E-COMMERCE ADOPTION AMONG MICRO, SMALL AND MEDIUM SECTOR IN NAIROBI COUNTY, KENYA

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DECLARATION

This thesis is my original work and has not been presented for a degree in any other

University.

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DEDICATION

This work is dedicated to my wife Judith, daughter Sharon, and sons Luther, Noel, and Tony.

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TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS AND ACRONYMS

ATM   Automated Teller Machines

BAAN   Budget Authorisation Account Number

B2B   Business-Business

B2C   Business-Customer

B2G   Business-Government

BI   Behavioural Intention

CAD   Computer Aided Design

OECD   Organisation for Economic Cooperation and Development

CEO   Chief Executive Officer

CNC   Computer Numerical Control

DL   Degrees of Freedom

EFT   Electric Funds Transfer

EDI   Electronic Data Interchange

ERP   Enterprise Resource Planning

GoK   Government of Kenya

IIAM   Intergraded Innovation Adoption Model

ICT   Information and Communications Technology

DIT   Innovation Diffusion Theory

IS   Information Systems

IT   Information Technology

KRA   Kenya Revenue Authority

LRA	Logistic Regression Analysis
MRP	Material Requirement Planning
MSME	Micro Small and Medium Enterprises
PBC	Perceived Behavioural Control
PEOU	Perceived Ease of Use
PU	Perceived Usefulness
SAP	Systems Applications and Products
SCM	Supply Chain Management
SMEs	Small and Medium Enterprises
SN	Subjective Norm
TAM	Technological Acceptance Model
TAM2	Extended Technological Acceptance Model
TPB	Theory of Planned Behaviour
TRA	Theory of Reasoned Action
WWW	World Wide Web
UNCTAD	United Nations Conference on Trade and Development

OPERATIONAL DEFINITION OF TERMS

E-commerce: All electronically mediated transactions between organisations and a third party in such areas as communication, product/service delivery, making payments, and business processes among others to enable cost-cutting and at the same time increase speed and quality of service delivery and online buying and selling of products and information.

E-commerce ttypology: Thiss includes Business-to-Business (B2B), Business-to-Customer (B2C), and Customer - to- Government (C2G).

Diffusion of Innovation Theory: The Diffusion of Innovation Theory (DIT) is a model developed to explain the process by which innovations in technology are adopted by users. An innovation can be defined as an idea, practice, or object which is perceived as new by an individual or organisation. The DIT takes into consideration a number of attributes associated with technological innovations, which are believed to influence the rate of widespread adoption of the innovations.

Drivers of e-commerce adoption: Factors that positively influence the adoption of e-commerce technologies and can be internal or external to the firm.

Micro, Small and Medium Enterprises (MSMEs): Firms that are categorised by size with micro enterprises having 1-9 employees; small enterprises having 10-49 employees; and medium enterprises having 50 - 250 employees.

Operations Management: Value-adding activities in the transformation of inputs into outputs and accompanying management aspects including service design, inventory management, supply chain management, and process design.

Perceived innovation characteristics: The perceived benefits that can be derived from the adoption of new technology, for example e-commerce, or the integration of new technology into a business operation including the innovation's relative advantage, compatibility, complexity, trailability, observability, and security/confidentiality (Rogers, 2003).

Perceived innovation compatibility: Compatibility of an innovation with a business is defined as "the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters.*

Perceived innovation complexity: The degree to which an innovation is perceived as being relatively difficult to understand and use.

Perceived innovation observability: The degree to which the results of an innovation are visible to others. Most innovations that are studied in past research are technological ideas.

Perceived innovation relative advantage: The degree to which an innovation is perceived as being better than the idea it supersedes.

Perceived innovