on other sectors of the economy, and the role which small businesses play in economic growth, makes this study worthwhile.

Nearly 68 percent in volume of all business transactions in a group of fifteen developed countries are now conducted via telecommunication channels. If this is compared to 2.1% in the Democratic Republic of Congo, 6.4 % in Afghanistan and 8.4% in Cameroon, then there is an urgent need for developing economies to develop communication infrastructures that are capable of sustaining electronic commerce. The volume of global electronic business transactions is growing rapidly which implies that if developing countries do not move quickly to close their communication infrastructure gaps they may be left out of this new economy. This study is intended to highlight the importance of communication technologies in economic development by providing greater insights into the potential of mobile telephony services in enhancing performance within the context of micro-businesses.

In developing countries, the opportunities to influence micro-business performance and the rate of adoption and use of mobile telephony services through policy initiatives can be significant. The proclivity of policy makers to developed good policies depends on the quality and quantity of information at their disposal. This study provides vital information which can be used to enhance the good-policy-making process. It proposes a set of recommendations based on empirical analysis.

1.4 Overview of the Methodology

In order to deepen our knowledge and further build theory related to the integration of mobile telephony services into business processes in micro-businesses, a research methodology which defines the nature of the research activity in terms of the research strategies, research techniques and research instruments was developed. The design strategy for the empirical study contains both quantitative and qualitative analysis. This mixed research strategy informs the splitting of the study into three sub-studies, Studies A1, A2 and B, in order to triangulate the findings and obtain a more holistic view of the impact of mobile telephony services on enhanced business performance. The main methodological processes of the study are represented in Fig.1.1

The quantitative facet of the study is made up of Studies A1 and A2. It is aimed at gaining insights into the existence and strength of the relationships hypothesised in Section 1.2 above, and also at identifying essential tools for answering the first, second and third research questions. A theoretical research model is first developed based on the existing literature, and then integrated with mega theories to delineate an eclectic conceptual framework, which is then translated into a research model through operationalisation of the concepts hypothesised in the theoretical model. Study A1 adopts a cross-sectional design using face-to-face semi-structured interviewing to collect data from a random sample of 210 micro-business owner-managers in four provincial towns of Afghanistan and four provincial towns in Cameroon using a carefully designed research instrument, a structured questionnaire. The collected data are then analysed using structural equation modelling techniques to test the relationships hypothesised in the research model using AMOS 17 analytical software package.

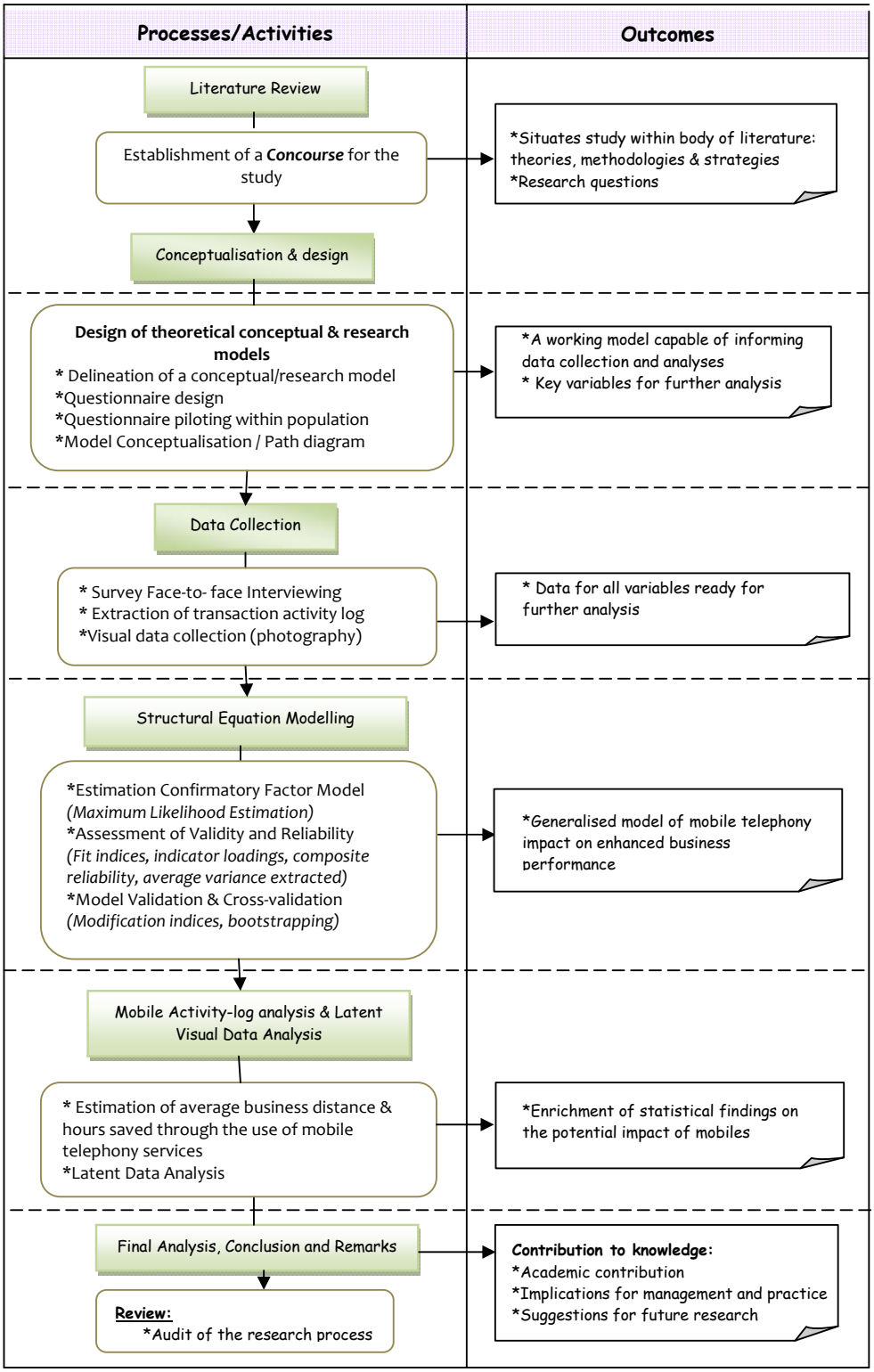

Fig.1.1: *The Research Outline*

Study A2 uses a retrospective scenario-based analysis to provide evidence in terms of *business time* and *business distance saved* thanks to mobile telephony services. It employs quantitative survey data to strengthened and further explain the outcomes of Study A1. It involves the repetitive extraction of business-related mobile telephony based transactions for over a one-year period, using the 'activity logs' present in the mobile phones of micro-business owner-managers.

Study B is a mini qualitative study designed to provide additional meaning to the quantitative outcomes of the research model represented by study A1. It involves the content analysis of visual data collected in course of field studies in Afghanistan and Cameroon. It consists of five still photos.

1.5 Overview of the Thesis Structure

The rest of the thesis is organized as follows:

- *Chapter Two*: This chapter adds a technological aspect to the study. It examines the evolution of mobile telephony technology from its inception in 1946 to present day and extends into the future. It also outlines the demand and supply chain of mobile telephony services with a focus on the principal actors in the chain.

- *Chapter Three*: This looks at the theoretical perspectives that govern the relationship between mobile telephony and enhanced business performance. It outlines the theoretical framework, and presents the epistemological and ontological perspectives of the research paradigm of the study.

- *Chapter Four*: This deals with the conceptual and research models. Mega theories related to entrepreneurship, mobile telephone use, and business performance are delineated into a conceptual framework which is then operationalised into a research model in which all variables of interest are declared and defined.

- *Chapter Five*: This chapter deals with the methodological standpoints of the study. It describes the research process and provides measures for the variables declared in Chapter Four, and provides bases for collecting and analysing the research data.

- *Chapter Six*: In this chapter, the results of the analyses are presented and commented upon. Answers are provided to the research questions.

- *Chapter Seven*: Here, the whole research process is discussed including the possible strengths and weaknesses of the research. The research questions are re-visited in order to provide succinct answers and analysis. The chapter wraps up with recommendations for future study and what the thesis has contributed to theory and practice.

1.6 Definitions

Because researchers do not often adopt uniform definitions for certain words, some key terms are hereby defined to establish the positions taken in this study:

- *Afghanistan:* A developing country randomly selected by a computer programme from which a sample of micro-businessmen is selected to test the

research hypotheses. It is situated in South East Asia, to the north and east of Pakistan and east of Iran, with geographical coordinates of 33 00 N, 65 00 E.

- *Cameroon:* a developing country purposefully chosen, from which a sample of micro-businessmen is drawn to test the research hypotheses. It is situated in Central Africa, bordering the Bight of Biafra, Equatorial Guinea, The Republic of Congo, Nigeria, Central African Republic and Chad, with geographical coordinates of 6 00 N, 1200 E.
- *Developing economies*: This refers to any country classified by the World Bank as either Low-income, Lower-middle-income, or Upper-lower income.
- *Integration of mobile telephony services into business processes:* This refers to the degree to which business information is exchange by micro business owners via mobile telephony services. It embodies all calls and messages (SMS/MMS) sent or received in the course of business transactions (placing orders, verifying prices, negotiating contracts or specifying deliveries) thanks to mobile telephony.

- *Micro-businesses*: Businesses with five or fewer employees.
- *Mobile Telephony Services*: This refers mainly to communication services provided by mobile phone networks and usually accessed with the aid of a mobile phone. They include voice calls, text messaging services (SMS), multimedia messaging services (MMS) and *beeping*[1]
- *Perceived enhanced business performance*: Subjective view of improvements to the functioning of a micro-business by its owner-manager.

[1] ***Beeping*** refers to an innovative way of using the call identification function of mobile phones to communicate with a correspondent without incurring a charge.

Other important, contextualised and technical words are explained using footnotes throughout the thesis.

1.7 Delimitations of Scope and Key Assumptions

This study focuses mainly on the integration of mobile telephony services in business processes by micro-business owner-managers in two developing countries, Afghanistan and Cameroon. The nature of the sample and the subjective nature of certain measures impose care in generalizing the results of the study. The study employs some subjective variables, and data were collected using self-reported questionnaires which may have been prone to social desirability effects and other biases. The ability to select a truly random sample was particularly limited in Afghanistan due to security problems and cultural issues, which prevented the survey team from conducting interviews in the Helmand Province and other localities around the country which had been randomly chosen as research localities. Also, cultural issues made it very difficult to interview female Afghan micro-entrepreneurs, which further biases the research sample and limits the generalisability of the findings. All these issues have been documented in Chapter 5. Because the study makes use of local and scenario-based data which may not be applicable elsewhere, the findings should be generalized to the entire small business population of both countries and other developing countries with some caution.

However, the similarity in the Afghan and Cameroonian findings provides a robust framework and a base for the assumption that mobile telephony has a similar impact on enhanced business performance in different developing economies. Moreover, this study only seeks to show that the hypothesised relationships exist and that the strength

of the relationships depends on local realities such as the entrepreneurship of micro-businessmen, organisation of the micro-business sector, and particularly the level of integration of mobiles into business processes.

It is my opinion that the research has been conducted within the norms of scientific research and that the findings are robust enough to provide an input into policy discussions related to the development of mobile telephony services and the micro-business environments of Afghanistan and Cameroon, extendable to other developing economies if local realities are taken into consideration.

1.8 Conclusion

This study extends our understanding of the relationship between mobile telephony services and business performance by using information and organizational knowledge such as entrepreneurship and performance measurement as mediators between the two concepts. Given the dearth of empirical knowledge on mobile telephony as a determinant of enhanced business performance, the study contributes significantly to the literature on entrepreneurship, business growth and strategy by providing empirical evidence on how the actions and abilities of owner-managers can interact with available technology and policies to positively or negatively influence business performance. The conceptual framework delineated for the study can also be used to assess the impact of mobile telephony and/or other related technologies in other geographical areas, business groupings, or sectors.

This is one of the few studies that have effectively demonstrated in empirical terms the impact of the mobile revolution on business performance at the micro-level

empirically. In particular, the study employs a structural and comparative framework to show the relative impact of two traditional performance variables, entrepreneurship and business environment, and a newly-created variable called *Integration of mobile telephony services into business processes* as defined in Section 1.6 above. While a significant amount of research has been undertaken on the determinants of micro/small business performance, this study is one of the first to include mobile telephony as a determinant.

The results show that micro-business owner-managers in Afghanistan and Cameroon perceive the integration of telephony services into business processes as an important enabler of enhanced business performance. Mobile telephony is perceived to enhance business performance by 40 percent, while entrepreneurial competence and the business environment enhance performance by 48 percent and 18 percent respectively. The three constructs (EC, ME and IB) however, could explain only 52 percent of the variance in the dependent variable (PEP).

CHAPTER TWO: MOBILE TELEPHONY - Technology and Supply Chain.

2 Introduction

In Chapter One, the general framework of the study was presented. In this chapter, the literature on mobile telephony is reviewed with a focus on the services and applications which the technology offers to the business world, particularly micro and small businesses. The major evolutionary aspects of the technology from basic analogue speech services of 1946 to present-day digital and multimedia services are also reviewed, together with its global diffusion patterns. The mobile telephony supply chain is also presented with a view to identifying the key elements that influence the demand and supply of services and their integration into business processes. The present state of the global mobile telephony market is presented with insights from the Afghanistan and Cameroon markets.

The special contribution of this chapter is that it adds a technology aspect to the study which is visibly absent in many economic impact studies related to technology. In many economic analyses of technology, everything is included that might be expected to influence innovative use and impact 'except any discussion of the technology itself' (Pinch & Bijker, 1984). Such economic impact studies tend to treat technology as a 'black box' (Whitley, 1972) whose contents and behaviour 'may be assumed to be common knowledge' (Layton, 1977, p.198). Economic impact studies which fail to take into account the technology itself tend to be subjected to 'poor conceptualisation', such as 'the widespread use of simple linear models to describe the process of innovation [and impact of technologies]' (Pinch & Bijker, 1984 p.22).

To avoid this pitfall, Pinch and Bijker recommended 'an understanding of technology from inside, both as a body of knowledge and as a social system'. So, therefore, this Chapter presents mobile technology as a body of knowledge and as a social system.

2.1 Mobile Telephony Technology

In this section, a review of the literature on mobile telephony technologies and services is conducted, with a focus on those services which are of particular interest to micro and small business communities in developing economies. Knowledge of the different services provided by mobile telephony is particularly important in shaping our view of their adoption and their applicability in business processes to achieve enhanced performance.

The *mobile phone,* also called *cell phone* or simply *mobile,* is an advanced radio system which employs cellular radio techniques to provide communication services to many users over a wide area. Telecommunications services are traditionally described as fixed or mobile. The term 'fixed' or 'mobile' with reference to telecommunication networks refers to the level of freedom with which the end user can move the access terminal, which could be a computer, a phone or other devices such as a satellite receiver station, without interrupting access to the service. Fixed networks have their user terminals fixed to a particular location such as a business premises or a home, while mobile network terminals can be carried about just as people do with mobile phones.

Also, telecommunication networks can be differentiated in terms of the type of information they carry. Traditionally, only two have existed: data communication

networks and voice communication networks, which can either be analogue or digital. Digital networks offer higher quality of services than the analogue ones. Recent advances in communications technology have seen convergence of voice and data services in both mobile and fixed networks, giving rise to multimedia networks which can handle varied types of information, voice, data and images. The mobile telephone network has evolved from a simple voice only network into a multimedia network. This evolution has been fuelled mainly by customer demand and the availability of technology. The evolution in mobile telephony technology and services is specified in terms of generations (*G*). It stretches from the zero generation (***0G)*** system, which was analogue and developed as early as 1946, to the ultra-modern digital fourth generation (4G) systems expected to be fully commercialized by 2010.

2.1.1 Zero Generation (0G)

The mobile phone was originally designed to add functionality to fixed telephones or landlines simply as an extension of basic voice services. Modern-day mobile phones are descendants of the *Mobile radio telephone* system, also known as *zero generation* (0G) mobile phones. Analogue in nature, the radio phone was part of the regular public switched telephone network (PSTN), and the *transceivers* or user terminals were mounted in cars with power supplied from the car battery to power the systems. The first commercially available mobile telephone system (MTS) was operated by Motorola in conjunction with the Bell System in 1946 in the United States of America. MTS was automated by the Bell System in 1962 into what was known as the Improved Mobile Telephone Service (IMTS), which offered automatic dialing to and from the mobile receiver terminal. This was followed by *Televerket* Norway by 1966. *Autoradiopuhelin* (ARP) in Finland in 1971, and B-Netz 1972 in West

Germany in 1972. The only service provided by these systems was a not-so-good quality analogue voice call, prone to interference and occupied large portions of the limited *radio spectrum*[2].

2.1.2 First Generation (1G)

The next generation of mobile phones, known as *1G* or *first generation*, only emerged in the early 70s. Although they were analogue in nature, they employed digital signaling in the network, particularly at the radio towers. The first generation of mobile systems was developed principally for voice services almost simultaneously in different countries, each with its own standard. The United Kingdom developed *TACS* (Total Access Communications System), while the Nordic countries developed the *NMT* (Nordic Mobile Telephone) which was used in these countries, and also Switzerland, the Netherlands, Eastern Europe and Russia. The Germans developed the *C-450 system* which was also used in Portugal. The French used *Radiocom 2000,* and the Italians developed the RTMI (Radio Telefono Mobile Integrato). In Japan, the *TZ-801, TZ-802*, *TZ-803* and the JTACS (Japan Total Access Communications System) standard systems were developed. Across the Atlantic, the Americans developed the AMPS (Advanced Mobile Phone System). This range of standards was a major hitch for the 1G as the different systems could not cross-function. Cross-functionality is a major characteristic of successful technologies of the modern age. It is estimated that 1G-technologies accounted for about 20 million subscribers in 1990. With poor speech quality and low reliability, marred by the low interoperability between the numerous systems and the growing number of subscribers which the 1G system could not support, it was upgraded to 2G.

[2] *Radio Spectrum* is the common transmission medium for all wireless communication, and forms part of the electromagnetic wave which extends from approximately 10 kHz to 300 GHz.

2.1.3 Second Generation (2G)

The second generation of mobile phones (2G) saw a more coordinated development of standards enabling roaming[3], although diverse fronts were still prevalent. 2G voice services are more consistent and reliable thanks to advanced modulation techniques which have increased capacity and spectrum efficiency, enabling easier implementation of advanced voice services, Short Messaging Service (SMS), fax and basic data services. The 1G standard also suffered from inadequate security and fraud prevention was minimal, but security has been greatly enhanced in 2G mobile systems. 2G technologies gravitate around two multiplexing technologies, with one based on time division called TDMA (Time Division Multiple Access) and the other on code division known as CDMA (Code Division Multiple Access). Both technologies employ digital techniques in the entire network, unlike in the analogue 1G-systems where only the signaling paths were digitalized. TDMA technology is based on four main standards; GSM (Global System for Mobiles), iDEN (Integrated Digital Enhanced Network), IS – 136 called D-AMPS (Advanced Mobile Phone Service) and PDC (Pacific Digital Cellular). One main CDMA-based standard known as IS-95 or *cdmaOne* eventually emerged (Table 2.1)

Technology	Standard	Place of origin	Main services	Radio characteristics
TDMA	GSM	Europe	Voice & SMS	Digital
	iDEN	*Nextel* in the USA and *Telus* in Canada		Digital
	PDC	Japan		Digital
	(IS-136, IS-54) D-AMPS	USA		Digital/Analogue
CDMA	(IS-95) cdmaOne	USA	Voice, SMS & some data up to 64Kbps	Digital

Table 2.1*: 2G Mobile Standards*

[3] *Roaming* is a service whereby subscribers of one mobile phone network can use their phones on the network of other operators in many parts of the world to access services.

2.1.3.1 ***GSM***

GSM (Global System for Mobile communications), originally known as *Groupe Spécial Mobile,* is actually the name of the study group created in 1982 by the Conference of European Posts and Telegraphs (CEPT) to develop a pan-European mobile telephone system. GSM quickly imposed itself as the leading mobile communication standard within all the 2G systems. Approximately 82 percent of all mobile connections in the world are based on the GSM standard (Fig. 2.1).

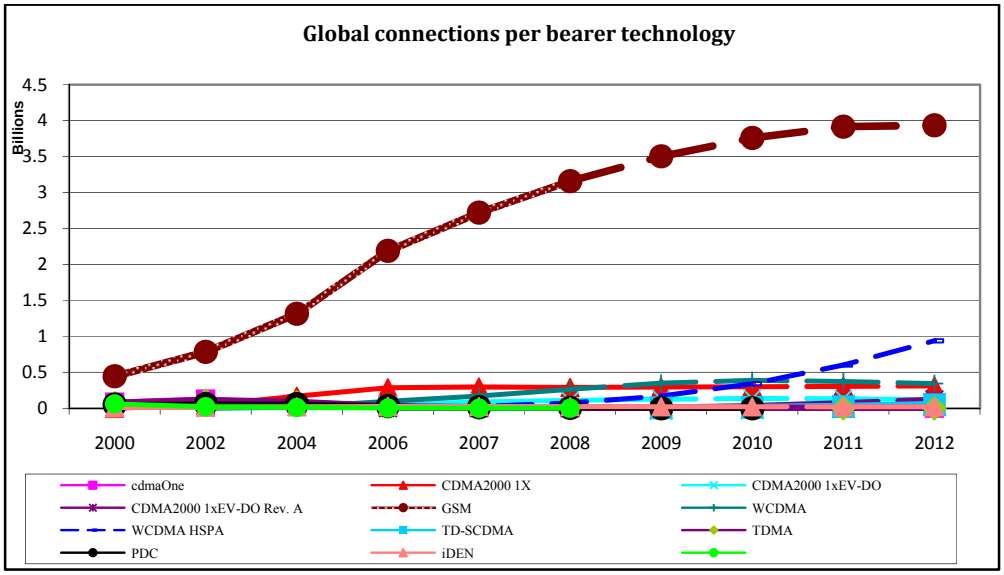

Fig. 2.1: *Evolution of Mobile Standards (Bearer Technology) In Terms of Connection (Global)*
Data: *Wireless Intelligence & the ITU*

The main driving force behind GSM's success is the GSMA (GSM Association). The GSMA 'is the global trade association representing the interests of over 850 GSM mobile phone operators and over 180 manufacturers and suppliers worldwide, encompassing technical, commercial and public policy initiatives. [It] focuses on ensuring wireless services work globally' (GSMA, 2008). GSMA has been particularly effective in facilitating the interoperability of mobile phones across networks which has brought about international roaming whereby subscribers of one

network can use their phones in many parts of the world. Also advances in *radio spectrum* management techniques have facilitated the growth of 2G mobile phones particularly as the GSM standard permits the optimal use of the radio spectrum by employing Time division multiplexing. One of the key features of GSM is the Subscriber Identity Module (SIM), commonly known as a *SIM card*. It contains the user's subscription information and phonebook and allows the user to retain his or her information after switching off the handset. It permits the handset to be used on other mobile phone networks by simply inserting in a new SIM.

2.1.3.2 cdmaOne.

The *cdmaOne,* also known as IS-95, created in 1993, employs code division multiplexing technology known as CDMA. The IS-95 A (Interim Standard – 95), which is the original standard, was designed mainly for digital voice services with limited data capability (14.4kbps), although they have more capacity than GSM due to their ability to spread a mobile call signal over a wide spectrum(from 9.6Kbps to 1.23Mbps. It was later revised in 1995 to IS-95B with enhanced data capabilities offering file transfers services of up to 64kbps, fax, SMS and supplementary services. IS-95B has comparative functionality with 2.5G and a subscriber base of nearly 420 million worldwide.

2.1.3.3 PDC

The PDC (Pacific Digital Cellular) system is a TDMA-based mobile phone system deployed mainly in Japan. The main benefits offered by the technology is its ability to use much smaller cells than GSM or CDMA, maximising the reuse of frequency via a

process called mobile assisted handoff (MAHO). By the close of 2008, PDC accounted for about 5.9 million subscribers worldwide.

2.1.3.4 iDEN (Integrated Digital Enhanced Network):

iDEN is a proprietary standard for Motorola released in 1994. Modern iDEN handsets use SIM cards like GSM and are also compatible with GSM. Its interconnection side even uses GSM signalling for call setup and mobility management. It is a fully digital system used commonly on the 800MHz frequency band in the United States of America, Canada, South America and Israel, and on 1.5GHz in Japan. It has the capability to integrate other wireless systems, and provides mobile telephony services, 2-way radio systems like the *Walkie-Talkie*, and also handles data services, fax and the internet. By the close of 2008, iDEN accounted for about 21.4 million subscribers worldwide.

2.1.3.5 (IS-136, IS-54) AMPS (Advanced Mobile Phone Service):

This system operates in the 800MHz frequency range and employs the IS-45 network standard developed by the Telecommunications Industry Association (TIA) of the USA. It is the predominant system in use across most of the USA. It provides mobile telephony services with a reduced set of diversion and call-barring features.

2.1.4 2.5 G and 2.75G

2.5G refers to the enhancement of 2G systems to accommodate more data at higher speeds. For 2G-GSM, the cellular system is enhanced by combining the system with a *General Packet Radio Service (*GPRS). 2G systems are designed specifically for voice and SMS services. The increasing customer demand for data enabled the system

to be upgraded to 2.5G. This was achieved by adding a mobile data service *GPRS,* which is a packet-based air interface as an overlay over existing 2G circuit switched networks. GPRS is capable of increasing data transmission rates from 14.4 Kbps in a normal 2G channel to about 171.2 Kbps per GPRS channel. Data transmitted over GPRS are typically charged per kilobyte of data transferred, contrary to circuit switched data (2G), which are charged per second of connection whether data is successfully transmitted or not. GPRS can be combined with Wireless Application Protocol [4](WAP) access and XML[5] (Extended Markup Language) to provide the user with limited Internet communication services, Short Message Service (SMS), Multimedia Messaging Service (MMS), and e-mails with small attachments.

In 2003, it became possible to further enhance 2.5G or GPRS to achieve higher data transmission rates and improved data transmission reliability. This further enhancement is known as *Enhanced Data rates for GSM Evolution (EDGE)* or *Enhanced GPRS (EGPRS)*. Theoretically, data rates of 476Kbps can be achieved with EDGE, although they are typically between 75Kbps and 135 Kbps. EDGE is generally classified as the unofficial ***2.75G*** standard. It can be used for any packet switched application, such as text and image-based web browsing, very slow file transfers (500-Kb file loads in about 30 seconds), limited internet-based phone known as VoIP[6], short video clips and limited corporate applications.

HSCSD (High-Speed Circuit-Switched Data) is another 2.5G technology integrated with the 2G GSM system. It is capable of transmitting data at up to 56.6Kbps, which

[4] ***Wireless Application Protocol (WAP)*** is a standard which enables access to the internet via mobile phones and other handheld devices.
[5] ***Extended Markup Language (XML)*** is a technical language used for encoding documents and serialising data to ease the sharing of information between different kinds of mobile telephony access devices, computers and applications.
[6] ***Voice over Internet Protocol (VoIP)*** is general a term used to describe a family of technologies which makes it possible to deliver voice communications over the internet or other packet-switched networks.

is about four times the speed of a normal 2G GSM system, thanks to its ability to provide access to four channels simultaneously per transmission.

2.1.5 Third Generation (3G)

3G is the third generation of mobile phone standards and technology, built particularly to increase the ability to use data applications on the move. It represents the point of real convergence between computing and telecommunications, enabling the transmission of e-mails with full attachments, multimedia messaging services with audio and video, full web browsing with a 100-Kb page taking just about 2 seconds to load, and data speeds estimated to reach 2Mbps. It also supports file transfers of up to 500-Kb in 10 seconds. 3G fully supports corporate applications and location-based services like navigation.

3G technologies enable network operators to offer users a wider range of more advanced services while achieving greater network capacity through improved spectral efficiency. Services include wide-area wireless voice telephony and broadband wireless data. 3G networks are *wide area cellular telephone networks* that have evolved to incorporate internet access and video telephony, providing extremely high-speed data transmission with services speeds of 5-10 Mb per second. 3G networks support greater numbers of voice and data customers at lower incremental cost than 2G, which makes it a viable option for network operators. The 3G family of technologies is defined by the International Telecommunications Union (ITU), and is called IMT-2000. The IMT-2000 defines the requirements of a mobile communication system capable of supporting Internet Protocol (IP) based applications and multimedia services. The system was conceptualised to ensure quality of service control and

bandwidth on demand, and was also recommended to be built on a single technology as a global standard. While ITU-2000 has been very successful in achieving its objectives, it has not succeeded in ensuring delivery of 3G services via one common technology. 3G currently runs on three technologies: UMTS (Universal Mobile Telecommunications System), cdma2001 (Code Division Multiple Access 2000) and TD-SCDMA (Time Division Synchronous CDMA), which consists of six radio interfaces:

- IMT- Direct Spread (IMT_DS) deployed as ***W-CDMA*** (Wide Code Division Multiple Access)
- IMT – Multicarrier (IMT-MC) deployed as ***CDMA2000*** (Code Division Multiple Access 2000)
- IMT – Time Code (IMT – TC) deployed as ***TD-CDMA / TD-SCDMA*** (Time Division CDMA/ Time Division Synchronous CDMA)
- IMT – Single Carrier) deployed as UWC (Universal Wireless Communication) and often implemented with EDGE.
- IMT – Frequency Time (IMT – FT) deployed as DECT (Digital Enhanced Cordless technology).
- OFDMA (Orthogonal Frequency-Division Multiplexing): deployed as 802.16 – WiMAX (Wireless Interoperability for Microwave Access). It is being defined by the IEEE (Institute of Electrical and Electronic Engineers)

2.1.5.1 UMTS

(Universal Mobile Telecommunications System) is the 3G system which has been proposed for Europe. The definition of UMTS standard is being handled by the Third Generation Partnership Project (3GPP). UMTS is built on a WCDMA (Wideband

Code Division Multiple Access) platform. It is one of the most diffused of 3G technologies, with close to 224.6 million users worldwide. UMTS delivers data speeds of between 384kbps to 2Mbps.

2.1.5.2 cdma2000:

It is mostly being defined by standardising bodies in the United States of America. It is an evolution of the cdmaOne standard (2G) employing WCDMA like the UMTS, although the two do not use the same protocols, making the two incompatible. The evolution of cdma2000 is being assured by a study group called 3GPP2. The first functional cdma2000 technology is the cdma2000 1xEV-DO, which is capable of delivering data rate of between 384kbps and 2.4 Mps and supports a wide range of services including videoconferencing, full internet and MP3 transfers. The second most evolved CDMA technology is the cdma2000 1xEV-DV, which is capable of delivering data speeds of up to 3.1 Mbps. *1x* implies that it uses a single carrier just like the cdmaOne, while EV-DO stands for Evolution Data Only and EV-DV for Evolution Data and Voice. CDMA developers have obtained approval from the ITU for a faster 3G CDMA technology called CDMA 2000-3x, which will operate in the 5MHz frequency range providing data speeds of 2-4 Mbps.

2.1.5.3 TD-SCDMA:

This is developed and promoted by the China Wireless Telecommunication Standard group (CWTS). It was approved by the ITU in 1999 and is compatible with UMTS. The main benefit of TD-SCDMA is that it uses the GSM core network and, as such, minimises the cost of upgrading current 2G GSM networks to 3G.It not yet

operational but it is expected that by the first quarter of 2009, half a million people mostly in China should access 3G services via TD-SCDMA.

2.1.5.4 UWCC:

It was launched in 1995 to promote deployment of TDMA – IS-136 and IS-41 WIN.

2.1.5.5 DECT:

This is mostly intended for unlicensed spectrum bands with low-power operation and is mainly destined to serve short distance cordless phones in residences, businesses and public environments. DECT can support both voice and data traffic, making it a viable technology for Internet Access and Local area data communications, with a high degree of secure communications. DECT is TDM- based, capable of supporting up to 100,000 users per KM^2 within a business environment.

2.1.6 3.5 G

As mentioned earlier, the desire of the International Telecommunications Union (ITU) in defining the specifications for a third generation global network was to have just one standard. However, this has not been possible and, at the moment, there are three main standard bodies working on three different but similar standards: the EV-DO Revision C, the IEEE 802.20 and the 3G-LTE. The three standards are promoted by the 3GPP2, IEEE and the 3GPP working committees respectively. These standards are considered as the 3G standards and offer higher speed services.

The 3GPP2 is supplying 3.5G services under the 1xEV-DO and 1xEV-DV, which were defined earlier in Section 2.1.5. EVDO–C is the upgraded standard for EV-DO,

which is aimed at achieving data speeds of between 150 – 200Mbps. It employs a mix of CDMA and OFDMA carriers in the uplink and OFDMA only in the downlink.

3GPP defines the radio access network systems which are beyond 3G, as *Long-Term Evolution (LTE),* and the corresponding network architecture as *System Architecture Evolution (SAE)*. 3GPP is currently deploying 3.5G services under the HSPDA (High-Speed Downlink Packet Access) technology with data speeds expected to reach 100Mbps for the downlink and 50 Mbps for the uplink within a 20MHz spectrum. LTE services are expected to support full mobility at speeds of up to 350km/h and possibly 500km/h. By the close of 2008, HSPA accounted for about 89 million subscribers worldwide.

The IEEE 802.16e standard, known as WiMAX (Worldwide Inter-operability for Microwave Access), is an emerging technology promoted mainly by Intel and Qualcomm companies. Data speeds are expected to reach 130 Mbps for a 20 MHz channel. They are increasing deployed mobile telephone networks to backhaul traffic to switching centres.

2.1.7 Fourth Generation (4G)

Beyond 3.5G, it is expected at least by the ITU that the three competing 3G standards (3GPP, 3GPP2 and IEEE 802.20) will fully converge into a single standard, giving users seamless mobility with broadband services everywhere every time.

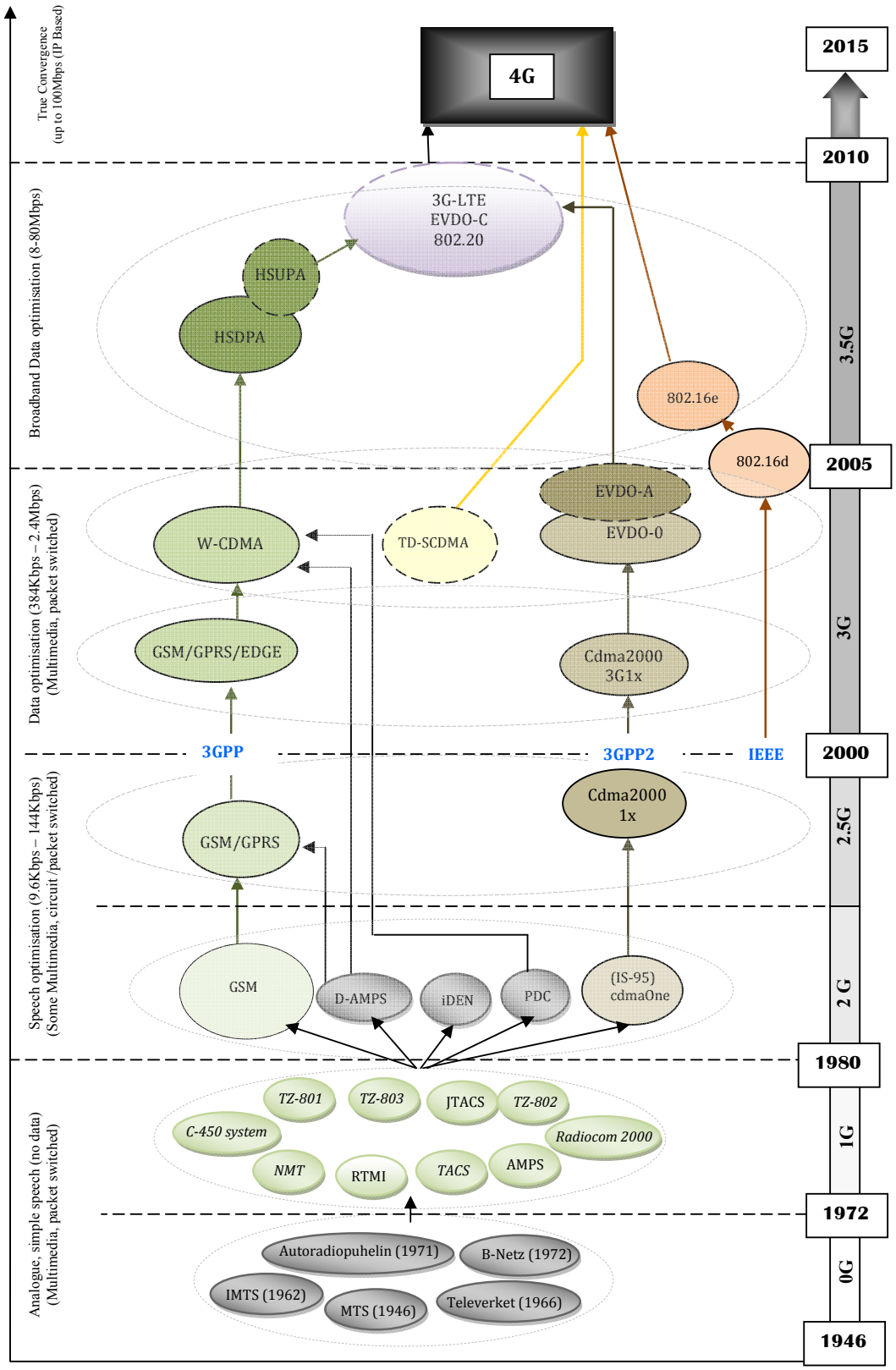

Fig. 2.2: *Evolution of Mobile Telephony Standards and Services.*

The unified standard or point of convergence is known as 4G, where broadcasting technologies and traditional computer networks like LAN (Local Area Network), MAN (Metropolitan Area Network) and WAN (Wide Area Networks) are expected to converge with mobile technologies into a single network with data and broadband speeds expected to reach 1 Gbps.

2.2 Mobile Telephony Services

Voice service is the standard function of mobile phones and modern ones can support a host of other communication services and applications, from simple short text messages such as the Short Messaging Service (SMS), transfer of multimedia data (photos, video), to more complex operations such as surfing and downloading from the internet. In this section the different types of mobile telephony services are reviewed.

2.2.1 Voice Services

As mentioned earlier, voice transmission and reception is the standard function of the mobile phone. Until very recently, voice was the only service provided over mobile telephone networks. By the close of 2008, an average mobile user in the world used 200 minutes per month. While North America topped the chart with an average of 735 voice minutes used per month per mobile phone subscriber, Latin America and Africa were the lowest with an average of 100 minutes per user per month (Fig. 2.3)

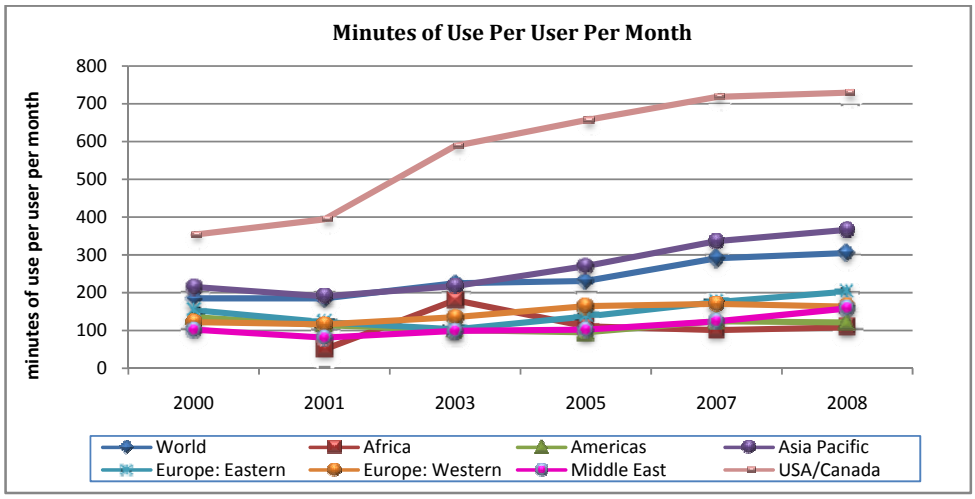

Fig. 2.3: *Mobile Phone Voice Minutes Used Per User per Month.*
Data: *Wireless Intelligence & the ITU*

In the third quarter of 2008 in the UK, voice traffic accounted for 71 percent of T-mobile's, 70.48 percent of Orange's, 55 percent of Vodafone's and 50 percent of O2's total revenue per user. 99 billion minutes of outbound mobile calls were made in the UK in 2007 alone (Ofcom, 2008). The average cost of one voice-minute in the UK is $US 0.22 (10.95pence), which implies that for 2007, mobile phone operators would have generated some $US 21.78 billion (£10.89 billion) from mobile voice services alone.

In developing economies, mobile services can be easily substituted for voice services. More than 90 percent of total mobile telephony activity in developing countries is concerned with voice calls. For example, voice traffic accounted for up to 85 percent of total revenue per user for MTN South Africa in the third quarter of 2008. According to the survey we carried out for the purpose of this study, 68 percent of regular mobile phone users in Afghanistan and 56 percent in Cameroon have never used any other mobile telephony service than voice. The other services are barely picking up, with SMS making giant strides. In developed countries SMS traffic is

threatening to catch up with voice traffic and Multimedia messaging Service (MMS) is on the rise. In this study, mobile telephony services refer basically to voice and SMS, although MMS is also included.

2.2.2 Short Messaging Service (SMS)

Short messaging service refers to sending short messages to and from mobile phones. According to Giussani (2001), the architects of the GSM system noticed spare capacity in the system in 1991, and decided to add a text messaging facility in case it might prove useful. It was primarily intended to notify mobile phone users of deposited voice mails and, subsequently, subscribers were permitted to exchange person-to-person messages. Each text message is limited to 160 characters in length made up of words, numbers or alphanumeric combinations. SMS can be enhanced into EMS (Enhanced Messaging Service), which can permit users to send and receive messages with special animations, pictures, icons, sound effects, and formatted text.

SMS has evolved considerably from a between-persons service to include machine-to-machine transactions, enabling SMS to be used more and more in complex business transactions. Application or machine-terminated SMS are mainly offered by Value-Added Service Providers (VASPs). VASPs provide services on behalf of their clients who in many cases are large companies such as supermarkets, banks, hospitals and government departments. For example, VASPs provide SMS platforms for TV voting and radio show interactions via short codes for broadcasters. Transmission of weather and stock market information, and payment systems in supermarkets, car parks and cinemas now employ SMS extensively. Some SMS-receiving terminals are capable of translating texts into voice, enabling visually impaired users to have more access to

information. In developing countries and in the two case-study countries, mobiles services are still mainly 'human-centric'. Money transfer and mobile banking are some of the areas where SMS is being used on a commercial scale. The M-PESA money transfer system initiated by the mobile operator, ROSHAN, in Afghanistan is largely based on SMS. Mobile adverts and government propaganda are increasingly distributed via SMS.

Globally, the volume of text messages sent from mobile phones is worth around $US80 billion per year and continues to grow, especially in developed countries. A quick estimation using industry figures shows that about 6,335 text messages are emitted from phones around the world every second. In the UK, an average of 67 text messages was sent per mobile user per month in 2007 amounting to some 58.8 million text messages per month, which constituted substantial revenue growth for mobile phone operators.

2.2.3 Multi-media Messaging Service (MMS)

Multimedia Messaging Service (MMS) allows users to send and receive messages that include multimedia objects (images, audio, video, rich text). It is an SMS evolution and it is associated with systems from 2.5G (GPRS and 1x/EVDO) upwards. MMS can either be delivered in the *immediate* or in the *deferred* mode. In the *Immediate delivery mode*, the MMS client on the mobile phone retrieves the MMS message from the Multimedia Messaging Service Center (MMSC) as soon as it receives the MMS notification, without the intervention or knowledge of the user who is informed of the newly-arrived message as soon as it has been retrieved. For the *deferred* delivery mode, the user is alerted of the availability of a message allowing the user to choose

when to retrieve it. The delivery mode is handset-dependent, which can be pre-set by the manufacturer or simply configured by the user from a menu. MMS can be transmitted only between compatible phones or devices that employ a common standard which is defined by the *Third-Generation Partnership Program* (3GPP for GSM/GPRS networks, 3GPP2 for CDMA 2000 networks), and the Open Mobile Alliance (OMA) ensures interoperability.

The application of MMS in the business environment is much more limited than SMS. The reason for this may be related to the fact that there are fewer numbers of MMS-enabled handsets within consumer groups. One other reason why MMS is yet to find wider application among businesses is linked to the relatively high cost of the service. Mobile network operators are reluctant to offer *Bulk* MMS services to large companies because MMS messaging involves several over-the-air transactions that become inefficient when MMS is used to send messages to large numbers of subscribers, as is typically the case with VASPs. 3GPP and 3GPP2 are currently working on MMS optimization techniques which could reduce the transactional overheads for bulk-messaging. This move could push mass MMS into the market.

2.3 Mobile Telephony Supply Chain and the changing business models

In this subsection, the mobile telephony supply chain and business models are examined. This establishes the foundation under which the second research hypothesis will be investigated, and helps the study to achieve its fourth research sub-objective.

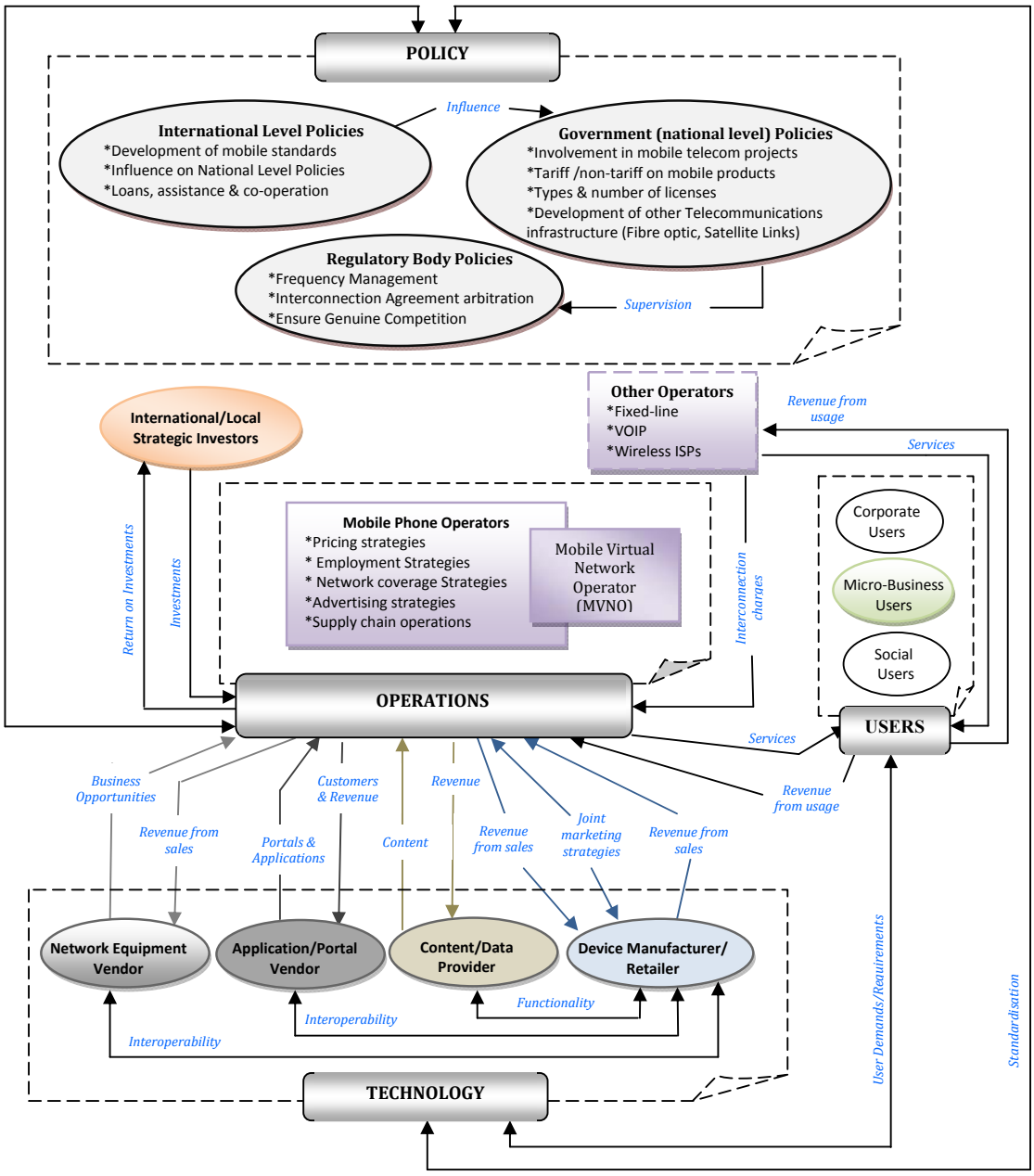

Fig.2.4: *An Operator-Perspective of a Mobile Telephony Supply Chain Showing Main Components': Policy, Technology and Operations.*

The demand and supply of mobile telephony services is a complex process involving many actors, which I have segmented into four main groups: Policy, Operations, users and Technology.

2.3.1 Policy:

The telecommunications industry in general is a highly regulated industry, especially wireless communications. All mobile communication services are transmitted over a common support or medium known as the radio spectrum or simply as the *spectrum*. The spectrum is part of the electromagnetic wave which extends from approximately 10 kHz to 300 GHz. The radio spectrum is a finite natural resource which means it cannot be created or extended. It is oversubscribed and supports communication for the national defence, aviation, emergency services, and particularly commercial radio and television broadcasting, and all other wireless communications including mobile telephony. Increasing spectrum demand calls for rigorous management of the resource, otherwise it could become like a motorway with no traffic regulations where people are free to drive in whatever direction they want, at any speed, and with any type of vehicle. If this were to happen, then such a motorway would end up serving no-one. A poorly managed spectrum will mean that if users transmit at the same time, on the same frequency, and are sufficiently close to each other, they may interfere with each other's system sufficiently to render both of their systems unusable (Cave et al., 2007). If the spectrum is properly managed, it could provide great value to society, ensuring interference-free communication between many users. The growing number of mobile phones is testimony of successful regulation.

The spectrum is a continuous resource extending across international boundaries, which calls for international level regulation. International spectrum regulation is the responsibility of the International Telecommunications Union (ITU), which is part of the United Nations. The ITU is also responsible for telecommunications *standardization* (see Section 2.1). It defines the industry standards which ensure that

telecommunication equipment such as mobile phones from different manufacturers obey international norms and, more importantly, that they can communicate with each other. The ITU works in collaboration with standards organizations such as AINSI (American National Standards Institute), ETSI (European Telecommunications Standards Institute), and IEEE (Institute of Electronic and Electrical Engineers) to ensure interoperability between all mobile telephone related equipment. The ITU is also responsible for telecommunications development. It offers advice and technical assistance to governments across the world on telecommunications development matters. As such, the ITU *influences* national telecommunication policy frameworks.

National level policies are as crucial as international level policies within the mobile supply chain. National level policies have a direct bearing on the availability and quality of mobile services within an economy. These policy issues include the number and type of mobile telephone operator licenses to be granted, mobile telephony related taxes, and overall fiscal policies such as repatriation of capital and availability of investment credit within the economic system. National level policies must also ensure that an overall pro-business environment is created which is free of ills such as corruption and crime in order to attract sufficient foreign and local investment into the mobile telephony sector. More importantly, if national level policy ensures that there is sufficient competition and a level playing-field for all mobile operators, then it will seriously influence the level of investment in, and availability and price of services.

If mobile telephony services are readily available and cheap, then many micro-business owner-managers will access the services and, because of network

externalities[7], the business benefits will even be higher. The national policy environment is therefore a major determinant of the availability of mobile telephony services, the level of their adoption, assimilation and integration into micro-businesses and, subsequently, their impact on enhanced business performance.

2.3.2 Operations:

Mobile telephone operators as service providers play a central role in the availability and integration of mobile telephony services into micro-business processes. A mobile telephone operator is typically any organization that has been licensed to provide mobile telephony services which include voice, SMS, MMS and other data services (see Fig.2.4 above) to the general public. Mobile telephone operators are mainly strategic investors or holdings apart from those that are state-owned. In many countries including Afghanistan and Cameroon, a strategic investor typically bids for a licence, then builds and operates a mobile telephone network for profit. Many strategic investors own networks in many countries, thanks to the liberalization of most telecommunication markets.

A very simple mobile telephone network is made up of hardware and software components. The hardware basically consists of network equipment which includes base stations (BTS), base station controllers (BSC) and mobile switching centres (MSC), and access devices such mobile phone handsets. The software includes application portals and content/data. Network operators generally source these components from a variety of manufacturers and ensure their inter-connectivity and inter-operability within their networks and across other networks. Different operators

[7] ***Network externalities*** in a mobile telephone network, refers to the change in the benefit or surplus which a network participant derives as more people join the network.

may work together to provide better and more affordable services to their customers. Typical areas of inter-operator collaboration include call termination, roaming and network resource sharing such as using the same antenna masts. Inter-operator collaboration can have far-reaching effects on the price and quality of services supplied to the public.

Telecommunications is a fast-moving industry, with technology and customer demands changing very rapidly. This suggests that the network operator has to make sense of all emerging technologies, understand customer demands, and offer competitive and innovative services in order to stay in business. In Section 2.1, the rapid evolution of mobile technology from 1G to 3.5G was discussed. Increasingly, operators have had to deal with many varied types of technology suppliers (Fig. 2.4) in order to satisfy increasingly complex customers and changing technology. While the good news for operators is that the changes are mostly fuelled by customer demand which is an indication of a market for the future services, making the right decision on which services to offer and technology upgrade paths to take is daunting. If an operator makes the right upgrade decisions, then services can be offered at lower prices which can stimulate more adoption and integration of services into business processes.

As network technology evolves from 2G to 3G and beyond, so do mobile business models. In 2G business models, operators own and supply all user services (voice and SMS) and, as such, they are the only customer-facing element in the mobile supply chain. In 3G models, many new content providers are directly in contact with user-customers who directly access and pay for services via online payment systems

independently of the network operator. The network operator is however paid for ensuring the connection between the provider and the user. In some cases, users access the content and the charges are included in their monthly phone bills or simply deducted from pre-pay mobile accounts, which is indicative of the fact that operators remain the main customer-facing element in the mobile supply chain despite the growing complexity in providing services.

The operator landscape has recently seen the emergence of Mobile Virtual Network Operators (MVNO). An MVNO is a company that does not own a network but resells mobile services under its brand name using the network of a licensed operator. MVNOs are basically commercial entities and are able to set their own tariffs independently from the operator whose network they are using. At the start of 2009, as many as 428 MVNOs were operating across the world, with 22 in the UK. Some UK MVNOs are *Virgin Mobile*, *Tesco Mobile, ASDA Mobile, BT Mobile* and *Fresh Mobile*. They use various licensed networks to sell mobile services. There are no MVNOs operating in Afghanistan or Cameroon. Advanced MVNOs each own their own Home Location Register [8](HLR). MVNOs can also upgrade their systems by installing additional intelligent network infrastructure which can permit them to offer value-added services and also to have full control over the SIM cards, billing and customer care. The main advantage the host operator enjoys from the relationship is the broadening of their customer base.

[8] ***Home Location Register (HLR)*** is a database of mobile subscriber information such as account information, account status, features subscribed to by the user and user's location. It is a vital network equipment which can allow the virtual operator to obtain capacity from multiple licensed operators, including 3G networks. It can permit the MVNO to support data backups, fault tolerance, reliability and user authentication.

In the mobile supply chain, the operator also interacts with other telecommunication operators such as the fixed line operators mainly for the purpose of call termination. Call termination agreements are part of a series of interconnection agreements which defines technical and commercial relationships between operators who naturally have to terminate some of their calls on the other's network.

2.3.3 Users:

Users are the demand elements of the supply chain. Three main user groups have been differentiated in Fig.2.4 to reflect the different levels and complexity of demand. Corporate users are heavy consumers and adopt varied services such machine-to-machine communications and machine-to-human communications. Micro-business users communicate mainly with business partners (suppliers and customers) while social users correspond mainly with friends and family members. Micro-business users are more likely to demand for higher levels of services than the social user. In this study, I have investigated and reported the demand and use of telephony services by micro-business owner-managers in Afghanistan and Cameroon.

2.4 Brief Review of Global Mobile Telephone Market

Mobile phones have reached virtually every nation of the world just twenty years on from the creation of the GSM (Global System for Mobiles) standard, the study group which defined the GSM standard. Approximately 1.3 million new mobile connections are achieved every day, making the mobile telephony the single most diffused communication technology in recent history (Conway, 2008).

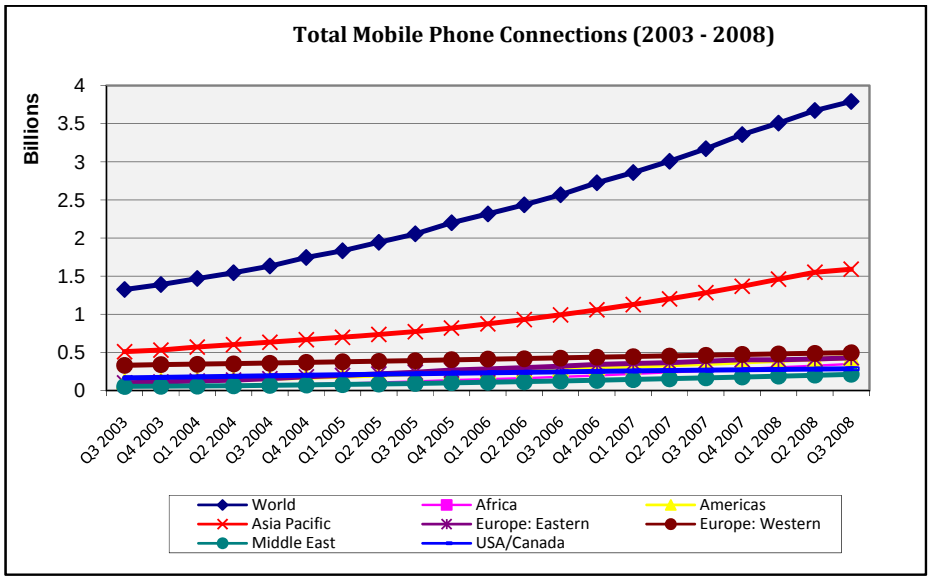

Fig. 2.5: *Global Growth in Mobile Telephone Connections*
Data: *Wireless Intelligence*

Mobile telephony services are driving growth around the world. In 2006, the technology contributed as much as €497 billion to the global economy (DigiWorld, 2007), with 70% of the growth coming from developing countries. Increased competition, falling network equipment costs coupled with the global economic downturn, are having significant impacts on average revenue per user (ARPU). ARPU has been in steady decline globally except in the Middle East and North America, where between the first (Q1) and the third (Q3) quarters of 2008 it rose from $US 17.2 to 18.7 and $US 52.3 to 52.6 respectively. For the same period, ARPU in Afghanistan plummeted from $US 11.0 to 6.0, while in Cameroon it stabilised at $US12.

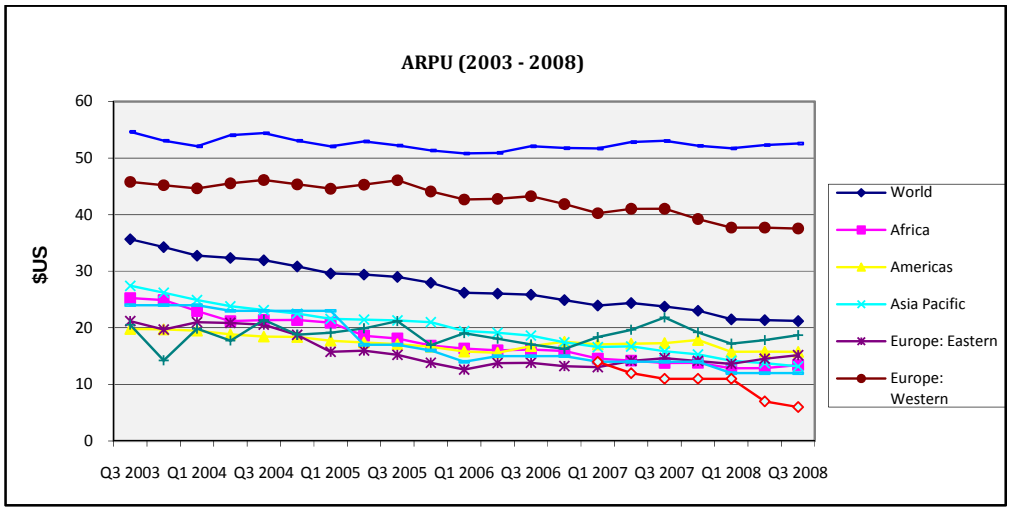

Fig. 2.6: *Global changes in Average Revenue per User (ARPU) – 2003- 2008*
Data: *Wireless Intelligence*

2.4.1 The European Market

The European market can be considered as the epicentre of the mobile revolution. In the early 1980s, the first generation of analogue mobile telephony systems were introduced in Europe, represented by three main systems; the *Nordic Mobile Telephone*(NMT), the German C-450 system and the British Extended Total Access Communication System (ETACS). The systems suffered from incompatibility, poor security and capacity problems, leading to their collapse. However, when a common standard was developed (GSM-900 and DCS-1800) and adopted by developers of the failed systems and other EU member countries, the technology rapidly developed and by the end of 2000, Europe was experiencing its biggest mobile growth rate, 58 percent in Western Europe and 28 percent in Eastern Europe.

In 2007, mobile telephony alone contributed about 1.4 percent to the GDP of the 15 member states of the EU, with some €155.1 billion generated in revenue by mobile telephone operators (Wireless Intelligence, 2008). Despite the massive revenue

generated by mobile operators in Europe, mobile growth rate within the region remains low (3.3%) compared to the rest of the world (22.0%), due to the maturing nature of the market, particularly the voice market. In the third quarter of 2008, mobile market penetration in Western Europe reached 123 percent, which is the highest in the world. This has led to a mobile-data race between operators who are actively upgrading their networks to 3G and beyond in an attempt to tap into the growing mobile broadband market, which is poised to drive growth in the coming years in the wake of falling revenue from voice services. The changing market strategy from voice-based services to data is clearly reflected in the shift in bearer technology from 2G to WCMA/HSPA (Fig. 2.7). WCMA/HSPA is capable of delivering data speeds of up to 80Mbs. Projecting into 2012, it seems clear that data will constitute the main battleground for operators, and high speed data-bearer technologies are poised to take up 38 percent of all installed capacity.

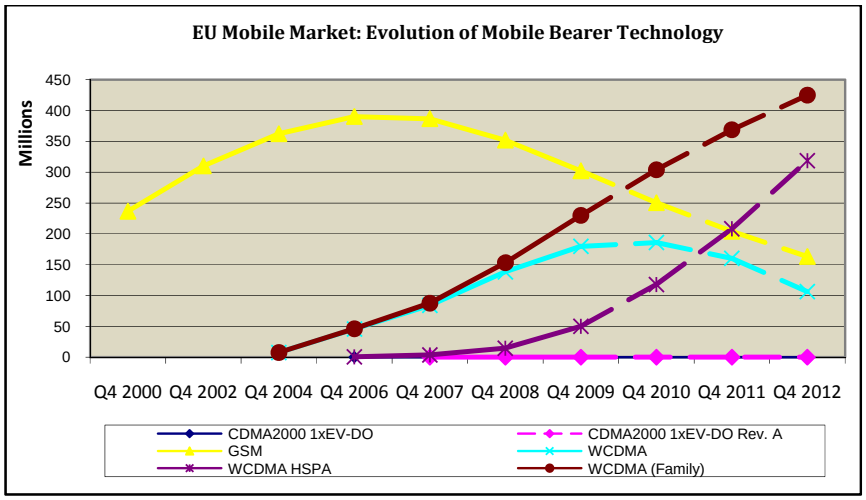

Fig. 2.7: *EU - Evolution of Bearer Technology in Terms of Number of Connections*
Data: *Wireless Intelligence*

2.4.2 The North American Market

The North American markets of Canada and the United States of America have achieved a mobile market penetration of 85.2 percent at an annual growth rate of 7.7 percent. Penetration in the region is projected to reach 100 percent by 2012, with the annual growth rate falling to nearly 3 percent (Fig. 2.8). OPEX /Revenue rose from 64 percent at the close of 2006, to about 80 percent at the close of 2007, as a reflection of spending in higher data speed technologies. CAPEX/Revenue fell from 20 percent to about 15 percent for the same period. There was a slight drop in earnings between 2006 and 2007 after a steady growth since 2000.

Like in Western Europe, demand for data services is experiencing rapid growth particularly with the coming of the *iPhone 3G* and the *Blackberry bold* handsets which offer innovative access to the internet. Contrary to Western Europe where the dominant bearer technology is traditionally GSM, the North American market has predominantly favoured and promoted CDMA technology.

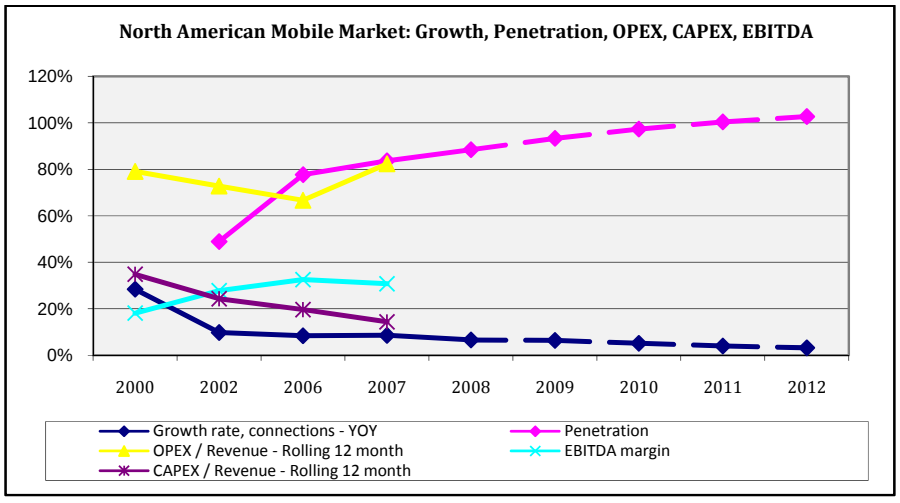

Fig. 2.8: *North American - Growth rate (YoY), Penetration, OPEX, CAPEX and EBITDA*
Data: *Wireless Intelligence & ITU*

WCDMA has also been re-enforced with HSPA to obtain data speeds of up to 80Mbs. The capability of WCDMA to deliver higher data speeds, makes it the preferred technology which is set to consolidate its growth over less data-capable technologies like the 2G, CDMA 2001X, and IDEN by 2012 (Fig. 2.9)

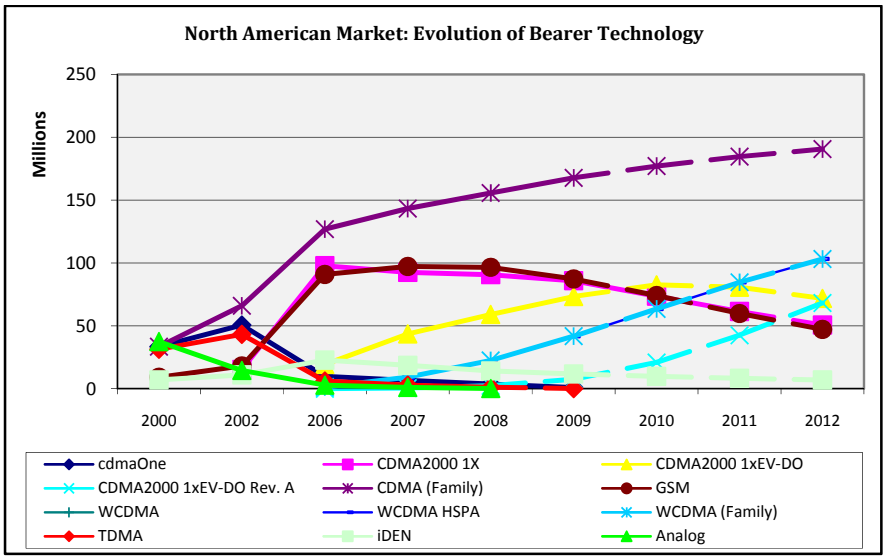

Fig. 2.9: *North American - Evolution of Bearer Technology in Terms of Connections*
Data: *Wireless Intelligence & ITU*

2.4.3 The Asian and South Pacific markets

The Asian Pacific market is predominantly a growing market, with market penetration just below 40 percent at the close of 2007. Despite experiencing very strong mobile growth rate in 2006, market growth year-on-year in the region stabilised at 30 percent between 2006 and 2007.

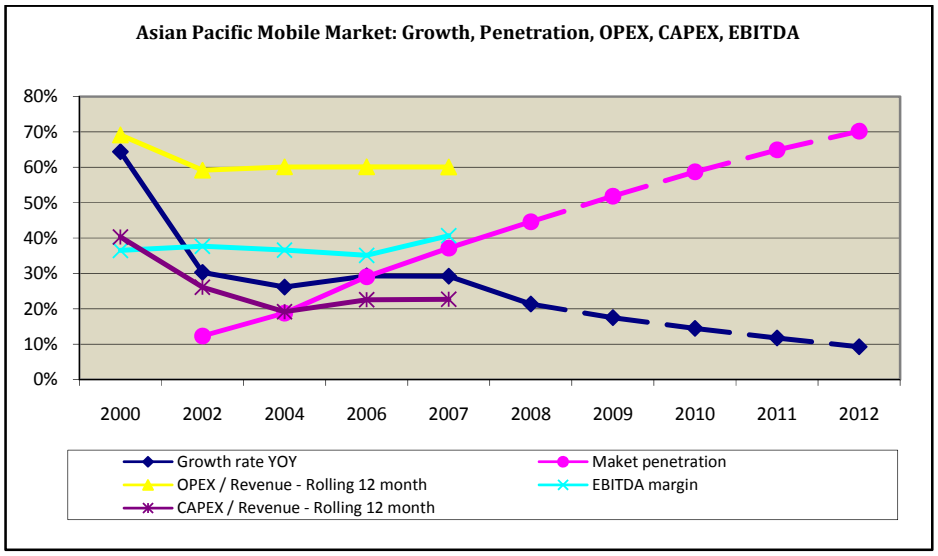

Fig. 2.10: *Asia Pacific - Growth Rate (YoY), Penetration, OPEX, CAPEX and EBITDA*
Data: *Wireless Intelligence & ITU*

Unlike in the North American and Western European markets where OPEX/Revenue has been rising due to investments in data-rich bearer technology to respond to customer demands and to achieve future growth, OPEX/Revenue and CAPEX/Revenue in the Asian Pacific region has remained stable since 2004. This is mainly due to the fact that the strategy in the region is about achieving market penetration of voice services, in which substantial investments have already been effected. This is reflected in the evolution of the bearer technologies (Fig. 2.11), where 2G clearly dwarfs other technologies, accounting for about 1,350 million connections (80%), against closest rivals CDMA 2000 1X (13%) and WCDMA (8%). GSM is expected to be the dominant technology in the region beyond 2012, although a steady rise will be observed in more data-supporting technologies like the WCMDA and TD-SCDMA, fuelled by rising data demand from Korea, Japan, and China. Most networks are currently *cashcows,* as evidenced by rising earnings (EBITDA) since 2006.

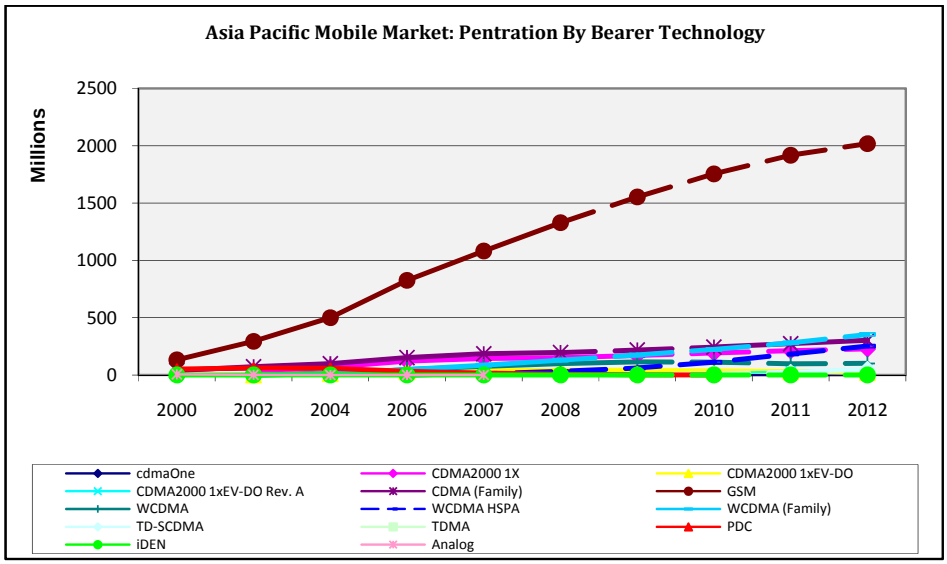

Fig. 2.11: *Asia Pacific - Evolution of Bearer Technology in Terms of Connection*
Data: *Wireless Intelligence & ITU*

2.4.4 The Middle East markets

The Middle Eastern markets grew at the rate of 6 percent between 2006 and 2007. OPEX/revenue fell from 40 percent to 38 percent. CAPEX/Revenue increased slightly, owing to 2G networks being upgraded to GPRS, EDGE and 3G. Investment has resulted in high penetration rates, which stood at 76 percent by the close of 2008 with very strong growth recorded in Afghanistan and Iran.

The region is projected to achieve 100 percent penetration by 2011, with 2G as the dominant technology accounting for some 260 million connections. WCDMA, which are data-rich technologies, are expected to grow strongly, to account for as much as 87 million connections by 2011, with demand being fuelled mainly by the Gulf States particularly the United Arab Emirates, Qatar, Kuwait and Saudi Arabia, causing a shift in the bearer technology configurations (Fig.2.13)

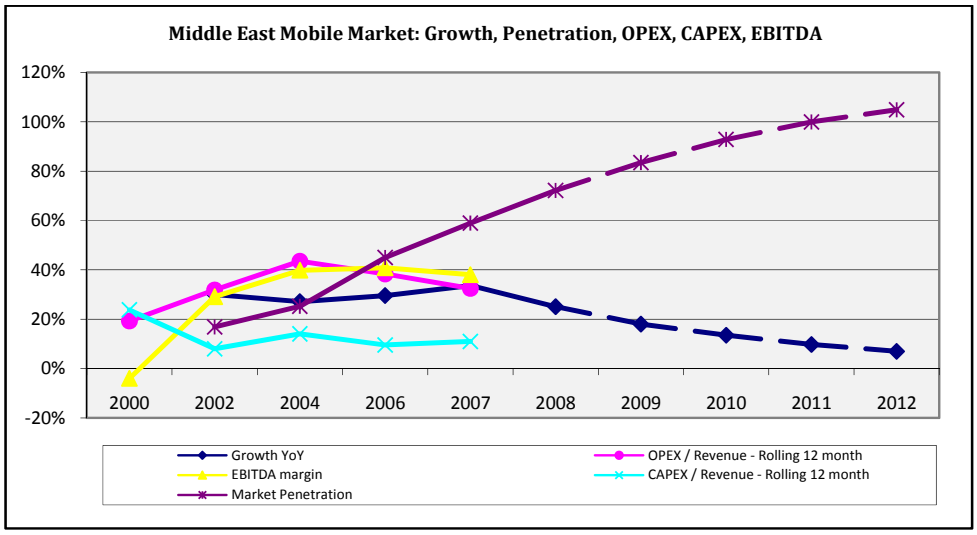

Fig. 2.12: *Middle-East Market: Growth Rate (YoY), Penetration, OPEX, CAPEX and EBITDA*
Data: *Wireless Intelligence & ITU*

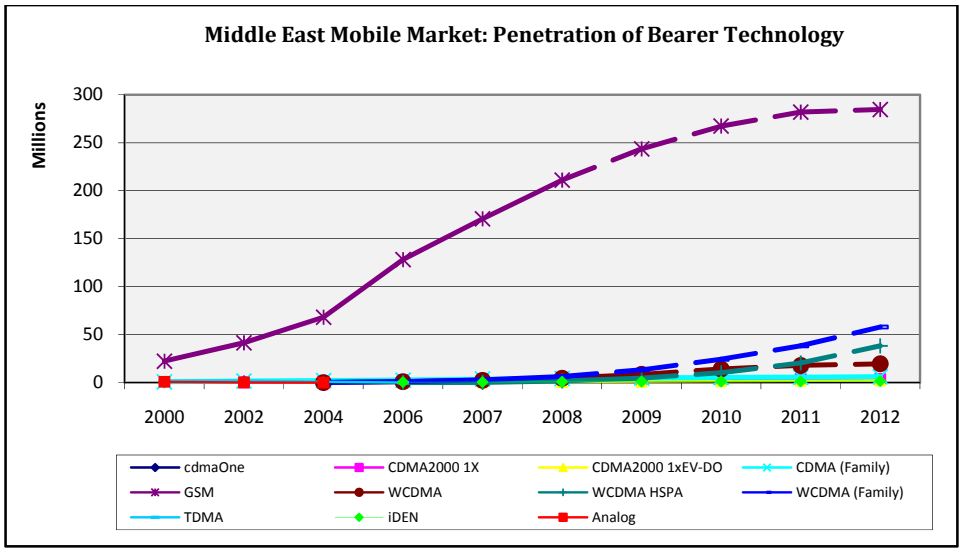

Fig. 2.13: *Middle East - Evolution of Bearer Technology in Terms of Connections*
Data: *Wireless Intelligence & ITU*

2.4.5 The Latin American Market

Growth rate in Latin American markets stood at 25 percent between 2006 and 2007. OPEX/Revenue in the region has fallen from nearly 78 percent in 2004 to 64 percent by the close of 2008. It is expected that CAPEX will rise from 2009 as many operators are poised to invest in data services, evidenced in the projected rise in connections via WCDMA technologies, which are expected to account for some 150 million connections by 2012. Total mobile penetration in the region by the end of 2008 stood at nearly 80 percent. With high growth rates and stabilised investments, most operators continue to 'milk' the 2G networks in place, as evidenced by the continuous growth in earnings since 2004.

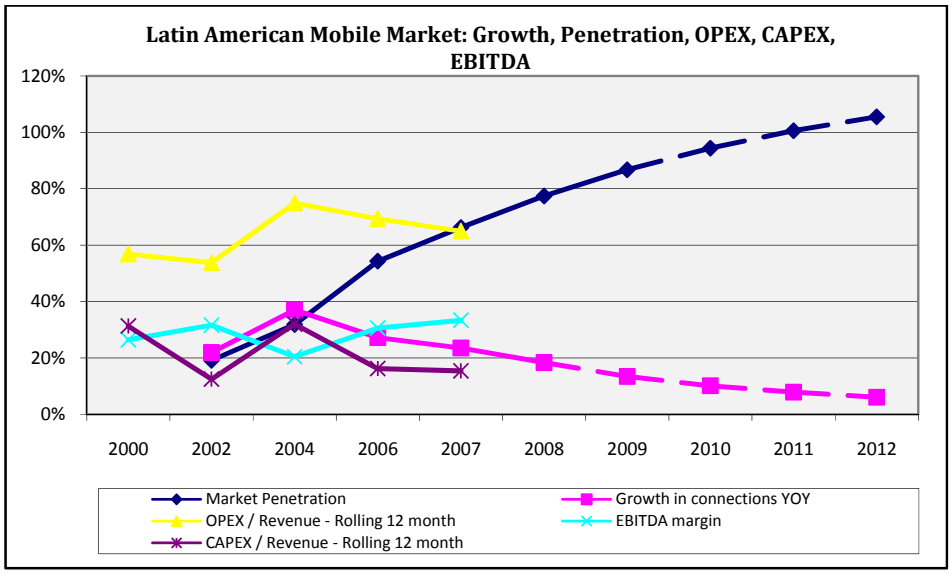

Fig. 2.14: *Latin America - Growth rate (YoY), Penetration, OPEX, CAPEX and EBITDA*
Data: *Wireless Intelligence & ITU*

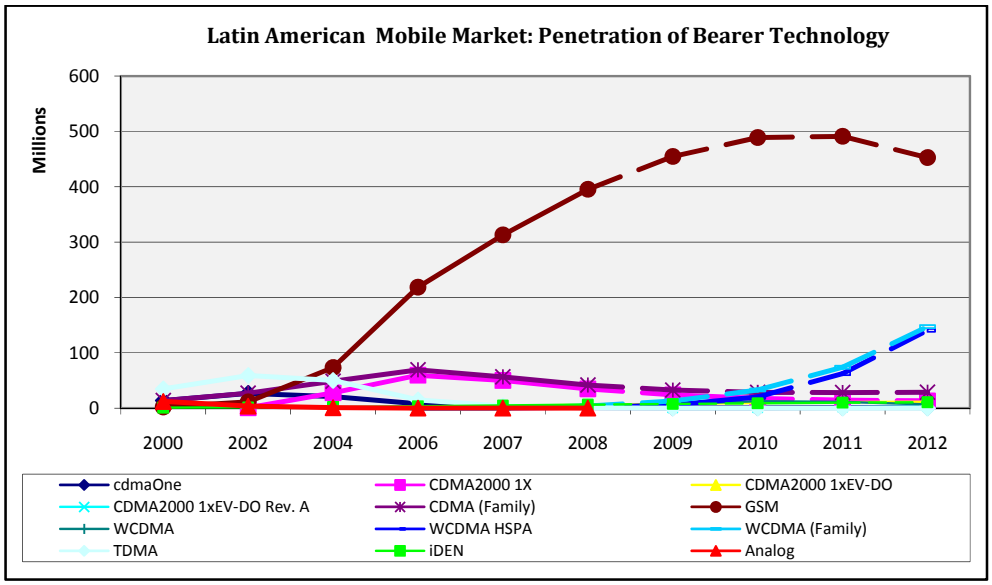

Fig. 2.15: *Latin America - Evolution of Bearer Technology in Terms of Connections*
Data: *Wireless Intelligence & ITU*

2.4.6 The African Market

The African market remains the pride of the mobile revolution. In a continent where communication services remained stunted until the coming of mobile telephony, the technology now accounts for nearly 98 percent of all telecommunication services on the continent. Mobile telephony has grown exponentially, to reach 369.7 billion subscribers at the close of 2008 from nearly zero in 2000. About 24.2 million new connections were added in the third quarter of 2008 alone. The rapid growth in mobile telephony is spurring economic growth on the continent.

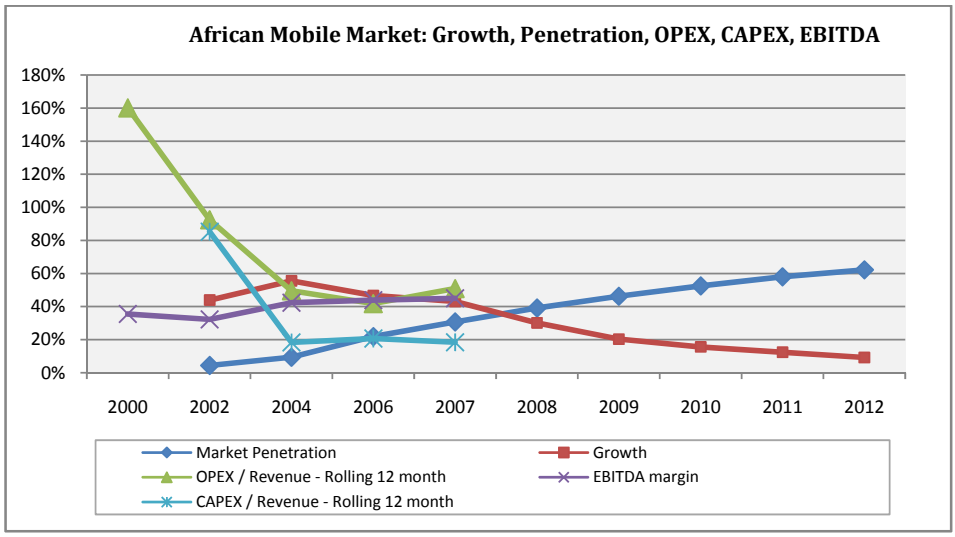

Fig. 2.16: *Africa - Growth Rate (YoY), Penetration, OPEX, CAPEX and EBITDA*
Data: *Wireless Intelligence & ITU*

In 2000, when operators invested heavily in building mobile networks and related infrastructure on the continent, overall OPEX/Revenue reached 160 percent and CAPEX /Revenue was nearly 85 percent. OPEX/Revenue dropped rapidly to 40 percent in 2006. In 2007, OPEX rose by 5 percent, and is set to rise further as operators are poised to upgrade their 2G networks to 2.5G (EDGE) and 3G (UMTS) in order to provide additional services in an increasingly competitive market. Investment in data enhanced technologies is also on the rise, with WCDMA poised to account for 3 million connections by 2012. With poor internet infrastructure on the continent, there are predictions that mobile broadband will easily step in to fill this void. Low ARPU is a major concern for investors.

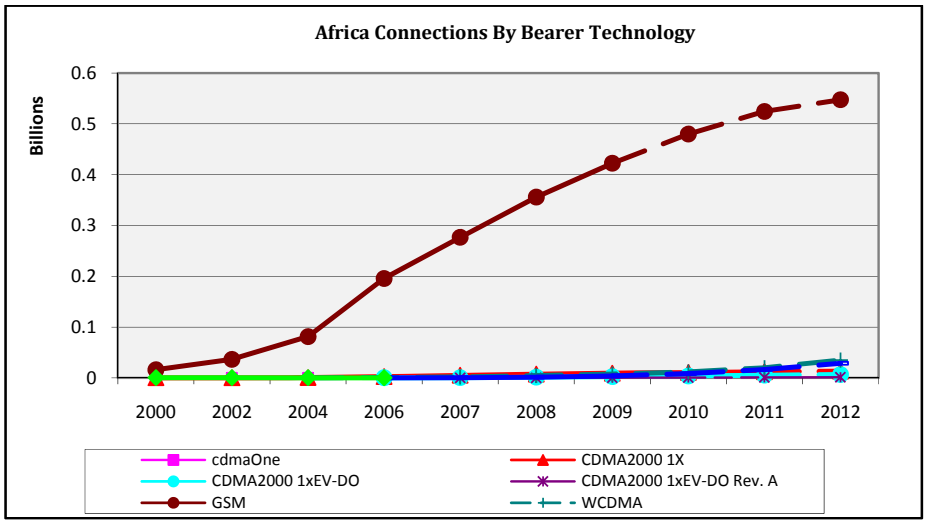

Fig. 2.17: *Africa -Evolution of Bearer Technology In Terms of Connection*
Source: *Raw Data from Wireless Intelligence & ITU*

2.4.7 The Afghan Telecommunications mobile Market

The mobile market in Afghanistan is one of the fastest growing markets in the world. Fuelled by low penetration of mobile, internet and fixed line services and a fairly functional telecommunications regulatory framework, the market has attracted investments in excess of $US 1.2 billion in the last five years, with six operators vying for market share. It is one of the most competitive markets in developing countries.

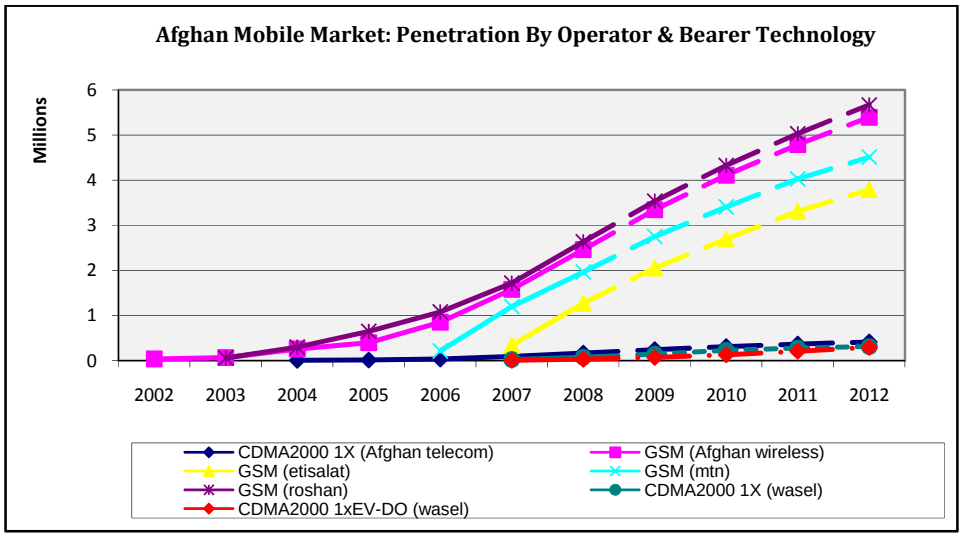

Fig. 2.18: *Afghan Mobile Market*
Data: *Wireless Intelligence*

The government is actively investing some $US 64.5 million in a fibre optic core infrastructure, and the national fixed line telephone network has been modernised and expanded at the cost of $US 50.5 million. The Ministry, through the government-owned operator *Afghan Telecom,* is engaged in rural telephony and internet programmes using CDMA Technology. A total capacity of 250,000 cdmaOne mobile phone lines has been commissioned for this purpose. A District Communication Network has recently been completed at the cost of $US 14.20 million, and up to some $US 41.92 million have been invested in telecommunication projects across the country.

Despite the high growth rate in mobile telephony uptake, penetration is still very low. By the close of 2008, only 29.5 percent of Afghans were connected despite the fact that the country already has coverage of nearly 70 percent. The major hindrance which is compressing mobile growth in the country is security and lack of basic

infrastructure such as road networks and electricity, and more importantly, low GDP per capita ($US800 – 2008 estimate). The rising insecurity caused by the ongoing fighting within the country means that network operators have to spend extra to ensure the security of their workforce and infrastructure. Also, because of the lack of electricity, mobile phone operators have to rely on generators to power network equipment at base stations. Because of poor road infrastructure, diesel to some generator sites has to be transported on donkeys. According to *Roshan*, the operator with the largest market share (30.07%), a mobile operator typical spends 12.4 percent of total revenue on extra security and an additional 12 percent to secure energy to power network equipment. With nearly 25 percent extra in OPEX, profitability is on the margin and investment budgets are compressed.

2.4.8 The Cameroonian Mobile Market

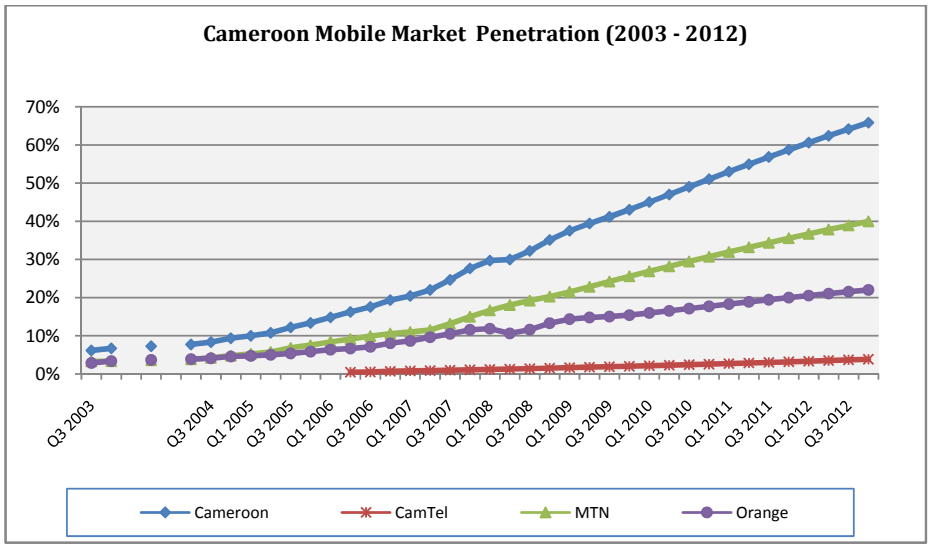

Fig. 2.19: *Cameroon Mobile Market*
Data: *Wireless Intelligence*

Cameroon was one of the first countries in Africa to deploy mobile telephony services. As early as 1993, a small state-owned mobile network called *Camtel Mobile* was operating in Cameroon. *Camtel Mobile* was taken over by MTN Cameroon in February 2000 in a wave of liberation and privatisation initiated by the Cameroon government. Since 2000, MTN has invested some $US 300 million in the market, which has enabled the company to extend coverage across the country. MTN currently holds 54 percent of market share, closely followed by Orange Cameroon with a 40 percent market share. Camtel, the national operator, is currently using CDMA 1X technology to offer mobile services and only has 4.3 percent of market share.

Despite the fact that the Cameroonian mobile market has been growing steadily since MTN and Orange entered the market, price per unit call is still one of the highest in the region and network coverage is still patchy and unreliable, with high rates of drop-call rates. While operators have blamed some of these market failures on high mobile related taxes, others like this writer attribute it to lack of intense competition. The regulatory apparatus has been slow to spot and correct these market lapses, which could have resulted in the award of at least one more mobile license to boost competition.

2.5 Conclusion

In this chapter, the global mobile telephony landscape has been reviewed with a particular focus on the evolution of the market in terms of technology and services. Projections into the future of the global market were made up to 2012 across six major regions of the world. The contribution of mobile telephony to overall economic output

by region was also the focus of this discussion. The mobile phone markets in Afghanistan and Cameroon were also reviewed to set the stage for the development of the empirical research in the next chapters.

This chapter has also provided certain bases on which the second research question can be answered, by looking at the mobile telephony supply chain. It was particularly stressed in the chapter that the policy environment and operator strategies can significantly influence the availability, quality and price of services, which are key determinants of mobile telephony adoption within micro-businesses and of their integration into business processes to achieve the hypothesised growth.

CHAPTER THREE: THEORITICAL PERSPECTIVES

3 Introduction

In Chapter Two, mobile telephony technology including its services and supply chain was presented. The present state of global diffusion and the future trends of mobile telephony services, and market growth expectations by 2012 were also outlined in the chapter.

The purpose of this Chapter is to explore the relevant literature related to the link between two main concepts, *Integration of Mobile Telephony Services into Business Processes (IB)* and *Perceived Enhanced Business Performance (PEP),* in order to support the delineation of the conceptual and research frameworks of the study (Berger & Patchener, 1988, pp. 156-159). The chapter links with the previous one to outline a theoretical framework which guides the development of the key concepts that inform the nature of the relationship between mobile telephony services and enhanced business performance in a micro-business environment.

Theoretical and philosophical perspectives reviewed from the existing literature are presented, and the research paradigm is also declared. Four mega theories, the *Theory of The Growth Of Firm*; *Theory of Entrepreneurship, The Resource-Based View (RBV) of the Firm, The Firm As A Locus of Strategic Control,* associated with business performance, technology adoption and growth are integrated into the theoretical frame to obtain a conceptual model which is presented in Chapter Four.

3.1 The Research Paradigm

This section explores the research paradigm[9]. The definition of 'paradigm' is always traced to Thomas Kuhn[10] in the literature of science. According to Kuhn, paradigm refers 'to a set of values and techniques which is shared by members of a scientific community; procedures used to solve specific problems and take theories to their logical conclusion, which acts as a guide or map, dictating the kinds of problem scientists should address, the type of theories or explanations that are acceptable, and the kinds of procedure that are used to tackle particular problems' (Kuhn, 1970). In its simplest form, a paradigm would refer to 'the way we see the world in terms of perceiving, understanding and interpreting, a set of theories, explanations, models or maps' (Covey, 1989).

The basic principles of paradigm are *epistemology*, *ontology* and *methodology* (Neuman, 2004, Guba and Lincoln, 1994). According to Kumar (2005), two main paradigms characterise social research: the first one is the *systematic, scientific* or *positivist* approach, which is rooted in the physical sciences; while the second is known as the *qualitative, ethnographic, ecological* or *naturalistic* approach. While each paradigm has often been dealt with as if it were surrounded by an impermeable wall, recent advances in research have identified possibilities for co-existence (Creswell, 2003; Datta, 1994). The paradigmatic approach adopted for this study was determined by the research purpose. In order to develop a research methodology

[9] ***Paradigm*** *is defined by the Merriam-Webster Online dictionary as "a philosophical and theoretical framework of a scientific school or discipline within which theories, laws, and generalizations and the experiments performed in support of them are formulated; broadly: a philosophical or theoretical framework of any kind (http://www.merriam-webster.com/dictionary/paradigm)*

[10] ***Thomas Kuhn*** was a historian of science who is widely believed to have given the word 'paradigm' its scientific or present-day meaning when he adopted in his book 'The Structure of Scientific Revolutions'. In this book, Kuhn defines paradigm in terms of: what is being observed and scrutinized, the kind of *questions* that are supposed to be asked and probed for answers in relation to this subject, *how* these questions are to be structured and *how* the results of scientific investigations should be interpreted

which is appropriate to help answer the research questions outlined in Chapter One, the ontological and epistemological perspectives which are defined by the assumptions and beliefs about the nature of knowledge, and the phenomena of mobile telephony and enhanced business performance, are both examined (Morgan and Smircich, 1980; Smith and Dainty, 1991). This section outlines the epistemological and ontological perspectives, while the methodology is presented in Chapter Five.

3.1.1 Epistemological Framework.

'Epistemology is the theory of knowledge, especially about its validation and the methods used - how one sees and makes sense of the world' (Walliman, 2005: p.432). It is concerned with 'the question of whether or not the social world can be studied according to the same principles, procedures, and ethos as the natural sciences' (Bryman and Bell, 2007). Epistemology is necessary to develop an appropriate methodology for the phenomena being studied (Smith and Dainty, 1991).

The epistemological stand which underpins the design of this research is built on the type of positivism described by Pugh in his reflections upon the Aston programme (Pugh 1983:45). In a study to 'make systematic comparisons across organisations that will enable generalisations about the relationship between organisational size, technology and structure to be made' (Bryman and Bell, 2007), Pugh was guided by the belief that 'organisations exist as concrete entities about which data can be collected' in order to gather facts which would inform the delineation of a *conceptual framework* made up of *analytical constructs* that could 'be used to analyse the regularities of the data' (Bryman and Bell, 2007). Once the data has been analysed, 'conclusions can be drawn about the structure and functioning of organisations and

the behaviour of groups and individuals within them' (Pugh 1983:48). This implies that by 'identifying the structures at work that generate' enhanced business performance, through the use of analytical constructs that define the integration of mobile telephony services into business processes, knowledge can be generated based on generalisable propositions or hypotheses that can be tested empirically, to discover how to better organise micro-businesses, mobile telephony and entrepreneurial competence.

Following from the positivist epistemological reflections of Pugh described in the previous paragraph, this thesis is designed such that data is collected from the organisations concerned (micro-business owner-managers) and from secondary sources (mobile phone activity logs, data bases) about the integration of mobile telephony services in business processes and their importance to micro-businesses. Once the data are collected and analysed, the resultant outcome *generates knowledge* and gives grounding to the nature of the structural relationships between the constructs.

Fig 3.1 represents the epistemological framework of the study, which corresponds with the literature on positivist epistemology (Pugh, 1983) and the literature on cross-sectional and observational research designs (David de Vaus 2004, Bryman 2007, Hair et al., 2006). The epistemology developed for the study is based on scientific methods which consist of systematic observation, classification and interpretation of data (Kumar, 2005 p.6).

The epistemological framework is a guide to ensure that conclusions drawn from the research are valid, verifiable and based upon hard evidence gathered from information collected from real-life experiences (empiricism). This epistemology suggests that the typology of the research is a structured or quantitative approach.

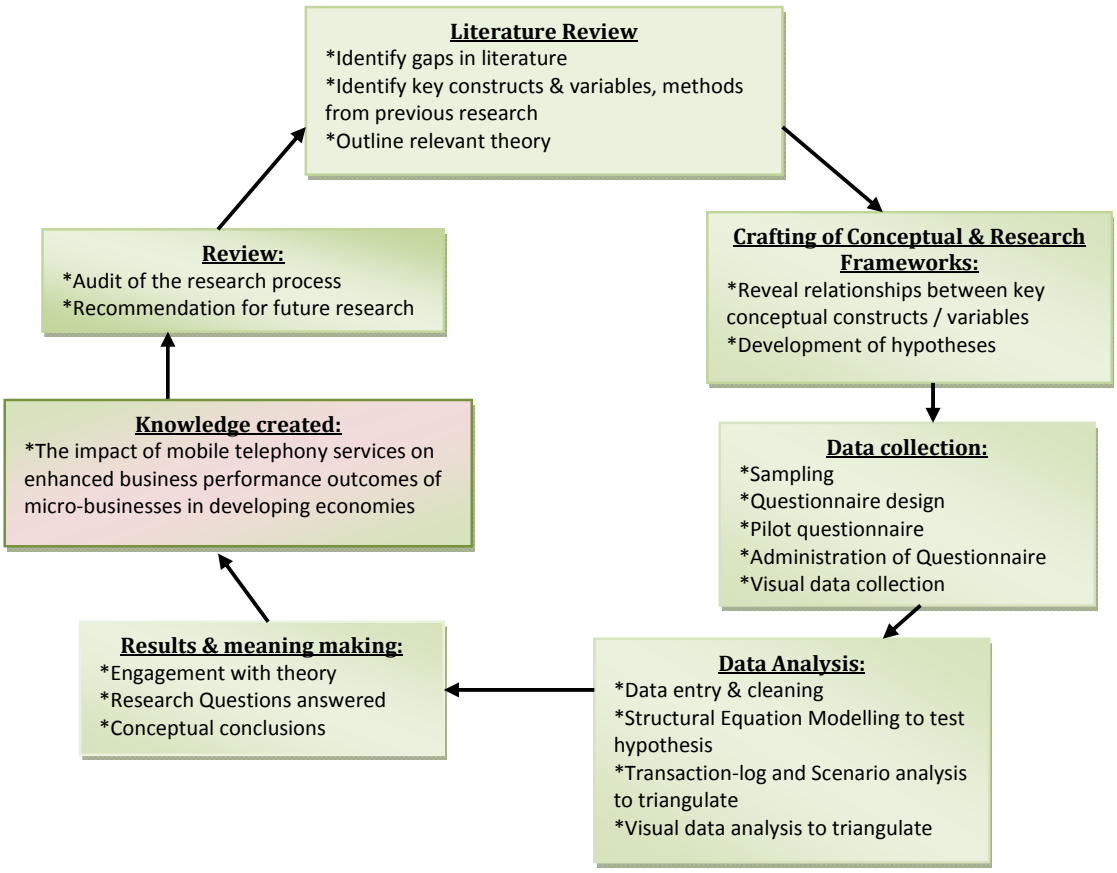

Fig. 3.1: *Epistemological Framework of the Research*

3.1.2 Ontological Framework

Ontology is all about 'reality'; what it is, and how it can be known (Guba and Lincoln, 1994). It is 'concerned with nature of social entities' and seeks to 'provide answers to the question whether social entities should be considered objective entities that have a reality external to social actors, or whether they can and should be

considered social constructions built up from the perceptions and actions of social actors' (Bryman and Bell, 2007). Lincoln and Guba (2000), and Heron and Reason (1997) have identified five ontological positions that are relatively isolated from one another:

- Positivism – Knowledge is context-free and there are controlled natural laws of cause and effect.
- Post-positivism – 'reality' is imperfect because human intelligence is imperfect and phenomena are complex in nature.
- Critical theory – 'reality' is shaped by gender, economic, political, social and ethnic values, which over time, this reality is assumed to be 'real'.
- Constructivism – 'reality is intangible and it is a construction of the human mind shaped by real-world experiences, which are dependent on the individual and can be altered with new information.
- Participatory – 'reality' is a product of the way the mind engages with the cosmos.

Burrell and Morgan (1979), and Morgan and Smircich (1980) have a similar view to Guba and Lincoln (2000) and Heron and Reason (1997), but argue further that the ontological positions form a continuum with very thin boundaries between them, stretching from *objectivism* (on the positivist side) to *constructionism* or subjectivism (on the constructionist/participatory side). Objectivism infers that 'social phenomena and their meanings have an existence that is independent of social actors' while 'constructionism asserts that social phenomena and their meanings are continuously being accomplished by social actors' (Bryman and Bell, 2007).

This thesis conceives the reason why micro-businesses adopt mobile phones and how they use and value them to be socially constructed. This infers a constructionist view. Additionally and importantly, the thesis assumes a critical theory perspective. It is assumed in particular that local socio-political, economic, and ethnic values in Afghanistan and Cameroon are 'realities' which must be taken into consideration both in the design and outcomes of the study. *Critical Constructivism* - a fine blend of critical theory and constructivism - defines the ontological position of the study. This ontology guided the operationalisation of the conceptual constructs and variables that are embedded in the conceptual framework which will be delineated in Chapter Four.

The ontological position adopted by this study implies that the adoption and use of mobile phones by micro-business owners depend on how they construct the technology and its importance, which in turn implies that it is not mobile technology which determines why and how it should be used by owner-managers; rather, they decide when to buy the technology, when to use it, where to use it and for what reasons.

The critical constructivist or social constructionist views adopted in this thesis are prevalent within the sociology of science (Pinch and Bijker, 1984). According to the literature on the Sociology of Technology (SCOT), in order to better understand technology and its impact, 'a crucial role is played by the sociological groups concerned' (Pinch and Bijker, 1984) with the technology. This literature further argues that 'all members of the same *social group* share the same set of meanings, attached to a specific' technology. The implications of Pinch and Bijker (1984)'s perspective for the methodology of this study are that micro-business owner-managers

in developing economies form a 'sociological group' from whom adequate knowledge about the importance of mobile telephony can be obtained.

For this study, the adopted paradigm - critical constructivism - guided the construction of a set of structured questionnaires built on tested mega-theories that underpin the research constructs. This questionnaire was administered on a sample of respondents drawn from the *sociological group* concerned - Micro-business owner-managers in Afghanistan and Cameroon - to gather knowledge of the impact of mobile telephony on enhanced business performance.

3.2 The Notion of Micro-Business:

There are wide variations within the academic and business circles in how to classify businesses based on size (Atkins and Lowe, 1997; Ganguly and Bannock, 1985; Fink and Kazakoff, 1997, p. 3; Storey et al., 1987). The classification of firms varies across national boundaries, across regions and across international organizations. Two prominent terms, *Small and Medium-sized Enterprises* (SMEs) and *Small or Medium-sized Businesses* (SMBs), have also been used interchangeably to define the concept of firm size. SME is an abbreviation which is commonly used in the European Commission (EC) and some international organizations such as the World Bank and United Nations, while SMB is commonly used by America and its trading partners. The European Commission uses three statistical criteria to classify firms: number of employees, annual turnover and annual balance sheet (Table 3.1).

Enterprise Category	Headcount: Annual Work Unit (AWU)	Annual Turnover	OR	Annual Balance Sheet total
Micro enterprise	<10	≤ €2 million (previously not defined)	OR	≤ €2 million (previously not defined)
Small enterprise	<50	≤ €10 million (in 1996 € 7 million)	OR	≤ €10 million (in 1996 €5 million)
Medium Sized enterprise	<250	≤ €50 million (in 1996 € 40 million)	OR	≤ €43 million (in 1996 € 27 million)

Table 3.1: *Definition of a Small Business According to the European Commission (EC)*
Source: *European Commission*

Using statistical definitions to classify businesses, like the EC, is popular but does not come without criticisms: 'they suffer from problems related to inflation and currency translation' (Burns, 2001 p7). Alternatives have been provided by Bolton (1971), who provided both statistical and economic definitions (Table 3.2). Other definitions are based on notions like market share, labour productivity, ownership and management, and different economies also have different definitions of small businesses.

The 'Statistical Definitions' of Small Firms	
Manufacturing	200 employees or less
Construction, Mining and Quarrying	25 employees or less
Retail and miscellaneous services	Turnover of £50,000 or less
Motor trades	Turnover of £100,000 or less
Wholesale trades	Turnover of £200,000 or less
Road transport	5 vehicles or less
Catering	All; excluding multiple and brewery managed houses.
The 'Economic definitions' of small firms	
i)	Have a relatively small share of their market place
ii)	Are managed by owners or part owners in a personalized way, and not through the medium of a formalized management structure
iii)	Are independent, in the sense of not being part of a large enterprise

Table 3.2: *The Bolton Statistical and Economic Definitions of Small Firms*

In a developing economy context, many of the SME definitions cited above collapse (Liedholm and Mead, 1999). In a series of surveys carried out between 1990 and 1998 of Micro and Small enterprises (MSEs) in Eastern and Southern Africa, '64

percent of those enterprises were made up of one person working alone, 33 percent had 2-5 workers including working proprietors and family members, and only 2 percent had 6-10 workers' (Liedholm & Mead, 1999). A majority of these MSEs do not even keep business records which makes it difficult to classify them based on turn over.

In Afghanistan and Cameroon, there are no clear definitions of what constitutes a small or micro-business. For the purpose of this study, a micro-business will refer to an economic entity which employs fewer than 10 people, with management and decision making in the hands of one person called the *owner-manager*. This includes service providers such as mechanics, hairdressers, electricians, plumbers, small professional businesses and others, including small farmers, street vendors and small retail outlet owners. A typical micro-business in this study would refer to a person called *owner-manager* or *entrepreneur* whose 'personality is imprinted on the way [the business] operates' and whose 'values dominate vis-à-vis aspects like business strategy and day-to-day management of the business' (Burns, 2001).

3.3 The Economic Importance of Micro-Businesses:

The role micro/small businesses play in economic development has received substantial attention from the research community (Bosma, et al., 2008; Liedholm and Mead, 1999; Davidsson, 2004, Burns, 2001; Steel, 2005; Davidsson & Wiklund, 2006; Acs and Kallas, 2007). The economic importance of micro-businesses is still the subject of debate, although there seems to be some consensus that SMEs contribute significantly to economic growth. Despite the fact that entrepreneurial activities differ widely across the globe, scientific evidence linking micro-

entrepreneurial activity to economic growth continue to accumulate (Bosma, et al., 2008).

The principle behind entrepreneurial productivity is that entrepreneurs identify opportunities within the economy and use resources which are 'yielding low return and shift them into a function which yields a higher return from which they personally gain' (Casson, 1982; Acs and Storey, 2004; Acs and Kallas, 2007). The modus operandi of entrepreneurship is the continuous reallocation of factors of production such as labour, capital and knowledge to enhance efficiency throughout the economy (Acs and Storey, 2004). This process generates economic growth and, in the absence of the entrepreneurial process, scarce resources will continue to be allocated in areas of low return 'leading to an ossified economy in which resources are underutilised' (Acs and Kallas, 2007 p.20).

Acs and Storey (2004) argue further that despite the fact that the entrepreneurial process is supposed to yield greater efficiency in resource utilisation, this is not always the case as not all entrepreneurial ventures are successful. In fact, some entrepreneurs end up wasting valuable resources, which can end up harming the economy. A clear example of this failed entrepreneurial process is the *sub-prime mortgage* fiasco which is believed to be at the origin of the financial crisis now rocking the world. Resources that were thought to be of low return were redeployed to riskier and potentially higher-yielding areas; and because entrepreneurs do not always have all the answers, this process flopped, sending shock waves around financial markets. Acs and Storey (2004) also highlight the fact that, even when entrepreneurial ventures fail, they may well act as learning points for other

entrepreneurs, which could enable them to reinforce their ability to build more profitable ventures.

Despite the fact that many micro-business ventures fail or exit the market prematurely, the sum total of micro-business successes in redeploying low-yielding resources to achieve efficiency seems to outstrip the failures (Hallberg, 2000, Acs and Kallas, 2007) in many economies. Successful micro-businesses play a crucial role in economic development. In the EU for example, SMEs of which the majority are micro-businesses represent more than 99 percent of the total business stock (Deakins and Freel, 2006). According to 2002 statistics published by the European Observatory of SMEs (EIM, 2002), the SME sector accounted for about 50 percent of total employment in all 18 economies considered in the study.

In 2007, the GEM (Global Entrepreneurship Monitor) research consortium undertook research in 42 countries aimed at measuring the prevalence of entrepreneurial activity within the working population, known as the *Total Entrepreneurial Activity (TEA) Index,* and its impact on economic growth. The findings showed a positive and significant correlation between entrepreneurial activity and economic growth (Bosma et al., 2008). The study argues that 'small and newer firms generate innovations, fill market niches, and increase competition, thereby contributing to resource reallocation in economic activity' (Bosma et al., 2008). Deakins and Freel (2006) used GEM data from 40 countries including developing economies to obtain a scatter plot of one-year lagged growth in GDP against TEA, and the findings showed that the two variables were strongly correlated (R=.45). Audretsch and Thurik (2001) used OECD data to investigate the relationship between entrepreneurial rate and income per capita and

suggested a positive relationship between growth in entrepreneurial activity and higher rates of economic growth and reduction in unemployment.

Despite the fact that there seems to be compelling evidence from the previous paragraph that micro-businesses contribute to economic growth, there are also counter-arguments: Deakins and Freel (2006) suggest on pages 34 and 35 that it may well be the change in the level of economic activity that influences the changes in entrepreneurial activity and not the reverse. Using evidence from the UK, Deakins and Freel found that changes in GDP growth precedes changes in the stock of VAT (Value Added Tax) registered firms and not the other way round, which led them to suggest that entrepreneurship is a 'consequence' and not a 'cause' of growth (Deakins and Freel (2006 p 35).

It is however important to note that the debate on the exact impact of SMEs on economic growth is ongoing, as there is a lack of cross-national harmonized data sets and findings on the nature of the relationship between small business entrepreneurship and economic growth. However, the role of micro-firms in combating poverty seems more evident (Mead, 1994; Liedholm and Mead, 1999; Steel, 2005; Deakins and Freel, 2006), and this is where the interest of this study lies. It is worth investing time to investigate factors such as mobile telephony which have the potential to enable micro-businesses to better fight poverty.

3.4 The Growth of Micro-Firms:

Many theories have been postulated to explain why and how firms grow. The long history which has marked research into the causes of firm growth has led to the development of many theories, ranging from the more abstract neo-classical economic and stochastic approaches to more practical ones, which have often had considerable influence on public policy and mainstream academic debate. There are multitudes of firm growth determinants listed in the literature. Liedholm and Carl (1992), Scherer and Ross (1990), Trau(1996), Deakins and Freel (2006), and Carton and Hofer (2006) provide useful summaries.

Despite this multitude of growth perspectives, the development of a theoretical consensus on firm growth process is still contentious, particularly at the level of small and micro-firms (Davidsson, 2004; Wiklund, 2006). The internal organisational structures and growth outcomes of smaller firms are quite different from those of bigger firms (Storey, 1994) which at times generate counter arguments for using certain firm growth theories to study micro-firms. An analysis of firm growth theories based on strategy, industrial economics, or indeed neo-classical economics tend to intersect around the common theme that firms which are capable of adapting to their environment through the adjustment of processes and strategy, are more likely to grow. This study relies on this intersection to develop an eclectic model which is based on four mega-theoretical approaches: *the Theory of the Growth of the Firm*, *the Theory of Entrepreneurship, the Resource-Based View of the Firm, and the Firm as a Locus of Strategic Control.*

These mega-theories are used to 'explain and operationalise the relationships among the observed activities' (Lin 1976:15) relating to adoption and use of mobile telephony services and their impact on enhanced business performance. Menzies (1982) distinguishes between two types of theories in terms of practitioners' activities – *theoriticians' theory* and *researchers' theory*. According to Menzies, when a practitioner is involved in developing an understanding of some social phenomenon in terms of basic concepts and ideas that may be very abstract and broad or not systematically tested by means of research, then it is known as theoriticians' theory. On the other hand, if a practitioner uses theory as a source of hypotheses to be tested or theory is generated in course of the research then it is called researchers' theory.

This study is about using existing theory to hypothesize relationships which are then tested empirically to infer the level of influence of the independent variables on the dependents which is characteristic of *researchers' theory*. The study brings together conceptual schemes within the literature on firm growth defined by the mega-theories into a theoretical argument in which concepts are then operationalised with appropriate variables to measure the influence of mobile telephony on enhanced business performance.

The eclectic conceptual model developed for the study is used to explain as well as to predict how the adoption of mobile telephony services can enhance business performance within a micro-business context. The objective in this study is not to test these mega-theories but to use them in the development and construction of hypotheses that are tested by the research. Hence, these theories are used to generate the conceptual model of the study. Discussions relating to the mega theories

themselves are limited in this work. The focus is on extracting those elements that are of interest to the construction of the eclectic model by attempting to build a self-contained theoretical framework of the impact of mobile telephony on enhanced micro-business performance based on the literature on the growth of firms by crafting a model which is theoretically and practically robust to investigate the hypothesised relationships.

3.4.1 Theory of the Growth of the Firm

The 'theory of the growth of the firm' is the title of a book by Edith Penrose which was first published in 1959. In a review of the book, Penrose and Pitelis (2002) summarized 13 key points about the book's contribution to the understanding of firms. Three of them are of interest to the development of this thesis and are hereby quoted:

1. Resources render (multiple) services. The heterogeneity of services from resources gives each firm its unique character. *Effective use of resources takes place when resources are combined with other resources*.
2. *Human, and in particular managerial, resources are of the essence*, because expansion requires planning, and managerial resources that enable the firm to plan are firm-specific; they cannot be acquired in the market.
3. Firms are bundles of resources, under internal direction, for the use of goods and services, sold in markets for profit. Their boundaries are defined by the *area of coordination* and *authoritative communication*.

In confirming Penrose's theory of the firm, G.B Richardson wrote the following: 'Mrs. Penrose's theory of the growth of the firm is widely known and accepted'

(Richardson, 1999). The theory of the firm is said to be one of the 'fastest growing areas in applied microeconomics' (Foss and Klein, 2004). Drawing from the importance of Penrose's publication to micro-economic studies, I have highlighted in *italics* within the three quotations above certain important dimensions from her work which are of significance to this thesis. These dimensions are operationalised and contextualized into the following propositions:

1. If a firm or small business is able to *effectively combine* resources like mobile telephony services with other resources (e.g. skills within the industry, ability to search for market information), then it should achieve growth.
2. The *managerial* values ('*resources')* of a micro-business owner-manager, such as his level of education and industry experience, can have an important influence on his decision to adopt and his ability to integrate mobile phone based services in his business. Adoption and integration of these services into business processes is a prerequisite for enhanced business performance.
3. If mobile telephony services are capable of increasing the area of *co-ordination* and *authoritative communication* of a firm, then the firm can achieve growth.

These three propositions shape the design of the theoretical framework delineated later in this chapter, and also the conceptual and research models presented in Chapter Four. According to the framework, the owner-manager is basically viewed as a resource coordinator whose decisions and creativity are fundamental to the growth of his business. Mobile telephony services are projected in the model as effective

channels through which resources can be effectively combined and co-coordinated to achieve enhanced business performance.

3.4.2 The Resource-Based View (RBV) of the Firm

Another theory which underpins the conceptual framework is the Resource-Based View of The Firm. The theory argues that firms can achieve competitive advantage created from the distinct combination of resources and capabilities that they currently possess or can acquire (Dollinger, 1999). The theory is concerned with attaining or achieving higher business performance compared to other firms within the same market, and hinges on the resources and capabilities of the firm as an underlying factor of performance.

Resources may be tangible or intangible (Castanis and Helfat 1991; Michalisin et al 1997). Tangible resources refers to physical resources like machines and raw material, while intangibles can be likened to resources like motivation, confidence and knowledge, quality of business contacts and the ability to adopt and integrate mobile telephony services into business processes. Micro-business managers can use mobile telephony services in combination with their unique entrepreneurial competences, strategic planning, and business networks, to enhance business performance. The ability to account for enhanced firm performance in terms of resources which include mobile telephony services makes RBV an appropriate candidate theory to be included in the research framework.

3.4.3 Theory of Entrepreneurship

There seems to be a lack of a clear and succinct definition of the term *entrepreneurial theory* in the literature. The main locus of the theory is that it views entrepreneurship as the management of assets and organization of assets within a small business in order to achieve growth (Kirzner, 1973; Kirzner, 1999; Foss and Klein, 2004). Unlike the Penrose on the growth of the firm, the Theory of Entrepreneurship is a more restricted view, focusing mainly on small businesses. According to Grebel et al (2001), an evolutionary approach of the theory 'should also contain some specific theories such as the theory of human capital (Schultz 1975), social networks (Granovetter 1973) and Neo-Schumpeterian economists such as Loasby (1999).

The main function of the micro-business manager is to manage and organise resources. By moving resources from low-yielding to high-yielding areas, entrepreneurs create wealth in that process, which is translated into business growth. The use of mobile telephony services may be low-yielding if used for other purposes; but, by integrating them into business processes to coordinate and organize resources, enhanced business performance which is a high-yielding activity can be achieved. Narrowing the management and organization of assets (resources) to the small firm level makes the theory of entrepreneurship a candidate theory for the conceptual framework.

3.4.4 The Firm as a Locus of Strategic Control:

Among the many approaches to the growth of the firm, *the firm as a strategic control approach* explains better how the integration of mobile telephony services into business processes can achieve growth. To a considerable extent, it embodies the

resource-based view of the firm theory (Foss, 1993, 2005; Foss and Loasby, 1998), the theory of the growth of the firm, and also the entrepreneurial theory. The firm as a locus of strategic control approach is capable of providing an explanation as to why and how firms grow, to about the same degree as either the Penrosian theory of the growth of the firm, the resource-based view of the firm, or the theory of entrepreneurship would do if taken separately (Richardson, 1972; Nelson and Winter, 1982).

This approach views the firm as an organisation that uses *factor inputs* and *factor services* to obtain outputs. While input factors are tradable and common to all firms, factor services are not. Factor services are 'derived from the detailed use that a firm makes of factor inputs' (Dietrich, 2007) and, as such, are comparable to the intangible resources discussed under the resource-based view of the firm. Factor services define the unique ability of the firm to transform tradable inputs into outputs. Firms with higher ability should achieve higher growth, while those with lower ability, lower growth.

The strategic control approach involves the management of and coordination of fundamental competences or resources (Langlois and Robertson, 1995), which can be likened to the theory of entrepreneurship although it has a much broader view. It therefore involves strategic management of resources and strategic decision-making (Cowling and Sugden, 1998). The mobile phone can contribute to growth if it is used to coordinate and properly manage factor inputs or resources to obtain output. This is the most suitable theoretical base on which to hinge the study, and it defines the thesis of the study: *mobile telephony services can predict enhanced business performance if*

they are efficiently integrated into business processes by owner-managers to coordinate and manage resources. This thesis statement is what drives the theoretical, conceptual and research models of the study.

A distinction has been made between micro-businesses owners who entered into self-employment because they have a desire to develop their businesses, to grow into medium or large firms and create jobs for others, and those who took up self employment because there is little or no alternative (Davidsson, 2004; Deakins and Freel, 2006). For the latter type of self-employed, their measure of business success or growth is simple: being able to provide for themselves and their families from the proceeds of their business. They simply want to survive and, typically, they are sole traders and may not create any new employment within their lifetime. They rarely keep business records and family members could always come in and work without any formal pay or contract, and they also have high exit rates. According to Bosma et al. (2007), survival-driven entrepreneurs are more likely to be found in low-income economies. The former, also known as the growth-oriented type of entrepreneurs, 'will be concerned mainly with the strategic objective of achieving growth, and will often go on to own more than one firm' (Deakins and Freel, 2006 p 158).

In this research, the majority of respondents belong to the group for whom survival is more important than growth. As such, their characteristics influence the design of the study, such as the design of the data collection or research instruments. For example, because they rarely keep business records, it is difficult to use financial performance measures like return on investment (ROI), return on assets (ROA), return on equity (ROE) or return on sales (ROS) to assess the enhanced business performance impact

of mobile telephony services. The study therefore relies on subjective measures linked to the literature on *assessment of value creation* (Brush and Vanderwerf, 1992; Murphy et al., 1996; Wall et al., 2004), which are particularly useful in situations of financial data deficiency (see Chapter Four Section 4.3.4).

How do growth-oriented firms achieve growth? Despite the long history of research into how and why some firms grow and others do not, there is still no definite answer. If there were a definite answer, then all firms that are growth-oriented should use that answer to grow. 'Even very successful entrepreneurs may not be able to recreate their success' (Deakins and Freel, 2006 p 158), which implies that there are many factors that combine in complex patterns to produce growth. This study postulates that mobile telephony services could be added to the list of business growth factors, thanks to their ability to enhance business performance.

3.5 The Role of Information in Micro-Economic Growth.

Economies are characterized by varying levels of information availability. An example of an economy with perfect information is one in which consumer needs can be easily determined, all resources are accurately priced, a baker bakes exactly the quantity of bread that is needed by consumers and a farmer will harvest just the quantity of apples or cocoyam needed by consumers. Information on demand and supply is known to all consumers and suppliers. Such an economy is almost non-existent. Even the Russian planned economy could not provide adequate information to match the demand and supply of goods and services. In every economy, therefore, there is an incessant attempt to match demand and supply information, and within such a process some producers and suppliers acquire more information than their

peers, giving rise to a condition known as 'information asymmetries'. Those with more information tend to have an advantage in the market.

While producers are trying to acquire consumer information, consumers are also desperately trying to get producer information. The acquisition of consumer or producer information comes at a cost, often referred to as the coordination and cooperation costs. The availability and cost of access to an information infrastructure has a direct impact on *information costs.* Working on the benefits of e-commerce to smaller firms, Covin, (1991), Poon and Swatman (1997) established that it is possible for these firms to 'access an information infrastructure which is much larger than that owned by many large corporations' if e-commerce is adopted. They also added that e-commerce can heighten the ability of the smaller firm to communicate internally and externally to the same degree as its larger counterparts. By extension this should be true for the adoption of mobile telephony services. Intuitively, it seems that mobile telephony as an information platform or conduit should play a major role in reducing information asymmetries and market inefficiencies especially in developing economies, rendering such markets more efficient.

In previous sub-sections, the available literature has shown how important information was in rendering markets efficient. Saunders et. al (1983), while investigating the impact of telecommunications infrastructural development on economic growth, cited the coordination of numerous activities such as acquisition of supplies, recruitment and coordination of labour, control of stocks, processing of materials, billing, record keeping, delivery of goods to buyers and general market search activities as integral to industrial and commercial development. Two important

studies (Richardson et al, 2000; Bayes et al, 1999) document how the Grameen network is used for price negotiations, employment opportunities and remittances. Mobile telephony is an important tool of information transfer, and because information flow is pivotal in the functioning of markets (Madden et al, 1998) via market integration, it would be reasonable to say that mobile telephony services contribute to enhance business performance in micro-businesses especially in developing economies by narrowing significant price dispersions and information costs.

While all enterprise activities run on four tangible resources: i.e. money, people, materials and technology, and one intangible resource, information, the intangible one is more often than not neglected by entrepreneurs (Duncombe and Heeks, 1999). The researchers argue further that because 'information is critical in decision making and learning…poor quality or total lack of information, leads to bad decisions and also slows down enterprise learning' and because effective decision making and learning are crucial ingredients in the growth of business, telecommunications as vehicles of information thus have a pivotal impact on the development of small businesses.

While the production of goods and services is the primary activity of the micro-business, the success of this activity depends on the quality and quantity of information received from both the supply and demand environments, and on how this information is processed to inform the production process. Additionally, it depends on the quality and quantity of information the business is sending out to both environments. For example if the micro-business receives information on rising cost, then it has to process that information alongside the demand information received, in

order to inform strategic decisions such as reducing output quantity, slashing employee benefits, renegotiating distribution contracts, all within a spectrum of strategic possibilities. On the other hand, if the micro-business sends out bankruptcy-related information, then the external environment may react by cutting supply or by offering bail-outs to the suffering business. Poor availability of information on suppliers, consumers and government may render micro-business owners isolated with a proclivity to make wrong business decisions. The information needs of small businesses can be summarised as in Fig.3.2 below.

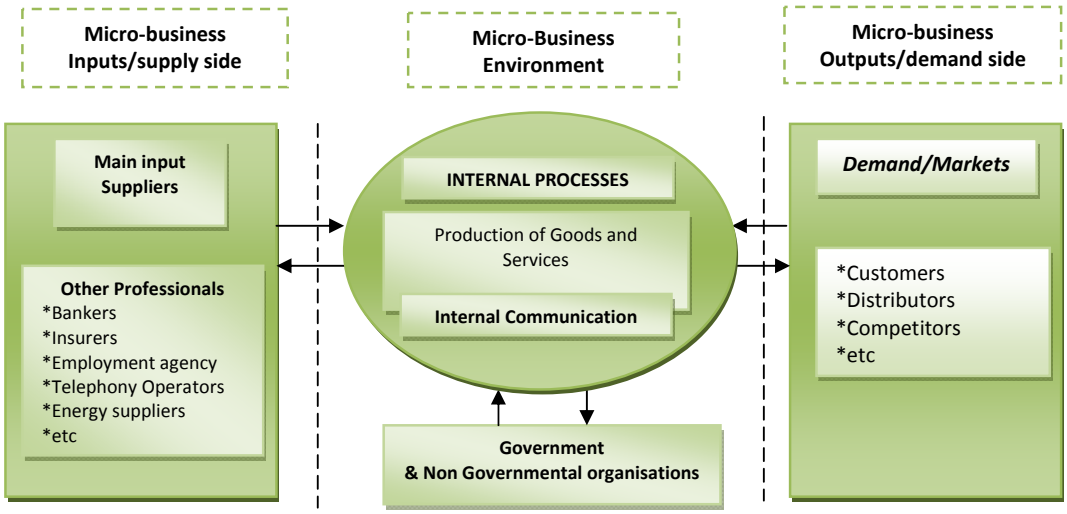

Fig.3.2 *The Information Needs of a Micro-Business*

Businesses need information from main input suppliers, other professionals and government to support the production process, as indicated by the *Input/supply* side of the diagram.

They equally need information on new customers for their goods/services, on competitors and new distribution channels, represented by the *Outputs/demand* side of the diagram. Businesses also need information on relevant government regulations and other business enhancement activities such as training and micro-financing

offered by non-governmental organisations, as shown in the *Business Environment* area of the diagram.

It is important to note that the information flow is two-way: while businesses receive information to inject into the production process, they equally need to send out information to other economic partners, such as placing orders, requesting payments, introducing new products, among other transactions. It is also important that businesses send out information into the wider market that they are viable businesses. Finally, the business itself needs information on its internal skills and those external to the business, on the performance of staff and factors of production. An efficient internal communication system is crucial for a successful business. It is therefore suggested that because mobile telephony services constitute the main and, in many circumstances, the only two-way media for information exchange between micro-businesses and the wider market environment, they play a crucial role in rendering markets more efficient and in determining the growth outcomes of micro-businesses.

As seen in Fig. 3.2, micro-businesses need to receive and send out information to a wide variety of agents such as suppliers, customers, collaborators and competitors, the government, NGOs and other business support organisations within the supply, internal and demand environments of the business to ensure efficient production of goods and services and income. Mobile telephony services, being the main communication channel in developing economies, are unarguably the glue interlinking these agents in a timely, cheap and efficient manner.

The primary interest of all for-profit businesses is to maximise earnings even if growth and expansion is not a priority. To meet target earnings, micro-businesses must have the right mix of information to operate their production mechanisms. Most large and successful businesses invest heavily in information systems because they are key in getting right the difficult balance between demand for inputs, level of production and supply to the market. Micro-businesses as identified by Duncombe and Heeks (1999), often ignore the crucial role which information plays in ensuring organisational effectiveness, probably due to lack of adequate education on the part of owner-managers (Huotari and Wilson, 2001), lack of trusted information sources and, more importantly, lack of reliable, timely and accessible information delivery channels like telecommunication networks.

With the rapid diffusion of mobile telephony services within micro-business communities in developing economies in the last decade, this study postulates that this has helped to reduce some of the information black holes and uncertainties which characterise businesses and the wider market environment. Because information is perishable and micro-businesses in developing economies tend to receive expired information more often than not (Duncombe and Heeks, 1999), timely access to this resource thanks to telephony services can enhance competitive advantage. Also, mobile telephony services have been interwoven into many supply, production, and, demand and distribution channels in contemporary business environments, enabling businesses to react more spontaneously to market signals and intuition, and the literature suggests that this enhances business performance.

3.6 Information and Communication Technologies and Business Growth.

Issues relating to and affecting the use of information and communication technologies in business, as mentioned in the last section, have attracted much attention from researchers, but the findings lack cohesion in understanding (Matlay and Addis, 2003). A coordinated or holistic view of the impact of ICT use in business is hard to establish because of the rapidly-changing nature and application of ICTs, coupled with the fact that many studies target only specific projects, business groups, regions or countries. While it is still very premature to state with certitude the quantitative business impact of ICTs in general, it is even more difficult to do so for mobile telephony, because, despite being the most diffused of ICTs, it has received little focus from empirical researchers.

While the history of telecommunications can be traced back to the 11th Century BC, such as the use of fire beacons, the first real long-distance communication system which has been documented to have an impact on businesses was the telegraph. The telegraph of 1840 and the trans-Atlantic cable of 1866 transformed business operations in the United States of America by contributing significantly to the shrinking of inter-market price differentials and the lowering of information and transaction costs (Garbade and Silber, 1978; Du Boff, 1980).

According to Du Boff , the telegraph did not only improved businesses by lowering information and transaction costs, which freed resources for alternative uses thereby improving the efficiency of markets, it also enabled farmers to cut out intermediaries and save on commissions paid to wholesalers. Carey (1988) documents how the

technology played a major role in ending arbitrage distances and in shifting arbitrage to the temporal dimension, which led to the birth of new markets.

There is quite a profusion of commercially available publications and some empirical studies which show the significant benefits of communication technologies for business growth. In particular, Leatherman (2000) has revealed that the Internet affords greater internal efficiency, leading to substantial cost savings. Baourakis et al. (2002) have shown that the Internet provides firms with the possibility of acquiring new customers and communicating with larger internationally located companies, enabling them to speed up transactions as well to reduce costs. Levy and Powell (2005) reckon that ICTs can be used to deliver outputs from organisational information systems, enabling the dissemination of information and knowledge which can enhance competitiveness. The entrepreneurial process, which involves the transformation of low-value inputs into higher-value outputs, requires the interaction between the 'entreprenuering' firm and other actors such as suppliers, distribution networks and customers. This interaction requires the communication channels or infrastructure which ICTs can valuably provide.

No matter how compelling the evidence seems to be that ICTs are important enablers of business growth, there are counter-arguments. The 'productivity paradox', also known as the 'Solow paradox', is the theory that the coming of the computer has contributed negligibly to productivity. Brynjolfsson (1993), who has investigated the productivity paradox in detail, has published a table of research work related to ICT use and firm growth (Table 3.3).

Study	Data Source	Findings
(Cron & Sobol, 1983)	138 medical supply wholesalers	Bimodal distribution among high IT investors: either very good or very bad
(Strassmann, 1990)	Computerworld survey of 38 companies	No correlation between various IT ratios and performance measures
(Roach, 1991; Roach, 1989a)	Principally BLS, BEA	Vast increase in IT capital per information worker while measured output decreased
(Harris & Katz, 1989)	LOMA insurance data for 40	Weak positive relationship between IT and various performance ratios
(Noyelle, 1990)	US and French industry	Severe measurement problems in services
(Alpar & Kim, 1990)	Federal Reserve Data	Performance estimates sensitive to methodology
(Parsons, Gotlieb & Denny, 1990)	Internal operating data from 2 large banks	IT coefficient in translog production function small and often negative
(Loveman, 1988)	PIMS/MPIT	IT investments added nothing to output
(Weill, 1990)	Interviews and Surveys	Contextual variables affect IT performance
(Morrison & Berndt, 1990)	BEA	IT marginal benefit is 80 cents per dollar invested
(Barua, Kriebel & Mukhopadhyay, 1991)	PIMS/MPIT	IT improved intermediate outputs, if not necessarily final output
(Siegel & Griliches, 1991)	Multiple gov't sources	IT -sing industries tend to be more productive; government data is unreliable

Table 3.3: *Publications on the Relationship between IT and Firm Performance*
Source: *Brynjolfsson (1993)*

From the table, the studies that have found a positive link between IT and business seem to out-number those that found little or no links, although it is still difficult to conclude that IT and consequently ICTs contribute to firm growth based on the table. Similarly, more recent publications (Jensen, 2007; Lanvin, 2008; Dedrick and Kramer, 2008; Kearney, 2007) clearly indicate a positive relationship between the use of IT and businesses performance.

Fillis et al (2003), Jones et al. (2003) and Levy and Powell (2005) among other researchers have shown that smaller firms, are low users of ICTs compared to larger firms which further weakens one's ability to investigate how ICTs are used in micro-businesses and their potential impact. The low rate of ICT adoption in smaller firms has been attributed to complete ignorance relating to their existence, their cost and the unavailability of ICT experts, the time and effort required to acquire new ICT skills,

the real or perceived lack of need, and a resistance to innovative business practices (Deakins and Freel, 2006 p 141). While these reasons may hold true for other ICTs such as computers and computer networks, they tend to collapse in the case of mobile telephony. Mobile phones are easy to use, readily available (70 percent of the world's population live within the reach of mobile signals), do not require the skills of experts, and their applicability transcends business boundaries.

ICTs are not the only factors that might contribute to firm growth: the entrepreneurial environments within which businesses operate and the entrepreneurial competence of owner-mangers have also been identified as important determinants of business growth outcomes. In 2007, the Global Entrepreneurship Monitor (GEM) used five-point Likert scale items to assess the impact of various national entrepreneurial framework conditions on the growth and prevalence of entrepreneurial activities, and the findings showed positive associations between high-growth and high-expectation entrepreneurship and government regulations (Bosma, 2007). In particular, the following were cited:

1. availability and accessibility of professional and business services for new and growing firms,
2. ease of market entry by new and growing firms,
3. effectiveness and enforcement of antitrust legislation,
4. availability and quality of support programs and initiatives for new and growing firms and availability of funding for new and growing firms (including venture capital),

5. debt funding, subsidies, business finance, and capital market finance (through initial public offerings).
6. government policy priorities with regard to entrepreneurship at national and regional government levels,
7. degree of regulatory burden within the economy (e.g., ease of obtaining permits and licenses, fiscal burden, and consistency and predictability of regulatory control)
8. availability and quality of support programs and initiatives for new and growing firms as key conditions for growth in entrepreneurial activities.
9. intellectual property right protection (for established high-growth entrepreneurship).

Reviewing all these nine determinants of business performance and growth, it could be suggested that mobile telephony services can play a central role by coordinating in a timely and flexible manner all the different elements embodied in the GEM framework. This study focuses on this coordinating role played by mobile telephony services to hypothesise a positive relationship between the integration of one of the World's most diffused ICTs and enhanced business performance. It investigates how the use of mobile telephony services might impact the growth outcomes of micro-businesses in developing economies. The study is expected to provide greater insights into the nature and strength of the hypothesised relationship.

3.7 The Theoretical Model:

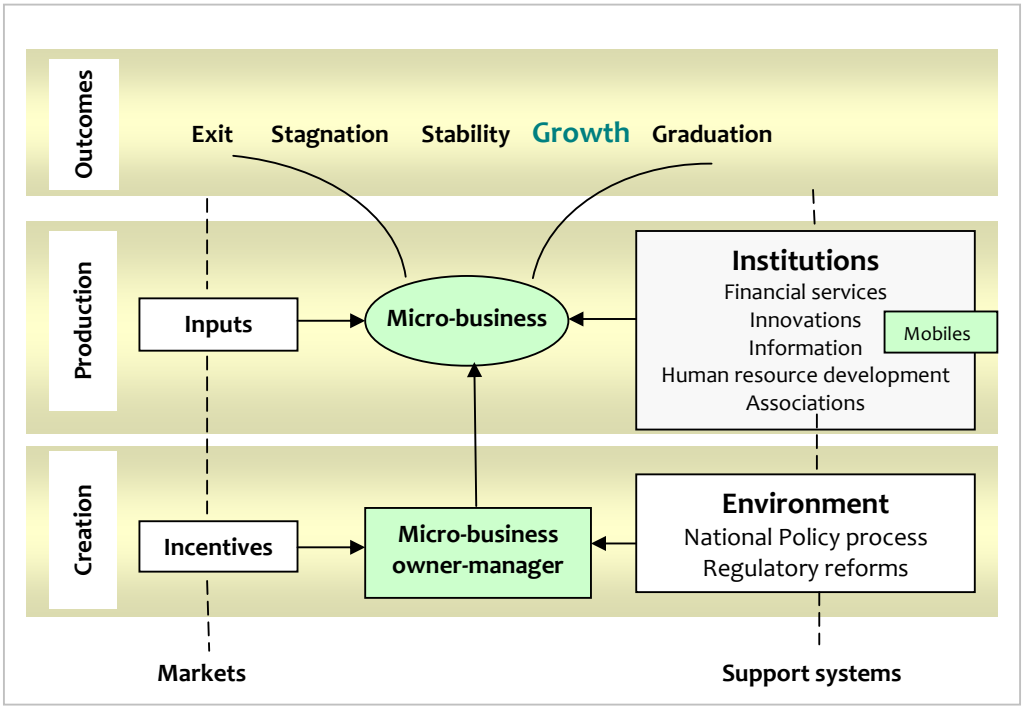

Fig. 3.3: *Agents of Change in Micro/Small Scale Enterprise Development*
Source: *Adapted from Steel (1995)*

The theoretical bases of this study lie in the work of William F. Steel (Steel, 1995), based on a keynote address presented in 1993 at a conference on how to improve policies towards small enterprise development in Africa. A visual representation to simplify the understanding of key agents of change in micro-scale enterprise development is presented in Fig.3.2, with a clear focus on growth outcomes related to the use of mobile telephony services by the micro-business owner-manager. This theoretical model is eventually crafted into conceptual and research models, with hypothesised relationships between keys variables identified in the literature.

Every micro-business depends first and foremost on the owner-manager who created the venture in the first place. An owner-manager takes risks, which imply that his individual skills and business acumen are crucial to the creation, productivity and outcome of the venture. A great number of micro-business managers in developing countries lack basic literacy and management skills, which could negatively affect the growth of their businesses. This implies that if they receive more information support from their business environments, they could improve on the performance of their business ventures.

At the time of creation, two components, namely *incentives* and the *environment,* play important roles which shape the nature and possible growth outcome of the micro-business. According to Steel (1995), '*incentives* refers to the determinants of the probability of investment, including demand for outputs, prices of outputs and inputs, and taxes'. If for a given economy these incentives are in short supply or completely absent, then enterprise creation may be affected negatively. The reverse is also true. This view is also supported by Dahlqvist et al. (2000), which has empirically demonstrated that, initial start-up conditions are very crucial in predicting the future performance of newly created businesses.

Once the micro-business has been created, two other dimensions, namely *inputs* and *institutions,* are crucial in the operation of the business and its eventual outcome. Steel (1995) conceptualises *institutions* to be a broad range of implementing agencies which are capable of facilitating the good working of markets by providing *inputs* and support to micro-entrepreneurs to help them succeed in their business ventures. If an economy fails to properly operate these institutions, it will constitute a powerful

barrier to micro-business growth. For example, if the financial system is non-responsive, then expansion of the micro-business sector may not be possible. If banks fail to provide credit to businesses, as is the case today with the present credit crunch, then the economic engine of the micro-business sector could turn only slowly and may even grind to a halt.

The *information* plus *innovation* elements represented in Fig.3.3 are of priority to this study, as it is there that mobile telephony services come in. The exchange of information which is related to the organisation and coordination of factors of production and distribution is one of two primary functions of an economic system (Porat, 1977; Jonscher, 1983). The second function of an economic system according to the researchers is 'the technical maximisation of production…. and the technical maximisation of the costs of distributing goods and services'. Communications infrastructure renders an economic system more functional by significantly facilitating and reducing the cost of information transfer within the system. 'As more economic activity becomes concerned with the generation, processing and exchange of information, technical developments [such as mobile telephony services] which affect this activity are of potential far-reaching significance, (Goddard and Gillespie, 1986).

Information and innovation feed directly into the production and sales process. As rightly identified by Steel (1995), 'small businesses find it difficult to obtain critical information on markets, inputs, and technology,' and agents such as mobile telephony services which can potentially introduce cost-saving innovations and access to vital information are important enablers in the production process and growth outcomes of the business venture. Information from manufacturers, equipment suppliers and other

support services must reach the manager or business on time and cheaply in order to operate the enterprise growth mechanisms. The mobile phone remains the only vital channel through which this happens in developing countries.

Human resources are important support system institutions for micro-businesses. They can provide assistance in the form of training and capacity building for micro-entrepreneurs, such as free or subsidised consultancy services. Effective *human resources* supported via the intermediary of government agencies, NGOs, donors and private foreign investors are an important ingredient which can ensure the growth of business ventures.

Steel (1995) also identified *Associations* as an important dimension in enterprise growth. Through associations, micro-entrepreneurs can lobby against unpopular business or regulatory policies and attempt to have them changed or scraped. Although business associations are always in conflict with governments in less democratic countries, it is a consensus that the existence of vibrant associations correlates strongly and positively with business growth. If these five dimensions represented in Fig. 3.3 are properly blended, then the business may grow and even *graduate* to higher levels of production and technology. Otherwise, the business may *phase out*, *stagnate* or simply *stabilise*.

This study hypothesises that the adoption and integration of mobile telephony services into business processes is an important enabler of micro-businesses as it provides the owner-manager with more and essential information in a sustained, cheap and timely manner, enabling him/her to increase the proclivity to make the right business

decisions. It also has the potential of enabling substantial cost savings, increased sales, geographic expansion of business activities, increased knowledge sharing and transfer, and eventually growth. The theoretical framework is translated into a more researchable conceptual framework in the next sub-section.

3.8 Conclusion:

In this chapter, theoretical perspectives related to the postulation of a potentially significant and positive relationship between the integration of mobile telephony services into micro-business processes (IB) and perceived enhanced business performance (PEP) have been discussed. In this chapter, it was stressed that the objective of this study is not to test the four mega-theories but to use them in the construction of hypotheses that are tested by the research. It is expected that outcomes of this research will support and strengthen certain aspects of these theories.

Using the existing literature, the theoretical framework of the study was outlined based around Steel (2005), from which abstractions will be made and integrated with aspects of GEM research on entrepreneurship (Basma, 2007) to delineate a conceptual framework and research model in the next chapter.

CHAPTER FOUR: THE CONCEPTUAL AND RESEARCH MODELS

4 Introduction

In Chapter Three, the theoretical perspectives that underpin the study were discussed. In particular, mobile telephony services were portrayed as vehicles and as part of a set of intangible inputs which galvanise the supply, production and distribution of goods and services in micro-business supply chains, which could generate enhanced business performance and growth. A theoretical framework was delineated for the study in the penultimate section of the chapter.

In this chapter, the theoretical perspectives that have been outlined in the last two chapters are brought together and developed into a *conceptual framework*[11]. The conceptual framework is made up of the conceptual model and the research model. The conceptual model provides a theoretical clarification of the research objectives and questions which were outlined in Chapter One, and provides information on how the questions will be answered to achieve the research objectives. It also creates theoretical links between the existing research, current theories and the research design (Leshem et al, 2007).

The developed conceptual model is then transformed into a more researchable *research model*[12] by operationalising all the research constructs. Inter-construct relationships are also operationalised in the *research hypotheses*. The model provides operational definitions for all of the research constructs and the structural equations

[11] A ***conceptual framework*** 'is simply a less developed form of a theory, [which] consists of statements that link abstract concepts to empirical data. Theories and conceptual frameworks are developed to account for and describe abstract phenomena that occur under similar conditions' (Rudestam and Newton, 1992, p.6).

[12] A ***research model*** is a more researchable conceptual model. It outlines all the research variables and their measures.

that underpin the research hypotheses, and defines a spectrum of indicator variables which are then built into a questionnaire to drive the data collection and processes of analysis which are outlined in the next chapter.

4.1 The Conceptual Model

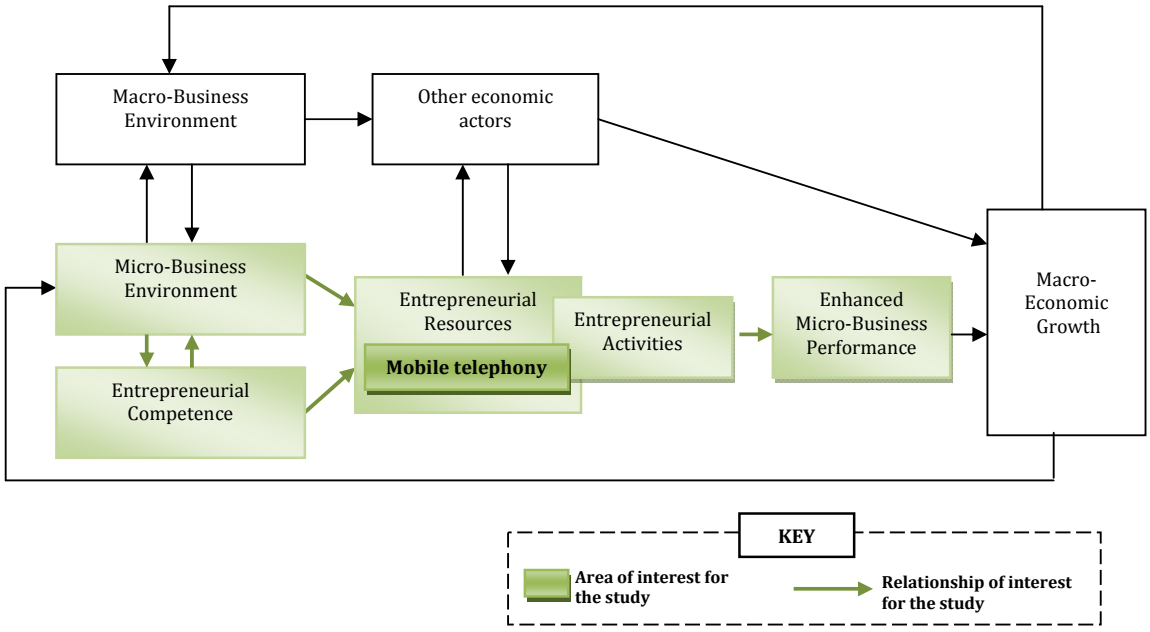

Fig.4.1: *Proposed Conceptual Model of the Study*

In the last chapter, we discussed the theoretical framework of the study based on adaptations of the ideas of Steel (1995) which indicated that the micro-entrepreneur is the main driver of the growth outcome of micro-businesses and that their capability to do this depends on their entrepreneurial competence and the resources which can be accessed from the business environment. The proposed theoretical framework was supported by the findings of GEM (Global Entrepreneurship Monitor), which hold that the environments within which micro-businesses operate are important determinants of small business growth outcomes. According to the GEM model

(Bosma, 2008), the business environment provides entrepreneurial framework conditions which, if available in the right quantities in an economy, should give rise to entrepreneurial opportunities to which entrepreneurs will apply their entrepreneurial skills to generate entrepreneurial activities and economic growth outcomes.

The proposed model (Fig.4.1) depicts the relationships between the main constructs which this study seeks to investigate, represented in green. The conception behind the model suggests that the *Micro-business Environment* and *Entrepreneurial Competence* of micro-entrepreneurs generate a set of entrepreneurial resources which combine together, along with the use of mobile telephony services, to predict business performance. It is hypothesised that, if the micro-business environment supplies the right amounts of business financing schemes, education and training programmes for entrepreneurs, information and technical support, and legal and institutional support which includes general security, absence of crime, and anti-corruption schemes, and also that the entrepreneurs supply the right set of skills known as *Entrepreneurial Competence*, then *entrepreneurial activities* will be generated. Additionally, it is hypothesised that the generation of the right entrepreneurial activities, which includes the ability to integrate mobile telephony services into business processes, should give rise to enhanced business performance.

The model also suggests that the micro-business environment depends on the macro-business or national environment. The macro-business environment refers to dimensions like national tax schemes, fiscal policies, GDP, country credit rating, political stability, and physical infrastructure like road, electricity and communication

networks. Although not investigated in this study, it is hypothesised that the micro-business environment is a replica on a smaller scale of the macro environment.

Other economic operators such as medium or large businesses and consumers also have a direct influence on the level of entrepreneurial activities generated within a micro-business environment. For example, consumers and other businesses need to purchase the goods and services produced by micro-businesses. The integration of mobile services into micro-business processes involves the rapid exchange of business information among micro-businesses, between micro-business and larger businesses, and between micro-businesses and consumers. The combined output from micro and larger businesses defines the overall national or macro growth outcomes, which in turn feeds back into the macro and micro-environments.

The green portion of the model constitutes the thesis of this study. All the elements in the green area have been transformed into researchable constructs, operationalised, and crafted into a research model in which all the elements and their structural relationships can be examined and tested (Fig.4.2).

4.2 The Research Model

In this section, the conceptual model is operationalised into a *research model* with measurable indicators and parameters to be estimated.

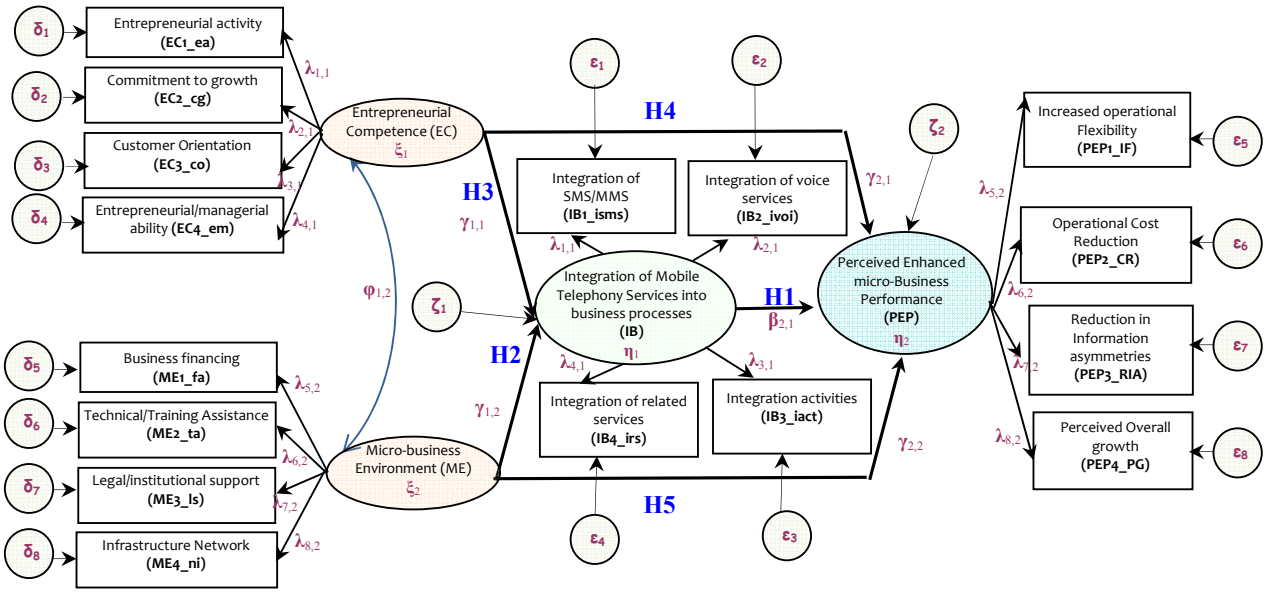

Fig. 4.2: *Path diagram depicting the conceptual model for the study of impacts of mobile telephony services*

4.2.1 The Structural Equations

Perceived Enhanced micro-business performance (PEP) *= f (Integration of mobile services (IB), Entrepreneurship Competence (EC), Micro-business Environment (ME), disturbance 2)*

$$\eta_2 = \beta_{2,1}\,\eta_1 + \gamma_{2,1}\,\xi_1 + \gamma_{2,2}\,\xi_2 + \zeta_2 \quad \text{----------(1)}$$

Equation (1) is the main relationship investigated in this study.

Integration of mobile telephony *= f (Entrepreneurship Competence, Business Environment, disturbance 1)*

$$\eta_1 = (\gamma_{1,1}\,\xi_1 + \gamma_{1,2}\,\xi_2) + \zeta_1 \quad \text{----------} \quad (2)$$

4.2.2 Measurement Equations for the Exogenous Variables:

***Entrepreneurial activity** (E1_ea) = f (Entrepreneurship Competence, error 1)*

$$(E1_ea) = \lambda_{1,1}\xi_1 + \delta_1 \quad \text{----------} \quad (3)$$

***Commitment to growth** (E2_cg) = f (Entrepreneurship Competence, error 2)*

$$(E2_cg) = \lambda_{2,1}\xi_1 + \delta_2 \quad \text{----------} \quad (4)$$

***Customer orientation (E3_co)** = f (Entrepreneurship Competence, error 3)*

$$(E3_co) = \lambda_{3,1}\xi_1 + \delta_3 \quad \text{----------} \quad (5)$$

***Entrepreneurial ability (E1_em)** = f (Entrepreneurship Competence, error 4)*

$$(E1_em) = \lambda_{4,1}\xi_1 + \delta_4 \quad \text{----------} \quad (6)$$

***Business Financing (ME1_fa)** = f (Micro-business Environment, error 5)*

$$(ME1_fa) = \lambda_{1,2}\xi_2 + \delta_5 \quad \text{----------} \quad (7)$$

***Technical/Training assistance (ME2_ta)** = f (Micro-business Environment, error 6)*

$$(ME2_ta) = \lambda_{2,2}\xi_2 + \delta_6 \quad \text{----------} \quad (8)$$

***Institutional/Legal support (ME2_is)** = f (Micro-business Environment, error 7)*

$$(ME2_is) = \lambda_{3,2}\xi_2 + \delta_7 \quad \text{----------} \quad (9)$$

***Infrastructure Network (ME4_ni)** = f (Micro-business Environment, error 8)*

$$ME4_ni) = \lambda_{4,2}\xi_2 + \delta_8 \quad \text{----------} \quad (10)$$

4.2.3 Measurement Equations for the Endogenous Variables:

**** Integration of SMS into business*** (IB1_*iSMS*) = *f (Integration of mobile in Business, error 1)*

$$(IB1_iSMS) = \lambda_{1,1}\eta_1 + \varepsilon_1 \quad \text{----------(11)}$$

****Integration of Voice into business*** (IB2_ivoi) = *f (Integration of mobile in Business, error 2)*

$$(IB2_ivoi) = \lambda_{2,1}\eta_1 + \varepsilon_2 \quad \text{----------(12)}$$

**** Business Integration activity (IB3_iact)*** = *f (Integration of mobile in Business, error 3)*

$$(IB3_iact) = \lambda_{3,1}\eta_1 + \varepsilon_3 \quad \text{----------(13)}$$

**** Integration of related services*** (IB2_irs) = *f (Integration of mobile in Business, error 4)*

$$(IB4_irs) = \lambda_{4,1}\eta_1 + \varepsilon_4 \quad \text{----------(14)}$$

**** Operational Flexibility (PEP1_IF)*** = *f (Perceived Enhanced Business Performance, error 5*

$$(PEP1_IF) = \lambda_{5,2}\eta_2 + \varepsilon_5 \quad \text{----------(15)}$$

**** Cost reduction (PEP1_CR)*** = *f (Perceived Enhanced Business Performance, error 6)*

$$(PEP1_CR) = \lambda_{6,2}\eta_2 + \varepsilon_6 \quad \text{----------(16)}$$

**** Reduction in Information asymmetries (PEP3_RIA)*** = *f (Perceived Enhanced Business Performance, error 7)*

$$(PEP3_RIA) = \lambda_{7,2}\eta_2 + \varepsilon_7 \quad \text{----------(17)}$$

**** Perceived Overall growth (PeP4_PG)*** = *f (Perceived Enhanced Business Performance, error 8)*

$$(PEP4_PG) = \lambda_{8,2}\eta_2 + \varepsilon_8 \quad \text{----------(18)}$$

4.3 Elements in the Model

The internal environment (managerial, entrepreneurial, internal operations/processes) and external environment (customers, suppliers, competitors, the legal and institutional frameworks) of the firm are crucial for its organic growth, and mobile telephony services are hypothesised to play an important role by ensuring that the much-needed information exchange between these two environments and within the internal environment is established in a timely manner and maintained. Entrepreneurs make business decisions based on available information and such decisions can be correct or incorrect. Incomplete information and uncertainty are disruptive in the decision making process of individual decision-makers such as micro-business owner-

managers. This implies that the greater the extent to which communication can be used to reduce uncertainty, the greater the probability of a correct decision and the better the chance that owner-managers will achieve enhanced business performance.

The proclivity of the owner-manager to make the correct business decisions will depend on his *entrepreneurial competence (EC),* which is reflected in his *entrepreneurial actions (EC1_ea),* his *growth commitment (EC2_gc)* to the business, his *customer orientation (EC3_co*) and his *entrepreneurial/managerial ability (EC4_em)*. Researchers (Thong, 1999; Riemenschneider and Mykytyn, 2000; Storey and Westhead, 1997) have identified level of education, industry experience, likeability, and trust as various values which are intrinsic to managers capable of influencing their ability to adopt and use technologies and the benefits that may accrue from using it.

In establishing a business venture, the entrepreneur should have some expectations of the outcome of the venture, and may also make certain growth commitments, and, as identified in the literature, the entrepreneur also needs the right mix of information to inform correct business decision-making in order to achieve growth. Heedless of the expectations, growth commitment and the type of business decision (correct or incorrect) made by the owner-manager, the outcome of the business venture depends largely on external circumstances linked to the business environment. External circumstances can either upset or enhance expected outcomes or predictions. The *micro-business environment (ME),* which embodies dimensions such as *business financing (ME1_fa)*, *technical/training assistance (ME2_ta)*, *legal/institutional support (ME3_ls)* from government and non-governmental organisations, and the

benefits of basic *infrastructure* including communications *networks (ME4_ni),* are some of such dimensions capable of upsetting predicted outcomes.

Consider the case whereby an owner-manager plans to expand his business by saving for a new piece of machinery and is suddenly hit by tax hikes. This could seriously constrain his expansion plans. By contrast, if he receives tax credits, he may be able to expand further than initially planned. Dimensions of the micro-business environment and entrepreneurship which have been identified by previous researchers (Davidsson, 2004; Davidsson and Wiklund, 2006; Storey, 2005) as antecedents of enhanced business performance and growth have been built into a single research framework with mobile telephony to produce the research model (Fig.4.2).

The hypothesised model in Fig. 4.2, like many other SEM models, is made up of two subunits: the *measurement model* which describes the links between the constructs and their indicators and the *structural model* which describes the connections or relationships among the constructs. The structural model is constructed using four hypothesised constructs, Entrepreneurial Competence (EC), Micro-business Environment (ME), Integration of Mobile Telephony Services Into Business Processes (IB), Perceived Enhanced Micro-business Performance (PEP), and also five relationships: H1, H2, H3; H4; H5;

The design adopts an eclectic framework in unison with Krueger et al. (2000), where more than one theory is tested in parallel (but separately) in order to be able to determine which of them best explains how mobile telephony impacts micro-business performance. As such, I investigate the structural relationships by applying the four

mega theories, The *Theory Of The Growth of the Firm*; *Theory of Entrepreneurship, The Resource-Based View (RBV) of the Firm, The Firm as a Locus of Strategic Control,* which were discussed at length in Chapter Three. According to Davidsson (2004; p 44), 'theories are tools,' and as such, can be modified and combined with other tools to meet specific needs and objectives. This is exactly what has been done in order to design the study.

While the proposed eclectic model (Fig. 4.2) is expected to provide a deeper understanding of the impact of mobile telephony penetration on micro-business performance, it also acknowledges that the framework is 'incomplete' like all other models in the social sciences, in which *'the whole world cannot be include in one model'* (Davidsson, 2004 p45). What is left is however compensated for by the inclusion of the error terms **δ**, **ε** and **ζ** in the model.

4.3.1 Entrepreneurial Competence (EC):

Entrepreneurial skills are a prerequisite for the success of any business venture. If the entrepreneur lacks the basic skills to drive the business processes, then the venture may never grow and could eventually die prematurely. A change (growth or decline) in the business performance of a firm can be attributed to either factors external to the firm such as economic factors or to factors internal to the firm known as organisational factors. Researching these two factors, Tvorik and McGivern (1997) reported that internal organisational factors accounted for twice as much variance in performance as external economic factors. In a similar piece of research, Hansen and Wernerfelt (1989) reported that two organisational factors, goal emphasis and human resources, accounted for 38 percent of performance variance, whereas only 18 percent

was accounted for by economic factors (industry variables, market share and firm size). Chaston (1996) identified market orientation, entrepreneurial personality, and locating and retaining customers as key determinants of small business success, while Dahlqvist and Davidsson (2000), identified business *start-up reasons* as important determinants of business performance.

In micro-businesses, the owner-manager symbolises the entire organisation. He/she develops, implements, and manages the strategy that drives the business. This implies that in focusing on the characteristics of owner-managers a significant proportion of the variance in business performance can be accounted for. In this study, entrepreneurial competence (EC) has been defined as a latent construct reflected in four manifest variables, *entrepreneurial activity (EC1_ea)*, *commitment to growth (EC2_cg)*, *customer orientation (EC3_co)* and *entrepreneurial/Managerial ability (EC4_em)*. These variables are hypothesised as being capable of influencing the integration of mobile telephony services and business performance.

EC represents the underlying intrinsic ability of the *owner-manager* (Gartner, 1990), enabling him to effectively *coordinate* and *organise* sector *resources* (Kirzner, 1983) such as information, finance, legislation and other resources like mobile telephony services, to generate enhanced business performance in the form of *profits/personal advantages* (Morris et. al, 1994). It consists of 'competitive behaviours of the owner-manager that drive the market process' (Kirzner, 1973, pp 19-20). These competitive behaviours are embedded in an entrepreneur in the form of roles (Kirzner, 1983). *EC*

is *Exogenous*[13] *or Latent* in nature, and is measured by the use of four manifests or indicators: EC1*_ea, EC2_cg, EC3_co and EC4_em*.

4.3.1.1 Entrepreneurial Action (EC1_ea):

This refers to the sum total of activities carried out by the entrepreneur in order to properly manage and grow his business venture. It is measured using an average of six 5-point Likert scale questionnaire items - strongly disagree/strongly agree (Table 5.3).

4.3.1.2 Commitment to Growth (EC2_cg):

This refers to the determination of the micro-business owner to grow his business. It embodies issues like hours put into the business (full-time or part-time), training programmes undertaken for the purpose of the business as well as financial commitment. It is measured using an average of eight five 5-point Likert scale questionnaire items - strongly disagree/strongly agree (Table 5.3). Part of the scale was developed by Davidsson (1989a).

4.3.1.3 Customer Orientation (EC3_co):

The link between customer orientation and firm performance has been investigated (Egeren and O'Connor, 1998; Kohli and Jaworski, 1990; Siguaw et al., 1994; Chang and Chen, 1998; Narver and Slater, 1990). The literature seems to be unanimous that higher levels of customer orientation lead to higher business performance. The ability to understand the customer in a micro-business is incumbent on the owner-manager, and it is a reflection of his entrepreneurial competence.

[13] ***Exogenous variables*** have no direct or single-headed arrows leading to them from another latent variable, which implies that they are not influenced by any other variables in the model. They are independent and their effects are reflected in those variables which they connect to.

Customer orientation refers to 'the sufficient understanding of one's target buyers to be able to create superior value for them continuously' (Levitt, 1980). It requires that a seller understand and predict a buyer's entire value chain (Day and Wensley, 1988). According to Narver and Slater (1990), customer value creation can be achieved either by increasing benefits to the customer in relation to the customer's costs or by decreasing the buyer's costs in relation to the buyer's benefits. It can also be achieved by doing both.

Customer value creation involves an understanding of 'the economic and political constraints at all levels in the channel' (Narver and Slater, 1990 p.21). It is hypothesised in this study that the ability to achieve higher levels of customer orientation is predicted by the owner-manager's entrepreneurial competence and as such, customer orientation can be used to measure entrepreneurial competence. Additionally, it is hypothesised that the process of customer orientation necessitates the integration of mobile telephony services.

Customer orientation is measured using an average of six 5-point Likert scale questionnaire items - strongly disagree/strongly agree (Table 5.3). The scale is a contextualisation of an original scale developed by Narver and Slater (1990).

4.3.1.4 Entrepreneurial Ability of the Owner-manager (EC4_em):

This refers to the sum total of personal attributes of the owner-manager required to bring about entrepreneurship. According to Bates (1993), entrepreneurial ability is a key determinant of entrepreneurial performance because even start-up capital cannot overcome deficiencies in entrepreneurial skills, and loans to less skilled individuals

often do not get repaid. These attributes, among others, include level of education, age, industry experience, functional management skills and marketing competence (Milne and Thompson, 1986; Gibb and Davis, 1990). It is measured using five 5-point Likert scale questionnaire items (Table 5.3).

4.3.2 Micro-business Environment (ME):

Having Entrepreneurial Competence is only a starting point to entrepreneurship. Entrepreneurship depends critically on the micro-business environment, which can either be pro-entrepreneurial of anti-entrepreneurial. As shown in the conceptual model, the micro-business environment is a reflection of the national business environment. In a country where the legal and institutional framework is favourable to entrepreneurial activity in general, there is a higher chance that micro-business enhancing programmes backed by policy will be instituted. If the micro-business environment is pro-entrepreneurial, then businesses will have access to financing, technology and training and other support infrastructure like roads, electricity and communication. Klein and Hadjimichael (2003) have also identified environments in which theft, corruption and crime are widespread as barren lands for entrepreneurship growth. ME is concerned with those policy, economic and strategic factors that aid micro/small businesses to develop and improve on their production levels and on the quality of their goods and services, which are precursors of enhanced business performance.

Many studies (McGrath, 1997; Dhonte, 1995) have demonstrated the importance of economic policies that promote the growth and development of small businesses. There is empirical evidence (Hayami and Platteau, 1997; Elbadawi et al. 1997b;

Easterly and Levine, 1998) that in countries or regions where there are failings in the infrastructure that support micro-businesses, productivity declines. McCormick (1999) and Pederson (1999) have also demonstrated the role of organisations and regulatory frameworks in micro-business growth. Other researchers have also examined the impact of macro-policies such as exchange rate competiveness, and of fiscal and monetary policies (Hadjimichael and Gura, 1995; Burnside and Dollar, 1997), of policies affecting openness (Sachs and Warner, 1997; Collier and Gunning 1997) and of political institutions (Ghura, 1995; World Bank, 2008).

For the small business sector to thrive and contribute to economic growth, policy makers like the government and other non-governmental organisations (NGO) must provide the support needed by micro-businesses to survive. For example, if the taxation system of a country fails to work properly, then widespread corruption and tax evasion may hamper small business growth in much the same way as rudimentary road infrastructures could prevent easy and cheap movement of goods and services round the economy which could slow down economic activity and business growth. The World Bank Development Report (World Bank, 1997) identified the state as an important player in micro-business development.

In Chapter Three, and in Section 4.3, the conditions necessary to develop a pro-entrepreneurship economic environment such as financing of business ventures, education and training, government sector policy and programmes including favourable legal and institutional support frameworks were addressed based on research by the Global Entrepreneurship Monitor. Relying on these framework conditions, and other relevant reviewed literature such as Hallberg (2000), this study

assumes that micro-business growth is significantly predicted by the overall business environment, and has therefore hypothesised a positive relationship (H5) between *ME* and perceived enhanced micro-business performance (PEP). Additionally, it has been hypothesised that the creation of a pro-business environment, necessitates a good communication network, and as such, the integration of mobile telephony services in the process is important. The operationalisation of ME in the model, including questionnaire design, is based on these two hypotheses. ME is measured using four indicators, *ME1_fa, ME2_ta, ME3_ls and ME4_ce,* mentioned above.

4.3.2.1 Business Financing (ME1_fa):

It measures the ease and access of micro-business owners to financing from government bodies, financial organisations such as banks as well as NGOs. It is measured using the sum of two subscales or *parcels*[14]:

- An average of ten 5-point scales - no assistance/very large assistance (Table 5.4), plus
- One 5- point scale - unaffordable/very affordable (Table 5.4).

4.3.2.2 Technical/training Assistance (ME2_ta):

This measures the ease and access of micro-business owners to technical and vocational training from government bodies, financial organisations such as banks, as well as NGOs linked to their businesses. It is measured using an average of nine 5-point scales - no assistance/very large assistance (Table 5.4).

[14] A ***Parcel*** is a battery of internally consistent questionnaire items, intended to measure an aspect of an indicator variable of a construct.

4.3.2.3 Legal/Institutional Support (ME3_ls):

This measures the ease and access of micro-business owners to legal representations with respect to their businesses and the overall institutional support from government institutions like the chamber of commerce and other institutions or agencies set up specifically for micro-businesses. It also takes into consideration the level of corruption, absence of peace and political stability, and policy initiatives implemented by all actors within the micro-business sector aimed at growing the sector. It is measured using an average of eight 5-point Likert scale questionnaire items - strongly disagree/strongly agree (Table 5.4).

4.3.2.4 Infrastructure Network (ME4_in):

This measures the availability and access to basic micro-business support infrastructures like electricity, road networks, and more importantly, the availability of and access to mobile telephony services and other telecommunication services. It is measured using an average of ten 5-point Likert scale questionnaire items - strongly disagree/strongly agree (Table 5.4).

4.3.3 Integration of Mobile Telephony Services into Business Processes:

This refers to the degree to which business information is exchanged by micro business owners via mobile telephony services. It embodies all calls and messages (SMS/MMS) sent or received in the course of business transactions (placing orders, verifying prices, negotiating contracts or specifying deliveries) thanks to mobile telephony. This variable was specially developed to assess the level of mobile telephony use for business by micro-entrepreneurs rather than relying on the more widely used variable, *number of connections.* While it is easier to obtain data on

number of connections, it would be misleading to employ the variable as an indicator of level of use because it simply reflects the adoption of services and not actual use.

It is hypothesised that the integration of mobile telephony services into business processes could reduce the cost of production, increase revenues through cost reduction and increase the operational flexibility offered by mobile telephony services. Integration of services could increase the level of information and knowledge available to owner-managers, which should logically result in more efficient cooperation and coordination. Business is largely about information processing; business transactions such as the buying and selling of goods and services are guided by the availability and exchange of commercial information (supply, demand, price), and because mobile telephony services are important vehicles of information, they could increase the level of business activities and, consequently, business performance.

According to the research model, **IB** is a latent dependable variable which is predicted or formed by two other latent variables (**EC** and **ME**). **IB** is also a latent independent variable because it predicts **PEP** (the main dependent or outcome variable) as delineated by the single-headed arrow leading from it to **PEP**. **IB** is a mediating latent variable because of its dual function as an independent and a dependent variable. It is measured using *transaction log analysis* (analysis of call data). Basically, a record of phone calls and messages sent and received by the owner-managers included in the study were extracted and analysed. Each owner-manager was then asked to identify all business-related transactions (voice, SMS/MMS, 'beep'). **IB** is measured using four indicators, *IB1_ivoi* (voice integration), *IB2_isms* (messages integration), and

IB3_iact (integration activities) and *IB4_irs* (integration of related communication services).

$$\eta_1 = (\gamma_{1,1}\ \xi_1 + \gamma_{1,2}\ \xi_2) + \zeta_1$$

4.3.3.1 Mobile Message Integration (IB1_isms):

This is the percentage of mobile-based business-related messages (SMS/MMS) to total mobile-based messages (business + non-business) sent and received by the owner-managers. The data is extracted from the mobile phone call logs of respondents over four quarters.

$$IB1_isms = \frac{N_{mB_msg/wk}}{N_{mT_msg/wk}} X\ 100$$

$N_{mB_msg/wk}$: *Number of mobile phone business-related SMS/MMS transactions per week*

$N_{mT_msg/wk}$: *Number of Total mobile phone SMS/MMS transactions per week*

4.3.3.2 Mobile Voice Integration (IB2_ivoi):

This is the percentage of mobile-based business-related voice transactions to total mobile voice transactions. The data is extracted from the mobile phone call logs of respondents over four quarters.

$$IB2_ivoi = \frac{N_{mB_voice/wk} * U_{mB_voice/wk}}{N_{mT_voice/wk} * U_{mT_voice/wk}} X\ 100$$

$N_{mB_voice/wk}$: *Number of mobile phone business-related voice transactions per week*

$U_{mB_voice/wk}$: *Number of mobile phone business-related voice units (mins) per week*

$N_{mT_voice/wk}$: *Number of Total mobile phone voice transactions per week*

$U_{mT_voice/wk}$: *Number of Total mobile phone voice units (mins) per week*

4.3.3.3 Mobile Integration Activities (IB3_iact):

This variable captures those business activities/transactions that make use of mobile telephony services. Put simply, it measures the level of application of mobile telephony services in business processes. It is measured using an average of eight 5-point Likert scale questionnaire items - strongly disagree/strongly agree (Table 5.5).

4.3.3.4 Integration of Related Communication Services (IB4_irs).

It is the percentage of business-related transactions (voice and SMS/MMS) carried out by owner-managers using other electronic communication technologies such as the Internet, other radio systems, fixed line phones, fax and telex to business-related transactions conducted over mobile phones. Data is obtained by using questionnaire items and call log.

$$IB4_irs = \frac{(N_{rsB_voice/wk} * U_{rsB_Voice/wk}) + N_{rsB_msg/wk}}{(N_{mB_voice/wk} * U_{mB_Voice/wk}) + N_{mB_msg/wk}} X \quad 100$$

$N_{rsB_voice/wk}$: *Number of business-related voice transactions per week using related technologies*

$U_{rsB_voice/wk}$: *Number of business-related voice units (mins) per week using related technologies*

$N_{rsB_msg/wk}$: *Number of business-related messages (SMS/MMS) transactions per week using related technologies*

$N_{mB_voice/wk}$: *Number of mobile phone business-related voice transactions per week*

$U_{mB_voice/wk}$: *Number of mobile phone business-related voice units (mins) per week*

$N_{mB_msg/wk}$: *Number of mobile phone business-related SMS/MMS transactions per week*

4.3.4 Perceived Enhanced Micro-Business Performance (PEP):

This embodies the sum total of micro-business [firm] enhancement activities or benefits associated with the integration of mobile telephony services in business operations/processes by the owner-manager [firm]. It measures the perceived positive change in the operational state (suppliers, customers, internal organisation) of a micro-business based on the perception of the owner-manager.

The business performance concept is a popular research topic in entrepreneurship research, where attempts have been made to identify its key dimensions (Steers, 1975; Murphy et al., 1996; Carton and Hofer, 2006). Many different variables have been used to measure enhanced business performance and growth. The effort to identify factors that determine the growth or failure of businesses, particularly small businesses, has been demonstrated in many academic works (Hughes, 1998; Besnik et al., 2008; Brown et al., 2004, Liedholm, 1999, 2002; Storey, 2004, Zahra, 1996). The conceptualisation of business performance and growth varies significantly across different studies. Many different variables are being employed although some of these variables intersect across the studies. *Return on investment (ROI)*, *return on assets (ROA)*, *return on sales (ROS), return on equity (ROE), employment, productivity*, *sales* and *assets* are variables that are often at the intersections.

ROI, ROA, ROS and ROE are variables which have their roots from financial accounting or financial performance literature, have been used extensively in research and are said to be 'objective measures'. Other measures which have also been widely used in research include; *objectives of the owner-manager, perceived growth and survival.* This latter group of variables are said to be 'subjective'.

One important concept that has been used to assess business performance is *value creation*. The premise behind the concept is that each firm or organisational stakeholder 'will have a different perspective of what is 'valuable' based upon their purpose of associating with the organisation' (Carton and Hofer, 2006 p.5). Growth-oriented owner-managers will have different perspectives of value creation from survival-owner managers. The perception of value created is a direct reflection of the

perceived performance of the business or organisation. This implies that to be able to measure or assess performance, it is imperative to select a performance perspective that conforms with the phenomenon of interest or to the purpose of the research (Jensen and Meckling, 1976; Carton and Hofer, 2006).

The evaluation of value creation for an organisation is complex and dependent on context as different organisations have different concepts of what constitutes a valuable outcome. Because value creation is context-dependent, the choice of the sample has to be homogenous in terms of the concept of value (Carton and Hofer, 2006). Value can be tangible or intangible, operational or financial. The question is, how does one determine what constitutes value for micro-businesses drawn from several sectors and across eight towns in two countries? The answer may lie in the choice of the sample and in the choice of outcome or performance indicators. Operational cost cutting, reduction in information asymmetries, increased operational flexibility, all constitute value to any business whether it is growth-oriented or not, large or small, for-profit or not-for-profit. Also, by employing a well-designed structured questionnaire, individual respondent value-assessments can be aggregated to obtain a fairly accurate reflection of the research phenomena.

With a sample of micro-businesses having five or fewer employees across countries with similar levels of development (developing economies) who are exposed to the same phenomenon (mobile telephony services) which has the potential to produce the same outcomes - reduce operational cost and information asymmetries and increase operational flexibility - then the impact of the phenomenon can be assessed fairly accurately using the *value creation* concept.

PEP is an outcome variable, and according to Venkatarama (1997), and following up from the last three paragraphs, the outcome variable of a business venture should measure in 'absolute terms' what the business investors consider as success relative to the investment. Understanding the goal of investors is not straightforward. This makes the argument for the use of subjective measures more plausible in a micro-business environment, where in most cases only the owner-manager knows what they consider as success relative to their investment.

While 'objective' measures are also being widely used to measure performance, the choice of indicators for **PEP** is highly skewed in favour of subjective measures, because the majority of micro-businesses in developing economies lack basic financial accounting data. A technique which employs a battery of indicators with many varied variables subjectively rated by the owner-managers of micro-businesses is delineated to gauge the impact of **IB** relative to **EC** and **ME** on enhanced business performance. The study assumes that a change in micro-business performance can be reflected by an increase in the operational flexibility (*PEP1_IF*) of the business, a reduction in the operational cost (*PEP2_CR*), a reduction in information asymmetries (*PEP3_RIA*). It also and assumes the owner-manager should perceive an overall growth in the business (*PEP4_PG*).

4.3.4.1 Increased Operational Flexibility (PEP1_IF):

This refers to those dimensions that offer the owner-manager more choices within the operation of the business thanks to mobile telephony. It includes benefits such as the ability to check the availability of a raw material by simply making a phone call or sending a text message rather than making a costly journey to the supplier, choosing

who to talk to or not to talk to, and the possibility of gaining new business even when out of the business premises. It is measured using the sum of two subscales or parcels:

- An average of six 5-point Likert scale questionnaire items (strongly disagree/strongly agree), plus
- One 5-point scale item (very small influence/very large influence).

4.3.4.2 Operational Cost Reduction (PEP2_CR):

Refers to the owner-manger's overall perception of the degree to which mobile telephony services help in cutting down operational costs. It is measured using the sum of three sub-scales or *parcels*:

- An average of five 5-point Likert scale questionnaire items (strongly disagree/strongly agree), plus
- An average of two 5-point scale items (much reduced/much increased), plus
- One 5-point scale item (very small influence/very large influence)

4.3.4.3 Perceived Reduction in Information Asymmetries (PEP3_RIA):

This refers to the owner-manger's overall perception of the degree to which mobile telephony services helps to provide more access to business information. Information asymmetry exists when information related to exchanges or transactions is not evenly distributed among the participants in a given market (Anthony and Gales, 2002; Lai et al., 2005). Information asymmetry can significantly influence the decision making process, operations and performance of a business (Daft and Lengel, 1986). Because some participants have an information advantage over others (Stigler, 1961; Akerlof, 1970), it can enable them to take advantage of the market. This situation is particularly serious in developing markets with micro-businesses being affected the most. Filia (2005), Lee et al. (2004) and Klastorin et al. (2002) have put forward

certain suggestions which could alleviate this situation but Fujun et al. (2007) thinks that few of the suggestions have been tested empirically.

While Stigler (1961) has suggested that information asymmetry may be reduced by searching for more information, which could be operationally costly, Stewart (1995) and Alba et al. (1997) have proposed that Information Technologies can significantly lower the cost of information searches. Mobile telephony is the most diffused information technology in developing economies and, as such, it could significantly influence the way 'information is disseminated and acquired, and how products are sold' (Stewart, 1995 and Alba et al. 1997).

It is thus suggested in this study that since micro-business owner-managers can use mobile telephony services to reduce information asymmetries, and because reduced information asymmetry is characteristic of efficient markets, the integration of these services into business to disseminate, acquire, and process information for businesses and customers should enhance performance. It is measured using the sum of two sub-scales or parcels:

- An average of two 5-point Likert scale questionnaire items (strongly disagree /strongly agree), plus
- An average of three 5-point scale item (very small influence/very large influence).

4.3.4.4 Perceived Overall Growth (PEP4_PG):

This refers to the owner-manager's overall perception of business growth attributed to the use of mobile telephony services in business operations. It is measured using the sum of two sub-scales or parcels:

- An average of ten 5-point Likert scale questionnaire items (strongly disagree /strongly agree), plus
- One 5-point scale items (very small influence/very large influence).

4.4 The Structural Relationship between IB and PEP (H1):

Although there is a paucity of empirical research examining the relationship between the use of mobile telephony services to achieve enhanced business performance, there is however quite a profusion of published work which investigates the relationship between the adoption of other information and communication technologies (ICTs) such as the computer and the internet, and business performance. Empirical evidence has shown that there is a positive and significant association between ICTs and firm performance (Brynjolfsson and Hitt, 2003, Brynjolfsson et al., 2002). Although only a handful of empirical studies have investigated the impact of telecommunications, particularly mobile telephony, on economic growth, evidence on the nature and strength of the relationship appears to be mixed. Some researchers have found very strong positive associations between mobile telephony penetration and macro-economic growth (Wavermann et al., 2005; Maliranta and Rouvenin, 2004), while others have not found a very significant impact (Milana and Zeli, 2004; Hempell et al., 2004).

The adoption and integration of mobile telephony services into business processes is hypothesised to increase operational flexibility, reduce operational costs and information asymmetries, which should be translated into perceived enhanced business performance by the owner-manager.

> **Hypothesis 1:** *The integration of mobile telephony services into business processes will positively predict the enhanced operational performance of micro- businesses.*

4.5 The Structural Relationship between ME and IB (H2):

A review of the literature appears to find no study that has attempted to investigate whether a relationship exists between the micro/small business environment and the integration of mobile telephony services into business processes. However, some researchers have found significant and positive associations between manufacturing sector strategies and the adoption of advanced manufacturing technologies (Raymond and St-Pierre, 2005), upon which the relationship between ME and IB can be conceptualised.

> **Hypothesis 2:** *The level of integration of mobile telephony services into business processes is influenced by the micro-business environment, including the supply of telephony services.*

4.6 The Structural Relationship between EC and IB (H3):

It is hypothesised in the structural model that *Entrepreneurial Competence* influences the *Integration of mobile telephony services into business processes*. Aspects of

entrepreneurship such as acquired knowledge and the experience of the owner-manager have been identified (Thong, 1999) to condition the behaviour of small business owners as adopters of information technology and, by extension, the adoption of mobile telephony services.

> **Hypothesis 3:** *The rate of Integration of Mobile Telephony Services into Business Processes will depend on the Entrepreneurial Competence of micro-business owner-managers*

4.7 The Structural Relationship between EC and PEP (H4):

In Chapter Three, it was clearly outlined using Steel (2005) and Bosma (2007) that entrepreneurial competence is a key determinant of business performance.

> **Hypothesis 4:** *The Entrepreneurial Competence of micro-business owner-managers can directly predict the Perceived Enhanced Business Performance Outcome of micro-businesses.*

4.8 The Structural Relationship between ME *and PEP*: H5

Empirical findings on the relation between the business environment and business performance show mixed results. Some findings show positive impacts (Roper and Hart, 2005; Nick Davis, 2006; Marshal et al, 1993). However, some studies show a weak relationship (Wren et al, 2002), while others simply find little or no evidence on the relationship between certain policy issues and business performance (Lambrecht et al, 2005; Marshal et al, 1993). It is assumed here that the latent construct ME

manifested via its indicators is an important predictor of enhanced micro-business performance-PEP.

> **Hypothesis 5:** *The Micro-business Environment (ME) can directly and positively predict the Perceived Enhanced Business Performance (PEP) Outcome of Micro-Businesses.*

4.9 Conclusion

In this chapter, the conceptual and research models, and the research hypotheses, have been presented. According to the proposed conceptual framework, a pro-entrepreneurial environment is essential for the generation and growth of entrepreneurial activity. The level and quality of entrepreneurial activities thus generated are directly dependent upon the entrepreneurial competence of micro-business owner-managers, who have the duty to redeploy low-yielding resources to higher-yielding activities for personal gains.

From the conceptual framework, the research model has been depicted and the research hypotheses have been determined and represented in a series of structural equations. In the next chapter, the paradigm of the study is discussed with a particular focus on the methodology. This section is however interested in the role of communication technologies, particularly mobile telephony, of entrepreneurial competence and of the overall micro-business environment in influencing business performance outcomes and growth.

The main independent variable, the Integration of Mobile Telephony Services into Business Processes (IB) and the main outcome or dependent variable, Perceived Enhanced Business Performance (PEP), were developed into a conceptual framework in which abstractions were systematically arranged so as to provide a theoretical overview (Leshem et al., 2007) of the whole research. The main research variables were presented, including the hypothesized relationships, alongside appropriate instruments for data collection and analysis. The research model will be tested for validity in the next chapter.

CHAPTER FIVE: THE RESEARCH METHODOLOGY

5 Introduction

In Chapter Four, the conceptual model was established based on theoretical considerations whereby, the *Integration of mobile telephony services into business processes (IB)* was hypothesised to predict *Perceived Enhanced Business Performance (PEP)* in micro-businesses. Furthermore, it was hypothesised that IB was predicted by *Entrepreneurial Competence (EC)* and the *Micro-business Environment (ME)*. All relationships were hypothesised to be positive and significant [IB +→ PEP, (EC + ME) +→IB]. In Chapter Three, the research paradigm was stated, and two of the three perspectives of this paradigm, epistemology and ontology, were discussed.

In this Chapter, the third paradigmatic perspective, methodology, is explored. The methodological perspective provides a framework for the collection and analysis of the research data, and for the underlying theory and analysis of how scientific research should be conducted. The questionnaire development including sampling techniques is explained, and an overview of the two statistical packages used in the research is presented.

The research methodology discussed in this Chapter indicates that the study is a simultaneous collection of quantitative data on the conceptual constructs and variables delineated in the research model (Fig. 4.2), and of some qualitative data to support the quantitative data. The data was drawn from a sample of 210 micro-business owners across four provinces in Cameroon and four provincial cities in Afghanistan.

Structural Equation Modelling - Confirmatory Factor Analysis (SEM-CFA) was employed to verify and validate the underlying dimensions of the research constructs (PEP, IB, EC and ME). Data were also extracted from the mobile phone call logs of respondents and analysed to isolate business-related from non-business transactions, which were then analysed using retrospective scenario-based techniques to ascertain certain operational benefits of using mobile telephony services. Visual data collected during the field research were also analysed to buttress the quantitative outcomes.

The study therefore adopts a mixed methods design which is not only growing in popularity but is generally recommended where possible (Creswell, 2003; Gelso, 1979; Howard, 1983). Information and ICT-based studies particularly employ mixed method designs (Case, 2002). The main benefits of combining techniques in a single study, as identified in the literature, are that by combining techniques they complement each other and increase the validity of the study. However, this is not simply said and done, as recommendations for designing, implementing and reporting mixed method studies must be followed in order to benefit from the strengths of the technique. Its widespread use has caused some researchers (Creswell, 2003, Creswell et al., 2003; Greene and Caracelli, 2003) to suggest that mixed methods can be considered a stand-alone research design.

For this study, the survey methodology was chosen not only because of its dominance relative to other methodologies, but because of its special suitability in small business research (Curran and Blackburn, 2001), and particularly for the reason that in both case countries, illiteracy, poor postal and internet services, and the general unavailability of secondary data, have all limited the possibility of employing other

techniques. Surveys are particularly useful in mixed design research because they allow the simultaneous collection of quantitative and qualitative data (Aldridge and Levine, 2001).

5.1 Research Problem:

It is widely assumed that information and communication technologies (ICTs) contribute to economic development (Roeller and Wavermann, 2001, Atrostic et al., 2004; Clayton et al., 2004; Wavermann et al., 2005; Hardy, 1980), including the enhancement of business performance in developed economies (Balwin et al., 2004, Hempell et al., 2004) and in developing economies. The widespread penetration of mobile telephony services in developing economies in the last decade has led to further assumptions and speculations that ICTs are important predictors of business performance and economic growth. Despite this widespread diffusion of mobile telephony services, it has not been matched with corresponding research to demonstrate precisely how these services may affect business performance and economic growth, and under which conditions.

Whilst many micro-business owner-managers in developing economies have adopted mobile services, questions remain about the impact of these services on business performance. Improving the understanding of the ways in which mobiles affect business performance and the factors that influence the potential impacts of mobile services thus remains important. Also, there is increasing evidence that micro-businesses are the economic engines of developed economies (Bosma, 2007; Davidsson, 2004; Storey, 1994) and of developing economies (Mead et al., 1993; Steel, 1995; Liedholm and McPherson, 1991; Liedholm and Mead, 1999). If there is

sufficient empirical evidence that there is a structural and positive link between mobile telephony penetration and micro-business performance in developing economies, then this research could be a right step in the direction of initiating policy and practical projects that can strengthen the relationship and, consequently, enhance economic performance.

This study aims to make a contribution in this area by presenting evidence that the integration of mobile telephony services into business processes can effectively enhance micro-business performance. In particular, the study attempts to establish the strength and direction of the relationship between the integration of mobile services and perceived enhanced business performance. It also compares the strength and direction of the relationship between mobile telephony integration and, *entrepreneurial competence* and *micro-business environment*, which are two traditional determinants of business performance. This chapter outlines the methods that have been employed in the study to provide answers to the research questions and objectives outlined in Chapter One.

5.2 The Research Methodology

An introduction to the methodology was provided in Section 1.4 of Chapter One: this section aims to build on that introduction. *Research methodology* refers to the 'overall nature of the research activity' (Pickard, 2007). It embodies three main facets; Research Method or Research Strategy, Research Techniques and Research Instrument.

5.2.1 Research Strategy

'Research strategy refers to a general orientation to the conduct of research business' (Bryman and Bell, 2007). A research strategy or method in its simplest definition refers to either quantitative or qualitative research strategies (Pickard, 2007). The quantitative research method 'entails a deductive approach to the relationship between theory and research, in which the accent is placed on testing theories; has incorporated the practices and norms of the natural scientific model and of positivism in particular; and embodies a view of social reality as an external, objective reality' (Bryman and Bell, 2007).

Qualitative refers to a research strategy which employs unstructured information or qualitative data such as interview transcripts and recordings, emails, notes, feedback forms, photos and videos, to answer research questions. Creswell (2007) highlights five main approaches to qualitative inquiry: narrative research, phenomenology, grounded theory, ethnography and case studies. Proponents of qualitative strategy (Guba and Lincoln, 1998; Jacob, 1987; Munhall and Oiler, 1986; Strauss and Corbin, 1990; Denzin and Lincoln, 2005; Miles and Huberman, 1994) say that it provides evidence of a different perspective to quantitative analysis: particularly cited, is the perspective of a rich and in-depth description/analysis of the phenomenon under investigation. Also, qualitative researchers are said to acknowledge that 'research is value-laden and that biases are present [and that] reality is subjective and multiple, as seen by participants in the study' (Creswell, 2007 p.17).

The debate about what constitutes qualitative or quantitative research, and which of the two strategies produces more valid results, is ongoing and may never end (Layder,

1993; Bryman and Bell, 2007). Many researchers even consider the debate sterile and unhelpful (Bryman and Bell, 2007). Bryman and Bell note that, despite the fact that 'there are striking differences [between the two strategies] in terms of the role of theory, epistemological issues and ontological concerns, … the differences are not 'hard-and-fast' which can permit the combination of both strategies in a single research project' (Bryman and Bell, 2007 p29). As declared in section 5.0, this study is largely a quantitative study with aspects of qualitative strategies to reinforce the quantitative outcomes.

This research investigates the relationship between mobile telephone use for business and enhanced business performance by employing latent constructs and measured variables. According to Bryman and Bell (2007), if the interest of the research is 'in teasing out the relative importance of a number of causes [IB, EC and ME] of a social phenomenon [PEP], it is quite likely that a quantitative strategy will fit [the] needs better because…the assessment of cause is one of [quantitative strategy's] keynotes'. Also, models which show the co-occurrence of latent constructs and measured variables as well as direct and indirect relationships such as the one proposed (Fig.4.2) are better investigated using Structural Equation Modelling (SEM) techniques (Fornell, 1987). This infers a quantitative research strategy.

The present study is a mixture of both, as described in the introduction to this Chapter (section 5.0), although it is largely a quantitative study. The quantitative part of the study uses statistical techniques to investigate and estimate the nature and strength of the relationship between mobile integration into business and enhanced business performance, while the qualitative part enriches the outcome of the quantitative study.

The quantitative part of the study is further split into two parts, *Study A1*and *Study A2,* while there is only a single qualitative part known as Study B.

5.2.1.1 Study A1:

This is the main study of this research project. It employs a cross-sectional design with data collected from owner-managers (primary source) of micro-businesses between July 2007 and September 2008 in Afghanistan and Cameroon using face-to-face structured interviewing techniques. Study A1 employs a hypothesised model which is analysed in a Structural Equation Modelling (SEM) environment to provide the *strength of the relationships* between the hypothesised constructs. SEM Confirmatory Factor Analysis was applied on the data collected from respondents in an attempt to obtain a model that fits or compares statistically and theoretically to the model proposed in Fig.4.2. The comparison or fit-test procedure employs a set of *fit indices* specially developed in SEM for this purpose.

If the proposed model fails the fit-test then a new theoretical model is re-proposed and tested until an acceptable fit which is theoretically tenable is obtained. If a theoretical model is successfully fitted to the data, then the relative influence or impact of variables on one another can be obtained. As such, the impact of mobile telephony on enhanced business performance can be assumed based on the model.

5.2.1.2 Study A2:

This uses a retrospective scenario-based analysis to provide evidence in terms of *business time* and *business distance saved* thanks to mobile telephony services. It employs quantitative survey data to enrich and further explain the outcomes of Study

A1. More precisely, data was extracted repetitively over a one-year period from the mobile phone call logs (secondary source) of 210 micro-business owner-managers (the same sample as in A1) in Cameroon and Afghanistan. The extraction was done across 7 random working days evenly spread across days of the week over four quarters (July2007/September 2007, December 2007/January 2008, March 2008/April 2008, and July 2008/September 2008) giving one year's worth of data. For 7 random working days in each quarter, all calls and messages sent or received by respondents present in the call log were extracted from their phones and entered in a table.

After the extraction exercise, respondents were asked to identify all business-related transactions in the extracted logs. Each business transaction (excluding international transactions) was then individually assessed with the help of the respondent based on the following scenario:

> '*Let us consider that this business transaction (call, SMS, MMS, 'beep') which you have just carried out over the phone were to take place without a mobile phone (pre-mobile era). How would you have carried out the transaction?'*

The information provided by the respondents was then analysed using two main criteria:

- Business time saved by making the transaction (call, SMS, MMS, 'beep');
- Business-travel distance saved by making the transaction (call, SMS, MMS, 'beep').

5.2.1.3 Study B:

Banks (2007 p ix) outlines seven ways of how to conduct qualitative research which take into account the different theoretical, epistemological and methodological

approaches to qualitative research. The first two on the list seem particularly relevant to the design of Study B. The first method refers to 'accessing experiences, interactions and documents in their natural context and in a way that gives room to the particularities of [these] and the materials in which they are studied', while the second is about refraining from 'setting up a well-defined concept of what is studied and from formulating hypotheses in the beginning in order to test them. Rather, concepts (or hypotheses, if they are used) are developed and refined in the process of the research'. What this implies for this study is that, Study B does not test any hypothesis: it is a tool used in the analytical part of the study to provide additional meaning to the outcomes of Studies A1 and A2.

The particular qualitative technique employed by Study B is the use of visual data. A study 'that incorporates images in the creation or collection of data might be able to reveal some sociological insight that is not accessible by any other means' (Banks, 2007).Visual data refers to still pictures, films or video tapes, diagrams, charts, graphs and so on created by the researcher (Banks, 2007). While the use of pre-existing visual data could be acceptable, Banks (2007 p.32) recommends the exclusive use of data created by the researcher for the purpose of a specific research project. Banks traces the use of photography in research to Victorian anthropologists who used images to morphologically distinguish between members of different societies.

Lambroso (1887 [cited in Banks, 2007]) used photography to advocate the theory of physiognomy by comparing dozens of photographs of arrested criminals and then seeking to determine if certain facial features were associated with certain types of

criminal activity. Banks also cites Gould (1981), Rose (2001) and Barry (1995) as important studies linked to visual data research.

During the field research for this study, images were collected which portray the impact of mobile telephony on business performance. These images were analysed using content analysis of the photographs to reveal additional insights into the importance of mobiles in enhancing business performance.

5.3 The Research Design Techniques:

The purpose of a research design is to ensure that evidence obtained from the inquiry enables the initial research questions to be answered as unambiguously as possible (De Vaus, 2001). The design was used as a guide to ensure that the study achieves internal and external validity. In this section, data collection techniques related to each of the sub-studies discussed above are outlined. The framework for data collection and analysis is discussed with a focus on the data collection instruments, and on considerations for achieving reliability, replication, and validity of the research. Bryman and Bell (2007 p44-73) describes in detail five main types of research designs: cross-sectional or social survey design, longitudinal design, case study design, and comparative design. Another perspective of research design types is outlined by Kumar (2005). Kumar uses three main criteria to distinguish research designs: number of contacts with the population, the reference period and the nature of the investigation (Fig.5.1).

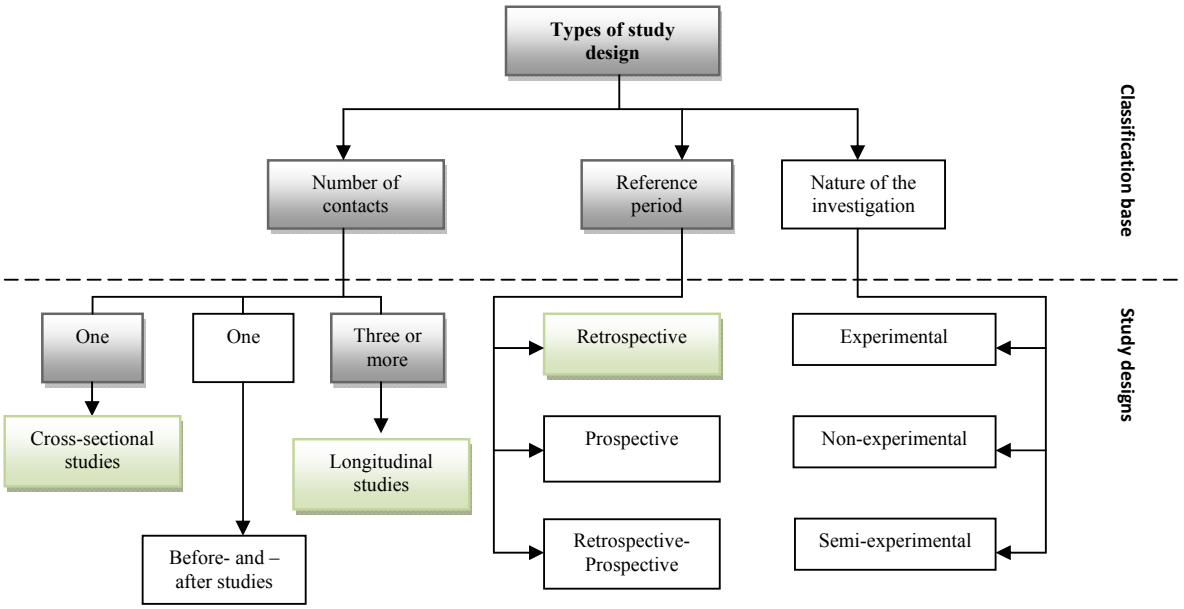

Fig.5.1: Research Designs
Source: Kumar (2005 p94)

Based on the descriptions of the different types of research designs outlined in Kumar (2005) and Bryman and Bell (2007), none perfectly fits the design adopted for this study. Some design types fit certain parts of the work and, as such, the study is a combination of three design types, cross-sectional, longitudinal and retrospective (Fig.5.1).

Study A1 employs a cross-sectional design technique, which 'is best suited for studies aimed at finding out the prevalence of a phenomenon, situation, problem, attitude or issue, by taking a cross-section of the population [at one given time]' (Kumar, 2005 p. 93). The questions: *How important are mobile telephony services in enhancing micro-businesses performance*? or W*hat is the 'situation' of mobile telephony use with regards to enhanced business performance*? can be answered satisfactorily by taking a snapshot of the situation at a given time.

For Study A1, respondents across Afghanistan and Cameroon were interviewed face-to-face just once (cross-sectional) while for Study A2, data were extracted from respondents' mobile phones seven times every three months. Study A2 data were analysed using a retrospective technique. 'Retrospective studies investigate a phenomenon, situation, problem or issue that has happened in the past' (Kumar, 2005). Respondents were asked to recall how differently they had conducted business in the pre-mobile era with respect to time and distance saved through the use of mobile telephony services today. In Study B, still pictures taken in course of the field research are analysed to further explain the impact of mobile telephony.

Choosing a design type is just a step in the whole design process of a study. Data collection is a crucial part of the design process. Typically, data are collected from primary or secondary sources. A secondary source refers to documents or simply to data that has already been collected either as part of a previous research or as part of a government, personal or other publications. Several secondary data sources were used in the study: the World Bank databases, Wireless Intelligence database, International Telecommunications Union (ITU) database, and other publicly available records. Data collection from these sources entailed extraction of portions of the datasets which are of interest to the study.

The main primary source in the study was the community of micro-business owner-managers in Afghanistan and Cameroon. Collecting data from primary sources is always pretty challenging and requires different skills, techniques and resources. Data was collected using observation, interviewing and questionnaires. For study A1, 'predetermined sets of questions using the same wording and order of questions

[were] specified' (Kumar, 2005) were used in order to provide uniform information, which assures the comparability of data from both countries.

Survey data can be collected by four main channels: postal-based questionnaires, telephone-based interviews, Internet-based questionnaires and in face-to-face-based interviews. A survey of the literature (Dillman, 1978; Walliman, 2005) reveals the following about the different techniques:

Technique	Some Strengths	Some Weaknesses
Postal-Based questionnaires	Interviewer biases are eliminated as the questionnaires represent a common stimulus to respondents.	The questionnaire has to be 'efficiently' written as respondents may not be able to obtain clarifications to 'ambiguous' questions.
	They have a high fixed cost, which could affect the sample size negatively.	They have a low marginal cost which makes it possible to achieve large sample sizes
	More likely to yield higher response rates on controversial, confidential or secretive issues than the other techniques, because of their anonymous nature	Lower response rates in general
Telephone-based interviewing	Quicker in obtaining data	Likely lower response rate on controversial, confidential or secretive issues
	The interviewers may probe for a clearer or more comprehensive explanation.	Could be very costly depending on location of respondents.
	Has the potential of yielding higher response rates than mail questionnaire	May yield low response rates if 'cold-calling'.
Internet-based Questionnaire/interviewing	Lower fixed and marginal costs	Response rates could be low.
	Respondents can obtain clarifications to 'ambiguous' questions, especially in the case of online interviewing	Limited applicability due to low penetration of Internet especially in developing economies.
Face-to-face-based interviewing	The interviewers may probe for a clearer or more comprehensive explanation.	Relatively higher marginal cost than other techniques if large sample rates are to be achieved
	Likely low response rates on controversial, confidential or secretive issues	Higher response rates in general
	Could be used in areas where the other techniques are non-existent (no telephone, no internet or postal services)	Prone to interviewer biases and social desirability effects, which can severely affect validity of data.

Table 5.1: *Data Collection Techniques, Compared.*

Questions were administered face-to-face, which provides the advantage of being able to explain the meaning of questions to respondents thus increasing the validity of the

study. This method was preferred because of its ability to allow those who do not know how to read or write to participate in the study. Also, poor postal and Internet services in both case study countries excluded the use of any of these services for data collection.

5.4 Earlier Approaches to the Study of the Economic Impact of Telecommunication services.

Studies investigating the impact of mobile phones on business and economic growth are rare. However, the literature on the effects of other telecommunication technologies, such as fixed line telephony, facsimile, computer networks, and telex, on economic development is more generally available (Bebee and Gilling, 1976; Baer, 1981, Hardy 1980, Saunders et al. 1983). Since mobile telephony is a telecommunication product, it is plausible to use past research on other telecommunication technologies to enrich the methodology of this research. Studies of the economic impact of telecommunications distinguish between two main research methodologies: one which uses the macroeconomic or top-down approach, while the other uses the micro-economic or bottom-up approach. Macro-level approaches have dominated the research scene in this domain. These studies are generally conducted at macroeconomic or country-level and may be in the form of aggregate correlation analysis or in the form of structural economic analysis.

5.4.1 Aggregate Correlation Analysis

This refers to the approach whereby telecommunications are viewed as an input to a productive system (a factor of production). Studies here typically take the form of statistical correlation or regression analysis wherein supposedly causal macro-

economic relationships (usually a single equation) are specified then parameters of the model estimated from data based on one or more national level economic indicators (GDP) and data on the provision or use of telecommunication services (tele-density) (Saunders et al. 1983). This approach includes both cross-sectional and time-series studies.

In 1968, the CCITT (Comité Consultatif International Téléphonique et Télégraphique), now known as ITU (Intenational Telecommunications Union), examined the correlation between teledensity and GDP using cross-sectional analysis (CCITT, 1968) and found high correlation coefficients (.91 to .92). Hardy (1980) also used aggregate correlation analysis to analyse data from 45 countries on the impact of telecommunications on development. Cronin et al. (1991, 1993a) employed the same techniques but increased their explanatory power through the use of Granger, Sims and modified Sims tests to confirm the existence of a feedback process in which economic activity and growth stimulate demand for telecommunication services.

Waverman et al. (2005) used a similar technique but employed three series of equations in order to control for reverse causality. The value of aggregate correlation analysis is that it gives a general indication of potentially causal relationships. While very useful, aggregate analysis has analytic limitations, especially because of its inability to perform the task of disentangling several simultaneous causal relations of varying directions and between different variables (Saunders et al. 1983).

5.4.2 Structural Economic Analysis

This refers to an approach which focuses on the 'structure of the economy as revealed by the levels of activity in different sectors (agricultural, manufacturing, services and so forth)' (Saunders et al. 1983 p.85). This approach relies on the classic tool of input-output analysis, which generally describes an economy in terms of more or less stable coefficients, relating the outputs of particular sectors to their requirements for inputs (Saunders et al. 1983). In order to examine the benefits of telecommunications to an economy using structural economic analysis, researchers often consider how much of the output of telecommunications sector is sold to final consumers, whether households or public agencies, that are not themselves production units, and how much is sold as an intermediate good that contributes to the production of other goods and services in the primary, secondary and tertiary sectors (Gille 1986; Saunders et al. 1983).

Structural Economic Analysis especially input-output analysis is valuable in the sense that it conveys a general picture of the role of communication services in the overall structure of an economy. Such analysis can also contribute significantly to the assessment or quantification of the benefits of telecommunications investment capable of informing effective telecommunication policy planning such as the type of operator licences to create or how to tax telecommunication products or attract foreign direct investment into the sector (Saunders et al. 1983).

However, the merits of cross country input-output comparisons are particularly weakened by the fact that the original raw data employed for such studies are subject to inaccuracies.

5.4.3 Information Sector Analysis

Information Sector Analysis is another technique used by researchers to determine the impact of telecommunications on the economy. In information sector analysis, the objective of the researcher is to 'identify the extent or the importance of directly productive activities that mainly involve handling information and processes of controlling, coordinating, monitoring, or more generally organising directly productive activities' (Saunders et al. 1983 p 107). It focuses on the broader role of all communications in national development and uses concepts from several disciplines, traditionally sociology, but increasingly also anthropology, psychology and political science. Until recently, such communications research focused almost entirely on mass media, although in recent years two-way communication has gained some attention (Saunders et al. 1983).

This study employs Structural Equation Modelling statistical techniques with micro-level data, which in its simplest form can be viewed as a bank of aggregate correlation analyses employing micro-level data. Elements of information sector analysis have been integrated into the study more specifically in the design of the research instrument.

5.5 Overview of the Research Process

This study attempts to investigate the impact of mobile telephony services on micro-business performance through the design and administration of an eclectic research framework based on a field survey of micro-business owner-managers in Afghanistan and Cameroon, and on desktop research involving numerous databases. Questions

regarding the adoption and integration of mobile telephony services into business processes and their impact on business performance are fully exploited.

The study combines the strength of both quantitative and qualitative analysis spread across three interrelated studies (Studies A1 and A2 and Study B.). Such a combination could give a more holistic view of the economic benefits of the mobile revolution on micro-business performance. The quantitative aspect provides the bases for answering all the research questions. Study B employs qualitative data to strengthen the answers provided by Study A1 and A2, especially to complete the answers to the fourth and fifth research questions. The details and chronology of the research process, from design of the study to data collection and analysis are supplied in Fig. 5.2.

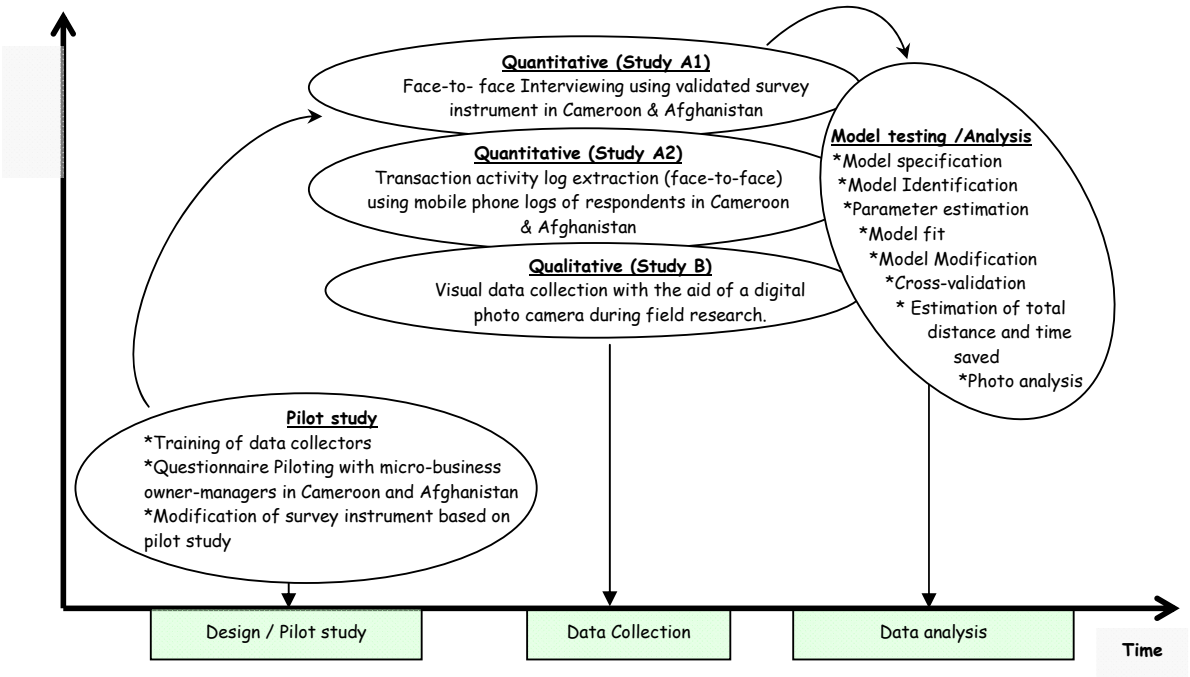

Fig.5.2 *The Research Process*

The impact of mobile phones on business performance is complex and may require a battery of evidence or triangulation to be ascertained. The research process started with the design of the project after the literature review, followed by a pilot study undertaken to refine and validate the research instrument. This was followed by data collection over a one-year period. The data were subsequently analysed and conclusions drawn about the hypothesised relationships. In order to properly address the research questions it was necessary to extend the study beyond one country in order to assess the extent to which local realities affected the level of adoption and integration of mobile telephony services by micro-business. Despite the fact that both Studies A1 and A2 are both quantitative, they employ different variables and research techniques, and as such, yield different pieces of evidence about the nature of the relationship between mobile telephony and business performance. Study B provides greater support to the research findings through the use of visual data.

5.5.1 Sampling Strategies

In this section, sampling issues are examined with the view of creating a representative sample which includes relevant parts of the empirical populations needed to test the relationships hypothesised in Chapter Four, in order to answer the research questions outlined in Chapter One.

Sampling is defined as 'the process of selecting a few (a sample) from a bigger group (the sampling population) to become the basis for estimating or predicting the prevalence of an unknown piece of information, situation or outcome regarding the bigger group' (Kumar, 2005 p.164). It is imperative for any research project to

achieve an empirical sample which is also *randomly-probabilistic*[15], so as to avoid giving undue weight to 'atypical cases' as well as to avoid the attribution of significant meaning to findings that might have been generated by chance factors (Davidsson, 2004). While every attempt was made to obtain a sample that is as randomly-probabilistic as possible for the study, it is important to note here that in practice it is very difficult to obtain a truly randomly-probabilistic sample in social research (Davidsson, 2004 p.68; Cohen, 1994; Oakes, 1986). According to Davidsson (2004), the *statistical inference theory,* which is behind random/probabilistic sampling, 'is a tool that is tailor-made for opinion polls and industry quality control rather than for the true needs of a social science researcher' (p.68). This is because it is very difficult to determine a social research population with the same precision as in opinion polls, and also because of the difficulty of obtaining a 100 percent response rate in social research.

In this study, random sampling was combined with empirical sampling to select respondents. The implication of this sampling technique is that the study can be replicated much more easily in several sub-groups of analysable size within the same study, as well as across several studies that investigate theoretically relevant samples from different empirical populations. The random sampling facet was achieved by using a computer programme called *Random Select* to choose one of the case study countries (Afghanistan) from a database of 36 developing countries. Also, Random Select was used to select 8 case study locations, Provincial towns from a database of 34 Afghan and 10 Cameroonian provincial towns. Empirical sampling was achieved by ensuring that respondents included in the analyses:

[15] A ***Randomly-probabilistic sample*** is one in which 'each element in the population [should have] an equal, and independent chance of selection in the sample' (Kumar, 2005 p.169).

- Should have been in business for at least six months before owning a mobile phone, and
- Should have been in operation for between 2-3 years by the time of interviewing.

The literature on entrepreneurship (Davidsson, 2004, Sarasvathy, 2004; Scott and Rosa, 1996) identifies five main levels of analysis in entrepreneurship research: the individual, the venture, the firm, the industry and the spatial unit (region, nation) levels. According to Davidsson (2004), many studies tend to erroneously mixup these levels, leading to sampling errors. Davidsson also recommends that for individual-level studies psychological constructs should be used where possible and for firm level studies, other workers within the firm should be included in the sampling frame, because the founder or manager represents only a fraction of the human capital of the firm (Davidsson, 2004).

In conceptualizing entrepreneurship, Burns, (2001) and Davidsson (2004) argue that for a sample of micro-businesses with not more than ten people, the distinction between the owner-manager and the firm becomes very permeable, and as such, for the purposes of this study, the notions of *entrepreneur* and *micro-business/micro-enterprise* have been fused into a single conceptual entity represented by the *owner-manager*. Psychological variables have been used to measure Entrepreneurial Competence, which is an individual-level construct (Davidsson, 2004 p.113).

5.5.1.1 Sample Size:

To achieve statistical significance and stability of results using structural equation modelling techniques, particularly in an AMOS environment, an optimal sample of

150-200 respondents is recommended (Hair et al; 2006; Tabachnick and Fidell, 2007). To achieve this optimal sample size, an initial sample size of 200 respondents was targeted for each of the sample countries so as to allow for any respondents dropping out of the study, particularly as data had to be collected several times from the same respondent for the purpose of study A2. Micro-entrepreneurs were contacted mainly at their businesses premises and introduced to the project. Out of a total of 470 that were contacted 340 agreed to take part in the project, giving an initial response rate of 72.3 percent.

All those who accepted to take part in the project were given $US5 worth of mobile phone air-time vouchers to entice them. These vouchers were handed to respondents every time they participated in the project. Door-to-door approaches in research have the advantage of yielding a high response rate (Dillman, 1978). By the end of the data collection process, 210 micro-business owner-managers, 103 from Afghanistan and 107 from Cameroon, had participated in the project, giving a final response rate of 44.7 percent and a participation rate of 61.7 percent.

5.5.1.2 Choice of Case Study Locations:

Based on the design of the study, it was necessary to collect data from at least two developing countries in order to offer the possibilities of cross comparisons. While Cameroon was chosen based on convenience sampling (the researcher's home country), Afghanistan was randomly chosen from a list of 36 developing countries which were identified as having significant sociological, political and economic differences with Cameroon, using a computer programme (*Random Select*).

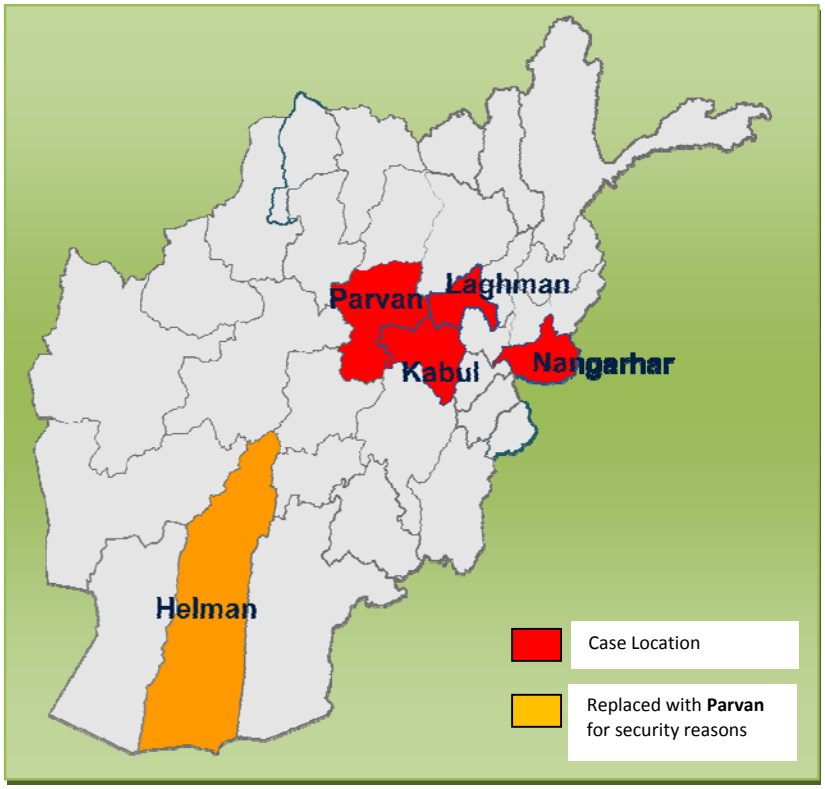

Fig.5.3: *Map of Afghanistan Showing Case Study Locations*

The programme then selected four towns randomly from each country (Table 5.2). *Lashkar Gah* in the Helmand Province of Afghanistan was chosen randomly by the programme but was later replaced with *Mehtar Lam* in Laghman Province due to security reasons.

Country	Province	Town	Effective Sample
Afghanistan	Kabul	Kabul	48
	Laghman (replacement for Helmand)	Mehtar Lam	22
	Nangarhar	Jalalabad	15
	Parvan	Charikar	18
	TOTAL		**103**
Cameroon	North	Garoua	20
	Adamawa	Ngoundéré	19
	Littoral	Douala	30
	South West	Limbe	38
	TOTAL		**107**

Table 5.2: *Case Study Locations and Sample Size*

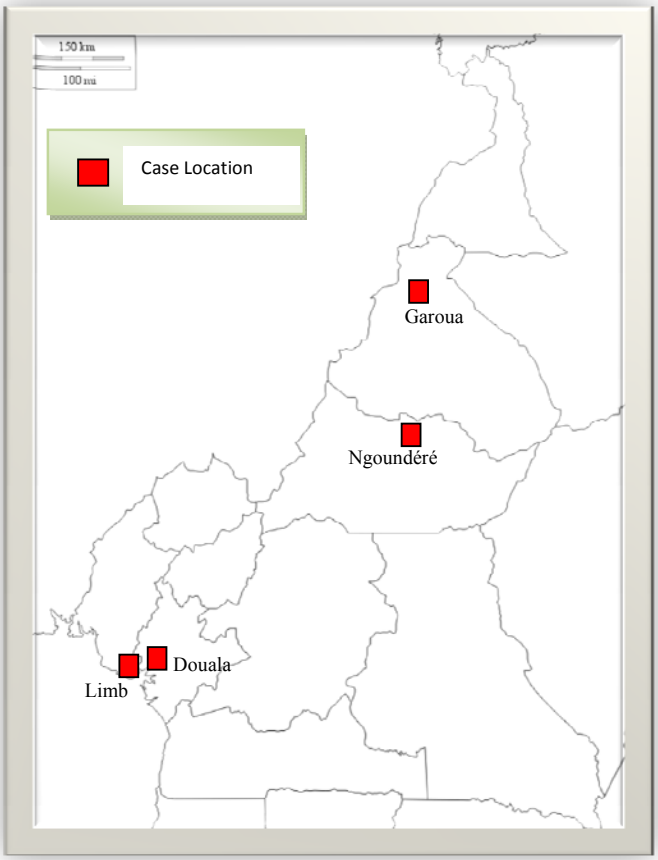

Fig.5.4: *Map of Cameroon Showing Case Study Locations*

In Cameroon, initial respondents were chosen randomly from the small business tax register although 40 percent were simply approach at their business premises. In Afghanistan, cultural and security concerns and the lack of a viable micro-business register meant that respondents were randomly approached at their business premises and those who were willing to participate in the study were interviewed. Although the door-to-door technique violated most of the conditions for achieving a random-probabilistic sample, it however, assured a higher response rate.

5.5.2 The Pilot

The merits of piloting a questionnaire and the need to consult with professional experts and cultural insiders on its structure and content before its use, have been highlighted by many researchers (Converse and Presser, 1986; Dillman, 1978; Presser and Blair, 1994, Czaja, 1998; Frey, 1989). Dillman, outlines seven main reasons for pre-testing a questionnaire, while Frey summarises his arguments for pre-testing a questionnaire into 10 main points. Converse and Presser have on their part put forward 11 considerations when testing a questionnaire. Czaja outlines 15 main techniques and their objectives for conducting a pilot (see Appendix –B: Table AB1 for details).

Piloting a questionnaire can, among other benefits, achieve the identification of questions that respondents cannot answer accurately, of words terms or concepts that respondents do not understand, of terms and concepts that respondents interpret differently from researchers, and of questions that are awkward or difficult to read (Czaja, 1998). It can also help in obtaining ideas for question wording, and in uncovering faulty interviewer instructions, incorrect skip patterns, inadequate space to record answers, and typographical errors (Czaja, 1998).

Once the questionnaire desktop design was over, it was presented to three Warwick University academics for homologation. The pilot phase in Cameroon was conducted in June 2006. Six local bilingual (French and English) data collectors (3 males and 3 females) were trained over a period of 4 days in the techniques of data collection and in the deeper understanding of the questionnaire in terms of general readability and interviewer instructions. Also, they were trained in the techniques of motivating

respondents to answer, ensuring that respondents understood the questions, and in how they could probe for clarification without unnecessarily altering the duration of the interviews or concurrence in responses. They were equally trained in how to use the branching questions that had been built into the questionnaire to direct respondents in answering the right questions in the proper sequence, preventing essential question-skipping.

The training was followed by a 3-day pilot study using a sample of 10 micro-business owner-managers in the English-speaking town of Buea and 10 from the French-speaking town of Douala. Another pilot study was also carried out in Kabul, Afghanistan from the 12th -22nd of September 2006. The pilot study enabled certain ambiguities in the questionnaire related to poor wording and translation of the original survey instrument from English to French, Dari and Pashto to be corrected. From the pilot, it was deduced that each interviewer took approximately 48 minutes to complete an interview which was very helpful in the quantification of actual resources (time, interviewers and other logistics) required to complete the data collection process.

Training data collectors in Kabul was particularly challenging. Firstly, I do not speak or understand any of the two local working languages (Dari and Pashto), which implied that I needed the services of a trilingual interpreter (English, Pashto and Dari). Although Dari and Pashto seem to have practically the same alphabet, both languages are very distinct. Attempts to recruit trilingual (English, Dari and Pashtun) data collectors were unsuccessful, and I ended up with two who were strictly Pashto-speaking, two strictly Dari-speaking, three bilingual (Dari, Pashtun) and only one trilingual. Secondly, being a male researcher it was extremely difficult to recruit

female data collectors due to cultural restrictions, which makes it very difficult for men to be in the presence of women who are not their wives or family members except in the presence of the women's husbands or in the presence of other female community leaders. I however, succeeded in recruiting one female who sat in training for the first day [with her husband] and never attended again until training ended on the fourth day. Consequently, all data collectors used in the Afghan study were males.

This explains the reason why only 8.4 percent (9 owner-managers) of the Afghan sample is made up of females, from whom data were collected thanks to negotiations between the data collectors and husbands or close relatives of the women to allow them participate in the interviews in the presence of family members. This obviously creates a generalisation problem for the study, as the female population is largely unrepresented. Training was followed by a pilot study which employed a sample of 5 Dari-speaking and 5 Pashto-speaking micro-business owner-managers across Kabul (mainly Dari-speaking) and Charikar (mainly Pashtu-speaking).

The piloted samples from Cameroon and Afghanistan were then subjected to an internal consistency examination based on the four language samples (French, English, Pasto and Dari). Three questions were observed to account for high variability (+3) in responses across the different language samples. These questions were examined with the help of professional translators to ascertain whether the variability was a result of poor translation. The Pashto and French versions of three questions were re-phrased, and the questionnaire re-piloted using other randomly-selected samples from across the different language groups. When re-tested, the

observed variability had reduced to (+2). One question which continuously loaded poorly for three of the four languages (French, Dari and Pashto) was eliminated from the survey.

The pilot phase of the study was completed by the end of September 2006. This was followed by a survey in Cameroon between June 2007 and July 2007, then in Afghanistan between September and October 2007.

5.5.3 The Survey

In Chapter Three, the epistemological and ontological perspectives of the study were outlined. The epistemology adopted was based on the assumption that 'organisations [micro-businesses] exist as concrete entities about which data can be collected', and can be analysed, and conclusions can be drawn about the 'structure and functioning of [the] organisations and the behaviour of groups and individuals within them' (Pugh 1983:48). The implication of this epistemology is that, by interviewing micro-business managers, real data can be collected on the integration of mobile telephony services into business processes and analysed to estimate their impact on business performance.

The ontology adopted was based on the assumption that 'reality' is shaped by gender, economic, political, social and ethnic values, and that over time, this reality is assumed to be 'real' and also that 'reality' is socially constructed. This implies that micro-business managers are quite aware of why they have adopted mobile telephony services, how they actually use these in business processes, and the benefits they reap from using the services.

This study adopts a survey methodology which 'seeks to identify principles about the design, collection, processing and analysis of surveys' (Groves et al., 2004 p. 30). Survey research embodies a set of orderly procedures which specify what information is to be obtained to represent the variables which have been declared for the study, and from which respondents it is to be obtained. A 'survey is a method for gathering information from (a sample of) [concrete] entities for the purpose of constructing quantitative descriptors of the attributes of the larger population of which the entities are members' (Groves et al., 2004 p.3). In practical terms, information was gathered by asking a sample of micro-business owner-managers (respondents) questions by interviewers who recorded responses into a structured questionnaire. The collected data was then examined to detect trends, attitudes, opinions and patterns of relationships for the hypothesised constructs by studying a sample of the population (Bryman and Bell, 2007 p. 733; Creswell, 2003 p. 153).

The advantages of survey research as a methodology identified in the literature include the following:

- It is very powerful in describing the characteristics of large populations and, if properly conducted, can permit generalizations to be made from a sample to the population with a high degree of assurance and confidence.
- It offers the possibility of achieving higher sample sizes.
- Survey has the flexibility of allowing the researcher to 'use a variety of question types and techniques' (Case, 2002), which are able to capture the past and present events, as well as predict the future. It has the ability to reveal a 'critical incident' in the life of a respondent or organization, such as changes

brought about by the use of mobile telephony services to certain business processes.

The following disadvantages have also been identified:

- It provides relatively lower chances of probing into the insights related to the phenomenon under study compared to other methodologies.
- There is a risk of applying the same structure of questions to respondent groups that may have different needs and levels of experiences. This can produce misleading results.
- It is very difficult to cover all aspects of a complex phenomenon and still achieve conciseness within a structured questionnaire. Long questionnaires tend to discourage respondents from participating.
- Interviewer behaviour may influence the activities of respondents. This can affect the validity of the results.

Survey research was adopted as a better methodology for the study because it is a better tool for data collection, particularly in areas where postal and internet services are not so well developed, and also where the culture of surveys is a relatively new concept. The survey method provides a firm basis for establishing the strength of hypothesised relationships. Study A1 and Study B employ cross-sectional designs while Study A2 employs a longitudinal design. All data were collected using face-to-face interviewing and data abstraction from the mobile phone activity logs of micro-business owner-managers.

Study A1 is the main part of the research. It employs a hypothesised model which is analysed in a SEM environment to provide the *strength of the relationships* between the hypothesised constructs. Confirmatory Structural Equation Modelling was applied to the data collected from respondents using the AMOS (Analysis of MOment Structures) statistical package, in an attempt to obtain a model that fits or compares statistically and theoretically to the model proposed in Fig.4.2. The comparison or fit-test procedure employs a set of *fit indices* specially developed in SEM for that purpose. If the proposed model fails the fit-test, then a new theoretical model is re-proposed and tested until an acceptable fit which is theoretically tenable is obtained. If a theoretical model is successfully fitted to the data, then the relative influence or impact of variables on one another can be obtained. As such, the impact of mobile telephony on enhanced business performance can be assumed based on the model.

Study A2 uses a retrospective scenario-based analysis to provide evidence in terms of *business time* and *business distance saved* thanks to mobile telephony services. Data was extracted repetitively over a one-year period from the mobile phone transaction activity logs (secondary source) of 210 micro-business owner-managers in Cameroon and Afghanistan. The extraction was undertaken across seven random working days evenly spread across days of the week over four quarters (July2007/September 2007, December 2007/January 2008, March 2008/April 2008 and July 2008/September 2008) giving one year's worth of data. For 7 random working days in each quarter, all calls and messages sent or received by respondents that were currently logged on their phones were extracted and recoded in a table (Table 6.13 is a sample activity-log).

After the extraction exercise, each business transaction (excluding international transactions) was then individually assessed with the help of the respondent using the following scenario:

> '*Let us consider that this business transaction (call, SMS, MMS, 'beep') which you have just carried out over the phone were to take place without a mobile phone (pre-mobile era). How would you have carried out the transaction?'*

The information provided by the respondents was then analysed using two main criteria:

- Time saved by making the transaction on the mobile (call, SMS, MMS, 'beep');
- Travel distance saved by making the transaction on the mobile (call, SMS, MMS, 'beep').

The extraction and interviewing exercise took approximately 35 minutes to complete for each respondent. 38 enthusiastic and literate owner-managers (25 in Cameroon and 13 in Afghanistan) opted to complete the forms by themselves for all four weeks (one week per quarter). As such, they were given proper training on how to complete the transaction-log form. They were then interviewed at the end of each of the four weeks using the form which they had completed. Transaction-log extraction ensures that data is freshly collected rather than depending on the memory of the respondents.

In *Study B,* which is qualitative, a digital still photo camera was used to take pictures that were thought to add explanatory power to the quantitative study. While a total of 14 photos were taken, only five have been analysed in this study. The choice of the five photos was based on their theoretical and conceptual relevance in explaining the

relationship between the two main concepts under investigation: the integration of mobile telephony services in business processes, and enhanced business performance, with no attention paid to statistical relevance. The photographic analyses have an illustrative function and are meant to support the statistical outcomes of Study A by providing additional meaning. As such, study B lacks all the methodology rigours of a full-blown study. For example, it does not take into consideration representative sampling procedures in choosing the photos, and no mega-analytical theories are employed.

The basic principle of observing and analysing a set of visual images in research is relatively well established, and is found across a wide range of disciplines (Robinson, 1976; Ball and Smith, 1992; Gibbs, 2007; Banks, 2007). Visual data analysts distinguish between *Manifest Content Analysis* and *Latent Content Analysis* of an image. Manifest analysis seeks to draw meaning uniquely from what is actually seen in the photo, while latent content analysis considers the symbolic meaning and associations with external narratives (Banks, 2007). Manifest analysis may involve describing the morphological difference between two facial structures in a photo or group of photos without seeking to explain why the faces may be identical or different. On the other hand, latent analysis may be interested in knowing why the pictures were taken in the first place, and why the faces may be similar or different.

Visual data analysis in this work adopts a latent approach by seeking to construct meaning from the images by associating them with external narratives (unstructured interviewing of those involved in the photos). It is therefore an attempt to present the subjective perspectives of those involved in the photos within the context of mobile

telephony use and business performance. The images are not intended to be interpreted independently of study A and do not form any meta-argument of their own.

5.6 Measuring the Research Constructs:

In order to reveal levels of theoretical variables which are latent in nature (not readily observable by direct means), measurement instruments have to be developed. These instruments are basically, 'items combined into a composite score' (DeVellis, 2003 p.8). The measurement instrument for the hypothesised constructs is a questionnaire which was derived from theoretical perspectives as discussed earlier in Chapters Two, Three and Four.

Scales are developed in research when measures are needed for a phenomenon that is believed to exist, but which cannot be assessed directly (DeVillis, 2003). A scale consists of 'effect indicators' (Bollen, 1989 p 64-65); that is, 'items whose values are caused by an underlying construct or latent variable' (DeVellis, 2003 p.10). The underlying principle behind the scales employed to measure the reflective latent variables (EC, ME and PEP) is the presumption that the strength of a latent variable is responsible for the value taken by an indicator or set of indicators. This presumption implies that responses given to questionnaire items are caused by the construct. If the value of each indicator item can be determined from respondent responses to questionnaire items, then a summation of individual item scores can reveal the 'true value' or prevalence of a construct. The answer provided by a micro-entrepreneur on a customer orientation item, is assumed to be indicative of his entrepreneurial competence (EC). In the same vein, an answer to a questionnaire item on perceived

increased flexibility is indicative or is a reflection of the entrepreneur's perceived enhanced performance. As such, a summated score on indicator items can be assumed to indicate the level or strength of the construct being measured.

The scale employed for a measurement generates a certain level of precision. A good description of this effect can be found in Davidsson, (2004 p.104). Most of the variables in this study are measured using ordinal scales wherein, respondents assess concepts by rating them on a five or seven point scale. This is a very *crude* measure and by principle, should generate substantial measurement errors (Davidsson, 2004 p.104). However, the precision of such measures can be improved by using several items to measure the same concept (multi-item scaling). By using a multi-item scale, 'a more continuous measure' that better reflects the underlying continuum of the concepts' distributions can be achieved and 'random measurement errors' issuing from the individual items tend to cancel out' (Davidsson, 2004 p.104).

Each indicator variable in the study was measured by a battery of questionnaire items parcelled together. Such a technique increases the validity of the scale item by representing several aspects of the construct in a single measure provided that the items are internally consistent (Hair et al., 2006 p.11; DeVellis, 2003). All the items in the scale were consequently tested for unidimensionality to show that they are strongly associated with one another and represent a single concept (Hattie, 1985; McDonald, 1981). All the items loaded significantly on their individual constructs. Reliability of the scale was tested using Werts et al. (1974) internal consistency scaling techniques which are highly recommended for path analysis.

In Tables 5.3, 5.4, 5.5 and 5.6, the four constructs under investigation are measured using indicator variables. An indicator is actually, a battery of questionnaire items.

Latent variable	Indicators	Measures	Measure description
Entrepreneurship Competence (EC)	**EC1_ea**: entrepreneurial action /activity	*You have introduced an innovative product in the market in the last three years. *You have adopted newer production technologies for your business in the last three years *You have opened a new branch of your business in another part of town, city or country in the last three years *You have applied for a bank loan in the last three years *You have diversified your business in the last three years *In the last three years, you have refurbished your business premises or acquired a better one.	**Questionnaire** Average of six 5-point Likert scale items (strongly disagree – strongly agree). Newly developed
	EC2_cg: Commitment to growth	*You are generally committed to the growth of your business *Your family and you are entirely dependent on the proceeds of this business *Your main intention is to grow the business as large and as fast as possible * You are currently devoting full time to the business, 35 or more hours a week. *You have always wanted to succeed and accomplish something in life *To face new challenges and to manage to cope with them is very important for you. *You are so satisfied with what you have achieved in life that you think now you can confine yourself to keeping what you already have (Reverse scoring) *You find it hard to understand people who always keep on striving towards new goals although they have already achieved all the successes they could have possibly imagine (Reverse scoring)	**Questionnaire** Average of eight 5-point Likert scale items (strongly disagree – strongly agree). The last 5 scale items marked in brown were developed by *Davidsson (1989a) who obtained Crombach alpha of .55*
	EC3_co: Customer Orientation	*You are fully committed to your customers. In fact, 'the customer is king' in your business *Your main focus is to create value for your customers *All the customer needs is low prices (Reverse scoring) *Your main objective is to provide the customer with innovative and competitively priced products *You continuously develop parameters to measure customer satisfaction *You always ensure that your customers can reach you should they have problems with your goods or services.	**Questionnaire** Average of six 5-point Likert scale items (strongly disagree – strongly agree). Modification of scale *Developed by Narver & Slater (1990) :they obtained Crombach alpha of .8547*
	EC4_em: entrepreneurial ability	*You hold membership of a professional group linked to your business area *You consider yourself experienced enough to carry on your job *You possess some unique business skills that your colleagues do not *You have broad knowledge about your business area. * Since you started this business, you have never taken any classes and/or workshops related to the business (Reverse scoring).	Average of five 5-point Likert scale items (strongly disagree – strongly agree). Newly developed.

Table 5.3: *Measuring Entrepreneurial Competence (EC)*

Latent variable	Indicators	Measures	Measure description
Micro-business Environment (ME)	**ME1_fa**: financial assistance to Micro- businesses	* Financial assistance provided by government before you started your business *Financial assistance provided by government since you started your business *Tax-assistance/credit offered to by government since you started your business * Financial assistance provided by an NGO before you started your business * Financial assistance provided by an NGO since you started your business * Financial assistance provided by family and friends before you started your business * Financial assistance provided by family and friends since you started your business * Financial assistance provided by business partners before you started your business * Financial assistance provided by business partners since you started your business *Level of loan assistance received from a financial institution (micro-finance, bank).	**Questionnaire** Average on ten 5-point scale items 1= no assistance 2= small assistance 3= no opinion 4= large assistance 5= very large assistance + 1 = unaffordable 5 = very affordable Newly developed.
		*How can you rate your affordability of the business tax you per tax season?	
	ME2_ta: Technical/training assistance to Micro- businesses	* Technical/training assistance provided by government before you started your business * Technical/training assistance provided by government since you started your business * Technical/training assistance provided by an NGO before you started your business * Technical/training assistance provided by an NGO since you started your business * Technical/training assistance provided by family and friends before you started your business * Technical/training assistance provided by family and friends since you started your business * Technical/training assistance provided by Business partners before you started your business * Technical/training provided by Business partners since you started your business	**Questionnaire** Average on eight 5-point scale items 1= no assistance 2= small assistance 3= no opinion 4= large assistance 5= very large assistance
	ME3_ls: Legal & Institutional support to Micro/small businesses	*Government officials visit your business to advise you on new business laws *NGO officials visit your business to advise you on new business laws *You may have to bribe government officials (taxation, council, police/gendarmes) in order to stay in business (Reverse scoring) *Overall, the government is helping you to succeed in your business *Overall, non-governmental organisations are helping you to succeed in your business *There are forums such as trade fairs, agricultural shows, radio/TV/newspaper created by the government to help you advertise your business *You consider the level of bribery and corruption as an important hindrance to the growth of your business (Reverse scoring). * The general security situation of where you live or do business is acceptable.	**Questionnaire** Average of eight 5-point scale Agree/disagree
	ME2_ni: Infrastructure	* Mobile network signal is always available *It is easy to have a mobile telephone number *Airtime retailers are readily available *It is easy to find a mobile phone shop *Mobile phone booths are readily available. *The price of mobile telephony services is affordable. *Most of the people you do business with have access and use mobile phones *Other telecommunication services (fixed line, internet, fax) are readily available and affordable *Electricity is readily available and affordable *The physical transport network (roads, railways, airports) which I need for my business are available and accessible.	**Questionnaire** Average of ten 5-point scale Agree/disagree

Table 5.4: *Measuring the Micro-business Environment (ME)*

Latent variable	Indicators	Measures	Measure description
Integration of mobile telephony services into business processes (IB)	**IB1_isms**: Integration of SMS/MMS services into business processes	*Percentage of mobile-based business SMS/MMS transactions to total mobile-based SMS/MMS transactions per week $IB1_isms = \frac{N_{mB_msg/wk}}{N_{mT_msg/wk}} X\ 100$	Average readings taken off respondent's mobile phone call log, followed by interview
	IB2_ivoi: Integration of voice services into business processes	*Percentage of mobile-based business voice transactions to total mobile-based voice transactions per week $IB2_ivoi = \frac{N_{mB_voice/wk} * U_{mB_voice/wk}}{N_{mT_voice/wk} * U_{mT_voice/wk}} X\ 100$	Average readings taken off respondent's mobile phone call log, followed by interview
	IB3_iact: Application of mobile services for business	*You use the mobile services regularly for business transactions * You use mobile services to stay in contact with customers/suppliers *Your business partners contact you mainly through the mobile phone * You use mobile telephony services frequently to place and receive orders * The easiest way to contact you for business is via mobile phones *Mobile phones help you improve internal communication and knowledge sharing *You find it difficult to do business with someone who does not have access to mobile services *You will encourage all businessmen to own and use phones regularly	**Questionnaire** Average of eight 5-point Likert scale items (strongly disagree – strongly agree)
	IB4_irs: Use of related services	*Percentage of business transactions via related services to business transactions via mobile telephony per week. $IB4_irs = \frac{(N_{rsB_voice/wk} * U_{rsB_Voice/wk}) + N_{rsB_msg/wk}}{(N_{mB_voice/wk} * U_{mB_Voice/wk}) + N_{mB_msg/wk}} X\ 100$	Average readings taken off respondent's mobile phone call log and interview

Table 5.5: *Measuring the Integration of Mobile Telephony Services into Business Processes (IB).*

Concept	Indicators	Variables	Measure description
Perceived Enhanced Operational performance (PEP)	**PEP1_IF**: Perceived increased operational flexibility	*You rarely turn off your mobile phone so as not to miss business *Mobile phones help you to stay in contact with customers/suppliers even when you are not in the business premises or closed for the day. *Mobile telephony helps you take new orders even when you are out of the business premises *Mobile telephony helps you have and do business with virtual customers/suppliers *Your customers/suppliers refer you to others by giving them your mobile telephone contacts *Mobile services help you to do business with virtual customers/suppliers	**Questionnaire** Average of six 5-point Likert scale items (strongly disagree – strongly agree) **+** One 5-point scale items (*1 = very small influence; 5=very large influence*)
		*Indicate the extent to which the use of mobile phones has influenced the benefit of your ability to check on the availability of products before travelling	
	PEP3_CR: Perceived reduction in operational cost	*Mobile telephony helps you cut cost *Mobile telephony helps you to save money by reducing the number of costly journeys you make *Your business is losing money because you waste it on mobile telephony services (Reverse scoring) *You waste valuable productive time talking on the phone or 'texting'(Reverse scoring) *Mobile telephony helps you to have and do business with virtual customers/suppliers	**Questionnaire** Average of five 5-point Likert scale items (strongly disagree – strongly agree) **+** Average of two 5-point scale items (*1 = much reduced, 5=much increased*) **+** One 5-point scale items (*1 = very small influence; 5=very large influence*)
		*How has your need to travel changed since your business became connected to the mobile telephone network *How has your costs of doing business changed since you started using mobile phones	
		Indicate the extent to which the use of mobile phones has on cost reduction for your business	
	PEP7_RIA: Perceived reduction in information asymmetries	*Mobile phones have significantly improved your access to information which helps you to reduce uncertainty in decision making. *Mobile phones have significantly improved the way you apply information to solve problems or make certain business decisions such as fixing prices.	**Questionnaire** Average of two 5-point Likert scale items (strongly disagree – strongly agree) **+** Average of three 5-point scale items (*1 = very small influence; 5=very large influence*)
		*Indicate the extent to which the use of mobile phones has influenced the benefit of acquiring better market prices for your business *Indicate the extent to which the use of mobile phones has influenced the benefit of less time needed to make business decisions *Indicate the extent to which the use of mobile phones has influenced your ability to access information on new products, their uses and application	
	PEP6_PG: Perceived overall growth	*Overall, mobile services contribute significantly to the growth of your business *Your competitive position has improved significantly thanks to Mobile services *Mobile phones help you find new customers out of your traditional localities *The overall equity of your business (salaries/wages, promotions) has been improving in the past three years *Your business has improved for the last three years in terms of customer acquisition and service provision *The conditions for your business to create new jobs/apprenticeships have improved for the last three *The security of your job and those of your employees have been improving for the last three years *Overall, mobile telephony services have improved the performance of your business *You use mobile simply because it is fashionable (everyone is using it)	**Questionnaire** Average of nine 5-point Likert scale items (strongly disagree – strongly agree) + One 5-point scale item (*1 = very small influence; 5=very large influence*)
		Indicate the extent to which the use of mobile phones has influenced the benefit of acquiring new customers for your business	

Table 5.6: *Measuring Perceived Enhanced Business Performance (PEP)*

The questionnaire was purposefully made extensive in order to increase the reliability of the measures. Although respondents would normally prefer a brief questionnaire, the danger of 'trying to reduce the burden on respondents' by 'using scales that are too brief to be reliable is a bad idea no matter how respondents appreciate its brevity' (DeVellis, 2003 p.12). The burden to respondents was somehow compensated for by enticing them with $US5 mobile phone air-time vouchers. In the next section we will examine the methods of analysis.

One of the four constructs, Integration of Mobile Telephony Services into Business Processes (IB), and its indicators, were newly developed from scratch, while the other three, EC, ME and PEP, are variables that have been pulled out from earlier research studies and contextually modified to suit the present research project. An inspection of the multiple item scale demonstrated face validity. A pre-test was performed using five professional judges; two with telecom backgrounds and three with various backgrounds in entrepreneurship and organisational behaviour, to match the items with the constructs. The judges found consensus on all but one of the hypothesised indicators (network externality) for PEP. This item was ultimately dropped.

5.7 Data Analysis:

In this section we shall examine the techniques that have been used to analyse the data collected for all the three sub-studies (Study A1, Study A2 and Study B). Study A1 uses multivariate techniques, particularly SEM, with the use of AMOS software to quantify the magnitude of the relationship between mobile telephony use and business performance. SEM also provides an indication of the confidence placed in the findings, and isolates the effects of other latent variables (EC and ME). Study A2

employs simple arithmetic techniques to calculate average business time and distance saved thanks to the use of mobile phones. The raw data is acquired from the mobile phone activity logs of respondents via abstraction, as described in section 5.5.3 above. In Study B, latent content analysis of four still photos taken during the field research was carried out to enrich the findings resulting from studies A1 and A2.

The results from the three studies are detailed in Chapter Six, and analysed further in Chapter Seven based on the theoretical and conceptual underpinnings of the study, in order to draw conclusions relating to the structural relationship between mobile telephony integration into business and perceived enhanced business performance.

5.7.1 Structural Equation Modelling (SEM)

The development of structural equation models is now widespread in many academic disciplines (Hair et al., 2006; Schumacker and Lomax, 2004; Blunch, 2008; Byrne, 2001). SEM models are used to substantiate and test theory, and to help establish associations between constructs that have been defined on firm theoretical foundations. SEM is a powerful data analysis technique that allows all of the entire theory put forward in a research project to be tested simultaneously by 'examining the structure of interrelationships expressed in a series of equations, similar to a series of multiple regression equations' (Hair et al, 2006 p.711).

SEM's ability to analyse a series of relationships simultaneously gives the technique an edge over other multivariate data analysis techniques (multiple regression, factor analysis, MANOVA, discriminant analysis), where only a single relationship can be tested at a time. SEM employs Confirmatory Factor Analysis (CFA) and multiple

regression in one procedure to determine whether there is empirical support for the specified factor-structure modelled for the study. Relationships like the ones specified in the research model (Fig.4.2), where one dependent (IB) becomes an independent variable in subsequent dependence relationships (IB→PEP), particularly demands the use of SEM. This is more so, because the proposed model has multiple constructs which are measured using multiple indicators in which the exogenous constructs (EC, ME) are used to explain the endogenous ones (IB and PEP), so that SEM is the most appropriate technique for analysis.

As indicated in Chapter Four - Section 4.2, structural equation modelling is a statistical technique that is purely driven by theory. The technique uses a series of measures to determine how well the theory proposed in the model fits the data collected by observing the covariance matrix among the measured variables. The main objective of this thesis is to test the proposed theory that the integration of mobile telephony services in business processes contributes to enhanced firm performance; and because SEM is a confirmatory analysis, its potential to confirm the proposed theory makes it essential.

The SEM technique was chosen from amongst other techniques like multiple regression, multivariate analysis of variance and canonical analysis, due to its ability to examine multiple relationships at a time and also to keep track of the measurement errors.

5.7.1.1 SEM Design Issues (Model specification):

In this section, issues that must be addressed in SEM by the study in order to produce empirical results are considered. The recommendations for SEM processes to produce empirical results with regard to the *type of data being analysed*, the *handling of missing data*, *sampling size*, *model complexity* and *model identification* are explained in detail here below.

5.7.1.1.1 Type of Data Analysed:

In practice, either a covariance matrix or a correlation matrix is first computed before being injecting into a SEM model for parameter estimates. The choice of using either a covariance or correlation matrix as input into a SEM model for analysis was one to be taken seriously prior to the development of robust SEM software packages (Hair et al., 2006 p.737) which are capable of handling both data structures. The main advantage of using a correlation matrix over a covariance matrix as input is that resulting estimates are standardised (values lie between -1 and +1) and can easily be interpreted. However, this advantage can be easily neutralised as most SEM software packages convert the non-standardised output estimates resulting from covariance matrix input by a simple click of the button. AMOS, LISREL and EQS are the most used SEM software packages and they all have the capability to compute a model solution from raw data and present it either in the standardised or non-standardised form based on the choice of the researcher. This study adopted the raw data input format using an AMOS 17 platform.

5.7.1.1.2 Missing Data:

Missing data plays an important role with regard to the validity of a research project. As such, three main methods are employed by researchers to remedy missing data problems (Hair et al. 2006, p738): the *complete case approach* or *listwise deletion* approach, the *all-available* or *pairwise deletion* approach, and the *model-based imputation* approach (Tabachnick and Fidell, 2007; Hair et al., 2006; Pallant, 2007). The first two approaches are widely used in research that employs techniques other than SEM. They however pose some challenges, as shown in Table 5.7, when applied in SEM analysis.

Method	Advantages	Disadvantages
Listwise	*Shows little bias under most conditions *Effective sample size is known *Easy to implement using any programme	Increases the likelihood of non-convergence unless factor loadings are high (>.6) and sample sizes are large (>250)
Pair-wise	*Fewer problems with convergence *Factor loadings relatively free of bias * Easy to implement using any programme	*Chi-square is biased upward when the amount of missing data exceeds 10%, factor loadings are high, and sample size is high *Effective sample size is uncertain *Not as well known.
Model-Based (ML/EM)	*Fewer problems with convergence *Chi-square shows little bias under most conditions *Least bias under conditions of random missing data	*Not available on older SEM programmes *Effective sample size is uncertain for EM

Table 5.7: *Some Advantages and Disadvantages of Different Missing Data Procedures*
Source: *Hair et al. (2006) p.739*

SEM software packages have tackled this problem by using a technique called *imputation* whereby the missing value of an observation is replaced based on values calculated from other values of the variables. Imputation techniques vary depending on the statistical package used. This study used AMOS 17 software which is equipped with advanced imputation techniques.

In the final dataset used for analysis in this study, AMOS imputation was used to complete the data for three missing observation values of the indicator variable, *ME3_ls,* before analysis. According to Hair et al. (2006 p.738), imputation should be used only in cases where missing observation values represent less than 10 percent of the dataset. The three missing observation values represented just 0.004 percent which is well below the recommended 10 percent baseline.

5.7.1.1.3 Sample Size:

Sample size issues in SEM are to be taken seriously. In general, SEM analyses require larger sample sizes compared with other multivariate techniques, so much so that some statistical analyses simply become unreliable with too small sample sizes. Too large sample sizes also affect reliability by biasing the chi-square statistics. The impact of sample size on the reliability of results is clearly detailed in Hair et al. (2006), Tabachnick and Fidell (2007), Javis, et al. (2003), and Kerlinger, (1980). For the analysis in this study, the sample size was determined based on five considerations put forward by Hair et al. (2006 p.742).

- SEM models containing five or fewer constructs, each with more than three observed variables, and with high item communalities (.6 or higher), can be adequately estimated with a sample size of 100-150.
- If any communalities are modest (.45-.55), or the model contains constructs with fewer than three items, then the sample size is more in the order of 200.
- If the communalities are lower or the model includes multiple under-identified (fewer than three items) constructs, then minimum sample sizes of 300 or more are needed to be able to estimate population parameters.

- When the number of factors is larger than six, some of which use fewer than three measured items as indicators, and multiple low communalities are present, sample size requirements may exceed 500.
- In addition to the four conditions already outlined, if data exhibits non-normality characteristics and more than 10 percent missing data is expected, than sample size should be increased.

Given the dataset and the design of this study, coupled with non-normality characteristics of the indicator variables, and applying all the recommendations above, it was estimated that a sample size of 150 – 200 can be used to estimate the population parameters effectively.

5.7.1.1.4 Multivariate Distribution:

Multivariate distribution of manifest and latent variables plays a crucial role in the design of an empirically valid study employing SEM data analyses techniques. Hair et al. (2006 p.740) and Silvia et al. (1988) recommend 15 respondents for each parameter to be estimated in a SEM model when normality is violated. This implies that for the research model outlined in Fig.4.2, which is made up of 16 indicator variables, a sample size of 240 respondents is required should all of the variables fail normality tests. Running a normality test on the indicators using SPSS 17 software, indicated that six of them violated multivariate normality. This study employs a sample size of 210, which falls within the recommended range given that only 37.5 percent of variables violate multivariate normality.

5.7.1.1.5 Estimation Technique:

Estimation technique refers to the mathematical algorithm which is the foundation on which SEM programmes estimate population parameters. Most SEM programmes use Maximum Likelihood Estimation (MLE) technique as a default. This is because MLE is 'more efficient and unbiased when assumption of multivariate normality is met', and it also has the ability to produce valid results at sample sizes as small as 50, although 100 to 150 is recommended with a maximum of 400 (Hair et al., 2006 p 741). MLE has grown in popularity within research communities at the expense of an earlier much more widely used estimation technique called the Ordinary Least Square (OLS) regression technique, which is more prone to biases due to its strictness on normality requirements (Hair et al., 2006) compared to MLE. At sample sizes greater than 400, 'MLE becomes more sensitive and almost any difference is detected, making goodness-of-fit to suggest poor fit' (Quinones and Ford, 1995).

Weighted Least Squares (WLS), Generalised Least Squares (GLS) and Asymptotical Distribution Free (ADF) are other estimation techniques that have been developed to counter MLE's 'potential sensitivity…to non-normality' (Hair et al., p743). Hair et al. (2006) also note that, although ADF is insensitive to non-normality of data, it requires larger samples. Unweighted Least Squares (ULS) is also another estimator used by SEM programmes. ULS has the advantage of robustness in estimating all parameters at the same time and consequently, takes less time and disc space to run estimates. However it has a major setback in that it is a scale-dependent estimator. This means that all the variables have to be of the same scale before parameters can be estimated. Because most SEM analyses tend to employ data from different sources with different

scales (one of the main selling-points of SEM), and because ULS cannot properly handle multiple scaling, this limits the popularity of the estimator.

In this study the sample is fairly normally distributed with a respondent base of 210, which suggests that MLE is the preferred choice. MLE is *interactive,* which means that after an initial solution is derived, the software keeps making attempts to improve on the model estimates by performing other cycles of calculations (Kline, 2005), making it a preferred and powerful estimator. Hoyle (2000) also recommends MLE as the preferred estimation techniques except in very extreme situations. Scaling is not particularly an issue for MLE, as it is for other techniques. Although GLS and MLE are both scale-independent, which implies that if the scale of one or more observed variables is transformed, the untransformed and transformed variables will yield estimates that are properly related, that is, that differ by the transformation, GLS requires a larger sample than this study can handle for the same parameters. This makes MLE the better choice. A ULS estimator is scale-dependent, and because this study employs data from different sources based on different scales, ULS may not be a good technique. This implies that MLE is suitable for the analysis of the research model delineated in Chapter Four (Fig. 4.2), and was therefore chosen as the estimation technique.

5.7.1.1.6 Model complexity:

The more complex the model, the larger the sample size required to estimate the model. If a model has five or fewer constructs with each construct having three or more indicators, it could be conveniently estimated with a sample size of 100-150 (Hair et al., 2006 p744). The proposed model of Fig.4.2 has four constructs with each

having at least three indicators. It can thus be estimated using a sample size of 100-150, provided the communality condition (average error variance of indicators) in the next point below is met. Also, Tabachnick and Fidell (2007) recommends a minimum of ten times the number of indicators. The proposed model has 16 indicators, literally requiring a minimum sample of 160, and employs a sample size of 210, which is acceptable.

5.7.1.1.7 *Average error variance of indicators:*

The impact of average error variance of indicators on sample size is defined in terms of communality. Hair et al. (2006 p 741) define communality as 'the average amount of variation among the measures/indicator variables explained by the measurement model'. Models with communalities greater than or equal to .5 or with standardised loadings greater than or equal to .7 will require the recommended optimal sample size (100-200). If the communality or standardised loading figures fall below these recommended values, then larger sample sizes will be required. A communality test was conducted during the *measurement model test* and is presented in Fig.6.1, in Chapter Six. Four out of the sixteen standardised loadings were equal to or higher than the recommended values, which implies that a sample size of between 150 and 200 is acceptable for the study. The study employs a sample size of 210, which is within the normal range.

*5.7.1.1.8 Model Identification**:***

Identification is the condition whereby, the proposed model has enough information to identify a solution for the hypothesised relations or set of structural equations. If a model does not have enough information, it cannot be identified. A proposed model

can be *under-identified*, *just-identified* or *over-identified*. An under-identified model has 'more parameters to be estimated than there are item variance and covariances, while a model with just enough variances and covariances to estimate the parameters is just-identified. Just-identified models cannot test any hypothesis. When a model has more variances and covariances than the parameters to be estimated, then it is over-identified. Over-identification is the preferred condition, and to ensure that the proposed model was identified, the *three indicator rule* proposed by Blunch (2008) was respected:

- Every factor has at least three indicators
- No manifest variable is an indicator for more than one factor.
- The error terms are not correlated.
- The covariance matrix for the latent variables does not contain zeros.

However, meeting the *three indicator rule* condition is not sufficient to ensure identification. The *order condition* should also be met. The order condition imposes that 'the number of free parameters to be estimated must be less than or equal to the number of distinct values in the proposed matrix known as matrix ***S*** (Schumacker and Lomax, 2004 p.64). The number of distinct values (covariances) in the matrix ***S*** is given by:

$$[p\,(p+1)/2] \quad \textit{where } p = \textit{number of observed variables.}$$

The number of free parameters to be estimated should never be greater than the number of distinct values (Schumacker and Lomax, 2004; Kline, 2005). In other words, the difference between the number of distinct values and parameters to be

estimated, which is known the *degrees of freedom* (*df*), must be positive. In the proposed model:

- the number of distinct moments: $\boldsymbol{(N_{dm}) = 16(16+1)/2 = 136}$
- The number of free parameters to be estimated: $\boldsymbol{(N_{fp}) = 38}$
- $N_{dm} \geq N_{fp}$, $\boldsymbol{N_{dm} - N_{fp} = 98\ df,}$ (implies the condition is supported)

Another condition for identification is the *Rank Condition* (Bollen, 1989; Jöreskog and Sörbom, 1981). Rank Condition refers to 'the requirement that each individual parameter estimated be uniquely, algebraically defined' (Hair et al., 2006 p 772). Put simply, no two equations should be mathematical duplicates. The proposed model obeys the rank order condition.

Also important in identification is the condition that all latent constructs must be scaled. Scaling in AMOS is undertaken by attributing the value **1,** to one of each set of indicator variables linking a construct in a process known as *Unit Loading Identification (ULI) Constraint*. The unstandardised coefficient terms for all the error terms are also set to unity.

Finally, to ensure identification, the proposed structural model should be *recursive*. Recursiveness refers to the condition where all of the structural relationships are *unidirectional*. This means that two latent variables are not reciprocally related and the disturbance terms are uncorrelated (ζ_1 and ζ_2 are not correlated). The proposed model submits to this condition.

5.7.1.1.9 Computer Programs:

The choice of which computer program to use for the analysis is also an important issue in SEM. The main software packages for SEM analysis include LISREL (LInear Structural RElationships), EQS (Abbreviation for Equations), AMOS (Analysis of MOment Structures), and CALIS (Covariance Analysis and Linear Structural Equations) which is available on SAS. In this study, AMOS was used for Study A1 due to its availability with the SPSS package which was used for data input, and also due to its user-friendliness. Its advanced imputation techniques and graphic interface also made AMOS the software of choice for the study.

5.8 Retrospective Scenario Based Analysis:

Data was extracted from the mobile activity logs of respondents such that at least one working week (7 days) worth of data was collected from each respondent's phone in four of the following five quarters: Q3 2007, Q4 2007, Q1, 2008, Q2, 2008, Q3 2008. Once the data was extracted from the phone, respondents were asked to identify business related calls which were then entered into the corresponding column in Table 5.3. The respondents were then asked to reflect on the pre-mobile era, to explain how they would have gone about the same transaction. If for example the respondent would have driven his car to meet his correspondent, then the distance which would have been covered and time taken are entered into the table. At the end of the study, total time and distance saved through the use of mobiles phone were calculated for every respondent over a working week and reported. The total time and distance for all 210 respondents who took part in the one-year-long study, was calculated and reported.

5.9 Visual Data Analysis

Six of fourteen photos taken during the field trip were analysed in terms of phone use and business impact. The respondents involved in the photographs were interviewed (unstructured interviewing) to ascertain their perception of the impact of mobile phones on the performance of their businesses. The interviews were then transcribed and the findings reported. The particular technique used to analyse the photos is called Latent Content Analysis, whereby items about the photo are related to the thesis of this study, the impact of mobile telephony services on enhanced business performance.

5.10 Strengths and Weaknesses of the Proposed Paradigm.

- Weaknesses:

Data for the independent and dependent variables were collected from the same informants. The weakness in this technique is that it is prone to common method bias, which is one main source of measurement error. Common method bias may lead to inflated estimates of the relationships between the variables due to the inclusion of *method variance*[16] in the actual variance (Podsakoff and Organ, 1986; Podsakoff et al., 2003). Some causes of method bias are Consistency Effect[17], Social Desirability[18], Transient Mood State[19], among others. Some method variance effects and possible

[16] *Method variance* refers to variance that is attributable to the measurement method rather than to the constructs the measures represents.

[17] *Consistency effect* refers to the tendency of respondents to try to maintain consistency in their responses to similar questions or to organize information in consistent ways (Johns, 1994; Podsakoff & Organ, 1986; Schmitt, 1994)

[18] *Social desirability* "refers to the need for social approval and acceptance and the belief that it can be attained by means of culturally acceptable and appropriate behaviors" (Crowne and Marlowe (1964, p. 109). It is generally viewed as the tendency on the part of individuals to present themselves in a favourable light, regardless of their true feelings about an issue or topic (Podsakoff et al., 2003)

[19] *Transient mood state* refers to positive and negative affectivity of respondent characteristics that may influence their responses to questionnaires. They could be produced from events like, interaction with a disgruntled customer, receiving a compliment from a co-worker or boss, receiving word of a promotion, death of a close friend or family member, a bad day at the office, among others.

solutions adopted from Podsakoff et al. (2003) are outlined in Appendix B: Fig. AB1. The negative impact of using the same self-reports from the same cross-sectional survey in both the dependent and independent variables is further supported by Davidsson (2004 p.130), who argues that, in such situations, there is no safeguard against response style or social desirability being the true source of correlations.

While it very difficult to eliminate method bias and method variance completely in a survey-based cross-sectional study, safeguards were, built into the questionnaire by using multiple method factors, which involved the varying of response types and scale, and by counterbalancing question orders which according Podsakoff et al. (2003) can be very useful in eliminating their negative effects.

The study is cross-national and employs four different languages (English, French, Dari and Pashto). This raises some issues with regards to the validity of the survey instrument across the different language groups. Variability could be introduced into the instrument in the course of translating it from English to the other three languages, French, Dari and Pashto. This problem was dealt with by testing for inter-language variability using data from four language-based samples during the pilot phase of the study. A first set of data were collected from the language-based samples, and analysed for archetypal relationship among respondents rather than among variables - Q-analysis[20]. Questions that were found to cause high variability were re-visited and discussed with the help of professional translators, and re-worded. The new instrument was then piloted and Q-analysed. Language-based variability improved from +3 to +2.

[20] Q-methodology allows for easy comparisons across multiple individuals

The inability to constitute a truly random sample for the study, as discussed in Section 5.5.3, introduces elements of bias in the findings which limits the generalisability of the findings. The use of local business environment data also raises generalisability concerns.

- **Strengths:**

The study combines the strengths of two common research strategies, quantitative and qualitative research enabling a more holistic view of the nature of the relationships hypothesized in the study. While the quantitative strategy helped to simplify the data and show the patterns of the relationships, the qualitative method provided explanatory power for the observed patterns in the relationships. This technique, known as triangulation has been widely acclaimed by researchers (Kumar, 2005, Creswell, 2003). Triangulation strengthens the validity of a research project by allowing the benefits of the different methods to be reinforced whilst the weaknesses are somehow contained.

Face-to-face data collection techniques are often associated with higher cost and complexity than phone or internet based techniques (Creswell, 2003). However, collecting data face-to-face is advantageous in terms of achieving high response rates, and is less prone to missing data complications inherent in postal or internet questionnaire survey where, at times, it is unclear whether respondents lacked the ideas asked of them or the data was simply missing. By employing interactive techniques through face-to-face interviews, a clearer picture of missing data can be established.

5.11 Conclusion.

In this chapter, the methodology of the study was outlined. The study was split into three sub-studies, Studies A1, A2 and B, in order to triangulate the findings in a bid to obtain a more holistic view of the impact of mobile telephony services. In the penultimate section of the chapter, critical SEM design issues for an empirically valid study were considered. In the next Chapter (Chapter Six), the models are tested and the test results presented.

CHAPTER SIX: DATA DESCRIPTION, MODEL TESTING AND MODEL VALIDATION

6 Introduction

In Chapter Three, the ontological and epistemological perspectives of the study were presented as part of the research paradigm. In Chapter Four, the conceptual and research models which were crafted from the theoretical framework were delineated. In Chapter Five, the methodological perspective was presented to complete the paradigmatic framework of the study. In presenting the methodology, the techniques employed to collect the data as well as the techniques for their analyses were outlined. Central to the methodology was the adoption of structural equation modelling (SEM) techniques to analyse cross-sectional data collected from face-to-face interviews with respondents across four Cameroonian and four Afghan towns. Also, data related to mobile phone-based business transactions were extracted from the mobile phone activity-log of micro-business owner-managers and analysed using a retrospective scenario-based analysis. Visual data which were collected during the field research were also analysed in order to provide additional meaning to the outcome of the study.

In this chapter, the hypothesised research models are tested and validated. In particular, the *measurement* and the *structural* models are tested including the research hypothesis, in order to predict and explain the set of endogenous constructs represented in the research model (Fig.4.2). The research questions are addressed by establishing the structural relationships hypothesised between the constructs, with the aim of achieving the research objectives set forth in Chapter One. Results from

Studies A1, A2 and B which were outlined in the last Chapter are presented throughout this Chapter.

6.1 Study A1 – SEM Analysis of Cross-Sectional Data: Model Estimation

In this section, cross-sectional survey data collected from 210 respondents in Afghanistan and Cameroon are used to estimate the population parameters which were hypothesised in the research model (Fig. 4.2), in order to compare theory to reality as represented by the data. The model parameters are estimated in a *Two-step process* whereby confirmatory factor analysis (CFA) is first used to assess the measurement model fit and the construct validity, followed by an assessment of the strength and significance of the structural relationship by testing the structural model. The tests are carried out using the AMOS 17 software statistical package.

The basic principle behind model estimation in structural equation modelling is to compare every element (parameters) of the estimated covariance matrix ($\boldsymbol{\Sigma}_k$) obtained from AMOS output with the original input covariance matrix ($\boldsymbol{S}$), which is composed of observed variances and covariances for each of the measured variables. The main goal of SEM estimation is to obtain estimates for each of the parameters specified in the model that produce $\boldsymbol{\Sigma}_k$, such that the parameter values yield a matrix as close as possible to $\boldsymbol{S}$ (Fornell and Larcker, 1981; Schumacker and Lomax, 2004; Hair et al., 2006; Blunch, 2008). Maximum Likelihood Estimation (MLE) techniques, as explained in Chapter Five, were preferred over other estimators because of their ability to use interaction to minimise the difference between $\boldsymbol{\Sigma}_k$ and $\boldsymbol{S}$, and their ability to use smaller sample sizes. A measure of the difference between $\boldsymbol{\Sigma}_k$ and $\boldsymbol{S}$ is called the Chi-Square statistics (χ^2). If [$\boldsymbol{S} - \boldsymbol{\Sigma}_k = 0$], ($\chi^2$) = 0, this implies a perfect

model fit to the data. The variation between χ^2 and zero is indicative of the differences between $\boldsymbol{S}$ and $\boldsymbol{\Sigma}_k$, and the strength of the hypothesised relationships.

6.1.1 Testing the Measurement Model (Validity and Reliability):

In Chapter Five, Section 5.7.2, the overall design assumptions needed for a proposed model to produce empirical results were examined and included in the design of the study. In particular, issues related to model specification such as the type of data being analysed, the handling of missing data, sampling size and model complexity, choice of software and model identification, were discussed at length. In this Sub-Section, the model parameters are estimated and used to determine how well the data fit the model, which gives an indication of how well the theoretical model is supported by the data.

Measurement model testing involves a global-type omnibus test of the entire model's fit, whereby each of the constructs is allowed to covary with all the others. Measurement model testing provides evidence on the validity of the measurement variables in relation to their individual constructs based on the model's overall fit. Measurement theory tests provide the starting point from which to assess how the constructs in the research model are related. Fig.6.1 indicates the chi-square statistics and its associated degrees of freedom, the item loadings (λ), and inter-construct relationships (γ,β,φ) produced by AMOS, which are used to assess the model fit and construct validity. All estimated parameters are inspected based on certain SEM guidelines which are discussed below in Sub-section 6.1.1.1

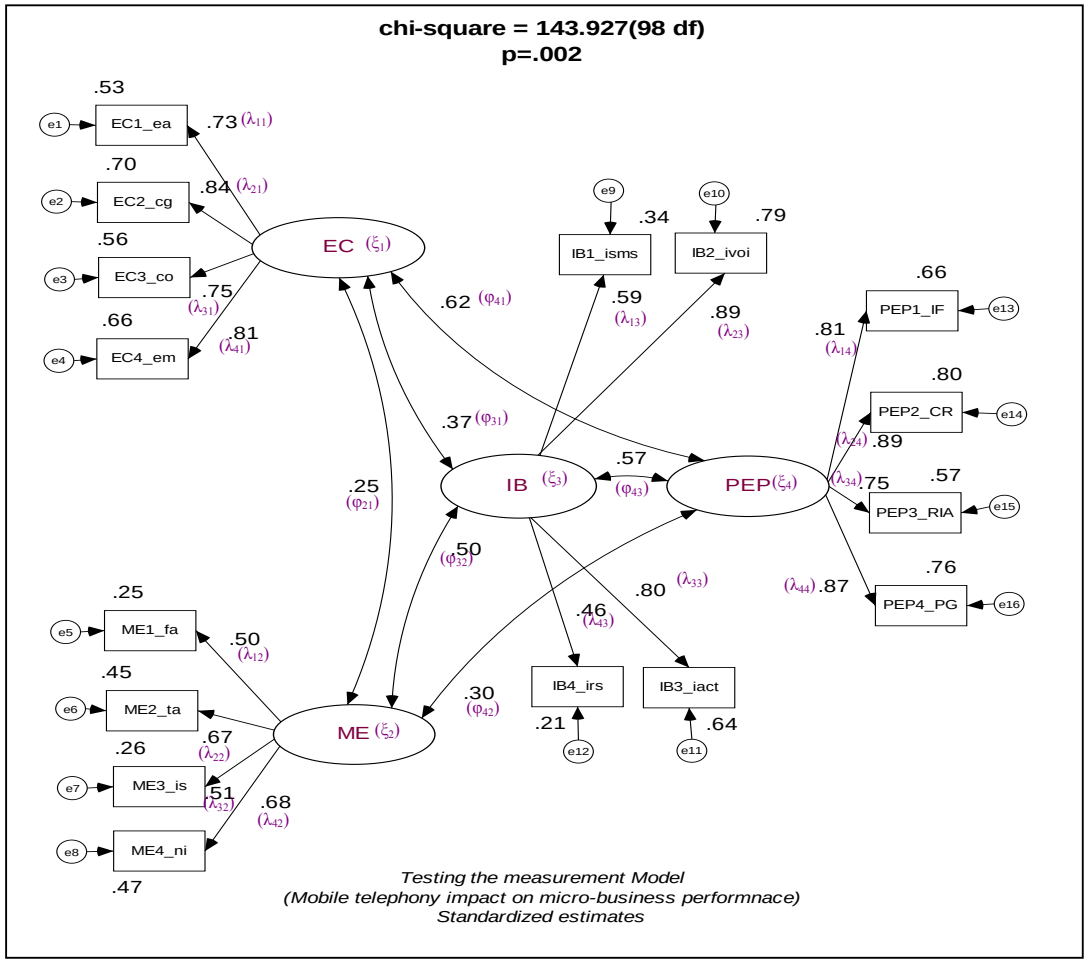

Fig. 6.1: *Testing the Measurement Model (N=210)*

6.1.1.1 Model Fit

The rationale of this sub-section is to establish whether the variables used to represent the latent constructs are reliable indicators of the construct, and also to establish how well collectively the indicators reflect the unobservable constructs. There are about a dozen fit indices, and the choice of which one to report depends on requirements which vary across academic journals and other publications.

However, it is recommended that for every research project, the value of the chi-square statistics (χ^2), which is the main statistical measure used to compare the observed and estimated covariance matrices, and the ratio of the chi-square statistics compared to the degrees of freedom of the proposed model, (χ^2/df) represented in AMOS as *(CMIN/DF,)* be reported at all times (Hair et al., 2006; Kline, 2005).

A Fit-Index can either be classified under the *Goodness-of-Fit Indices* such as GFI, CFI, NFI and TLI, or under another group known as *Badness-of-fit Indices,* represented by RMSEA and RMSR. It is also recommended (Hair et al., 2006; Kline, 2005) that at least one from each group be reported in a research project. Generally, the Chi-square goodness-of-fit statistics ($\chi^2 GOF$), the Root Mean Square Error of Approximation *(RMSEA),* and the Comparative Fit Index *(CFI)* are reported by about 95 percent of all SEM-related publications.

6.1.1.1.1 *Chi-square Goodness-Of-Fit Statistics (χ^2GOF))*

This is the fundamental measure that is used in structural equation modelling to provide a quantitative difference between the observed and estimated covariance matrices. The SEM null hypothesis is that $\boldsymbol{\chi^2 = 0}$, which implies a perfect fit between the covariance matrices.

Ho**: $\boldsymbol{\chi^2 = 0}$ or [S - $\boldsymbol{\Sigma_k = 0}$]**

Ha: **$\boldsymbol{\chi^2 \neq 0}$ or [S - $\boldsymbol{\Sigma_k \neq 0}$]**

The ideal situation in SEM analysis is to be able to accept the null hypothesis. This is because by accepting the null hypothesis, it would imply that the proposed model perfectly fits the data, which is the ultimate goal of a research project. This implies

that if the value of $\chi^2 \neq 0$, then the null hypothesis is rejected. In this study, the value of $\chi^2 = 143.927 \neq 0$, which implies that the proposed model does not fit the data perfectly, prompting the rejection of the null hypothesis.

The χ^2 GOF value is highly dependent on sample size (N). As the sample size increases, χ^2 GOF also increases even if the differences between S and Σ_k are identical which makes it not a perfect measure of the model fit. From the value of χ^2, it is possible to calculate the probability that any observed sample and the estimated matrix Σ_k are equal in a given population (Hair et al., 2006). The probability value is called the p-value, which is computed at the same time as χ^2 in AMOS. In SEM analysis, high p-values are recommended in comparison to other multivariate techniques: typically, the p-value should be greater than or equal to .05 (Hair et al., 2006), i.e. p-value should be non-significant in the language of other multivariate techniques such as regression. Put simply, greater p-values indicate better model fit than smaller ones. The p-value for the proposed model is 0.02, which indicates a poor fit.

For the proposed Model:

$\chi^2 = 143.927$ (98 *df*), p = .002

This indicates a fairly acceptable fit.

The shortcomings of the χ^2 statistics as fit indicator, lead to the development of other fit indices which have to be considered before a final decision is made as to whether the model has fitted the data adequately or not. Below, some of these fit indices are considered.

6.1.1.1.2 The Normed Chi-square (CMIN):

The sample size effect on the value of χ^2 GOF implies that it cannot be used singly to determine a model's fit. Among the many fit indices that have been developed to help in determining model fit is the Normed Chi-square Index (NCI), which is the value of $\chi 2$ divided by the degrees of freedom of the model under consideration. The NCI is produced in AMOS as CMIN/DF.

CMIN

Model	NPAR	CMIN	DF	P	**CMIN/DF**
Default model	38	143.927	98	.002	**1.469**
Saturated model	136	.000	0		
Independence model	16	1375.083	120	.000	11.459

- ✓ **CMIN/DF = 1.469**: This value is acceptable. Hair et al, (2006) recommends that CMIN/DF values less than or equal to 2.0, and Bollen (1989) recommends that CMIN/DF values of 2.0, or even as high as 5.0, can be considered as indicating reasonable fit.

6.1.1.1.3 *The Root Mean Square Error of Approximation (RMSEA):*

The RMSEA measures the error of approximation. It is a reflection of the degree to which the proposed research model fails to fit the population covariance matrix. It assumes that the population fit of the proposed model is not perfect, which implies that it approximates a non-central chi-square distribution, which does not require a true null hypothesis like the Chi-square statistics. It is often referred to as a "badness-of-fit" index because a value of 0 indicates the best fit while higher values indicate

worse fit. According to rules of thumb by Browne and Cudeck (1993, [cited in Kline, 2005]), RMSEA ≤ .05 indicates a close approximate fit, .05<RMSEA < .08 suggests an error of approximation, and RMSEA ≥ .10 is suggestive of a poor fit. RMSEA has two null hypotheses based on the lower and upper bounds of the population parameter:

Ho1: LO 90 ≤ .05 [Implies good or close fit to the population], and should not be rejected.

Ho2: HI 90 ≥ .10 [Implies fit is as *bad-as-worse*], and should be rejected

If the lower bound of a 90% confidence interval of the population parameter (***LO 90***) estimated by RMSEA is less than .05, the proposed model has close approximate fit to the population. If the upper bound of 90% confidence interval (***HI 90***) estimated is greater than .01, then the proposed model is a poor fit. Any values between the acceptance and rejection intervals indicate sampling errors which may be linked to sample size. This test is also known as the *statistical power test* which provides the probability that an incorrect model will be rejected.

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	**.052**	.032	.069	.420
Independence model	.244	.233	.256	.000

- ✓ **Ho1: LO 90 = .03, which is less than .05.** This implies proposed model has a close approximate fit to the population. Ho1 is not rejected.
- ✓ **Ho2: HI 90 = .06, which is not greater than .10.** This implies the fit is not as bad-as-worse. Ho 2 is rejected.
- ✓ **RMSEA = .052, which to one decimal place is .05.** This is the recommended cut off point by Browne and Cudeck (1993). Hair et al. (2005 p753) recommends values of up to .8 for sample sizes less than 250. The sample size for this study is 210.

6.1.1.1.4 *GFI, AGFI and PGFI*

The *Goodness-of-Fit Index* **(GFI)** and *Adjusted Goodness-of-Fit Index* **(AGFI)** are based on the ratio of the sum of the squared differences between the observed matrix **(*S*)** and the estimated matrix **($\sum_K$).** GFI measures the amount of variance and covariance in ***S*** that is predicted by $\sum_K$ (Schumacker and Lomax, 2004). A GFI value of **.9** or higher is recommended (Hair et al., 2006). The Adjusted Goodness-of-Fit Index (AGFI) is adjusted for the degrees of freedom of a model relative to the number of variables (Schumacker and Lomax, 2004).

$$\boldsymbol{AGFI = 1 - [\left(\frac{k}{df}\right)(1 - GFI)]},$$ where k is the number of unique distinct values if S.

GFI, AGFI

Model	RMR	GFI	AGFI	PGFI
Default model	.127	**.907**	.871	.653
Saturated model	.000	1.000		
Independence model	.794	.362	.277	.319

Moderate Goodness-of-fit index (GFI) = .90 (recommended value ≥.9; Hair et al, 2006)

The proposed model has a:

- ✓ **GFI of .907**. This implies that the S matrix reproduces up to 90.7% of the $\sum_K$ matrix.
- ✓ **AGFI = .871**. Produced by AMOS indicates an acceptable fit.

6.1.1.1.5 Root-Mean-Square Residual Index (RMR):

This uses the square root of the mean-squared differences between corresponding elements (the residual of the error terms in predicting covariance terms) in S and $\sum_K$ matrices to compare the fit of the two models of the same data (Schumacker and Lomax, 2004). Lower RMR values indicate good fit while higher values indicate poor fit (Hair et al., 2006). RMR is usually known as *badness-of-fit*.

For the proposed model:

- ✓ **RMR= .127** computed by AMOS.

RMR values of .10 or lower are generally considered favourable (Kline, 2005 p.141). The output value of .127 is within range.

6.1.1.1.6 PGFI (Parsimonious Goodness-of-Fit Index):

The PGFI is also another fit index normally reported in research. It takes into account the number of degrees of freedom used to obtain a given level of fit.

For the proposed model:

✓ **PGFI = .871.** This indicates a good fit.

A PGFI index close to .9 or higher but lower than the GFI value is considered acceptable (Hair et al., 2006)

6.1.1.1.7 Normed Fit Index (NFI) and Comparative Fit Index (CFI):

These are baseline comparative fit indices. NFI is a measure which rescales the chi-square statistics (χ^2) into a 0 (no fit) to 1 (perfect fit) range (Bentler and Bonette, 1980, [cited in Schumacker and Lomax, 2004]).

CFI

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.895	.872	.964	.955	**.963**
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

Robust CFI = .96 (recommended value ≥.9; Hair et al, 2006)

For the proposed model:

✓ **CFI = .96.** This is quite robust, indicating good fit.

A CFI of .9 or higher is acceptable (Hair et al., 2006).

Importantly, from the different fit indices we can conclude that the proposed measurement model provides a reasonably good fit pending further tests related to construct validity, discriminant validity, nomological validity and face validity, which are conducted in the next Sub-section.

6.1.1.2 Construct Validity (CV):

CV indicates the extent to which a set of indicators or manifest variables actually reflect the prevalence of the theoretical construct or phenomenon which they are representing. Construct validity is made up of four components:

- Convergent validity, which is made up of three measures:
    - Factor loadings (λ)
    - Variance extracted (VE)
    - Reliability (ρ)
- Discriminant validity
- Nomological validity
- Face Validity

6.1.1.2.1 *Convergent Validity*

This is the extent to which indicators of a particular construct "converge" or share a proportion of variance in common (Hair et al., 2003). The test for convergent validity requires three main measures: factor loadings (λ), Variance Extracted (VE) and Reliability (ρ). According to (Hair et al., 2003), convergent validity is supported when:

- Individual Item reliability or Standardised Loading estimates are .5 or higher (ideally .7) for face validity to be supported.
- Variance extracted is .5 or higher
- Variance extracted estimates are greater than the square of the correlation between that factor and other factors to provide evidence of discriminant validity.

- Reliability is .7 or higher to indicate adequate convergence or internal consistency.

Table 6.1 indicates the factor loadings (λ) produced by AMOS, including values calculated for Item Reliability, Variance Extracted, and Construct Validity. These values are the bases for estimating Convergent Validity.

	EC (λ)	ME(λ)	IB(λ)	PEP(λ)	Item reliabilities (λ^2)	$\Sigma\lambda^2$	delta = ($1-\lambda^2$)
EC1_ea	.73				.518		.48
EC2_cg	.84				.705		.29
EC3_co	.75				.562		.43
EC4_cm	.81				.672	2.457	.33
ME1_fa		.50			.250		.74
ME2_ta		.67			.448		.55
ME3_ls		.51			.250		.74
ME4_ce		.68			.476	1.424	.52
IB1_isms			.59		.348		.65
IB2_ivoi			.89		.792		.21
IB3_iact			.80		.640		.36
IB4_irs			.46		.211	1.991	.78
PEP1_IF				.81	.676		.34
PEP2_CR				.89	.792		.20
PEP3_RIA				.75	.562		.44
PEP4_PG				.87	.757	2.787	.24
Variance Extracted	**61.42%**	**35.60%**	**49.77%**	**69.67%**			
Construct Reliability(ρ)	**.69**	**.70**	**.79**				

Table 6.1: *Standardised Factor Loadings (λ), Variance Extracted, and Reliability Estimates*

- *Individual Item/Indicator Reliability*: All the *correlation loadings (λs)* for reflective latent variable indicators should be significant ($\lambda \geq .5$) for face validity to be met. All items exhibited high loadings, with the lowest being .46 for *IB4_irs,* which can be approximated to .5 (Table 6.1). After bootstrapping, all the indicators still loaded significantly and were consequently retained for further analysis.

- *Variance Extracted (VE)*:

This represents a summary measure of convergence among a set of indicator or manifest variables representing a latent construct. It is the average percentage of variation explained among the items (Hair et al., 2005 p.773). The variance extracted was calculated using the formula below and then recorded in Table 6.1.

$$\textbf{Variance Extracted (VE)} = \frac{\sum_{i=1}^{n} \lambda_i^2}{n}$$

Using the variance extracted figures shown in Table 6.1, it is evident that all the indicator variables *converge moderately.* Convergence among indicator variables implies that the indicators are effectively measuring the same phenomenon. Hair et al. (2005), recommend that VE figures should be **50 percent** or higher. Although $\boldsymbol{VE}_{ME}$ is barely 35.6 percent, $\boldsymbol{VE}_{IB}$ is just at the edge, 49.77 percent, while $\boldsymbol{VE}_{EC}$ and $\boldsymbol{VE}_{PEP}$ are 61.42 percent and 69.67 percent respectively. The combination indicates a moderately acceptable convergence.

- *Construct Reliability (ρ):* This is a measure of the reliability and internal consistency of the measured indicators representing a construct (Hair et al. 2006 p 771). For path analysis, Werts et al., (1974) recommend the use of internal consistency also called composite reliability, as a better measure compared to the Cronbach's alpha.

$$Reliability\ (\boldsymbol{\rho}) = \frac{(\sum_{i=1}^{n} \lambda)^2}{\left(\sum_{i=1}^{n} \lambda\right)^2 + \left(\sum_{i=1}^{n} \delta_i\right)}$$

$\delta = (1-\lambda^2)$ which is the measurement error

Applying the formula, the reliability measures were obtained and recorded in Table 6.1. The results show that the set of indicators are all stable and are reliable measures of their individual constructs except for *IB4_irs,* which is off the minimum target of .5 by.04 units. Hair et al. (2006) recommend ρ≥ .7. All the measured values are within the range and consequently, construct reliability for the proposed model is validated.

Taken together, the evidence provides initial support for the convergent validity of the measurement model, although one of the constructs (ME) failed the test on VE (35.6%). All Standardised loadings estimates are above .5 except one (IB4_irs). Many, in fact, exceed the .7 target. Also, more importantly, construct reliability (ρ) values are greater than .7 (ρ_{EC} = .69 nearly .7). In addition, the model fits relatively well based on the GOF measures. As such, adequate evidence of convergent validity has been provided, and all indicator variables are retained for discriminant, nomological and face validity tests.

6.1.1.2.2 *Discriminant Validity:*

This measures the extent to which a construct is truly distinct from other constructs (Hair et al., 2006). To assess discriminant validity, the inter-construct correlations (IC) produced by AMOS represented in Table 6.2 below are used. For discriminant validity to be supported, the Square of the Inter-construct Correlations (SICs) should

be smaller than the corresponding Variance Extracted (VE) estimates (Table 6.3), which implies that the indicator variables have more in common with the construct they are associated with than they do with other constructs in the model. Also, discriminant validity requires that the proposed model should be *congeneric*[21].

			Estimate (IC)
IB	<-->	PEP	.566
ME	<-->	PEP	.296
EC	<-->	PEP	.623
ME	<-->	IB	.502
ME	<-->	EC	.249
EC	<-->	IB	.374

Table 6.2: *Inter-construct Correlations (SIC) AMOS output*

Variance extracted	EC	ME	IB	PEP
EC	**.614**			
ME	$(.249)^2 = .062$	**.35**		
IB	$(.374)^2 = .139$	$(.502)^2 = .252$	**.50**	
PEP	$(.623)^2 = .388$	$(.296)^2 = .087$	$(.566)^2 = .320$	**.69**

Table 6.3: *Convergent Validity - Variance Extracted*

The estimates in Table 6.3 show that all the *average variances extracted* which are located on the diagonal are greater than the corresponding squared inter-construct correlation estimates (SIC) located below them. Fig. 6.1 also shows that the model is congeneric. Since both requirements for discriminant validity are supported, the proposed model is 'discriminantly' valid.

6.1.1.2.3 *Nomological Validity:*

The condition for nomological validity is that the correlation estimates between the constructs represented by (φ) in the measurement model (Fig.6.1) should be positively

[21] *A congeneric model* is one in which there are no cross-loadings either among measured variables or among the error terms.

related and make sense (Hair et al, 2003). Also, the covariances between the constructs should be significant (Hair et al., 2006). From Fig. 6.1 and Table 6.6, it is evident that all the correlation estimates are positive and make theoretical sense. Their theoretical bases were discussed in Chapter Four. The covariances are significant at .05 level (Table 6.5), although two (ME→PEP and ME→EC) fell short of this condition. When taken together, nomological validity is supported.

Standardised covariance matrix			Estimate (φ)
ME	<-->	EC	.249
IB	<-->	PEP	.267
ME	<-->	PEP	.296
EC	<-->	PEP	. 262
EC	<-->	IB	.305
ME	<-->	IB	.311

Table 6.4: *Standardised Inter-Construct Correlation –AMOS Matrix Output*

			Estimate(φ)	S.E.	C.R.	P	Label
IB	<-->	PEP	.748	.156	4.806	***	par_13
ME	<-->	PEP	.162	.055	2.916	.004	par_14
EC	<-->	PEP	.624	.107	5.809	***	par_15
ME	<-->	IB	.558	.140	3.981	***	par_16
ME	<-->	EC	.210	.086	2.451	.014	par_17
EC	<-->	IB	.764	.209	3.657	***	par_18

Table 6.5: *Standardised Covariance - AMOS Matrix Output*

6.1.1.2.4 *Face Validity*

Face validity is supported when visual inspection indicates that all factor loadings are positive and above .5 in value. Also, inter-construct correlations should be in the hypothesised directions. These conditions are all fulfilled by the data and consequently, face validity is supported.

6.2 Modification of the measurement model:

In structural equation modelling, if the proposed model exhibits poor fit or poor validity, it has to be modified and retested until acceptable fit and validity are obtained. The proposed model, as has been shown above exhibits acceptably good fit and validity. However, before final conclusions are drawn on whether to modify the model or not, the standardised residual covariances matrix produced by AMOS is examined for values that are typically above $\left|4\right|$. Hair et al. (2006) recommend that if values higher than $\left|4\right|$ appear in the residual covariance matix, then model modification should be considered. Jöreskog et al. (1981), recommend that values in the matrix should typically not exceed $\left|2\right|$. Through an examination of the standardised residual covariances matrix produced by AMOS (Table 6.6) indicated $\left|1.8\right|$ as the highest standardised residual covariance, which represents the residual covariance between PEP2_CR and ME1_fa. This value ($\left|1.8\right|$) is well below the cut-off point

	IB2_ivoi	IB1_isms	PEP2_CR	PEP4_RIA	PEP3_ME	PEP1_IF	IB4_irs	IB3_iact	ME1_fa	ME2_ta	ME3_is	ME4_ce	EC1_ea	EC2_cg	EC3_co	EC4_em
IB2_ivoi	.000															
IB1_isms	-.058	.000														
PEP2_CR	-.344	-1.033	.000													
PEP4_RIA	-.050	-.759	-.076	.000												
PEP3_ME	-.097	-1.148	-.215	.429	.000											
PEP1_IF	.165	-.617	.387	-.329	-.262	.000										
IB4_irs	-.242	1.652	.736	.952	.822	.178	.000									
IB3_iact	.122	-.212	.256	.547	-.081	.837	-.695	.000								
ME1_fa	-.223	-.269	**-1.806**	-.047	.361	.027	.256	-1.531	.000							
ME2_ta	.014	1.476	-.033	.856	.124	-.662	.958	-.207	-.348	.000						
ME3_is	-.322	-.502	-.269	.778	.052	-.536	.415	-1.116	1.170	.201	.000					
ME4_ce	.205	1.300	.072	.956	-.562	-.262	.967	.213	.020	.028	-.533	.000				
EC1_ea	-.710	-.448	.564	.689	.386	.410	1.054	-.494	-.867	-1.718	.730	-1.215	.000			

Table 6.6: *Standardised Residual Covariance - AMOS Matrix Output (N=210)*

Modification Indices and Regression Weights (Group number 1 - Default model)

Covariance:			M.I.	Par Change
e9	<-->	PEP	4.098	-.230
e16	<-->	ME	5.525	.076
e13	<-->	e14	5.435	.054
e12	<-->	EC	4.310	.229
e12	<-->	e9	6.196	.585
e5	<-->	e14	**11.272**	-.099
e1	<-->	e7	6.660	.294
e1	<-->	e8	5.294	-.228
e2	<-->	e16	7.528	.151
e3	<-->	e10	6.885	.249
e4	<-->	e9	4.424	.380
e4	<-->	e7	7.843	-.205

Regression Weights:			M.I.	Par Change
IB1_isms	<---	IB4_irs	4.757	.265
PEP2_CR	<---	ME1_fa	**11.032**	-.153
PEP4_RIA	<---	ME	4.890	.167
PEP4_RIA	<---	EC2_cg	4.224	.046
IB4_irs	<---	EC	4.875	.189
IB4_irs	<---	EC2_cg	4.694	.111
IB4_irs	<---	EC4_em	6.628	.169
IB3_iact	<---	ME1_fa	4.032	-.232
EC1_ea	<---	ME	4.169	-.422
EC1_ea	<---	ME2_ta	4.518	-.205
EC1_ea	<---	ME4_ce	7.051	-.321

Table 6.7: *Modification Indices Regression Weights – AMOS Matrix Output*

The final test on the measurement was to examine the Modification Indices (M.I.) matrix. M.I. indicates the amount the overall chi-square value would be reduced by, should a path be added or deleted between matrix elements. An examination of the Covariance and Regression M.I. indices (Table 6.7), it is evident that if a covariance link is connected between e5 and e14, or a correlation between PEP2_CR and ME1_fa, the χ^2 value falls by approximately 11 points which should indicate a better fit. However, there is no theoretical justification for establishing these relationships, and moreover the model exhibits reasonably good fit overall. As such, the model was not modified.

The measurement model exhibited reasonably good fit and validity all round, and consequently there was no justification for modifying the proposed model. As such, all indicator variables and their constructs were retained in order to test the structural theory.

6.3 Testing the Structural Model

The key hypotheses for the study were evaluated with the help of AMOS 17 and SPSS 17 statistical packages. The dataset contained responses from 210 micro-business owners-managers across Afghanistan (103) and Cameroon (107). Fig.6.2 represents the output of the estimated model.

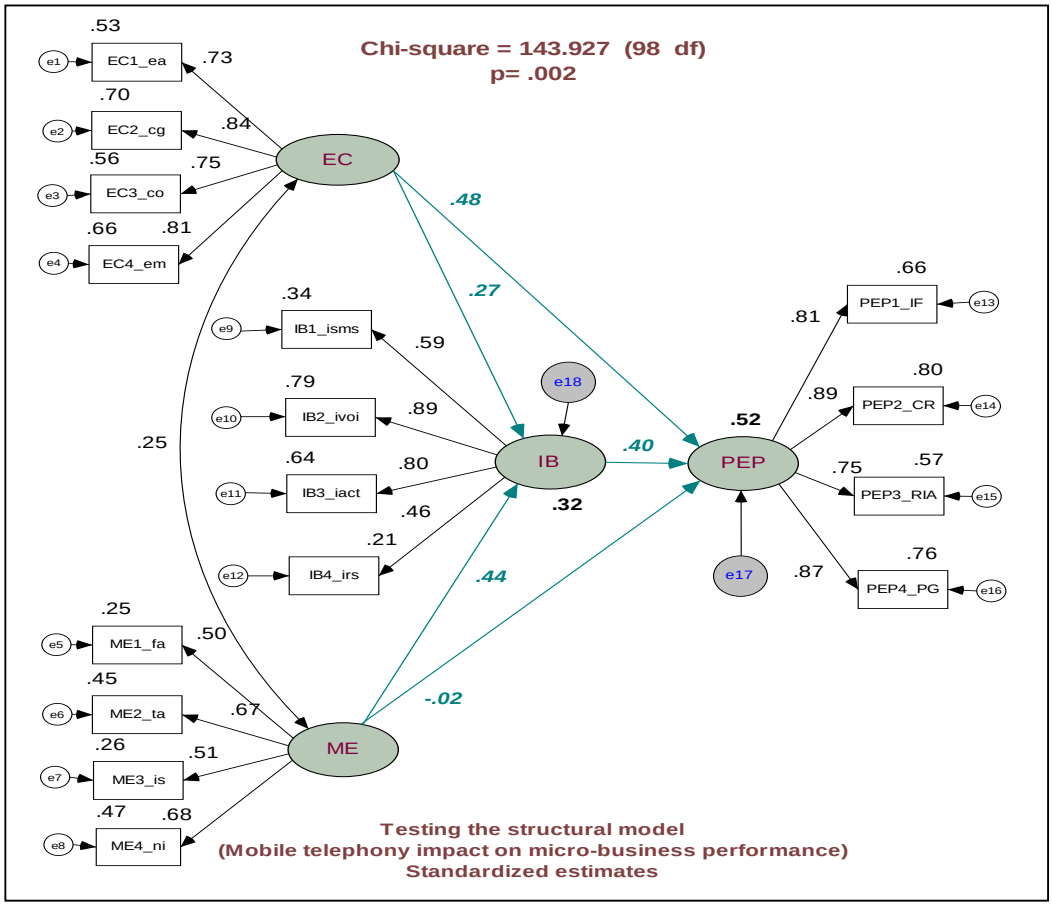

Fig.6.2: *Testing the Structural Relationships (N=210)*

6.3.1 Assessing Structural Model Validity:

There are two main activities needed when assessing the structural model (Hair et al., 2003):

- The Goodness-Of-Fit (GOF) of the structural model is examined,
- The significance, direction, and size of the structural parameter estimates are evaluated.

6.3.1.1 Examining GOF:

GOF values for the structural model are the same as for the measurement model. As such, the model test was validated. GOF for the structural model has an acceptably good fit.

6.3.1.2 Evaluating the significance, direction, and size of the structural parameter estimates:

Maximum Likelihood Estimates Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
IB	<---	**EC**	.351	.116	3.013	.003	par_7
IB	<---	**ME**	1.056	.272	3.881	***	par_13
PEP	<---	**IB**	.195	.048	4.049	***	par_8
PEP	<---	EC	.310	.052	5.987	***	par_9
PEP	<---	ME	-.027	.106	-.256	.798	par_14
ME3_is	<---	ME	.789	.153	5.153	***	par_1
ME1_fa	<---	ME	.622	.122	5.101	***	par_2
ME2_ta	<---	ME	1.227	.203	6.060	***	par_3
ME4_ce	<---	ME	1.000				
EC2_cg	<---	EC	1.322	.111	11.865	***	par_4
EC1_ea	<---	EC	1.254	.124	10.087	***	par_5
EC3_co	<---	EC	.782	.075	10.453	***	par_6
EC4_em	<---	EC	1.000				
PEP4_PG	<---	PEP	1.098	.081	13.528	***	par_10
PEP3_RIA	<---	PEP	1.001	.090	11.091	***	par_11
PEP2_CR	<---	PEP	1.043	.075	13.972	***	par_12
PEP1_IF	<---	PEP	1.000				
IB2_ivoi	<---	IMB	1.155	.146	7.895	***	par_15
IB1_isms	<---	IMB	1.000				
IB3_iact	<---	IMB	.919	.120	7.668	***	par_16
IB4_irs	<---	IMB	.407	.079	5.134	***	par_18

**** indicates significance at 0.001level (2 tailed)*

Table 6.8: *Unstandardised Regression Weights AMOS Output Matrix*

Table 6.8 shows that three of the five hypothesized relationships (ME→IB, IB→PEP and ME→PEP) are significantly different from zero at the .001 level (two-tailed). One (EC→IB) is significant at the .01 level (two-tailed), and the last relationship (ME→PEP) is not significant at the .05 level (two-tailed).

6.3.2 Direct effects

Standardised direct effects	Entrepreneurial Competence (EC)	Micro-business Environment (ME)	Integration of mobiles in business (IB)	Perceived enhance performance (PEP)
Integration of Mobile Telephony Services Into Business Processes (**IB**)	**.266**	**.436**		
Perceived Enhanced Business Performance (**PEP**)	**.479**	**-.023**	**.398**	
Integration of Related Services (**IB4_irs**)			.407	
Mobile Integration Activities (**IB3_iact**)			.799	
Integration Of Mobile Voice Services Into Business (**IB2_ivoi**)			.890	
Integration of Mobile SMS/MMS Services Into Business (**IB1_isms**)			.585	
Perceived Cost Reduction (**Pep2_cr**)				.893
Perceived Overall Growth (**PEP4_PG**)				.871
Perceived Reduction in Information Asymmetries (**PEP3_RIA**)				.754
Perceived Increase In Operational Flexibility (**PEP1_IF**)				.815
Financial Assistance from the Environment (**ME1_Fa**)		.502		
Technology And Training Assistance From The Environment (**ME2_Ta**)		.671		
Legal And Institutional Support (**ME3_iLs**)		.508		
Network Infrastructure (**ME4_ni**)		.684		
Entrepreneurial Action (**EC1_Ea**)	.728			
Commitment To Growth (**EC2_Cg**)	.839			
Customer Orientation (**EC3_Co**)	.750			
Entrepreneurial Ability (**EC4_Em**)	.814			

Table 6.9: *Direct Standardised Effects– AMOS Output Matrix (N=210)*

6.3.2.1 Hypothesis 1 (IB +→ PEP):

Perceived Enhanced Business Performance (PEP) was predicted by IB by **.398**. This implies that due to the direct effect of IB on PEP, when IB goes up by 1 standard deviation, PEP goes up by .398 standard deviations. IB accounts for 39.8 % of PEP's variance. The relationship is positive and significant at the p<.001 level (2-tail), which implies that H1 is supported.

> **Hypothesis 1 (H1): the** *Integration of Mobile Telephony Services into Business Processes (IB) will positively predict the Enhanced Operational Performance of Micro- Businesses* (PEP)**.**
>
> IB positively and significantly (.001 level) predict 39.8 % of PEP's variance accounted for by the Model → H1 is supported

6.3.2.2 Hypothesis 2 (ME +→ IB):

Micro-business Environment (ME) predicted Integration of mobile telephony services into Business processes (IB) by **.436**. This implies that due to the direct effect of ME on IB, when ME goes up by 1 standard deviation, IB goes up by .479 standard deviations. ME accounts for 43.6 % of IB's variance. The relationship is positive and significant at the p<.001 level (2-tail). This implies that H2 is supported.

> **Hypothesis 2 (H2):** *The level of Integration of Mobile Telephony Services into Business Processes (PEP) is influenced by the micro-business environment including the supply of telephony services.*
>
> ME positively and significantly (.001 level) predict 43.6 % of IB's variance accounted for by the Model → H2 is supported

6.3.2.3 Hypothesis 3 (EC +→ IB):

Entrepreneurial Competence (EC) predicted Integration of mobile telephony services into Business processes (IB) by .**266**. This implies that due to the direct effect of EC on IB, when EC goes up by 1 standard deviation, IB goes up by .26 standard deviations. EC accounts for 26.66 % of IB's variance. The relationship is positive and significant at the p<.01 level (2-tail). H3 is thus supported.

> **Hypothesis 3:** *The rate of Integration of Mobile Telephony Services into Business Processes (IB) will depend on the Entrepreneurial Competence of micro-business owners-managers*
>
> EC positively and significantly (.01 level) predict 26.6 % of IB's variance accounted for by the Model → H3 is supported

6.3.2.4 Hypothesis 4 (EC +→ PEP):

Entrepreneurial Competence (EC) predicted Perceived Enhanced business Performance (PEP) by .**479**, which implies that due to the direct effect of EC on PEP, when EC goes up by 1 standard deviation, IB goes up by .479 standard deviations. EC accounts for 47.79 % of PEP's variance. The relationship is positive and significant at the p<.001 level (2-tail). H4 is thus supported.

> **Hypothesis 4:** *The Entrepreneurial Competence of micro-business owner-managers can directly predict the Perceived Enhanced Business Performance (PEP) Outcome of Micro-Businesses.*
>
> EC positively and significantly (.001 level) predict 47.7 % of PEP's variance accounted for by the Model → H4 is supported

6.3.2.5 Hypothesis 5 (ME +→ PEP):

Micro-business Environment (ME) predicted Perceived Enhanced business Performance (PEP) by **-.023**, which implies that due to the direct effect of ME on PEP, when ME goes up by 1 standard deviation, PEP actually goes down by .023 standard deviations. ME accounts for 2.30 % of PEP's variance. The relationship is negative (ME -→ PEP) and non-significant at the $p<.05$ level (2-tail). H5 is not supported.

> **Hypothesis 5:** *The Micro-business Environment (ME) can directly and positively predict the Perceived Enhanced Business Performance (PEP) Outcome of Micro-Businesses.*
>
> ME negatively predicts 2.30 % of PEP's variance accounted for by the Model. The relationship is non-significant at .05 level → H5 is not supported

However, this is a strong indication of the impressions which micro-business owner-managers who took part in the study have about their business environments. Actually, what this statistics shows is that instead of receiving support from the environment as we hypothesised, micro-business owners are losing to the environment.

These statistics are also supported by the World Bank's *ease of doing business index* (World Bank, 2008), which shows high levels of taxation and difficulties of obtaining credits particularly in Cameroon, poor infrastructure such as electricity and roads, and general insecurity especially in Afghanistan, and increasing levels of corruption in both countries.

The fact that ME contributes significantly to IB's variance and not PEP's suggests that micro-business owner-managers are increasingly integrating mobile telephony services (*ME +→ IB)* into their business processes thanks to the growing mobile telephone networks and the power of communication network/call externalities.

6.3.2.6 Overall Effect:

Collectively, the three predictors of PEP (IB, EC and ME) account for 52 percent of its variation. The contribution is significant at the $p<.05$ level. The variance error of PEP also called *disturbance* - ζ_2 (48.3 percent) is accounted for by other predictors such as *inputs* including other technologies, marketing, financial management and others.

The two predictors of IB can explain 30 percent of its variance (Fig. 6.2). This implies that 70 percent of IB's variance is not accounted for in the model. This is called the *disturbance* ($\zeta_{1)}$ on IB. The disturbance theoretically should include other IB predictors such as the price of mobile telephony services, network coverage, teledensity and others (ζ_1).

6.3.3 Indirect effects:

Standardised indirect effects	Entrepreneurial Competence (EC)	Micro-business Environment (ME)	Integration of mobiles in business (IB)	Perceived enhance performance (PEP)
Integration of Mobile Telephony Services Into Business Processes (**IB**)				
Perceived Enhanced Business Performance (**PEP**)	.106	.174		
Mobile Integration Activities (**IB3_iact**)	.121	.199		
Integration of Mobile Voice Services Into Business (**IB2_ivoi**)	.212	.349		
Integration Of Mobile SMS/MMS Services Into Business (**IB1_isms**)	.237	.388		
Perceived Cost Reduction (**PEP2_CR**)	.156	.255	.372	
Perceived Overall Growth (**PEP4_PG**)	**.523**	.135	.355	
Perceived Reduction In Information Asymmetries (**PEP3_RIA**)	**.510**	.131	.347	
Perceived Increased In Operational Flexibility (**PEP1_IF**)	**.441**	.114	.300	
Financial Assistance From The Environment (**ME1_fa**)	**.477**	.123	.324	
Technology And Training Assistance From The Environment (**ME2_ta**)				
Legal And Institutional Support (**ME3_is**)				
Network infrastructure (**ME4_ne**)				
Entrepreneurial Action (**EC1_ea**)				
Commitment To Growth (**EC2_cg**)				
Customer Orientation (**EC3_co**)				
Entrepreneurial Ability (**EC4_em**)				

Table 6.10: *Indirect Standardised EffectsOutput Matrix (N=210)*

Strong indirect effects, .523, .510 and .441 are observed between Entrepreneurial Competence (EC) and three outcome indicator variables, PEP4_RIA, PEP3_ME and PEP1_IF respectively. This concurs with the four mega-theories which drive the research process, *The Theory of The Growth Of Firm*; *Theory of Entrepreneurship, The Resource-Based View (RBV) of the Firm, The Firm As A Locus Of Strategic Control.* In Chapters Three and Four, these mega-theories were presented as the underlying assumptions on which it was hypothesised that the impact of mobile telephony services will largely depend on the Entrepreneurial Competence of the micro-business owner-managers.

The owner-manager, as the coordinator and organiser of business *resources* (Kirzner, 1983), makes use of his/her underlying unobserved ability (Gartner, 1990) known as Entrepreneurial Competence to integrate mobile telephony services into business processes which has been shown by the data to be very important in determining the strong observed enhanced business performance outcomes: PEP4_RIA, PEP3_ME and PEP1_IF. It is the Entrepreneurial Competence of the owner-manager which enables him/her to access the right business information which is then used to make the right business decisions, coordination and organisation of resources capable of enhancing business performance.

The mobile phone is only a tool requiring the craftsmanship (EC) of the craftsman (owner-manager) to produce the expected business enhancement outcomes. It is the same with obtaining business financing and financial assistance from the environment. A sizeable majority (74%) of respondents have never applied for financing elsewhere other than their family members and friends. Those who had applied and obtained financing (12.5%) exhibited higher levels of EC than their peers. The low indirect effect between EC and the fourth outcome indicator variable (PEP2_CR) may be explained by the fact that *operational cost reduction* depends on many more environmental dimensions than the previous three.

IB also shares significant variance indirectly with the outcome variables. This is a reflection of the mechanisms through which mobile telephony services impact on business performance. Integrating mobile telephony services in business processes (IB) increases operational flexibility (PEP1_IF {.300}), reduces information

asymmetries (PEP3_RIA {.355}) and operational costs (PEP2_CR {.372}), which are reflected in the overall perceived Business growth (PEP4_PG {.355})

6.3.4 Standardised Total effects:

TOTAL EFFECTS	Entrepreneurial Competence (EC)	Micro-business Environment (ME)	Integration of mobiles in business (IB)	Perceived enhance performance (PEP)
Integration of Mobile Telephony Services Into Business Processes (**IB**)	**.266**	**.436**		
Perceived Enhanced Business Performance (PEP)	**.585**	**.151**	**.398**	
Integration of Related Services Into Business (IB4_irs)	.121	.199	.456	
Mobile Integration Activities (**IB3_iact**)	.212	.349	.799	
Integration of Mobile Voice Services Into Business (**IB2_ivoi**)	.237	.388	.890	
Integration of Mobile SMS/MMS Services Into Business (**IB1_isms**)	.156	.255	.585	
Perceived Cost Reduction (**PEP2_CR**)	**.523**	**.135**	**.355**	.893
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Perceived Reduction In Information Asymmetries (**PEP3_RIA**)	**.441**	**.114**	**.300**	.754
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Communication Network/Call Externalities (**ME4_ne**)		.684		
Entrepreneurial Action (**EC1_ea**)	.728			
Commitment To Growth (**EC2_cg**)	.839			
Customer Orientation (**Ec3_co**)	.750			
Entrepreneurial Ability (**EC4_em**)	.814			

Table 6.11: *Total Effects – AMOS Output (N=210)*

6.4 Model Validation:

The multi-model sampling technique called *replication* was used to validate the research model. Typically, AMOS was asked to randomly generate 200 different samples from the population of 210 respondents (sampling with replacement) which were then used to calculate new estimates (λ, γ, β) in order to evaluate the stability of the parameters (bootstrapping) as well as to determine the impact of outliers on these estimates and on the fit statistics (jackknifing).

The results show that:

- All parameters are stable and the impact of outliers was non-significant;
- ECVI (Expected Cross-validation Index) proposed by Browne & Cudeck (1989) to cross-compare groups using one sample of data was also carried out. According to Schumacker and Lomax (2006 p 274), the alternative model with the smallest ECVI is the most stable in the population.

Model	ECVI	LO 90	HI 90	MECVI
Default model	1.257	1.096	1.463	1.303
Saturated model	1.554	1.554	1.554	1.722
Independence model	8.040	7.380	8.744	8.060

Table 6.12: *ECVI – AMOS Output*

From the ECVI figures in Table 6.12, it is evident that the proposed research model, which AMOS designates as – *default model*, has the smallest ECVI compared to the *saturated* and *independence* models which indicates that it is the most stable of three. As such, the proposed model was retained.

- Two samples were created from the population of respondents; An Afghan sample and a Cameroonian sample. Parameters were estimated separately for both samples (basic multiple-sample modeling) to explore if any differences existed between the groups. Perceived impact of mobile telephony within the Cameroonian sample was *.40*, while that of the Afghan sample was *.38*. This implies that the perceived impact within the Cameroonian sample rose slightly by .01 compared to the combined sample with a corresponding fall of *.01* in the Afghan sample. Although the slight difference observed in the level of the perceived impact between the two samples is statistically non-significant, nonetheless it could mean theoretically that Cameroonian micro-business owner-managers integrate mobile services much more than their Afghan counterparts and thus have a greater appreciation of the services.
- There was also a statistically non-significant change in the strength of the relationship between the micro-business environment (ME) and (PEP) for both samples. For the Afghan sample, the value of ME→PEP fell from -*.02* for the combined sample to -*.03*. For the Cameroonian sample, the value rose slightly to **.***00*. This could be an indication that Cameroonian micro-businesses have a much better perception of their business environment than their Afghan counterparts. For both the Cameroonian and Afghan respondents, instead of the business environment supporting them as was hypothesised, they are instead losing to their environment.

6.5 Results Based On Transaction Log and Scenario Analysis

Following up from the methodology, respondents were asked to compare each business transaction extracted from the activity log of their mobile phones to one of the pre-mobile era. Information provided by the respondents was analysed against *time saved* and *travel distance saved* by making the transaction via mobile.

Table 6.13 shows the mobile activity-log for respondent No. *b'da 019*, who is an electrician located in the town of Bamenda - Cameroon for the week 03/09/2007 – 09/09/2007. According to the statistics presented in the spreadsheet (Table 6.13), this respondent would have incurred approximately 411 business-distance (km) and 30 business-hours (hrs) between 03/09/2007 and 09/09/2007 to conduct the same volume of business if he did not use a mobile phone. The results of similar spreadsheets for all respondents were aggregated to obtain an approximation of total business-distance and business-hours saved through the use of mobile telephony services for over a one year period.

It was found that (international transactions were excluded from the analysis):

- Mobile phones save as many as 2.8 business hours a day for an average micro-business owner-manager.
- An average of 33.6 business kilometres were saved every day per micro-business owner-manager

CASE No: b'da 019	CASE LOCATION: Bamenda - Cameroon		MAIN BUSINESS: Electrician							
Quarter **Week 1** From: 03/09/2007 To: 09/09/2007			Total Communications **Voice/SMS/MMS**		Business Related Communications **Voice/SMS/MMS**		Mobile Telephony Activity (**MTA**)	Mobile Telephony Activity Business -related (**MTAb**)	Approx. Business Distance saved by using mobile phones (***Km***)	Approx. Business Time *saved by* using mobile phones (***Hours***)
	VOICE Mobile Telephony - based	Received	Q'ty:	43.0	Q'ty:	30.0	3990.4	2172.0	-	-
			Mins:	92.8	Mins:	72.4				
		Made	Q'ty:	29.0	Q'ty:	21.0	1980.7	980.7	310.0	20.0
			Mins:	68.30	Mins:	46.7				
	SMS/MMS – Mobile Telephony-based	Received	Q'ty:	9.0	Q'ty:	7.0	13.0	9.0	23.0	6.0
		Sent	Q'ty:	4.0	Q'ty:	2.0				
	VOICE Other Technology - Based	Received	Q'ty:	0.0	Q'ty:	0.0	0.0	-	-	0.0
			Mins:	0.0	Mins:	0.0				
		Made	Q'ty:	0.0	Q'ty:	0.0	0.0	-	-	0.0
			Mins:o		Mins:	0.0				
	SMS/MMS /Beeps other technology - based	Received	Q'ty:	5.0	Q'ty:	2.0	6.0	-	-	-
		Sent	Q'ty:	1.0	Q'ty:	1.0				
	BEEPS Mobile Telephony - based	Sent	Q'ty:	13.0	Q'ty:	5.0	32.0	14.0	78.0	4.0
		Received	Q'ty:	19.0	Q'ty:	9.0				
	Total Mobile Telephony Activity (MTAt)/wk						6022.1	**Total Business Distance saved (km)/wk**		411
	Total Mobile Telephony Activity – Business (MTAt_b)/wk						3175.7	**Total Business saved (Hrs) /wk**		30.0
	MTAt_b/MTAt						52.7 %			

Table 6.13: *Sample Activity Log Extraction-Spreadsheet*

6.6 Analysis of Mobile Activity-Logs and some Questionnaires Items

In this section, questionnaire aspects are analysed to support the findings of the empirical model hypothesised in Chapter Three.

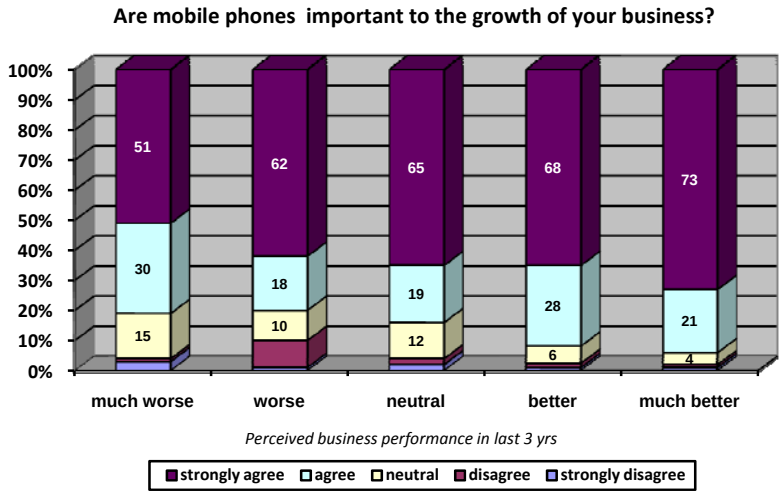


Fig.6.3: *Perception of Mobile Telephony Importance versus Perceived Enhanced Business Performance (N=210)*

Are mobile phones important to the growth of your business?

According to the results presented in Fig.6.3, among the owner-managers who perceived that their businesses had performed *much better* in the previous three years, 73 percent *strongly agreed* with the above question, while only 1 percent *strongly disagreed*. On the other hand, owner-business managers who perceived that their businesses had performed *much worse* in the previous three years, 51 percent *strongly agreed* with the above question, while 3 percent *strongly disagreed*.

Observing the overall figures shows an important trend: that the more micro-business owners perceived their businesses as performing better, the higher they rated the importance of mobile phones. This could imply that perceived enhanced business performance increases with perceived mobile telephony importance, and as such,

mobile telephony services enhance business performance (Hypothesis 1 is further supported).

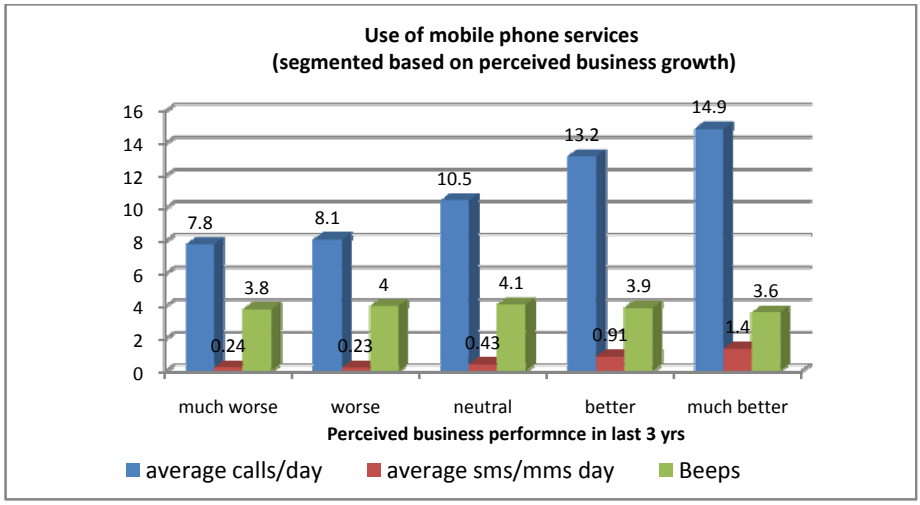


Fig.6.4: *Average Consumption of Mobile Telephony Services per Day versus Perceived Enhanced Business Performance (N=210).*

In Fig. 6.4, another interesting trend is observed. Increased perceived enhanced business performance is correlated (α = .58, at p = .05) with higher levels of *Mobile Telephony Activity* [22]*(MTA)*. This is an important indication that mobile telephony may be predicting enhanced business performance, as hypothesised. It could be argued that increased perceived enhanced business performance implies higher

[22] *Mobile Telephony Activity* (MTA) refers to the average number of voice calls, SMMS/MMS and 'beeps' sent and received per day.

- MTA_0 = *Mobile Telephony Activity in the First Quarter of the research (Q3 2007)*
- MTA_1 = *Mobile Telephony Activity in the Second Quarter of the research (Q4 2007)*
- MTA_2 = *Mobile Telephony Activity in the Third Quarter of the research (Q1 2008)*
- MTA_3 = *Mobile Telephony Activity in the Fourth Quarter of the research (Q2 2008)*
- MTA_4 = *Mobile Telephony Activity in the Fourth Quarter of the research (Q3 2008)*
- $\Delta MTA_{1,0} = MTA_1 - MTA_0$
- $\Delta MTA_{2,1} = MTA_2 - MTA_1$
- $\Delta MTA_{3,2} = MTA_3 - MTA_2$
- $\Delta MTA_{4,3} = MTA_4 - MTA_3$

$$\Delta MTA_t = \frac{\Delta MTA1,0 + \Delta MTA2,1 + \Delta MTA3,2 + \Delta MTA4,3}{4}$$

revenue and consequently higher disposable communication income. The argument becomes stronger upon examination of Fig. 6.5 below. The figure shows that between Q4 2007 and Q3 2008 during which data was collected, micro-entrepreneurs whose MTA and mobile phone business contacts had increased, also rated more positively the importance of mobile telephony than those whose contacts stagnated or decreased.

According to Fig. 6.5, respondents who perceived that their businesses were performing *much worse* over the survey period had also seen an average drop in their MTA by 1.1 units, while those who perceived their businesses to be performing *worse* saw a drop in MTA of 0.5 units. On the positive side of the graph, micro-businesses whose MTA increased by 1.5 units perceived their businesses as performing better, and those whose MTA had increased by 1.8 units perceived their businesses as performing *much better*. This trend is also reflected in the growth of the number of phone contacts.

On the average, respondents who perceived that their businesses performed *much better*, between Q3 2007 and Q3, 2008 had added on the average 2.3 new business phone contacts than those who during the same period, perceived their businesses as performing *much worse* or *worse*. It could therefore be concluded that increases in MTA are associated with increased perception of enhanced business performance (Hypothesis 1 is further supported).

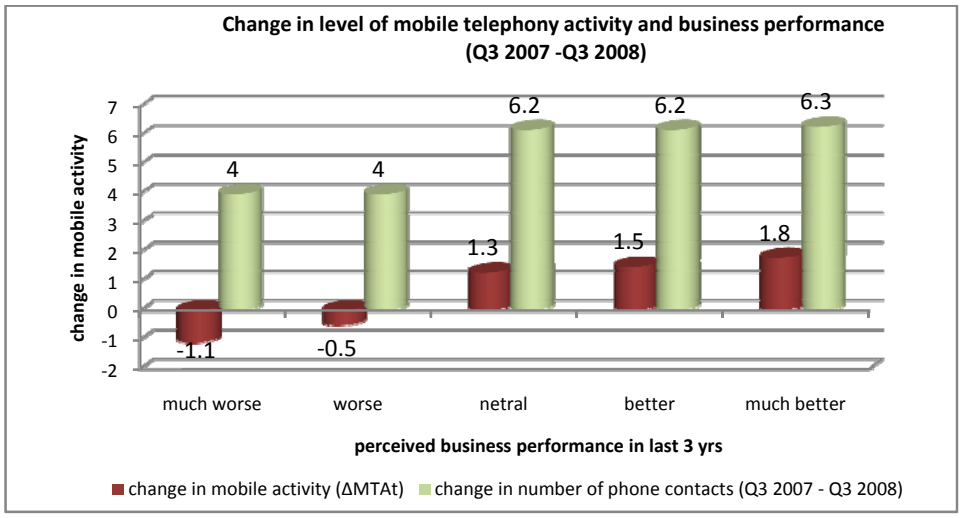


Fig.6.5: *Change in Level of Mobile Telephony Activity (MTA) versus Perceived Enhanced Business Performance (PEP). Q3 2007 – Q3 2008). N=210*

The impact of mobile telephony services on business performance was also assessed by asking respondents to rate the impact on their economic activities should they stop using mobile phones.

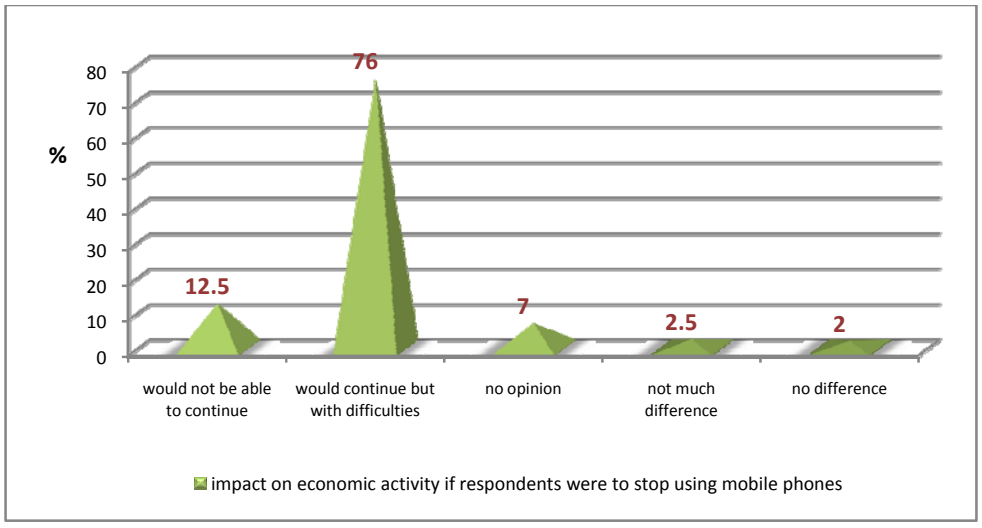


Fig.6.6: *Impact on economic activities should respondents stop using mobile telephony services (N=210)*

12.5 percent thought they *would not be able to continue* while just 2 percent thought there would be *no difference*. A massive 76 percent thought that their businesses would be hampered in some way should they stop using mobile telephony services.

Furthermore, respondents were asked to rate the impact of mobile telephony on their costs and risks of doing business. The results represented in Fig.6.7 show that the majority of micro-entrepreneurs (59 percent) believed that mobile services had reduced their costs of doing business, while 34 percent thought there was no change and only 11 percent thought it had increased their costs of doing business. Using unstructured interviewing techniques to probe into why some respondents thought that mobiles have increased their risks of doing business, they cited mostly crime. According to theses respondents, the number of assaults linked to mobile phone theft has greatly increased and that, mobile telephony services offer criminal gangs a better platform on which to coordinate their activities. 56 percent (52 percent in Cameroon and 4 percent in Afghanistan) of these respondents have been victims of mobile phone theft.

On the average, respondents perceive that mobiles have a higher impact on costs reduction than on reduction of risks. Micro-businesses therefore perceived mobile telephony services as an important enabler of costs and risks reduction.

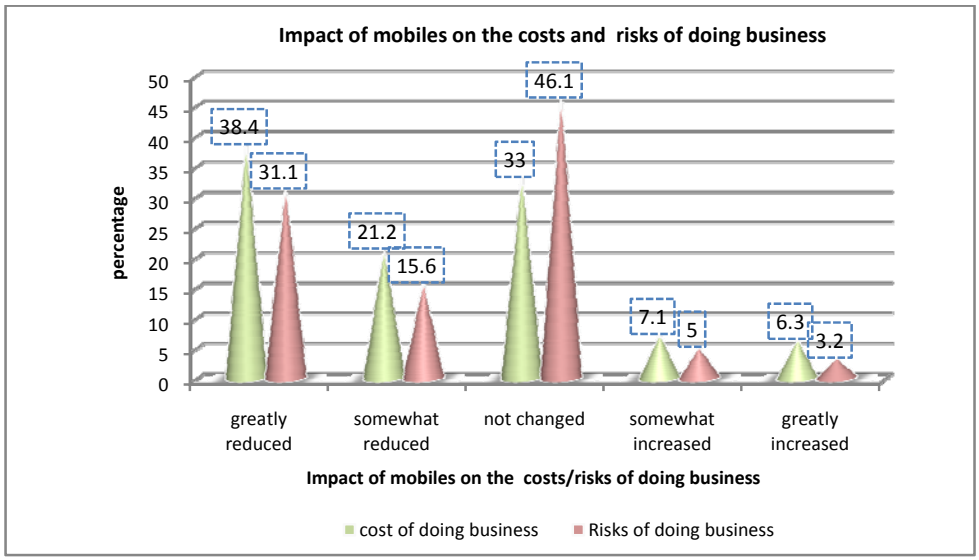


Fig.6.7: *Impact on the Costs and Risks of Doing Business since Respondent Started Using Mobile Telephony Services (N=210)*

The performance of micro-businesses depends largely on the business environments within which they operate. In order to situate the impact of mobile telephony on business performance within the body of literature relating to determinants of firm performance, aspects of the micro-business environments in Afghanistan and Cameroon were investigated. Generally, the business environments in both countries are not quite pro-entrepreneurial, although the Cameroon situation is much better than Afghanistan's. Both environments are marred by rising corruption, poor micro-business financing, inadequate technical and training support, and lack of basic infrastructure.

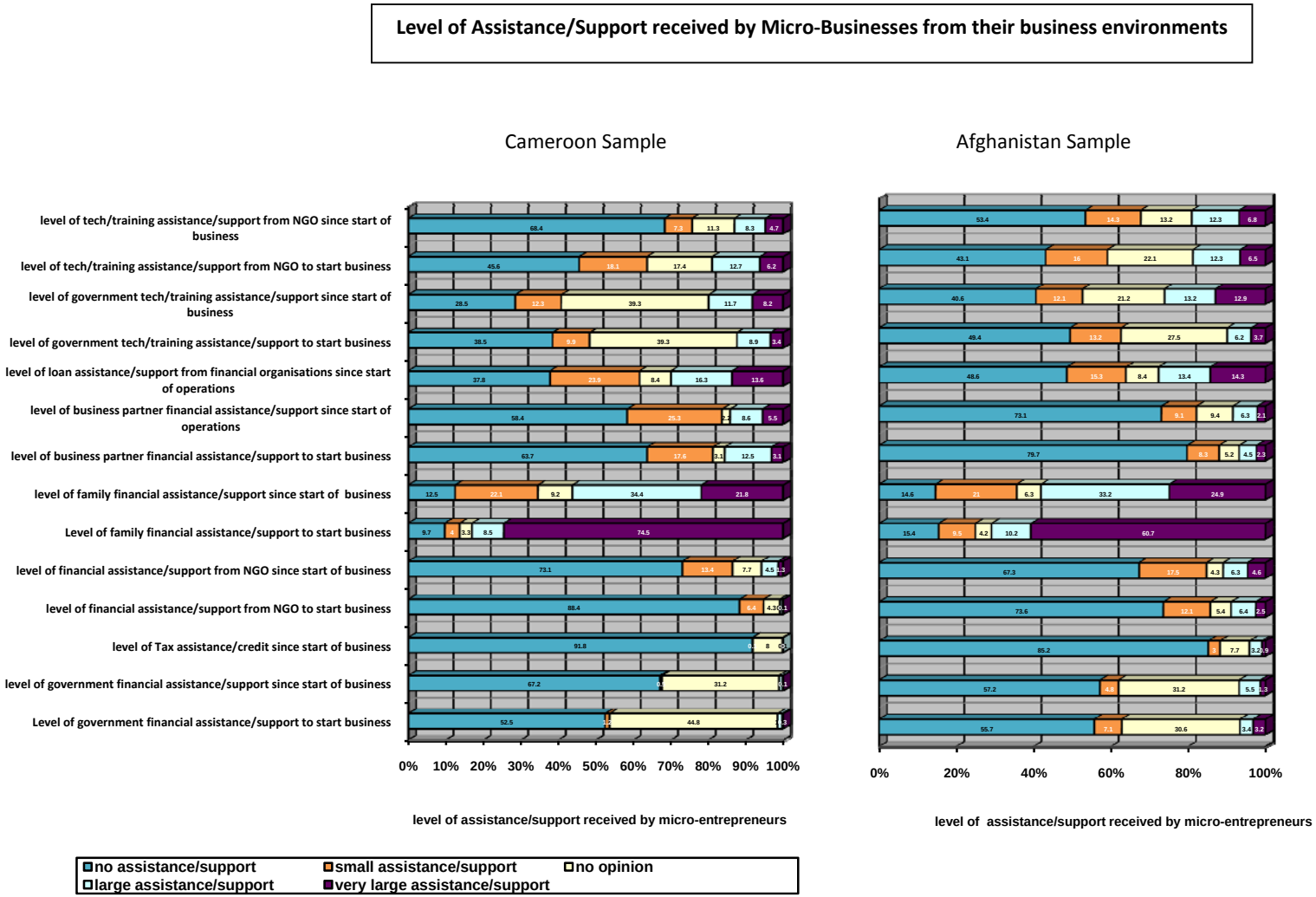


Fig.6.8: *Respondent Perception of the Business Environment (N=107, N=103)*

Fig.6.9: *Assessing the Suitability of the Business Environment for Enhanced Business Performance (N=107, N=103)*

police, the gendarmerie, taxation and custom officials in order to stay in business. In Afghanistan, up to 69.4 percent of respondents think that corruption is a hindrance to their business activities and 76.8 percent think that they have to offer some sort of bribe (generally a token) to government officials in order to stay in business.

In both countries, there are limited financing as well as technical and training assistance schemes from government and NGOs for business start-up. Most available assistance schemes only come in after businesses start operations. According to the sample, a potential micro-business owner has barely a 0.9 percent chance to receive finance to start a business while in Afghanistan, it is 3.73 percent. In Cameroon, 34.8 percent of micro-businesses get funding mainly from family and friend sources in order to start a business while in Afghanistan, family and friends, finance 32.25 of business start-ups in the sample. Government agencies, NGOs and micro-financial organisations are possible source of micro-business financing once the businesses are up and running. Overall, there are fewer effective micro-business financing schemes in Cameroon than they are in Afghanistan. This difference is largely due to the presence of International NGOs in Afghanistan who are helping in micro-business financing. NGO activities aimed at encouraging micro-business growth are much greater in Afghanistan than in Cameroon.

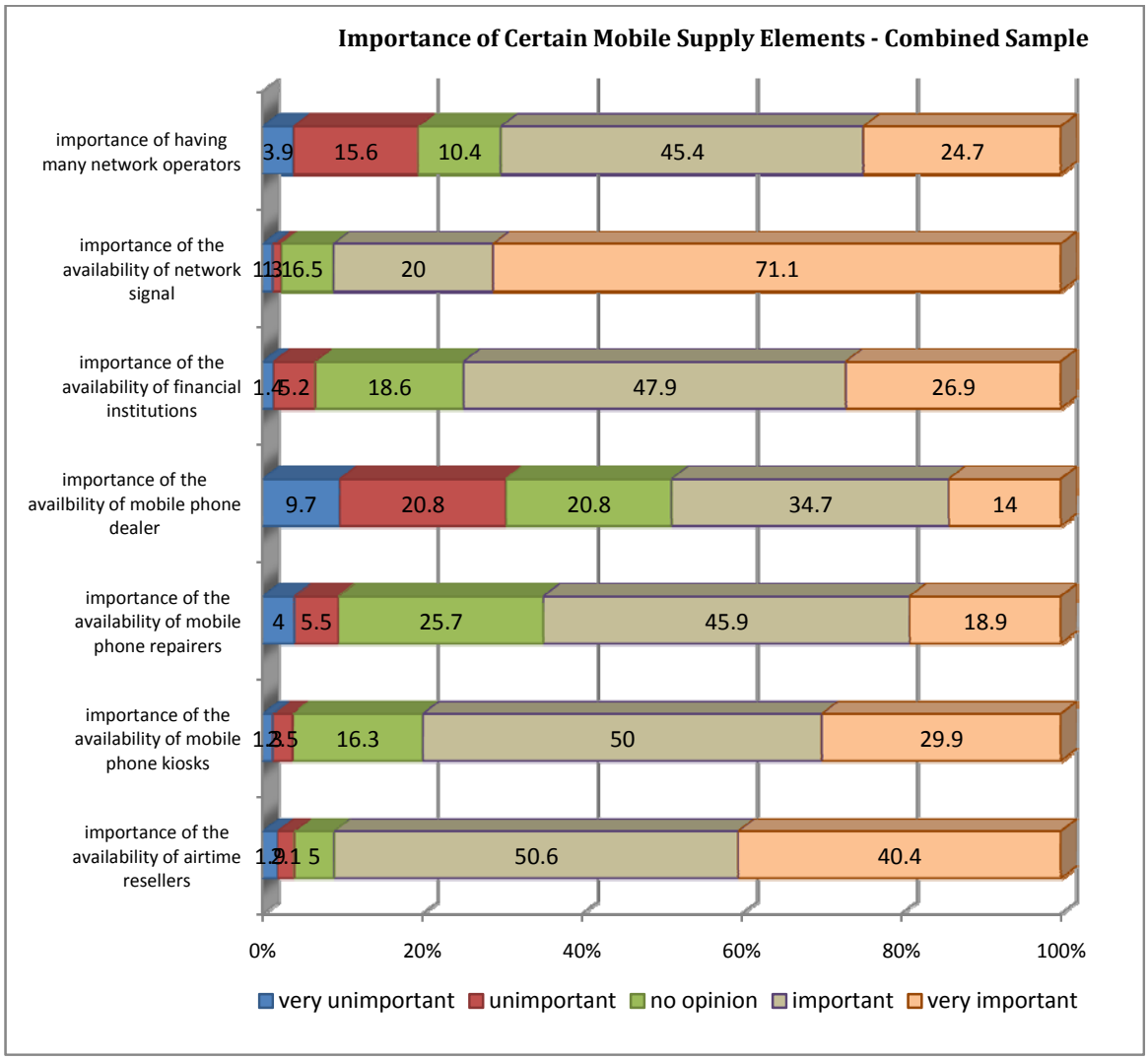


Fig. 6.10: *Importance of Certain Mobile Telephony Supply Elements (N=210)*

Network availability is a very crucial element for micro-entrepreneurs. As many as 91.1 percent of respondents think mobile network availability is very crucial, followed by availability of air-time retailer and phone booths. Fig. 6.10 clearly shows that the availability of mobile telephony services and support structures like air-time resellers, mobile phone repairers and mobile phone kiosks are very important to micro-business owner-managers.

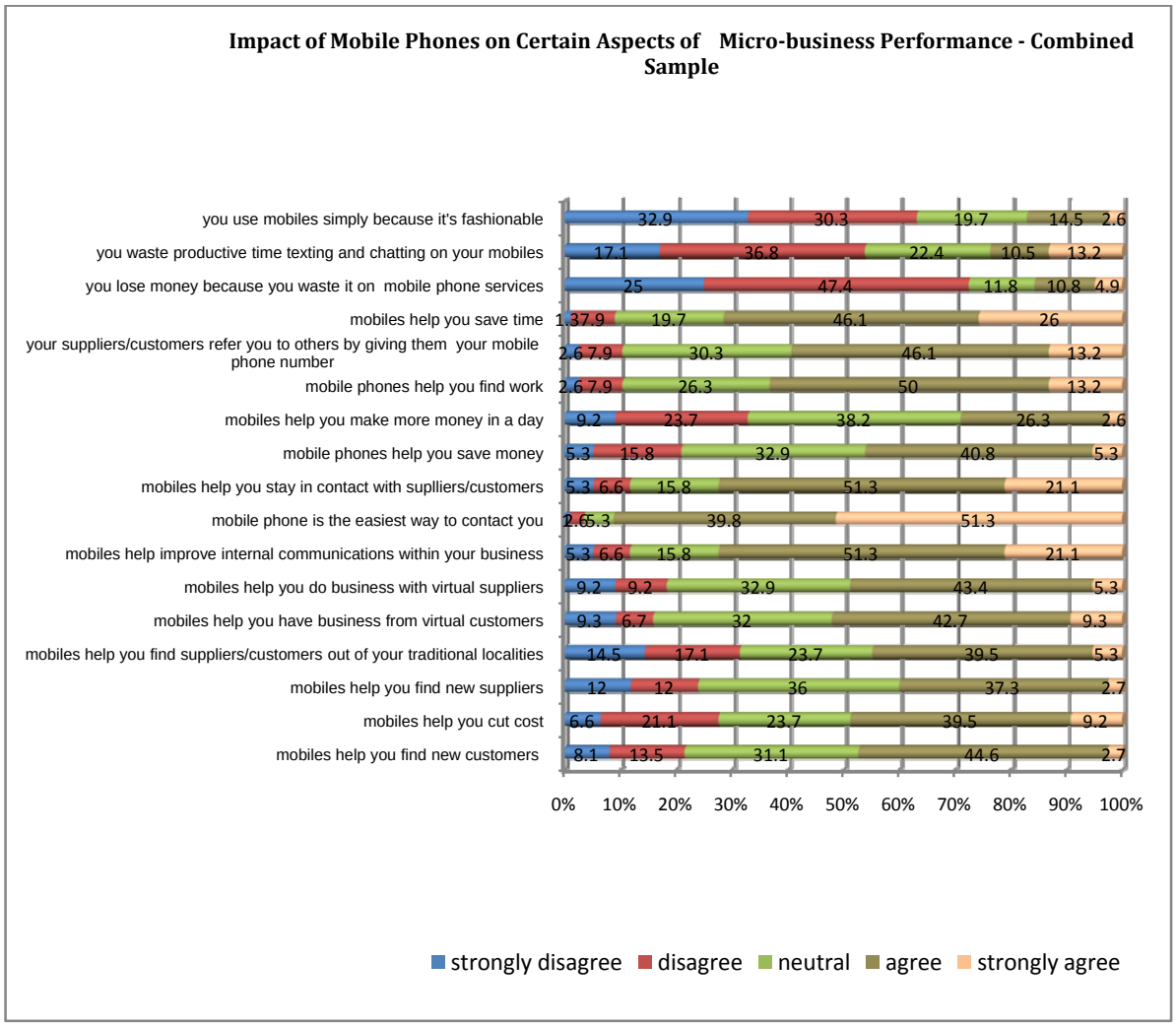


Fig. 6.11: *Impact of Mobile Telephony Services on Some Aspects of Business Performance (N=210)*

Fig.6.11 above indicates respondent ratings on the impact of mobile telephony services on certain aspects of business performance. Clearly, mobile services play a crucial role in reducing operational costs and information asymmetries, increase operational flexibility, widen the market geographically and contribute to overall growth.

The easiest way to contact 91 percent of respondents is via mobile telephony services. The data in Fig. 6.11 also reveals that respondents use mobile phones to contact

suppliers, customers, and that mobile telephony services increase their availability to other economic operators even during out of office hours. This data concurs with the theory which drives this study; that mobile telephony services play a crucial role in providing micro-entrepreneurs with vital business information which increases their proclivity of making correct business decisions, and also enables them to coordinate resources more cheaply and timely, which potentially enhance business performance.

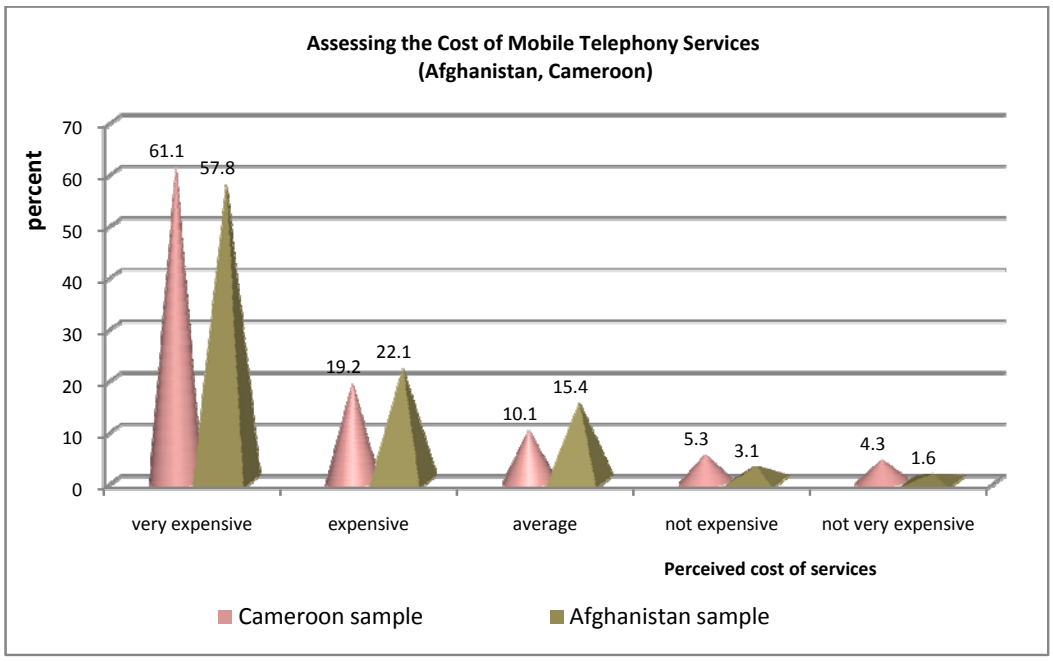


Fig. 6.12: *Perceived Cost of Services (N=107, N=103)*

Despite the importance attached to mobile telephony services, 80.3 percent of Cameroonian respondents against 79.9 percent of Afghans think that mobile services are expensive. Less than 20 percent think that prices are average and just 9.8 percent (Cameroon) and 4.7 (Afghanistan) perceive prices as acceptable or cheap. This is evidenced by the brief nature of a unit in both countries. Respondents tend to speak very quickly and briefly, especially during per-second billing. An average call in

Cameroon lasts just 80seconds as against 98 seconds in Afghanistan and 3.4 minutes in England. The perceived high cost of services has led to the innovative use of mobile phones. Averagely, respondents in Cameroon beep 2.6 times a day against 1.2 times for Afghans. There seems to be an unwritten code for 'beeping'. Respondents tend to beep those who stand to benefit from the transaction. For example, if a respondent wants to inform his correspondent about a business deal that is potentially beneficial to the correspondent, there is a 69.8 percent chance that the respondent will beep rather than call.

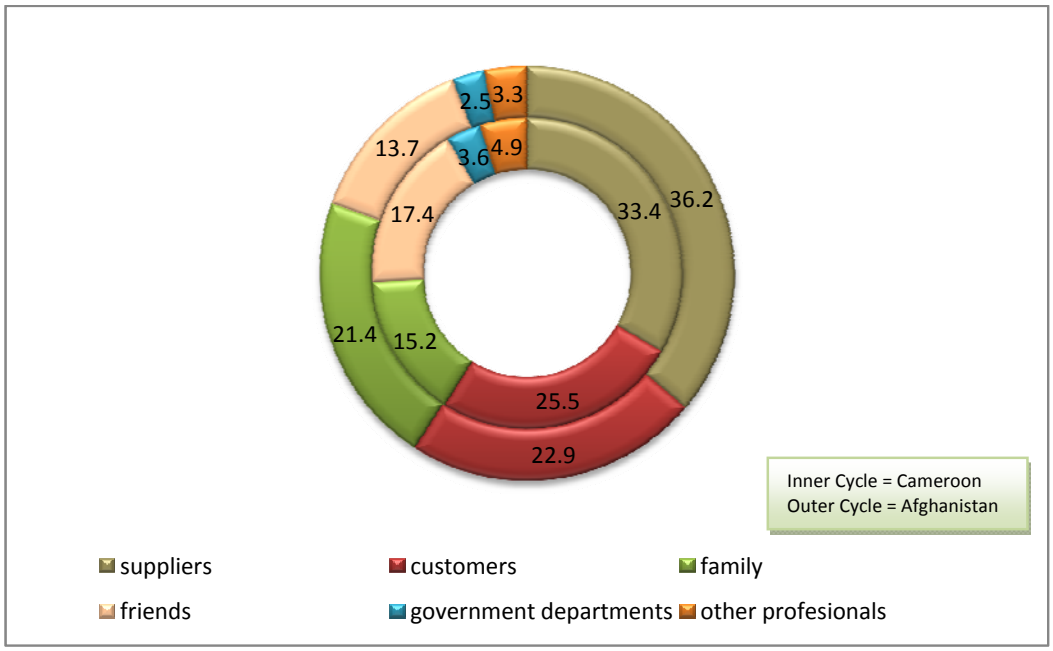


Fig. 6.13: *Percentage of Communication Exchange by Interest Groups (N=107, N=103)*

Fig.6.13 indicates how much in relative terms micro-business owner-managers communicate with interest groups. The bulk of Mobile Telephony Activity (MTA) is focused towards customers and suppliers. In Cameroon, 58.9 percent of mobile activity is directed towards direct business transactions (suppliers, customers) while 8.5 percent is directed towards support services like government and other

professionals (insurance, banks, mechanics). Family and friends take up 32.6 percent of mobile activities. The figures are comparable for Afghanistan, although there is a slight increase in family communication, decrease in communication with friends, and a decrease in communication with support services.

6.7 Study B: Latent Visual Data Analysis

In this subsection, the visual data are presented and analysis. The results show strong support for the quantitative study.

6.7.1 Information Asymmetries and Market Efficiency:

It was statistically shown in Section 6.3.4 that mobile telephony services can reduce information asymmetries by 30 percent (Table 6.11). By reducing information asymmetries, unorganised markets can be rendered more efficient, which should be reflected in the enhanced business performance of the market participants.

Fig. 6.14: *Using Mobile Telephony to obtain Better Prices for Products*

Mobile telephony services reduce information asymmetries and render unorganised markets more efficient. The fisherman in the photograph (Fig. 6.14) is receiving a call from one of his special customers who is a fish supplier to a chain of luxury hotels located all over Cameroon. The species of fish which he is holding in the photograph

is particularly rare and expensive. In the pre-mobile era, his customer used to travel 210 km to the shore not knowing whether the fishermen would be lucky that day to catch the type of fish ordered by the hotels. On average, one out of every seven journeys used to be fruitless because he would not find any fish. It was not only very costly for him alone, as he often passed this cost to the fishermen, which meant that he paid less for the fish.

On the other hand, there were several instances during the pre-mobile era where the fisherman had to auction his catch to the local people because his hotel customer never turned up and moreover, he also had little opportunity to negotiate prices in his favour. With the advent of mobiles, the fisherman in the photograph now has a list of six special customers whom he calls from his mobile phone in order to negotiate the best price for his catch as well as to arrange delivery options. The mobile phone has not only expanded his customer base and provided him with the possibility of earning more from his trade; it has also freed him the time which was often spent at the shore waiting for customers.

Mobile telephony services are very pivotal in the fish business as the fisherman is able to quickly relate to his customers, other distributors and to his family. Without mobiles, it would be not be easy for the fisherman to pursue the highest price, by selling his catch to customers who value it most. Mobile services have rendered the fish market more efficient by providing participants with more information.

The photo analysis concurs with the quantitative findings that mobile telephony services are capable of reducing information asymmetries by 30 percent. This

reduction in information asymmetries renders markets more efficient and enhances business performance.

6.7.2 Market Expansion

The ability to use mobile services to enhance business performance depends largely on the Entrepreneurial Competence of micro-entrepreneurs. In *Fig.6.15*, a small pig farmer is now able to sell his pigs without having to take them to the local pig market which is held just once a week. According to the farmer, he now has clients all over the region thanks to mobile services.

Fig. 6.15: *Mobile Telephony Services Expand the Market*

By providing his mobile phone number on a simple advert as shown in the photograph, the farmer reckons he now has a higher turnover and his business has become more profitable, his client base has greatly expanded and he can sell his pigs all the time, and it permits him to go about other businesses knowing that if a customer needs him, then he is just a phone-call away. This advert is located near a busy road and those who drive past can easily get hold of the farmer's easiest contact.

The impact of mobile telephony services on business performance is highly dependent on innovative use.

6.7.3 Increased Operational Flexibility

The tremendous effort invested by a cocoa farmer to locate mobile signals on one of his cocoa trees (Fig. 6.16) is indicative of the importance of mobile telephony services to the performance of his business. Mobile network coverage is poor in many rural areas, and this skilful farmer has located the network signal from a cocoa tree branch and has specially adapted his mobile phone by connecting a very long headset from the phone which he perches on the branch. When the phone rings he is able to answer the call from the ground level.

Fig. 6.16: *Innovative and Operational Flexibility: Sourcing for Network Signal from a Tree Top*

This farmer spends most of his working day on his cocoa farm, but he also runs a cocoa-drying oven business which is located some 78 km from the farm. With the help of his mobile phone, he is able to effectively manage the oven business from his

farm. He is also a cocoa dealer and buys cocoa from other smaller farmers in the area. His suppliers can always get to him to negotiate prices and delivery. The level of flexibility offered by mobile services to this farmer concurs with the quantitative study, which showed that the Integration of Mobile Telephony Services into Business Processes – **IB** – accounted for 32.4 percent of the variance in perceived operational flexibility - *PEP1_IF* (Table 6.11). Through this variance in operational flexibility accounted for by **IB**, micro-entrepreneurs can do more in a day, offering them the possibility to multitask.

Fig. 6.17: *Operational flexibility*

The younger generation of employees or family members who help in the running of micro-businesses have been brought up with mobile telephony or, at least, can very easily grasp the principles linked to the use of mobile phones much more than some of

the older generation of owner-managers, who have become dependent on the younger generation to help them understand and use the technology.

In *Fig 6.17*, the young schoolboy, who knows better than his father how to manipulate various menu aspects of the phone, has just dialled the number of a new insecticide dealer located some 190 kilometres from their cocoa farm and hands over the phone to the father, who can then negotiate price and potential shipment. The flexibility offered by mobile phones is quite evident from the photo. From the top of a cocoa tree, farmers can now contact suppliers or customers for various business transactions.

6.7.4 Improved Internal Communication

The importance of an efficient internal communication system in determining enhanced business performance was discussed in Chapter Three, Section 3.5 (Fig.3.2). In particular, it was argued in Section 3.5 that in order to produce goods and services more efficiently, the owner-manager needs be able to coordinate firm resources in an effective manner. Owner-managers need the right set of business information in order to take decisions that are likely to produce business performance-enhancing outcomes.

The statistical findings presented in Table.6.11 indicate that 72.4 percent of respondents either *strongly agreed* (21.1 %) or simple *agreed* with the statement that mobile phones have improved the level of internal communications in their businesses.

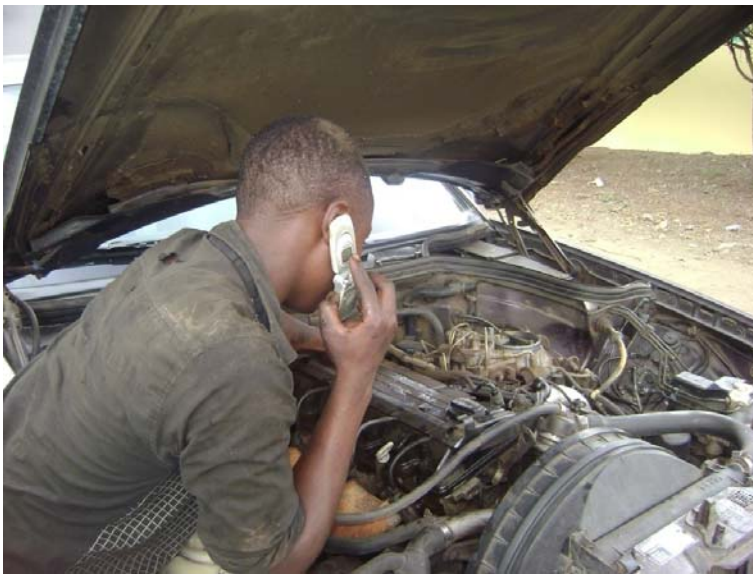


Fig.6.18: *Knowledge Transfer*

In *Fig. 6.18*, the trainee automobile mechanic seen in the picture has been sent by his trainer to repair a customer's car which has broken down some 115 km away in a stretch of road located in the rain forest. As can be seen from the image, the trainee has run into difficulties over what to do and has called his boss who is assisting in the repairs. Without mobile telephony services, this level of information exchange would not have been possible. The boss of the garage acknowledged during an interview that his business turnover has *greatly increased* since his business adopted mobile telephony services. Customers can get through to his business 24 hours a day, and his trainees have become more productive as they can handle many faults even in his absence, through the use of mobile telephony services.

6.7.5 Cost Reduction

Mobile telephony services play a very vital role in reducing operational costs. According to the statistical analysis in Table 6.11, the Integration of Mobile Telephony Services into Business Processes (IB) can reduce operational costs by 35.5 percent. Also, 59.6 percent of respondents believe that mobile telephony services have either *greatly reduced* (38.4 %) or *somewhat reduced* (21.2 %) their operational costs, with just 13.4 percent believing that mobiles have *somewhat increased* (7.1%) or *greatly increased* (6.3 %) their operational costs (Fig. 6.7).

The visual data (*Fig. 6.19*), speaks for itself. With not so good physical transportation links in the case study countries, as is the case in many developing economies, much of productive time and many other resources such as money are wasted attempting to travel on roads like the one in the picture by micro-entrepreneurs, who are often making their journey for simple motives like to confirm a delivery date or to specify an order.

Fig. 6.19: *Cost Reduction and Timeliness*

Ndohsi, the palm oil trader from *Mundemba* town in the South West province of Cameroon, used to do on average two return journeys per month through the muddy road in the picture (Fig. 6.19), with some of these journeys taking as many as four days to complete probably just to inquire about the availability of a spare part for his boiler. *Ndohsi*, spent on average $US58 for every round trip, from which he now saves 99 percent of the money by using mobile telephony services.

6.8 Conclusion

In this chapter, the quantitative results from the analysis were presented and commented on. In study A1, all the hypotheses were supported. ME→PEP was quite weak and showed a direct-negative relationship which suggested that micro-businesses owner-managers perceived that they were actually losing to their environment, which had been hypothesised to be supportive. Overall, the main independent latent variable, Integration of Mobile Telephony Services into Business Processes (IB) predicted 39.8 percent the variation in the outcome variable; Perceived Enhanced Business Performance (PEP). The three independent latent variables (IB, ME and EC) accounted for 52 percent of the variation in PEP. In study A2, questionnaire items were used to further explain the observations or outcomes of study A1. It was largely shown that mobile telephony, lower operational costs and information asymmetries, increase operational flexibility and contribute to overall perceived-growth.

Six images related to the thesis of the study were also analysed in Study B. These analyses provided qualitative support to the statistical outcomes of Studies A1 and A2. In particular, it was shown that mobile telephony services reduce information

asymmetries and improve market efficiency in unorganised markets, contribute to operational cost reductions, improve internal communications and knowledge transfer, and also provide the possibility for multitasking and operational flexibility.

In the next Chapter, the summary of the findings of the research project will be presented so as to draw theoretical, conceptual and practical conclusions of the study.

CHAPTER SEVEN: DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

7 Introduction

In Chapter One the study was introduced, and in Chapter Two mobile telephony technology and business models were presented. This was followed by Chapter Three in which the ontology and epistemology, and certain theoretical assumptions that drive the study, were outlined. In Chapter Four, the conceptual and research models of the study were presented including operationalisation of the research constructs. In Chapter Five, the methodology of the study was presented, and in Chapter Six the results were presented.

Chapters Two, Three and part of Chapter Four deal with theoretical issues, while the rest of Chapter Four and Chapter Five focus on the empirical issues. The chapters combined together show the theoretical and empirical exploration, and describe the relationships between the Integration of Mobile Telephony Services into Business Processes (IB) and Perceived Enhanced Business Performance (PEP).

This chapter summarises the conclusions presented in all parts of the research, provides clear answers to the research questions put forward in Chapter One, discusses the implications of the study with regard to its contribution to knowledge, and makes suggestions for future research.

The main research question in this study is:

How important are mobile telephony services in determining enhanced business performance outcomes of micro-businesses in Afghanistan and Cameroon?

7.1 Conclusions

This research has come up with interesting findings on the relationship between mobile telephony use in micro-business processes and enhanced business performance. Theoretically and practically, it has contributed to the understanding of how micro-business owner-managers integrate voice calls, SMS/MMS and beeps to reduce operational costs and information asymmetries, and to increase operational flexibility, access to larger and newer markets, all resulting in growth. Overall, the use of mobile telephony services in developing economies has increased the level of national productivity and competiveness, created thousand of new jobs with the importation of new skills, and provides an interactive platform where vital business information can be exchanged instantly and affordably.

The study has identified that the use of mobile phones to achieve enhanced performance does not operate in singleton. The adoption and use of mobile telephony services must be combined with other dynamics related to the micro-business environment and the entrepreneurship of micro-business owners. Notably, a strong pro-entrepreneurial environment endowed with micro-business financing opportunities, basic skill training opportunities for micro-business owners, absence of corruption and general insecurity and the availability of support infrastructures such as mobile telephone coverage, good road infrastructure, water and electricity, and the

level of entrepreneurial competence of micro-business owner-managers, are crucial in determining the impact of mobile telephony services.

The study has also revealed that the age of the micro-business owner-manager appears to matter when the potential of mobile telephony services to enhance business performance is concerned. In particular, the younger generation (16-45 years) have a higher propensity to adopt and use (quantitatively) these services than the older generation (46+) who tend to use the services in a more qualitatively (mainly for the purpose of business). Hence, the average ratio of business to non-business calls for owner-managers who are older than forty years is higher (insert value) compared with the same ratio for their younger counterparts (insert value). This implies that although the older generation may spend less on mobile services, they tend to generate a higher enhanced business performance impact *per unit of services* consumed than the younger generation. This is because the younger generation tend to make many non-business calls to friends and family and non-business calls contribute little in enhancing business performance.

The study has also revealed that the perceived impact of mobile telephony services on business performance is sector-dependent. The level of impact is determined by the nature of the micro-business in terms of the goods they handle or sell. Micro-businesses that lie in the middle of the supply chain such intermediaries (whole sellers) and service providers (craftsmen – hairdressers, plumbers, electricians, mechanics); in short, businesses that handle a lot of information within their operations (production, procurement and sales) tend to report a higher mobile

telephony activity and impact than those who handle very little information such as grocery store keepers.

The perceived impact of mobile telephony services on enhanced business performance has been revealed by the study to vary across geographies (countries or regions) depending on the local micro-business environments which are themselves dependent on the macro socio-political and economic conditions (Fig.4.1). The number of potential micro-business customers and their purchasing power is a function of the GDP which implies that enhanced business performance cannot be achieved by using mobile telephony services alone but through the integration of these services with the wider business environment and other firm growth determinants like entrepreneurship and organisational strategy.

Micro-business owner-managers in both Cameroon and Afghanistan generally expressed dissatisfaction with their micro-business environments in terms of pro-entrepreneurial policies and regulation, and physical infrastructure such as roads and electricity including the absence of ICT infrastructure such as the internet.

To discuss the conclusions, the research questions and objectives are next re-evaluated against the findings.

7.1.1 Research Questions

The following sub-questions were outlined to help answer the main question outlined above in Sub-section 7.0:

1. *What is the relationship between the integration of mobile telephony services into micro-business processes and perceived enhanced micro-business performance in Afghanistan and Cameroon?*
2. *How does mobile telephony compare to two traditional determinants of enhanced business performance, Entrepreneurial Competence and the Micro-business Environment, in terms of enhancing business performance?*
3. *What are the mechanisms through which micro-business integration of mobile telephony services contribute to performance enhancements?*
4. *How do micro-business owner-managers in Afghanistan and Cameroon use mobile telephony services for business? Who do they communicate with?*
5. *How important is the mobile functionality of mobile telephony to the integration of its services into micro-business processes?*

7.1.1.1 Sub-Question 1:

What is the Relationship between the Integration of Mobile Telephony Services into Micro-Business Processes (IB) and Perceived Enhanced Micro-Business Performance (PEP) in Afghanistan and Cameroon?

This aspect of the research was dealt with in Study A1. In this Study, structural equation modelling techniques were used to test the nature of the relationship between

IB and PEP which was hypothesised in the research model (Fig.42). The research model was constructed from theoretical evidence extracted from the relevant literature in the following areas: adoption and use of Information and Communication Technologies (ICTs), information economics, strategic management, entrepreneurship, small business growth and business performance.

The data for the Study A1 was collected with the help of a cross-sectional design employing face-to-face structured interviewing of micro-business owner-managers across four Cameroonian and four Afghan towns. Data from 210 micro-business owner-managers were retained for the analysis. The hypothesised model was successfully fitted on to the data using standardised fit indices provided in the AMOS 17 analytical software package. The fitted model was also validated for stability of variables using bootstrapping and knife-jacking techniques involving the generation of 200 random samples, and also against the criteria for assessing convergent validity, discriminant validity, nomological validity and face validity.

The findings showed that:

The Integration of Mobile Telephony Services into Business Processes (IB) was positively and significantly related to Perceived Enhanced Business Performance (PEP) at the $p<.001$ level. IB predicted PEP by **.398** which implies that when IB goes up by 1 standard deviation, PEP goes up by .398 standard deviations. IB accounted for 39.8 percent of the perceived variation in PEP.

There is a positive and significant relationship between Integration of Mobile Telephony Services into Micro-Business Processes (IB) and Perceived Enhanced Micro-Business Performance (PEP) in Afghanistan and Cameroon.

H1: IB →+ PEP

The strength of the relationship between IB and PEP is represented (Table 6.11) in the structural equation (1) by $\beta_{2,1}$

$\beta_{2,1}$ = .398

These findings also meant that the first research hypothesis (H1), *the integration of mobile telephony services into business processes will positively predict the enhanced operational performance of micro- businesses,* is supported.

In fact, H1 actually answers the first research question: '*What is the relationship between the integration of mobile telephony services into micro-business processes and perceived enhanced micro-business performance in Afghanistan and Cameroon?*'

7.1.1.2 Sub-Question 2

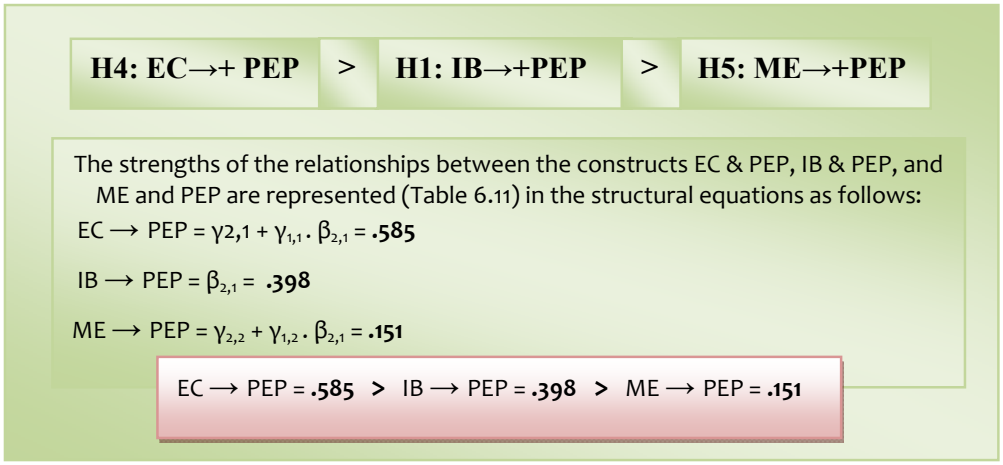
> *How does mobile telephony compare to two traditional determinants of enhanced business performance, Entrepreneurial Competence (EC) and the Micro-business Environment (ME), in terms of enhancing business performance?*

In the research model, it was also hypothesised that: *the Entrepreneurial Competence of micro-business owner-managers can directly predict the Perceived Enhanced*

Business Performance Outcome of micro-businesses - Hypothesis 4 (H4). EC was defined as the underlying intrinsic ability of *owner-managers* (Gartner, 1990) which enables them to effectively *coordinate* and *organise* sector *resources* (Kirzner, 1983) such as information, finance, legislation and other resources like mobile telephony services, to generate enhanced business performance in the form of *profits/personal advantages* (Morris et. al, 1994). EC is manifested in the form of the competitive behaviour of owner-managers, such as entrepreneurial ability, entrepreneurial action, customer orientation, and roles which drive the market process (Kirzner, 1973, pp 19-20).

It was also hypothesised in the research model that the micro-business environment under which entrepreneurs operate is important in determining the growth outcomes of their businesses. This led to the stating of the fifth research hypothesis (H5): *the Micro-business Environment (ME) can directly and positively predict the Perceived Enhanced Business Performance (PEP) Outcome of Micro-Businesses.* The theoretical framework indicated that for micro-businesses to thrive and contribute to economic growth, policy makers like the government and other non-governmental organisations (NGOs) must provide the support needed by micro-businesses to survive. The availability of micro-business financing schemes, technical and training opportunities, viable and reliable physical infrastructure like roads, electricity supply as well as telecommunications services, and the general absence of crime and corruption, were all identified as important elements of a pro-entrepreneurial environment.

Employing the same data collection and analysis techniques described in Sub-section 7.11 above, the relationships between EC, ME and IB were established. The results showed that:



Entrepreneurial Competence (EC) contributes the most of the observed variability in PEP, followed by the Integration of Mobile Telephony Services into Business Processes (IB) and then by the Micro-business Environment (ME), which contributes the least.

The findings provide the answer to the research question: *How does mobile telephony compare to two traditional determinants of enhanced business performance; Entrepreneurial Competence and the Micro-business Environment?*' The results also show that the first (H1) and the fourth (H4) research hypothesis have been supported at the $p<.001$ level while the fifth hypothesis (H5) was not supported even at the $p<.05$ level.

A negative direct relationship exists between ME and PEP, which suggests that the micro-business environments in Cameroon and Afghanistan are actually slowing down micro-business growth rather than enhancing it. However, if the effects of ME are moderated with the Integration of Mobile Telephony Services into Business Processes, a weak positive relationship emerges.

7.1.1.3 Sub-Question 3

What are the mechanisms through which micro-business integration of mobile telephony services contribute to performance enhancements?

The integration of mobile telephony services into business processes contribute to business performance mainly by reducing operational costs, providing timely access to business information and increases in revenue. This facet of the research was dealt with in Chapters Three, Four, Five and Six. In Chapter Three, the theoretical framework was delineated based on the review of the relevant literature (Steel, 2005; Bosma, 2008). The theoretical model (Fig. 3.3) was further developed into the conceptual and research models of the study in Chapter Four, by integrating four main theories related to why firms grow: *the Theory of the Growth of the Firm*, *The Theory of Entrepreneurship, the Resource-Based View (RBV) of the Firm,* and *The Firm as a Locus of Strategic Control.*

In Chapter Three it was argued that the entrepreneurial process, which is at the root of the business performance and growth of the firm, involves the transformation of low-yielding inputs into higher-yielding outputs. This process requires the interaction between the 'entreprenuering' firm and other market participants such as suppliers,

distributors and customers. This interaction process requires that information from manufacturers, equipment suppliers and other support services must reach the owner-manager or business on time and cheaply in order to operate enterprise growth mechanisms. The mobile phone remains the only vital channel through which this happens in Afghanistan and Cameroon, and also other developing countries.

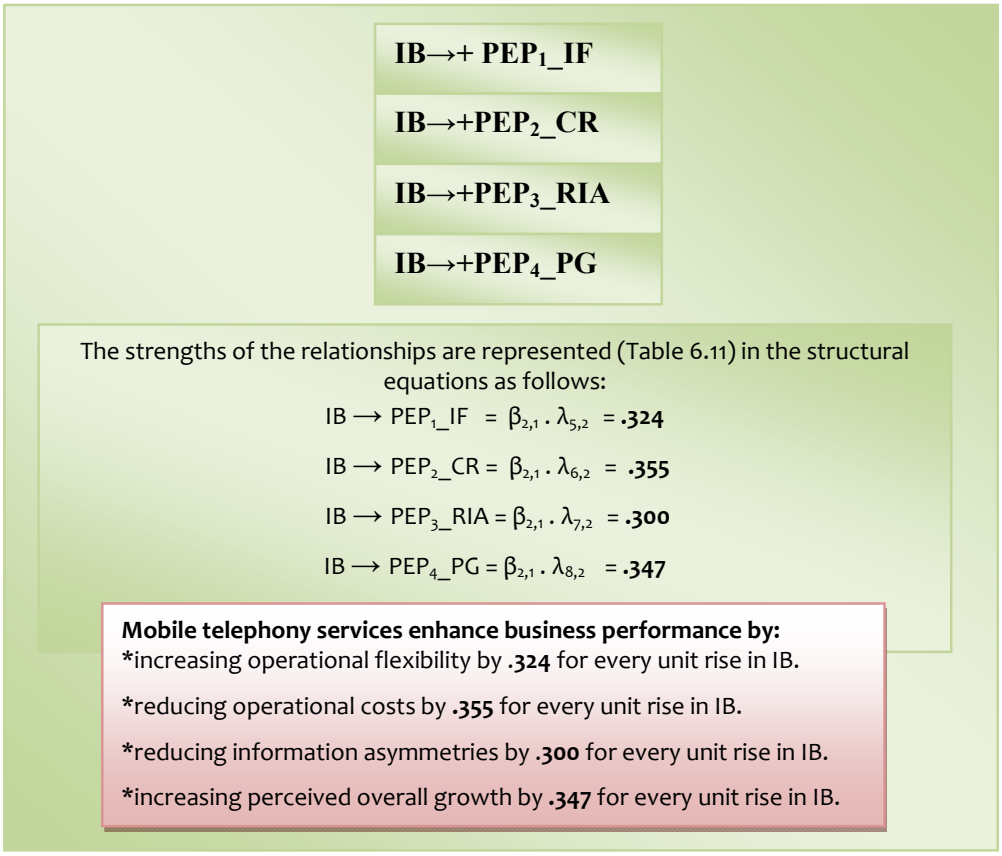
The theoretical framework which was developed in Chapter Three, also demonstrated that mobile telephony falls under one of five micro-business institutions known as the *Information Institution.* When this institution is functioning properly, it can enable the exchange of vital information related to the organisation and coordination of factors of production and distribution which can potentially introduce cost-saving innovations and access to vital information. This institution also ensures that information from manufacturers, equipment suppliers, and other support services reach the micro-business manager on time and cheaply in order to operate the enterprise growth mechanisms.

It was also argued that mobile telephony and its services (voice, SMS/MMS) have been interwoven into many supply, production, demand and distribution channels in contemporary business environments, and constitute the main information exchange channel which provides the owner-manager with more and essential business information in a sustained, cheap and timely manner. This increased access to business information enables them to increase the proclivity to make the right business decisions as well as to react more spontaneously to market signals. The use of these services can effectively enhance business performance and growth. It was also argued that if micro-business owner-managers use mobile telephony services in

combination with their unique entrepreneurial competences, strategic planning, and business networking, then enhanced business performance can be achieved.

In using empirical findings drawn from Du Boff (1980), Carey (1988) and Garbade and Silber (1978), which have successfully argued that the telegraph played an important role in the shrinking of inter-market price differentials and in lowering information and transaction costs, which ultimately freed resources for alternative uses and thus enhanced business performance, it was suggested that because mobile telephony services play the same role in modern businesses as the telegraph did in the 1840s , they should have a similar positive effect on business performance.

In Chapter four, it was concluded based on the available literature that mobile telephony services have the potential to reduce information asymmetries, increase sales, increase the potential for extending business activities beyond local markets, increase knowledge sharing and transfer, cut operational costs, increase operational flexibility, and increase the perception of business growth. This conclusion helped in the operationalisation of the PEP construct. The hypothesised relationships between the Integration of Mobile Telephony Services into Business Processes (IB) and indicator variables for Perceived Enhanced Business Performance (PEP) - *increased operational flexibility, reduction in information asymmetries, operational costs reduction, and perceived growth* - were empirically tested using a sample of 210 micro-business owners from Afghanistan and Cameroon. The structural equation modelling (SEM) analysis produced the following results:



The SEM results were corroborated with findings from Study A2. This study used retrospective scenario analysis to determine the business distance and time saved through the use of mobile telephony services using data extracted from the activity logs of respondents' mobile phones. The collected data were then analysed against the following scenario posed to each respondent:

> '*Let us consider that this business transaction (call, SMS, MMS, 'beep') which you have just carried out over the phone were to take place without a mobile phone (pre-mobile era). How would you have carried out the transaction?'*

The findings showed that for local and national (international transactions were excluded) mobile telephony based transactions:

A micro-business owner-manager **saves an average of 2.8 business hours a day** by simply using mobile telephony services.

A micro-business owner-manager **saves an average of 33.6 business kilometres per day** through the use of mobile telephony services.

Also, visual data analysis was also carried out in Chapter Six, in which six research photos were 'latently' analysed to enrich the findings of Studies A1 and A2. In particular, it was shown that:

Mobile telephony services contribute to the acquisition of new customers, increase knowledge sharing within the micro-business, contribute to the reduction of information asymmetries and cost, and also increase operational flexibility, which all combine to enhance perceived business performance.

Conclusively, the study has revealed that mobile telephony services are growing in importance within micro-business communities in Afghanistan and Cameroon where access to these services are quite high (84%) although the intensity of use is still low due the cost of the services which are still being perceived as high-to-very high and poor coverage in certain districts. These mobile services are used daily by owner-managers as a common means to serve customers, access vital business information

on products and services, purchasing, marketing and procurement. These findings provide the answers to the third research question.

7.1.1.4 Sub-Question 4

How do micro-business owner-managers in Afghanistan and Cameroon use mobile telephony services? Who do they communicate with?

This aspect of the research was partly handled in Chapter Three then completed in Chapter Five. It was shown in the theoretical framework in Chapter Three that owner-managers need to communicate with many economic market participants such as suppliers, customers, other professionals such as bankers and insurers, and government officials who are external to the business, as well as with their internal collaborators, in order to achieve business goals. In Fig. 6.13, it was shown that nearly 59 percent of all mobile telephony activities are related to business transactions while 32 percent of these activities are linked to transactions between family and friends.

The main function of mobile telephony is to enable a timely and cost effective link between these groups of agents. The variable *Mobile Integration Activities (IB1_iact)* was created to capture this information. The *IB1_iact* variable was operationalised using an average of eight 5-point Likert scale items as shown in Table 5.5. Also, respondents were followed over one year, tracing their communication business footprints which culminated in an in-depth analysis of the footprints in Chapter Five.

The conclusion from the analyses, show the following:

In ***Cameroon,*** micro-business owner-managers use:

*** 58.9 percent** of their total Mobile Telephony Activity (MTA) on direct business transactions (suppliers, customers)

***8.5 percent** of total MTA on support services like government and other professionals (insurance, banks, mechanics)

In ***Afghanistan,*** micro-business owner-managers use:

*** 59.1 percent** of their total Mobile Telephony Activity (MTA) on direct business transactions (suppliers, customers)

***5.8 percent** of total MTA on support services like government and other professionals (insurance, banks, mechanics)

The findings provide the answers to the fourth research question.

7.1.1.5 Sub-Question 5

How important is the mobile functionality of mobile telephony to the integration of its services into micro-business processes?

The *mobile functionality* of mobile telephony was shown to be very important to the integration of its services into business processes. This was dealt with in Chapters Two, Three, Five and Six. In these chapters the different mobile services were analysed and, while it was argued that the phenomenal growth of mobile telephony services in developing countries might have resulted from the failure of fixed line services to satisfy telephony demand, it was easily shown that mobile telephony is quite a different product from fixed line services because of its mobile functionality. This argument was corroborated with claims that, although mobile telephony was developed as an extension of fixed line services, it has also enjoyed excellent growth among businesses even in countries that had high fixed line penetration before the

introduction of mobile telephony services. Mobile telephony growth has overtaken fixed line growth in many countries including those that had very high fixed line penetrations, which demonstrates that the mobile functionality is very important. This study assumes that had mobile telephony preceded fixed lines, fixed lines would not have had a similar 'overtaking-effect' as it has been with fixed telephony preceding mobiles.

In Chapter Three it was shown through the use of questionnaire responses that one of the positive points that mobile telephony services have in influencing business performance was the flexibility offered by the technology. It permits micro-business managers to take business calls even when out of their business premises or when closed down for the day, which enables them to increase the level of their economic activities. In Chapter Five, Study B used visual data to show the importance of the mobility of mobile phones. In particular, it was shown that mobility enabled farmers to carry out business transactions even on the top of cocoa trees and that a trainee mechanic can be helped through a difficult car repair while in a remote area by his trainer or boss. Mobile functionality of telephony services offers the possibility for multitasking, as was shown in the case of the cocoa farmer who was able to control two other businesses from his farm thanks to mobiles. With the present state of fixed line technology, this level of flexibility is not possible. It can therefore be concluded that:

The *mobile functionality* of mobile telephony is **very important** to the integration of its services into business processes.

The findings provide the answers to the fifth research question.

7.1.2 Mobile telephony technology, business model and supply chain.

These issues were dealt with in Chapter Two. That chapter was intended to provide a technology aspect to the study which is visibly absent in many economic impact studies related to technology which tend to treat the technology as a 'black box' whose contents and behaviour 'may be assumed to be common knowledge' (Pinch and Bijker, 1984). Aspects that influence the adoption and innovative use of mobile telephony services were discussed.

The chapter offered an overview of the evolutionary generations of mobile telephony technology from 1946 till today and projected into the future. It was particularly shown that evolution from 0G characterised by poor quality analogue voice services and massive car-mounted user terminals, rapidly gave way to 1G with improved voice services and much smaller access terminals. The multitude of different 1G technologies which developed across the world, with almost every important developed country developing its own standard, gave rise to poor interoperability which prompted the need for the harmonisation of standards, which in turn gave birth to 2G. 2G technologies are advanced and provide digital quality voice services and SMS.

The GSM standard developed in Europe quickly imposed itself as the leading 2G standard and now accounts for over 3 billion subscribers worldwide today against its closest rival cdmaOne with less half a billion subscribers. With rising demand for access to data via mobile devices, 2G systems are being upgraded to accommodate data. Notably, 2G GSM networks are being overlaid with EDGE to upgrade data speeds from 9.6Kbps to 144Kbps while cdmaOne are being upgraded to CDMA2000

1x increasing data speeds from about 14Kbps to 176Kbps. Data-hungry users have also fuelled the development of 3G and 3.5G technologies which are capable of delivering data speeds as high as 80Mbps per second over three main standards, 3G – LTE (3Gpp), CDMA – EVDO-C (3GPP2) and IEEE 802.200 (WiMax). These three standards are expected to fuse into a single 4G standard by 2010 to provide seamless mobility to users.

The regulatory, technological and operational elements of the mobile telephony supply chain were presented and the relationship between the elements highlighted. Changes to mobile telephony business models were highlighted with investments shifting from voice-only technology to more data-intensive technologies. New business models based on MVNOs (Mobile Virtual Network Operators) are now emerging rapidly, and operators have now to deal with a wider range of supply elements as computing, broadcasting and telecommunication networks converge. The global state of the mobile market was also reviewed according to six regions, Europe, North America, Latin America, Asia, the Middle East and Africa.

The objectives of the chapter were largely met as the contents of the mobile telephony 'black box' were unveiled to pave the way for a better conceptualisation of the study.

7.1.3 The Conceptual and Research Models

The conceptual and research models were delineated in Chapter Three. The conceptual model was crafted out of the literature on entrepreneurship, business growth and information technology, and is represented in Fig.3.2. It establishes theoretical links between the Micro-business Environment (ME), Entrepreneurial

Competence (EC), and Entrepreneurial Resources represented by mobile telephony services and Enhanced Business Performance (PEP). The conceptual model suggested that the external business environment gives rise to entrepreneurial resources which combine in complex patterns with entrepreneurial competences which are intrinsic to micro-business managers to produce varying performance and growth outcomes.

The conceptual elements and relationships issuing from the model were then transformed into a researchable framework called the research model (Fig.3.3) which defined the nature of the constructs, relationships and hypotheses that drive the whole research project. The research model outlined and defined the indicators and latent variables. The structural relationships were defined in terms of research hypotheses. Six hypotheses were put forward:

Hypothesis 1: *The integration of mobile telephony services into business processes will positively predict the enhanced operational performance of micro- businesses.*

Hypothesis 2: *The level of integration of mobile telephony services into business processes is influenced by the micro-business environment.*

Hypothesis 3: *The rate of integration of mobile telephony services into business processes will depend on the Entrepreneurial Competence of micro-business owners-managers*

Hypothesis 4: *The Entrepreneurial Competence of micro-business owner-managers can directly predict the enhanced business performance outcome of micro-businesses.*

Hypothesis 5: *The Micro-business environment can directly predict the enhanced business performance outcome of micro-businesses.*

The research model was represented in Structural Equation Modelling notation and in graphics which suggested the analytical techniques to be applied to the data collected from a sample of 210 micro-business users across Afghanistan and Cameroon. All the research hypotheses were tested and the results presented in Chapter Six.

7.1.4 The Research Paradigm.

In Chapter Four the paradigm of the study was clarified in terms of its epistemology, ontology and methodology. The paradigm of the study defined the set of values and techniques which guided the whole research process and was represented in Fig. 4.1.

The epistemology adopted to help answer the main and secondary research questions was guided by the belief that 'organisations exist as concrete entities about which data can be collected', in order to gather facts which informed the delineation of the *conceptual model* made up of *analytical constructs* that can 'be used to analyse the regularities of the data' (Bryman and Bell, 2007). This corresponds with the literature on positivist epistemology (Pugh, 1983) and the literature on cross-sectional and observational research designs.

The ontology of the study conceived the reasons why micro-businesses adopt mobile telephony services, how they use and value them, to be socially constructed. This infers a constructionist ontology, which holds that the adoption and use of mobile phones by micro-business owners depend on how they construct the usability and

importance of the technology. This guided the operationalisation of the conceptual constructs and variables embedded in the conceptual framework. In particular, it demonstrated that to understand the impact of mobile telephony services on enhanced micro-business performance, information or data should be sourced from the *social group* concerned, i.e. the owner-managers themselves.

The research methodology defined the nature of the research activity in terms of the Research Method or Research Strategy, Research Techniques and Research Instruments. The strategy design for the empirical study contains both quantitative and qualitative analysis. The quantitative analysis was aimed at gaining insights into the existence and strength of the hypothesised relationships in the research model, while the qualitative analysis sought to provide more meaning to the quantitative outcome of the model. This mixed strategy informed the splitting of the study into three sub-studies, Studies A1, A2 and B, which provided triangulation to the findings, and a more holistic view of the impact of mobile telephony services on enhanced business performance. In the penultimate section of the methodology presentation, critical SEM design issues for an empirically valid study were considered.

The use of mixed methods employing quantitative and qualitative data increased the validity and reliability of the findings. Generalisation was stimulated by the randomness of the sample, and cross-country comparison offered by the design of the study. However, generalisability was compressed due to use of local-level indicator variables to operationalise the *Micro-Business Environment* (ME) construct.

By comparing the influence of mobile telephony services on business performance with two traditional variables, entrepreneurial competence and micro-business environment, the study provided more interesting insights into the phenomenon of enhanced business performance and firm growth by bringing together literature from four scholarly disciplines, entrepreneurship, business performance and growth, strategic management, and information and communication technologies.

7.1.5 General Conclusion:

To advance a general conclusion for this study, the main research question has to be re-examined:

> *How important are mobile telephony services in determining enhanced business performance outcomes of micro-businesses in Afghanistan and Cameroon?*

The research in this study shows a strong influence of the Integration of Mobile Telephony Services into Micro-Businesses Processes (IB) on Perceived Enhanced Business Performance in Afghanistan and Cameroon. The findings and conclusions of the study, with regard to the main research question and the five sub-research questions, have been presented in Sub-section 7.1.1 above. Generally, it can be concluded that there is a positive and significant relationship between the Integration of Mobile Telephony Services into Business Processes (IB) and Perceived Enhanced Business Performance (PEP).

This impact does not automatically apply by simply using the phone. It must be blended with the intrinsic values of micro-business owners-managers, which include

entrepreneurial abilities, entrepreneurial actions, customer orientation and the commitment to grow the business, as well as the business environment under which the businesses operate.

Also, the findings show that although micro-business environments are vital in enhancing business performance outcomes by influencing the level of entrepreneurial activities within an economy, they are poorly developed in Afghanistan and Cameroon. Both environments are characterised by not-so-well-developed electricity networks or road infrastructures, limited and un-coordinated micro-funding regimes, widespread micro-level corruption and rising insecurity, none of which is favourable to the development of entrepreneurial activities. This poorly-developed entrepreneurial environment is particularly notable in Afghanistan compared to Cameroon.

The most developed and functional infrastructure in both countries is the mobile telephony network. Despite the fact that they are well developed in both countries, the cost of services is still considered as 'expensive-to-very expensive' by 80.3 percent of Cameroonian and 79.9 percent of Afghan respondents. This perceived high cost of mobile services is limiting the level of mobile telephony integration into business processes and its potentially beneficial impact on enhanced business performance and firm growth. This is evidenced by the brief nature of a unit mobile phone call in both countries. Respondents tend to speak very quickly and briefly, especially during per-second billing. An average call in Cameroon lasts just 80 seconds as against 98 seconds in Afghanistan and 3.4 minutes in England. The

perceived high cost of services has led to high levels of 'beeping' in order to cut expenditure on mobile telephony services.

Afghanistan and Cameroon mobile markets are quite well developed, with active competition in the provision of mobile services. The regulatory and institutional frameworks are being improved in both countries in order to attract more investment in mobile telephone networks. Approximately 70 percent of both countries have mobile phone coverage, although only about 29 percent of Afghans and 40 percent of Cameroonians are connected to the mobile telephone network.

Another facet of the findings is that the influence of mobile telephony services on enhanced business performance depends strongly on the entrepreneurial competence of the micro-business managers. Respondents who use mobile services more for business than for non-business transactions as measured by the ratio of business-related mobile activity to total mobile activity asserted that businesses were performing much better compared to those who had lower ratios. There was also a strong, positive and significant correlation ($\alpha = .68$) between the intensity of mobile telephony use and perceived business performance. This explains the crucial role the owner-manager has in determining business performance outcomes via the use of mobile telephony services. The services can only contribute to business growth if they are used innovatively in business processes. Some businessmen were found to use the services poorly, such as by sustaining long and fruitless conversations with other business friends. This attitude increased their monthly communication expenditure but yielded minimal business benefits. This was particularly noticeable among respondents who are younger than 45 years of age.

7.2 Methodological issues:

In this study, the methodology was treated as part of the overall paradigm that drives the study. The methodology combined two main strategies, quantitative and qualitative. While the quantitative strand guided the overall empirical study, the qualitative strand added meaning to the empirical aspect. The methodology adopted a cross-sectional design and a semi-longitudinal design in an attempt to obtain a more rounded view of the nature of the relationships hypothesised in the study.

7.2.1 Methodological limitations

Fundamental to the conduct and outcome of this study is the conceptual model which defined the research model. The conceptual model combines concepts from four scholarly fields and a focused choice of variables. While this combination of concepts has increased the explanatory power of the model, it is debatable whether the model has been able to achieve equilibrium between breadth and depth in combining the concepts. In order to ensure that a valid combination was achieved, inspiration was drawn from previous researchers (Davidsson, 2004; Davidsson and Wiklund, 2006; Carton and Hofer, 2006) who have also combined variables from different academic disciplines, this was also achieved by adopting structural equation modelling techniques to analyse the data because of its ability to handle data from varied sources employing different measures (Hair et al. 2006; Tabachnick and Fidell, 2007, Schumacker and Lomax, 2004 and Kline, 2005).

While the proposed eclectic model (Fig. 4.2) is expected to provide a deeper understanding of the impact of mobile telephony penetration on micro-business performance, it also acknowledges that the framework is 'incomplete' like all other

models in the social sciences, in which *'the whole world cannot be include in one model'* (Davidsson, 2004 p45). However, error terms **δ** and **ζ** were included into the model to compensate for what could not be included. While this inherent difficulty of including all possible variables has the potential of generating validity issues, it was minimised in this study by using large batteries of questionnaire items to cover many facets of the constructs, by employing previously tested and validated indicator variables, and also by ensuring that newly created variables were subjected to stringent pre-testing and validation procedures before being included in the research instrument. Despite taking these precautionary measures to ensure validity, these issues can only be minimised, not eliminated.

Attempts to obtain a truly representative sample were stalled particularly in Afghanistan where security problems prevented data collection in Lashkar Gah, Helmand Province which was chosen randomly for the study. Cultural issues limited the number of female entrepreneurs included in the sample. These issues generate concerns linked to the generalisation of the study.

The main outcomes of the study are merely quantitative estimates of the structural interaction between the integration of mobile telephony services into micro-business processes and perceived enhanced business performance based on the perceptions of 210 micro-business owner-managers in Afghanistan and Cameroon. The period allocated for the study was rather short, and it cannot be claimed that 210 micro-business managers from within two countries is fully representative of the entire micro-business communities of both countries and of developing countries in general.

Although it may be possible to mirror the findings of the study beyond the sample, generalisation beyond the sample is constrained by these practical limitations.

One main limitation of the methodology of the study rests on the fact that data for the independent and dependent variables were collected from the same informants. The weakness in this technique is that it is prone to common method bias, which is one main source of measurement error. Common method bias may lead to inflated estimates of the relationships between the variables due to the inclusion of *method variance* in the actual variance (Podsakoff and Organ, 1986; Podsakoff et al., 2003).

It is recognised in the study that the proposed and tested model is far from complete in the sense that the model can be further improved through the refinement of the hypothesised constructs and the inclusion of other variables. Also, it was not possible within the framework of this study to carry out an extensive testing of the mega-theories that were used to construct the hypotheses in the light of available information and timetable.

7.3 Contributions to Knowledge.

This study set out to examine the nature and the role of the integration of mobile telephony services into business processes on the performance outcomes of micro-businesses.

7.3.1 Theoretical Contributions:

This study has attempted to contribute to the theoretical debate on the growth of firms and the role of mobile telephony services, entrepreneurial competence and micro-business environments in determining the growth outcomes of micro-enterprises. The study has also contributed to theory through the development of a framework which integrates different perspectives related to the explanation of micro-business performance and growth of the firm.

Relying on the assumption that 'theories are tools,' and as such, can be modified and combined with other tools to meet specific needs and objectives (Davidsson, 2004; p 44), this study has used four mega-theories (*Theory Of The Growth of the Firm*; *Theory of Entrepreneurship, Resource-Based View of the Firm, Firm as a Locus of Strategic Control)* which related to firm growth and business performance to fashion and eclectic model that meets the specific needs of this research project. The benefit of integrating a set of related mega theories to develop a set of testable hypotheses in a single research project is that the outcome of the findings benefit from the strengths and individual explanatory power of the individual theories thus increasing its validity.

It is worth noting here that this study was not out to test these mega theories per se but to use them as bases for the development of testable hypotheses. By effectively testing these hypotheses, this study therefore contributes to, supports and strengthens certain aspects of the mega theories. This study has extended and validated facets of these theories as outlined in Chapters Three and Four by identifying a testing a 'new' variable known as '*The Integration of Mobile Telephony Services into Business Process*' to the list of determinants of business performance.

The study has also conceptualised, operationalised, tested and validated a model to assess the impact of mobile telephony services on micro-business growth in a developing economy context. This model can be applied in other studies across different geographies and business sectors.

The research has also succeeded in showing the importance of the *Integration of Mobile Telephony Services into Business Processes* as a determinant of business performance outcomes relative to two other variables, the *Entrepreneurial Competence* of business managers and the *Micro-business Environment* within which these businesses operate.

7.3.2 Methodological Contributions

The results of the analyses present the structural relationship between two constructs which are traditional determinants of business performance, entrepreneurial competence and business environment, and a 'new' determinant, mobile telephony services. In building the research model, 16 multi-item indicator scales were developed to measure the four hypothesised constructs. 12 of these scales were

completely new, while 4 were pre-existing, contextualised to meet the design of the study. The richness of these scales and the overall robustness of the model imply that they can be used across a wider range of academic disciplines, making them valuable inputs in future studies.

The introduction of the latent variable, *Integration of Mobile Telephony Services into Business Processes (IB)*, its operationalisation and application as a predictor of enhanced business performance offers a more scientific approach and valuable contribution in investigating the impact of mobiles phones on business and economics compared to a variable like teledensity which is very widely used.

By bringing together elements of the adoption and use of new information and communication technologies including key variables associated with the creation of a pro-business environment and the structural links that make them work, the study contributes to science by enabling further use of these concepts in empirical research on the relation of mobile telephony use for business and enhanced business performance.

The study provides alternative ways of measuring firm performance not based on growth accounting measures (ROI, ROA). This is particularly useful in environments where no concrete firm performance data exists, such as in most micro-businesses in the case countries and beyond. By introducing the models in Figs.3.2 and 3.3 a contribution to the scientific fields of entrepreneurship, business performance and firm is therefore provided.

The study has also succeeded through the use of appropriate philosophical perspectives to demonstrate the possibilities and techniques of combining survey and visual data analysis in the same research project without endangering traditional ontological and epistemological standings.

7.3.3 Practical Contribution.

The practical contribution of this study lies in its objective of situating mobile telephony services within other determinants of enhanced business performance and firm growth. By reviewing and analysing the literature from the fields of entrepreneurship, strategic management, policy, information technology, growth of the firm and economic development in developing countries, an attempt is made to answer some of the development issues facing developing economies. Fighting poverty requires the combination of many tools. This study has successfully brought together a set of tools from different scholarly areas which can potentially be applied to improve on the performance of micro-businesses in the case countries and beyond.

Although the main objective of this study has been to ascertain the extent to which mobile telephony services determine the growth outcomes of micro-businesses, the study has also explored the role of two other determinants of firm growth; *entrepreneurial competence* and the *micro-business environment* that have the potential to influence the adoption, integration and impact of these services on micro-business performance. This has been achieved by analysing the extent to which existing micro-level policies (micro-financing, infrastructure, legal and institution support) related to micro-businesses in Afghanistan and Cameroon facilitate or inhibit the adoption and integration of mobile telephony services and their impact. The

findings reveal that there important policy issues such as the need to tackle corruption, achieve political stability and the absence of violence, the training of micro-entrepreneurs in areas of general management and the availability of micro-business financing schemes. These hurdles inhibit the creation of pro-entrepreneurial environments in the case countries and their relative importance has been statistically identified in the study.

Other important policy areas that must be tackled in order to enhance business performance through the use of mobile telephony services involve the total liberalisation of the telecommunications markets in both countries, the re-enforcement of the independence of the telecommunications regulator and the creation of a truly competitive and level playing field for all operators. While much has been achieved with regards to market liberation and competition in both countries, the institutional and regulatory environments are still struggling to meet up with fast pace of a dynamic telecommunications industry. This can be achieved through continuous training of regulators and specialised recruitments. The International Telecommunications Union provides a good starting point for optimising regulatory efficiency.

Because mobile telephone related taxes appear to have a direct impact on the cost of services and consequently adoption and intensity of use (Fig. AC6), it is important that governments fix their mobile telephone related taxes in a fair and transparent with the view that lower taxes may lead to more adoption and integration of mobile services in business processes and enhanced business performance. In Cameroon for example, mobile related taxes are high compared to other countries within the region (Table AC1) or with similar level of development. This is reflected in the price per

unit call which is considered one of the highest in the region. To increase adoption and the impact of mobiles beyond the 38.9 percent estimated in the research model, it is worth considering mobile tax cuts for Cameroon.

While operators in Afghanistan consider mobile related taxes to be 'fair', lack of stability and rapid fluctuation of the country's financial bills are a major concern. According to the major operators in the country, new taxes can be created over night if the government needs money. Stabilising the financial system can boost the impact of mobile telephony services on business performance

The preceding suggestions can be exploited by policy-makers to improve on the growth of entrepreneurial activities which are precursors of real economic growth. The study also provides managers with important information on how mobile telephony despite being a general purpose technology can be very instrumental in securing enhanced business performance.

This study also reiterates to micro-business owners that the success of their business lies in their own hands. They have to develop their entrepreneurial skills and managerial competence through adequate training. They must be able to use communication technologies innovatively in order to create unique capabilities for their businesses.

The study also draws the attention of policy-makers to the fact that micro-businesses must be supported by other agents in the economic environment such as governments and NGOs by ensuring that they have access to the necessary tools which can enable

them to shift scarce resources from low-yielding areas to high-yielding ones in order to enhance economic performance and growth.

7.4 Suggestions for Further Research.

This study presents analysis relating to three potential predictors of enhanced business performance. While these predictors and outcome variables were selected and investigated based on certain criteria already discussed in the study, this subsection looks at alternatives.

7.4.1 The conceptual model

While the three constructs chosen for investigation are considered to be particularly important in predicting enhanced business performance, other predictors that are equally important and worth investigating exist. Using different or supplementary combinations of variables and relationships may yield a much better predictor for enhanced business performance. The construction of the model makes use of up to four mega- theories related to the constructs. Perhaps it would be important in future to build a model that is entirely driven by just one mega-theory in order to fully test that theory. It could also be interesting to develop a model that is entirely operated by 'objective' variables which can permit more in-depth analysis and forecasting. This will require a longitudinal design whereby growth accounting measures are constructed and collected over time alongside changes in mobile telephony usability.

7.4.2 Methodology.

The methodology for this study which is embodied in the research paradigm was chosen over other competing methodologies for its merits and adaptability to the present research contexts. Most of the measures used in the study are subjectively based on the perceptions of the respondents. Adopting a methodology that is capable of capturing more objective data may increase the validity and applicability of its findings. Reinforcing the qualitative component of the study through the use of grounded theory techniques can provide a more holistic view on the mobile telephony impact on enhanced business performance.

7.4.3 Consideration for other Information Technologies.

Mobile telephony is one of the many emerging information and communication technologies that can potentially impact the performance of businesses in developing and developed economies. While the choice of mobile telephony services in this study was prompted by the rapid growth in penetration of the services within micro-businesses, the rise of other technologies like mobile broadband and TV is imminent. Despite the fact that cable communication networks have remained poorly developed resulting in low broadband penetration rates in developing economies, the mobile networks are well developed. The growing capability of mobile networks in providing broadband services may well mean that many developing countries may have to rely on mobile networks to achieve internet penetration. Because the internet is poised to drive economic growth in the next few years, it is crucial that research instruments should be developed to capture the potential impact of mobile broadband in order to provide decision-makers with reliable data that can inform policy developments. The

model developed in this study can effectively be modified to tackle such investigations.

7.4.4 Consideration for other sectors.

The model and methodology developed for this study can be used to investigate the impact of other technologies and services within different sectors. The research framework developed in this study has to be tested across many economies and sectors to ascertain the stability of the models proposed.

7.5 Assessing whether the Research Objectives have been Achieved:

The main objective of the research:

> '*To ascertain the impact of mobile telephone use by micro-entrepreneurs on enhanced business performance by investigating how micro-business owner-managers in Afghanistan and Cameroon perceive the business enhancement potential of mobile telephony services',*

Was largely achieved as the study was able to demonstrate theoretically and empirically that the integration of mobile telephony services into business operations is 'highly-significantly' and positively related to enhanced business performance. The use of mobile telephony for business could account for as much as 39.8 percent of the observed variation in perceived enhance business performance.

The first sub-objective was*:*

> '*To explore the usage patterns of mobile telephony services by micro-business owners in Cameroon and Afghanistan, to show that the contribution of mobile*

telephony services to enhanced business performance depends on their innovative integration into the production apparatus of micro-businesses',

This was largely achieved as the study was able to capture fresh mobile phone usability data related to business transactions of some 210 micro-business owners-managers over four business quarters (Q3 2007 to Q3 2008) across four Afghan and four Cameroonian towns. Statistical analysis and theory outlined in the research showed that the ability to effectively integrate mobile telephony services into the production apparatus depends on the *Entrepreneurial Competence* or *innovativeness* of micro-entrepreneurs (Hypothesis 4).

In the study, Figs. 6.14, 6.15, 6.16, 6.17 and 6.18 showed visually that it not sufficient for business managers to own a mobile phone and achieve enhanced business performance. An innovative pig farmer was able to increase his business earnings by simply making his phone number available to passersby of a busy road, while another innovative farmer was able to adapt his mobile phone to access the network from the top of a cocoa tree, so as not to miss important business calls. It was also shown in the study that owner-managers who had a higher ratio of business-related *Mobile Telephony Activity* (MTA) to total *Mobile Telephony Activity,* perceived their businesses to be *better-performing* than those who had a lower ratio.

The second sub-research objective was:

'To develop a set of indicators that can be used to evaluate the impact of mobile telephony on enhanced business performance in a developing economy context',

This objective was achieved by extracting theory from the literature to construct a research model (Fig. 4.2) made up of four latent variables, the Integration of Mobile Telephony Services into Business Processes (IB), Perceived Enhanced Business Performance (PEP), Entrepreneurial Competence (EC), and Micro-business Environment (ME), each with a set of four indicators which were operationalised using *parcels* of questionnaire items. The model was empirically tested to confirm the validity, reliability and stability of the variables.

The third sub-research objective:

> *'To explore the relationship between the factors that contribute to the Integration of Mobile Telephony Services into Business Processes'*

This objective was achieved through the use two traditional business performance determinants, Entrepreneurial Competence and the Micro-business Environment (ME) which were hypothesised to directly influence the Integration of Mobile Telephony Services into Business Processes'. The results of the statistical analysis showed that together, both variables (EC and ME) accounted for 32 percent of the variation in IB accounted for by the model.

Finally, the fourth sub-research objective was to:

> *'To demonstrate that the integration of mobile telephony services into business processes enhances small business performance in localities across Afghanistan and Cameroon',*

This objective was also largely achieved by the study through the use of statistical analysis of data collected across four Afghan and four Cameroonian towns from a sample of 210 micro-entrepreneurs. The findings showed that the Integration of Mobile Telephony Services into Business Processes accounted for 39.8 percent of the variation in Perceived Enhanced Business Performance.

7.6 Concluding thoughts

Mobile telephony services have an important impact in determining enhanced business outcomes of micro-businesses in developing economies. The level of impact depends on some intrinsic values of micro-business owner-managers grouped under the variable, *Entrepreneurial Competence* and also on a set of factors linked to the business environment grouped under the variable, *Micro-business Environment*. And that, it is possible to influence the level of impact through policy issues linked to the availability and access to these services and the creation of a pro-entrepreneurial environment.

The impact of mobile telephony services on business performance and economic growth is positively enormous in developing economies, which implies that incentives aimed at growing mobile penetration and use should be a strategic priority and policy makers like the government and other non-governmental organisations (NGO) must provide the support needed by micro-businesses to survive.

This study is the first step in quantifying empirically the impact of mobile telephony services on business performance at the micro-level. For scholars, the research must

be replicated in diverse environments and over time to validate the stability of the variables used in the study. The study employs scenario-based data, which undermines its generalisability. Future research should consider extending the study to bigger businesses which can enable the impact of firm size to be fully assessed. Future studies should also consider extending the sample size in such a way that there is sufficient data to allow for in-depth analysis and comparison between the different economic sectors since the study has shown that the quantity of information processed and perceived impact are sector-dependent.

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Appendix A: Some Population Characteristics

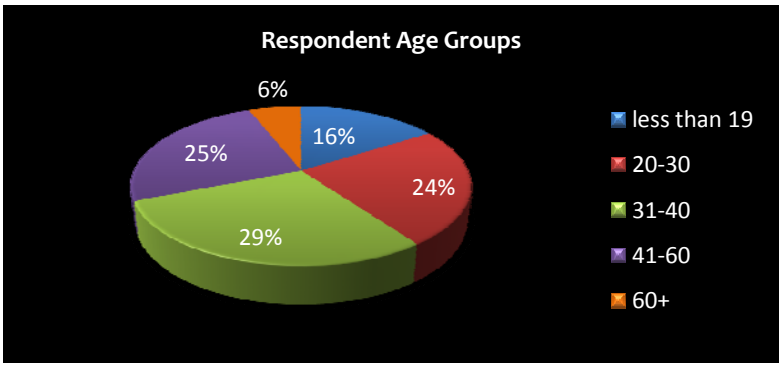


Fig. AA1: *Respondent Age Groups (N=210)*

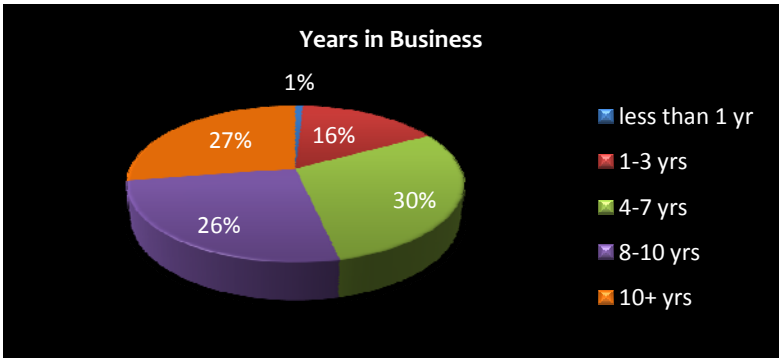
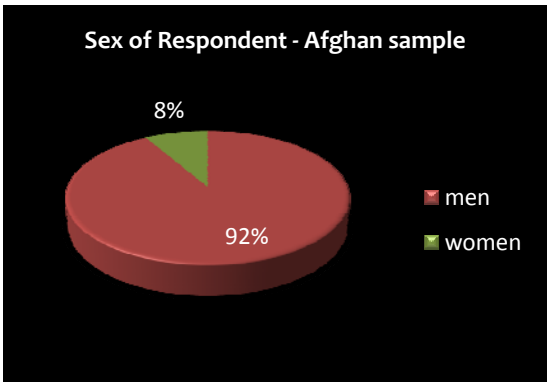


Fig. AA2: *Respondent Years in Business (N=210)*



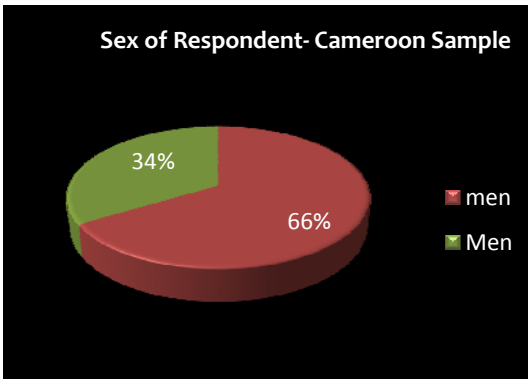


Fig. AA3: *Sex of Respondents (N=103, N=107)*

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
IB1_isms	24.53	20.262	.563	.738
IB2_ivoi	21.79	23.401	.699	.626
IB4_irs	20.93	32.864	.440	.768
IB3_iact	21.93	26.503	.633	.673

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
EC1_ea	23.03	17.725	.664	.448	.831
EC2_cg	22.60	17.933	.754	.573	.775
EC3_co	22.29	24.024	.678	.489	.823
EC4_em	25.59	21.592	.733	.560	.792

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
ME1_fa	6.20	6.358	.433	.194	.641
ME2_ta	5.78	4.642	.509	.275	.592
ME3_is	6.15	5.601	.439	.199	.633
ME4_ce	5.99	5.566	.503	.268	.593

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
PEP1_IF	10.63	7.400	.752	.609	.876
PEP2_CR	10.59	7.318	.829	.710	.850
PEP3_ME	11.35	7.189	.713	.524	.893
PEP4_RIA	11.32	7.032	.810	.667	.855

Table AA1: *Initial Reliability Test on Construct Items Using SPSS*

Implied (for all variables) Correlations (Group number 1 - Default model)

	EC	ME	IB	PEP	IB4_irs	IB3_iact	IB2_ivoi	IB1_isms	PEP2_CR	PEP4_PG	PEP3_RIA	PEP1_IF	ME1_fa	ME2_ta	ME3_is	ME4_ni	EC1_ea	EC2_cg	EC3_co	EC4_em
EC	1.000																			
ME	.249	1.000																		
IB	.374	.502	1.000																	
PEP	.623	.296	.566	1.000																
IB4_irs	.171	.229	.456	.258	1.000															
IB3_iact	.299	.401	.799	.452	.364	1.000														
IB2_ivoi	.333	.447	.890	.504	.406	.711	1.000													
IB1_isms	.219	.294	.585	.331	.267	.468	.521	1.000												
PEP2_CR	.556	.265	.505	.893	.231	.404	.450	.296	1.000											
PEP4_PG	.542	.258	.493	.871	.225	.394	.439	.288	.778	1.000										
PEP3_RIA	.469	.223	.427	.754	.195	.341	.380	.250	.674	.657	1.000									
PEP1_IF	.507	.241	.461	.815	.210	.368	.410	.270	.728	.710	.614	1.000								
ME1_fa	.125	.502	.252	.149	.115	.201	.224	.147	.133	.129	.112	.121	1.000							
ME2_ta	.167	.671	.337	.199	.154	.270	.300	.197	.178	.173	.150	.162	.337	1.000						
ME3_is	.127	.508	.255	.151	.116	.204	.227	.149	.135	.131	.114	.123	.255	.341	1.000					
ME4_ni	.170	.684	.344	.203	.157	.275	.306	.201	.181	.177	.153	.165	.343	.459	.348	1.000				
EC1_ea	.728	.181	.273	.453	.124	.218	.243	.159	.405	.395	.342	.369	.091	.122	.092	.124	1.000			
EC2_cg	.839	.209	.314	.522	.143	.251	.279	.184	.466	.455	.394	.425	.105	.140	.106	.143	.610	1.000		
EC3_co	.750	.187	.281	.467	.128	.224	.250	.164	.417	.407	.352	.380	.094	.125	.095	.128	.545	.629	1.000	
EC4_em	.814	.203	.305	.507	.139	.244	.271	.178	.453	.442	.382	.413	.102	.136	.103	.139	.593	.683	.610	1.000

Table AA2: *Implied Correlation Matrix for the Structural Model (Amos output)*

Factor Score Weights (Group number 1 - Default model)

	IB4_irs	IB3_iact	IB2_ivoi	IB1_isms	PEP2_CR	PEP4_PG	PEP3_RIA	PEP1_IF	ME1_fa	ME2_ta	ME3_is	ME4_ni	EC1_ea	EC2_cg	EC3_co	EC4_em
EC	.001	.002	.003	.000	.056	.043	.020	.029	.004	.005	.003	.006	.108	.216	.197	.237
ME	.006	.018	.030	.005	.002	.002	.001	.001	.147	.182	.120	.240	.002	.004	.003	.004
IB	.081	.241	.413	.065	.064	.048	.022	.033	.029	.036	.024	.047	.001	.003	.003	.003
PEP	.003	.008	.013	.002	.309	.234	.107	.161	.000	.001	.000	.001	.006	.011	.010	.012

Table AA3: *Factor Score Matrix for the Structural Model (Amos output)*

Summary of Bootstrap Iterations (Default model) (Default model)

Iterations	Method 0	Method 1	Method 2
1	0	0	0
2	0	0	0
3	0	0	0
4	0	0	0
5	0	0	0
6	0	0	0
7	0	0	0
8	0	17	0
9	0	34	0
10	0	41	0
11	0	43	0
12	0	22	0
13	0	17	0
14	0	8	0
15	0	9	0
16	0	5	0
17	0	3	0
18	0	1	0
19	0	0	0
Total	0	200	0

0 bootstrap samples were unused because of a singular covariance matrix.
0 bootstrap samples were unused because a solution was not found.
200 usable bootstrap samples were ob

Table AA4: *Bootstrap Iterations (Amos output)*

	EC	ME	IB	PEP	IB4_irs	IB3_iact	IB2_ivoi	IB1_isms	PEP2_CR	PEP4_PG	PEP3_RIA	PEP1_IF	ME1_fa	ME2_ta	ME3_is	ME4_ni	EC1_ea	EC2_cg	EC3_co	EC4_em
EC	1.547																			
ME	.210	.459																		
IB	.764	.558	2.692																	
PEP	.624	.162	.748	.649																
IB4_irs	.311	.227	1.095	.304	2.140															
IB3_iact	.702	.513	2.473	.687	1.006	3.557														
IB2_ivoi	.883	.645	3.110	.864	1.265	2.857	4.536													
IB1_isms	.764	.558	2.692	.748	1.095	2.473	3.110	7.860												
PEP2_CR	.651	.169	.780	.677	.317	.716	.901	.780	.884											
PEP4_PG	.685	.178	.821	.712	.334	.754	.948	.821	.743	1.031										
PEP3_RIA	.625	.162	.749	.650	.304	.688	.865	.749	.677	.713	1.144									
PEP1_IF	.624	.162	.748	.649	.304	.687	.864	.748	.677	.712	.650	.977								
ME1_fa	.131	.286	.347	.101	.141	.319	.401	.347	.105	.110	.101	.101	.706							
ME2_ta	.258	.563	.685	.198	.279	.630	.792	.685	.207	.218	.199	.198	.350	1.534						
ME3_is	.166	.362	.441	.128	.179	.405	.509	.441	.133	.140	.128	.128	.225	.445	1.108					
ME4_ni	.210	.459	.558	.162	.227	.513	.645	.558	.169	.178	.162	.162	.286	.563	.362	.980				
EC1_ea	1.941	.263	.958	.782	.390	.880	1.107	.958	.816	.859	.783	.782	.164	.323	.208	.263	4.595			
EC2_cg	2.046	.278	1.010	.825	.411	.928	1.167	1.010	.860	.906	.826	.825	.173	.341	.219	.278	2.566	3.847		
EC3_co	1.210	.164	.598	.488	.243	.549	.690	.598	.509	.536	.488	.488	.102	.201	.130	.164	1.518	1.600	1.685	
EC4_em	1.547	.210	.764	.624	.311	.702	.883	.764	.651	.685	.625	.624	.131	.258	.166	.210	1.941	2.046	1.210	2.335

Table AA5: *Implied (for all variables) Covariances (Group number 1 - Default model) – AmosOutput*

Appendix B: Questionnaires

SECTION ONE (Q1-Q16): YOU AND YOUR BUSINESS

1) Name of Respondent [*Optional*] _____

2) Age range of respondent in years [***Please tick the appropriate box***]

≤19 (1) ☐ 20-30 (2) ☐ 31-40 (3) ☐ 41-60 (4) ☐ 61+ (5) ☐

3) Sex of respondent ***[Please tick the appropriate box]***

Male (1) ☐ Female (2) ☐

4) Highest Level of Education attained by respondent [***Please tick the appropriate box***]

No Formal Schooling (1) ☐ Primary Sch. (2) ☐ Secondary Sch. (3) ☐ Islamic Sch. (4) ☐ University/Prof. Sch (5) ☐

5) Main occupation of respondent? [***Please tick the appropriate box***]

Civil Servant/student (1) ☐ Professional (2) ☐ Farming (3) ☐ Small Business Owner (4) ☐ Others (777) ☐

6) Respondent's Main line of business?

_____

_____

7) Since when have you been in this business? [***Please tick the appropriate box]***

≤1 year (1) ☐ 1-3 years (2) ☐ 4-7 years (3) ☐ 8-10 years (4) ☐ 10 + years (5) ☐

8) How many people work for you? ***[Please enter the value in the box]*** ☐

9) a) How can you describe your business for the past three years? ***[Please tick only one box]***

Much worse (1) ☐ Worse (2) ☐ No change (3) ☐ Better (4) ☐ Much better (5) ☐

b) What main factors / reasons account(ed) for your answer in (a)?

_____

_____

_____

10) a) How do you foresee the position of your business in the next three years? ***[Please tick only one box]***

Much worse (1) | Worse (2) | No change (3) | Better (4) | Much better (5)

b) What main factors / reasons account(ed) for your answer in (a)?

_____

_____

_____

11) Does your business /Work place (premises) have the following? [***Please tick the appropriate box***]

Electricity (grid/generator) — Yes (1) No (2)

Television — Yes (1) No (2)

Computer / Laptop — Yes (1) No (2)

Radio — Yes (1) No (2)

12) How can you rate the business tax you pay? ***[Please tick only one box]***

Unaffordable (1) | Barely affordable (2) | No opinion (3) | Affordable (4) | Very Affordable (5)

13) In the last three years, how has your competitive position changed? ***[Please tick the appropriate box]***

Increased sharply (1) | Increased (2) | Same (3) | Decreased (4) | Decreased sharply (5)

14) How can you describe your level of experience in this business? ***[Please tick one box]***

Very inexperienced (1) | Inexperienced (2) | No opinion (3) | Experienced (4) | Very experienced (5)

15) (a) Since when did you or your business first acquire a mobile phone? ***[Please tick the appropriate box]***

Last year (1) | 2 -3 years ago (2) | 4 -5 years ago (3) | 5+ years ago (4)

16) How often do you turn off your phone***? [Please tick the appropriate box and explain]***

Very often (1) | Often (2) | At times (3) | Not very often (4) | Never (5)

Please explain why

_____

_____

_____

SECTION TWO (Q17-Q20): Entrepreneurship

17) Please indicate the extent to which you agree or disagree with the following statements?
Code: **1**=*strongly Disagree*; **2**=*Disagree;* **3**=*Neutral*; **4**=*Agree*; **5**=*Strongly Agree*
[Please indicate your level of agreement /disagreement by entering the appropriate rating code in the corresponding box]

You have introduced an innovative product in the market in the last three years.	(a)
You have adopted newer production technologies for your business in the last three years	(b)
You have opened a new branch of your business in another part of town, city or country in the last three years	(c)
You have applied for a bank loan in the last three years	(d)
You have diversified your business in the last three years	(e)
In the last three years, you have refurbished your business premises or acquired a better one.	(f)
You are generally committed to the growth of your business	(g)
Your family and you are entirely dependent on the proceeds of this business	(h)
Your main intention is to grow the business as large and as fast as possible	(i)
You are currently devoting full time to the business, 35 or more hours a week.	(j)
You have always wanted to succeed and accomplish something in life	(k)
To face new challenges and to manage to cope with them is very important for you	(l)
You are so satisfied with what you have achieved in life that you think now you can confine yourself to keeping what you already have (Reverse scoring)	(m)
You are fully committed to your customers. In fact, 'the customer is king' in your business	(n)
Your main focus is to create value for your customers	(o)
Your main objective is to provide the customer with innovative and competitively priced products	(p)
You find it hard to understand people who always keep on striving towards new goals although they have already achieved all the successes they could have possibly imagine (Reverse scoring)	(q)
All the customer needs is low prices	(r)
You continuously develop parameters to measure customer satisfaction	(s)
You always ensure that your customers can reach you should they have problems with your goods or services.	(t)
You hold membership of a professional group linked to your business area	(u)
You consider yourself experienced enough to carry on your job	(v)
You possess some unique business skills that your colleagues do not	(w)
You have broad knowledge about your business area.	(x)
Since you started this business, you have never taken any classes and/or workshops related to the business	(y)

18) Please indicate the Level of assistance/support related to your business that you have received.
Code: 1=*no assistance/support*; **2**=*small assistance/support*; **3**=*no opinion* **4**=*large assistance/support*; **5**=*very large assistance/support.*

[Please indicate the level of assistance/support by entering the appropriate rating code in the corresponding box]

Financial assistance/support provided by government before you started your business (a) ☐

Financial assistance/support provided by government since you started your business (b) ☐

Tax-assistance/credit offered to by government since you started your business (c) ☐

Financial assistance/support provided by an NGO before you started your business (d) ☐

Financial a assistance/support provided by an NGO since you started your business (e) ☐

Financial assistance/support provided by family and friends before you started your business (f) ☐

Financial assistance/support provided by family and friends since you started your business (g) ☐

Financial assistance/support provided by business partners before you started your business (h) ☐

Financial a assistance/support provided by business partners since you started your business (i) ☐

Level of loan a assistance/support received from a financial institution (micro-finance, bank). (j) ☐

Technical/training assistance/support provided by government before you started your business (k) ☐

Technical/training assistance/support provided by government since you started your business (l) ☐

Technical/training assistance/support provided by an NGO before you started your business (m) ☐

Technical/training assistance/support provided by an NGO since you started your business (n) ☐

Technical/training assistance/support provided by family and friends before you started your business (o) ☐

Technical/training assistance/support provided by family and friends since you started your business (p) ☐

Technical/training assistance/support provided by Business partners before you started your business (q) ☐

Technical/training provided by Business partners since you started your business (r) ☐

19) Please indicate the extent to which you agree or disagree with the following statements?
Code: 1=*strongly Disagree*; **2**=*Disagree*; **3**=*Neutral*; **4**=*Agree*; **5**=*Strongly Agree*

[Please indicate your level of agreement /disagreement by entering the appropriate rating code in the corresponding box]

Government officials visit your business to advise you on new business laws (a) ☐

NGO officials visit your business to advise you on new business laws (b) ☐

You may have to bribe government officials (taxation, council, police/gendarmes) in order to stay in business (c) ☐

Overall, the government is helping you to succeed in your business (d) ☐

Overall, non-governmental organisations are helping you to succeed in your business (e) ☐

The general security situation of where you live or do business is acceptable. (f) ☐

You consider the level of bribery and corruption as an important hindrance to the growth of your business (g) ☐

There are forums such as trade fairs, agricultural shows, radio/TV/newspaper created by the government to help you advertise your (h) ☐

20) Please indicate the extent to which you agree or disagree with the following statements?
Code: 1=*strongly Disagree*; **2**=*Disagree*; **3**=*Neutral*; **4**=*Agree*; **5**=*Strongly Agree*
[Please indicate your level of agreement /disagreement by entering the appropriate rating code in the corresponding box]

Mobile network signal is always available (a) ☐
It is easy to have a mobile telephone number (b) ☐
Airtime retailers are readily available (c) ☐
It is easy to find a mobile phone shop (d) ☐
Mobile phone booths are readily available. (e) ☐
The price of mobile telephony services is affordable. (f) ☐
Most of the people you do business with have access and use mobile phones (g) ☐
Other telecommunication services (fixed line, internet, fax) are readily available and affordable (h) ☐
Electricity is readily available and affordable (i) ☐
The physical transport network (roads, railways, airports) which I need for my business are available and accessible. (j) ☐

SECTION THREE (Q21): Integration

21) Please indicate the extent to which you agree or disagree with the following statements?
Code: 1=*strongly Disagree*; **2**=*Disagree*; **3**=*Neutral*; **4**=*Agree*; **5**=*Strongly Agree*
[Please indicate your level of agreement /disagreement by entering the appropriate rating code in the corresponding box]

You use the mobile services regularly for business transactions (a) ☐
You use mobile services to stay in contact with customers/suppliers (b) ☐
Your business partners contact you mainly through the mobile phone (c) ☐
You use mobile telephony services frequently to place and receive orders (d) ☐
The easiest way to contact you for business is via mobile phones (e) ☐
Mobile phones help you improve internal communication and knowledge sharing (f) ☐
You find it difficult to do business with someone who does not have access to mobile services (g) ☐
You will encourage all business men to own and use mobile phones regularly (h) ☐

SECTION FOUR (Q22-Q25): Business Performance

22) Please indicate the extent to which the use of mobile phone has *influenced* the following benefits with regards to your business:
Code: **1**=*very small influence*; **2**=*small influence*; **3**=*Neutral*; **4**=*large influence*; **5**=*very large influence*
[Please indicate the level of influence by entering the appropriate rating code in the corresponding box]

Your ability to check on the availability of products before travelling (a) ☐
The ability to reduce operational costs for your business (b) ☐
The ability of acquiring better market prices for your business (c) ☐
The ability of taking less time to make business decisions (d) ☐
The ability to access information on new products, their uses and application (e) ☐
The benefit of acquiring new customers for your business (f) ☐

23) Please indicate the extent to which the following has changed with regards to your business:
Code: **1**=*much reduced*; **2**=*reduced*; **3**=*Neutral*; **4**=*increased*; **5**=*much increased*

[Please indicate the level of change by entering the appropriate rating code in the corresponding box]

Your need to travel since your business became connected to the mobile telephone network (a) ☐
Your costs of doing business since you started using mobile phones (b) ☐

24) Has your risk and costs of doing business changed since you started using mobile phones? Has it……

[Please tick the appropriate boxes]

		Risks	**Costs**
Greatly reduced	(1)	☐	☐
Somewhat reduced	(2)	☐	☐
Not changed	(3)	☐	☐
Somewhat increased	(4)	☐	☐
Greatly increased	(5)	☐	☐

25) Please indicate the extent to which you agree or disagree with the following statements?
Code: 1=*strongly Disagree*; **2**=*Disagree*; **3**=*Neutral*; **4**=*Agree*; **5**=*Strongly Agree*

[Please indicate your level of agreement /disagreement by entering the appropriate rating code in the corresponding box]

You rarely turn off your mobile phone so as not to miss business	(a)
Mobile telephony helps you take new orders even when you are out of the business premises	(b)
Mobile telephony helps you have and do business with virtual customers/suppliers	(c)
Your customers/suppliers refer you to others by giving them your mobile telephone contacts	(d)
Mobile services help you to do business with virtual customers/suppliers	(e)
Mobile telephony helps you to save money by reducing the number of costly journeys you make	(f)
Your business is losing money because you waste it on mobile telephony services (R)	(g)
You waste valuable productive time talking on the phone or 'texting'(R)	(h)
Mobile telephony helps you to have and do business with virtual customers/suppliers	(i)
Overall, mobile telephony services have improved the performance of your business	(j)
The security of your job and those of your employees have been improving for the last three years	(k)
Overall, mobile services contribute significantly to the growth of your business	(l)
Mobile phones have significant improved your access to information which helps you to reduce uncertainty in decision making.	(m)
Mobile phones help you find new customers out of your traditional localities	(n)
Your main focus is to create value for your customers	(o)
Mobile phones help you to stay in contact with customers/suppliers even when we are not in the business premises or closed for the day.	(p)
The overall equity of your business (salaries/wages, promotions) has been improving in the past three years	(q)
Your business has improved for the last three years in terms of customer acquisition and service provision	(r)
The conditions for your business to create new jobs/apprenticeships have improved for the last three	(s)
Mobile phones have significantly improved the way you apply information to solve problems or make certain business decisions such as fixing prices.	(t)

TECHNIQUES AND REASONS FOR PILOTING A QUESTIONNAIRE

TECHNIQUE	OBJECTIVES
PRETESTING ACTIVITIES	
Focus Groups	Determine how respondents define key words, terms, and phrases Determine whether respondents interpret phrases and questions as the researcher intends Obtain a general assessment of respondents' ability to perform required tasks (e.g. recall relevant information, estimate frequency of specific behaviours, etc.) Obtain ideas for question wording
Intensive Individual or Cognitive Interviews **Thinkalouds** **Special or follow-up probes:** **Comprehension probes** **Information retrieval probes** **Probes to evaluate response choices**	Identify words terms or concepts that respondents do not understand, interpret consistently, or interpret as the researcher intends. Identify questions that respondents can not answer accurately (e.g., recall problems, inability to estimate frequencies accurately) Assess close-ended response choices Obtain suggestions for revising questions and/or the questionnaire
Response Latency	Identify questions that are too complex or that are difficult to understand Measure attitude strength
Computer-Assisted Coding of Concurrent Protocols	Identify respondent comprehension, retrieval, judgement, and response problems
Expert Panel Review of Questionnaire and/or response problems	Identify potential respondent comprehension Identify potential interviewer problems Identify potential data analysis problems Obtain suggestions for revising questions and/or the questionnaire
Questionnaire Appraisal Coding System	Identify potential respondent comprehension, retrieval, judgment, and/or response problems Identify potential interviewer problems Identify potential data analysis problems Obtain suggestions for revising questions and/or the questionnaire

TECHNIQUE	OBJECTIVES
FIELD PRETESTING	
Respondent Debriefing	Identify words terms or concepts that respondents do not understand, interpret consistently, or interpret as the researcher intends. Identify questions that respondents can not answer accurately (e.g., recall problems, inability to estimate frequencies accurately) Assess close-ended response choices Obtain suggestions for revising questions and/or the questionnaire
Interviewer Debriefings **Group discussion of field pre-test experiences and questions** **Use of rating forms**	Identify faulty interviewer instructions, incorrect skip patterns, inadequate space to record answers, and typographical errors Identify questions that are awkward or difficult to read
Group discussion of behaviour coding results	Assess respondent interest Obtain suggestions for revising questions and/or the questionnaire Identify sampling problems
Vignettes	Assess whether different question wording affects respondents' interpretation of a question Identify terms and concepts that respondents interpret differently from researchers
Behaviour Coding	Identify problem questions based on the frequency of occurrence of specific interviewer and/or respondent behaviours

Table AB1: *Techniques and reasons for piloting a questionnaire*
Source: *Czaja (1998)*

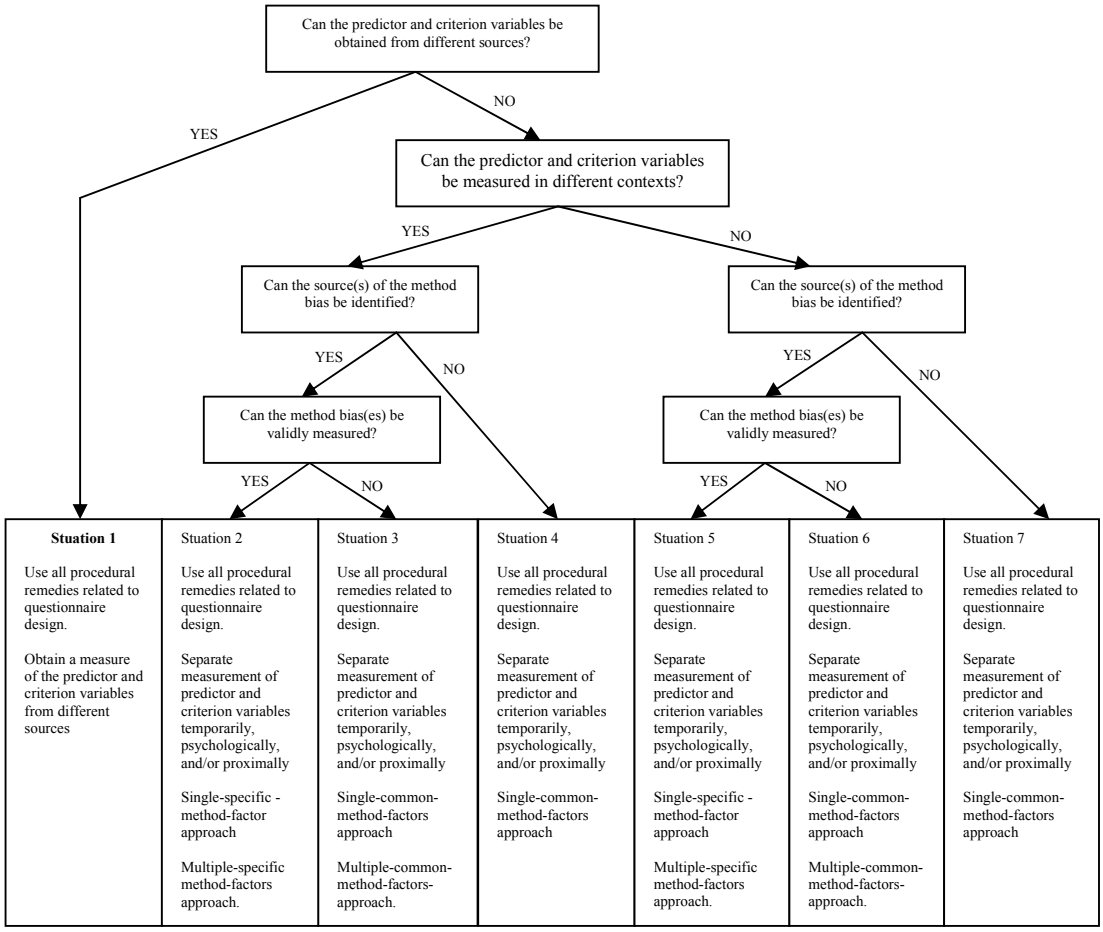


Fig. AB1: *Recommendations for Controlling Common Method Variances in Different Research Settings*
Source: *Podsakoff et al. (2003)*

Appendix C: Some Characteristics of Afghanistan and Cameroon Business Environment

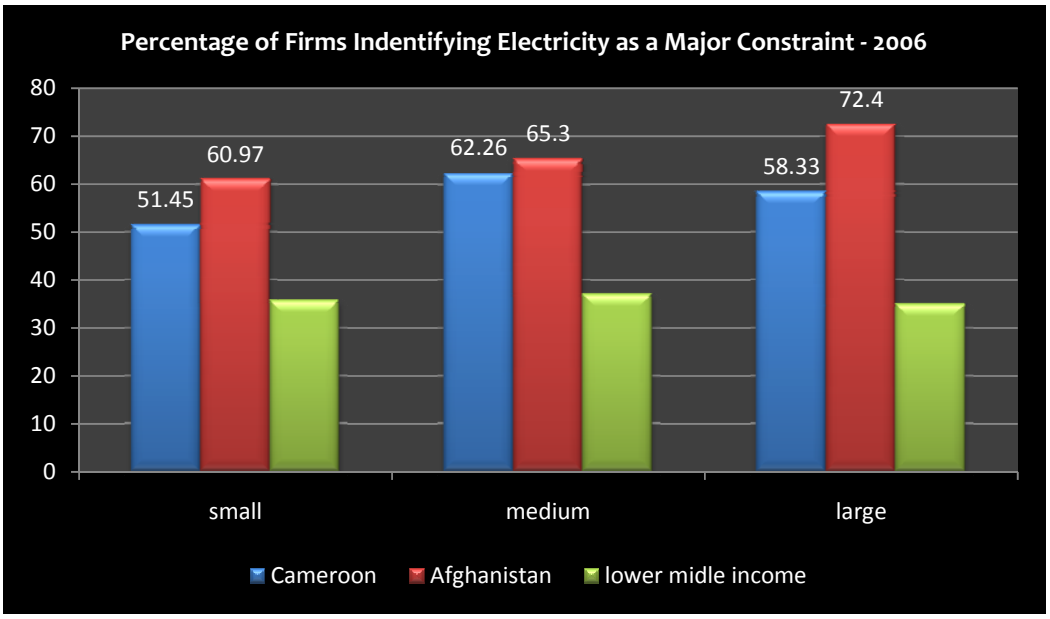


Fig. AC1: *Percentage of Firms that Indentify Electricity as a Major Concern (2006)*
Data Source: *The World Bank (http://www.enterprisesurveys.org)*

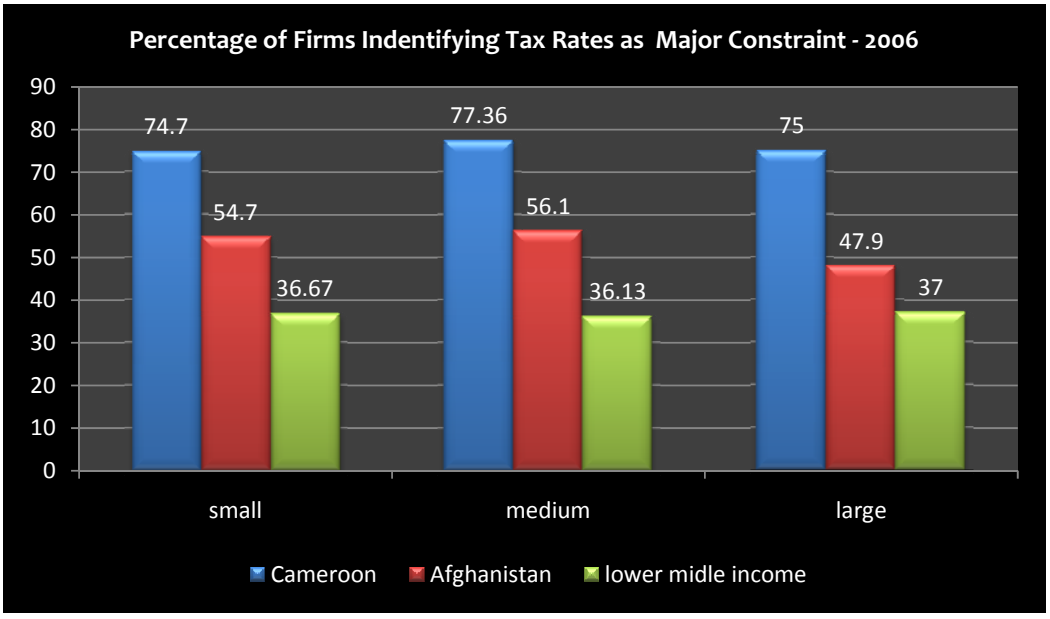


Fig. AC2: *Percentage of Firms that Indentify Tax Rates as Major Constraint (2006)*
Data Source: *The World Bank (http://www.enterprisesurveys.or)*

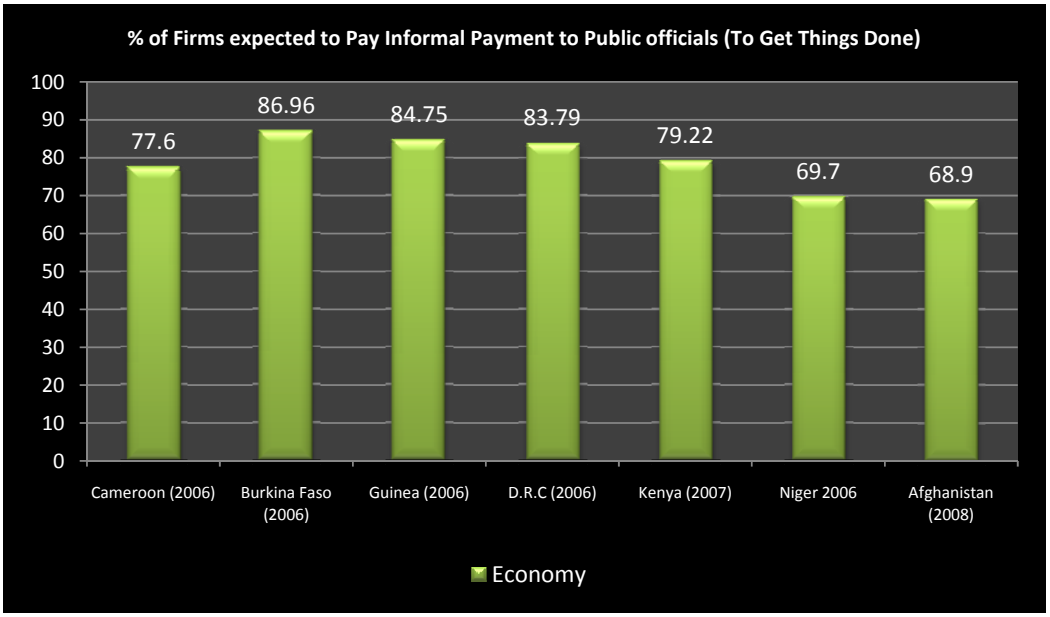


Fig. AC3: *Percentage of Firms expected to Pay Informal Payments to Public Officials (to get Things Done)*
Data Source: *The World Bank (http://www.enterprisesurveys.org)*

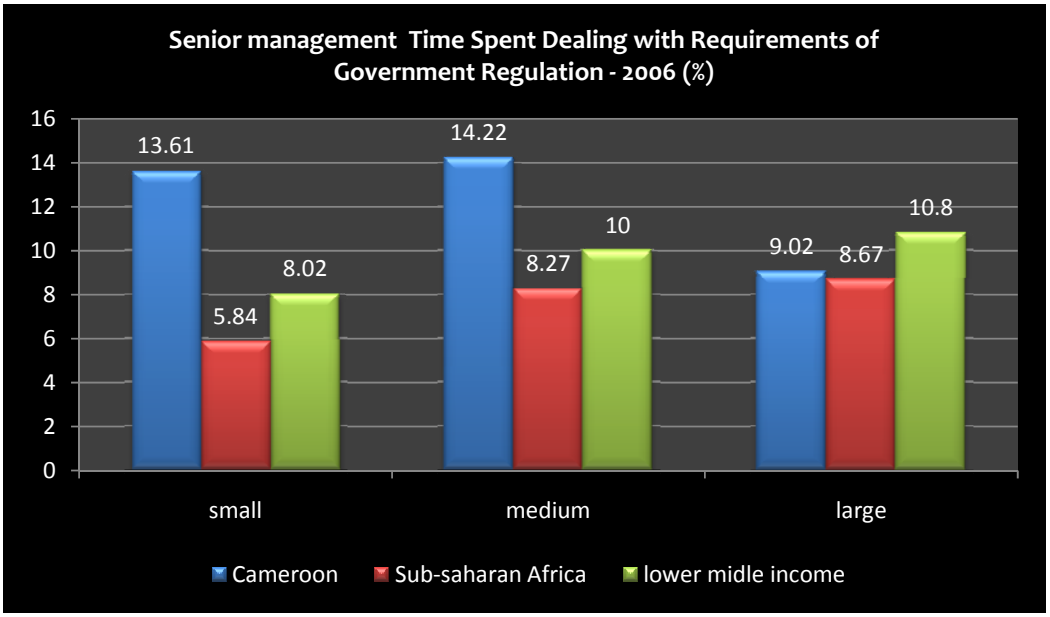


Fig. AC4: *Percentage of Senior Management Time Spent Dealing with Requirements of Government Regulation (2006)*
Data Source: *The World Bank (http://www.enterprisesurveys.org)*

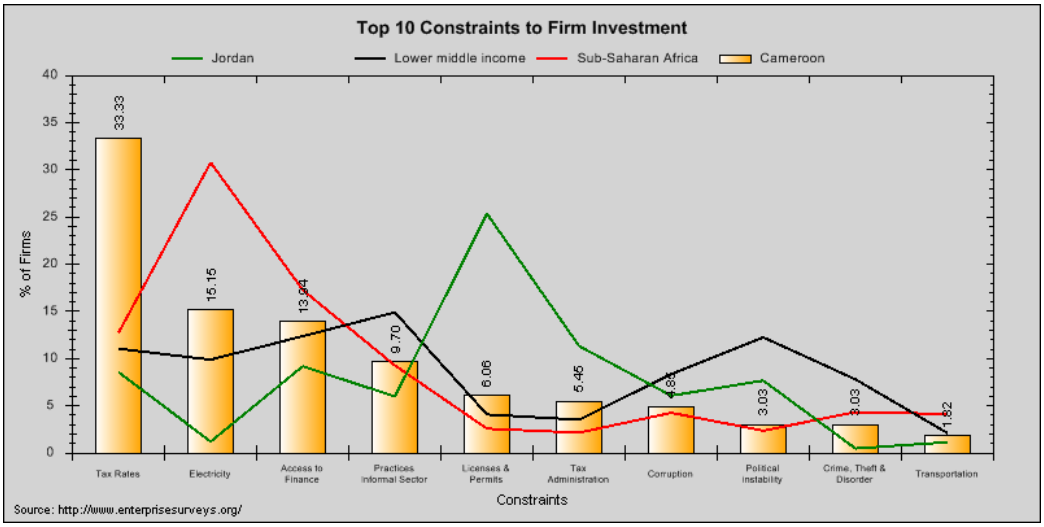


Fig. AC5: *Constraints to Firm Investment (2006)*
Data Source: *The World Bank (http://www.enterprisesurveys.org*

Country	Input Taxes								Corporate Tax
	Equipment			Handsets			Employment		
	Import Duties	Input VAT	Other taxes	Import Duties	Input VAT	Other taxes	Income Tax	National Insurance	
Burkina Faso	0 - 8%	18.0%		14.0%	18.0%		30.0%	30.0%	35.0%
Cameroon	22.5%			31.5%	0.0%				38.5%
Chad	14.2 - 39.6%			30.0%	0.0%				45.0%
Rep Congo	20.0%	21.6%	3.7%	41.0%	21.6%		30.0%		38.0%
DRC				20.0%			40.0%		40.0%
Gabon	0 - 20%	18.0%		10.0%	18.0%		22.1%	20.1%	25.0%
Ghana	10.0%			20.0%					25.0%
Guinea	2.5%			12.5%					35.0%
Kenya	10 - 25%	16.0%			16%***	2.3%			30.0%
Madagascar	10 - 20%	18.0%	3.0%	10.0%	18.0%	3.0%			30.0%
Malawi	0 - 45%	18.0%		30.0%	18.0%		29.0%		30.0%
Nigeria	0 - 12%	5.0%		10.0%	5.0%		25.0%		30.0%
South Africa		14.0%		8.1%	14.0%				29.0%
Tanzania	20.0%	20.0%			20.0%		15.0%		30.0%
Uganda	0 - 10%	18.0%			18.0%			30.0%	30.0%
Zambia	0 - 15%	17.5%		5.0%	17.5%		30.0%	5.0%	35.0%

** based on average import duty rates for main equipment types provided by operators*
*** excluding 3.65% of other taxes on imported equipment*
***** excluding 2.25% IDF fee on handsets*
**** levied on subscription only*

Table AC1: *Mobile Related Taxes in some sub-Saharan Countries (2007 estimates)*
Data Source: *GSMA*

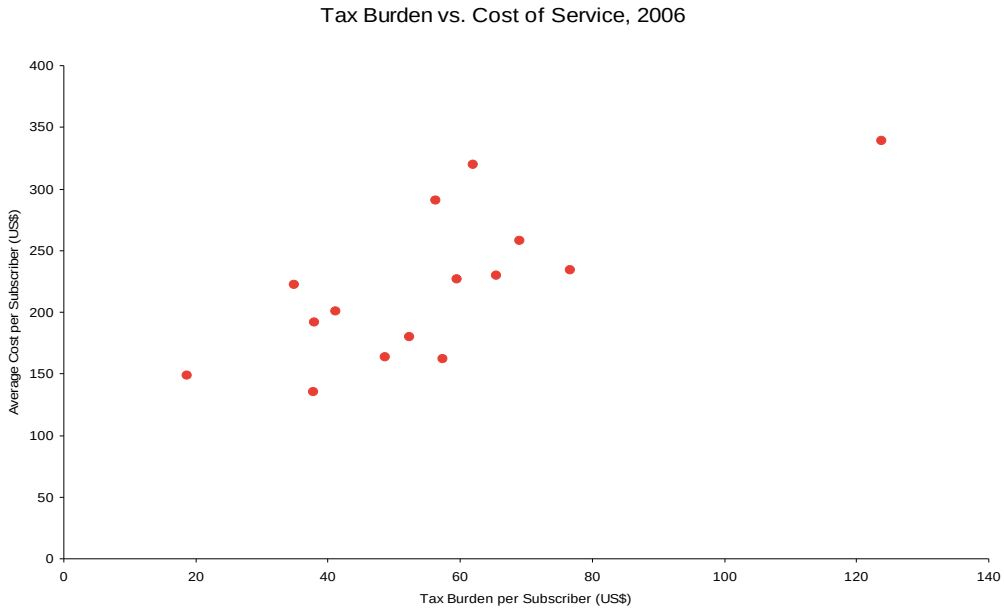


Fig. AC6: *Impact of Taxation on Cost of Mobile Telephony Services (estimates for Sub-Saharan Africa, 2006)*
Source: *GSMA*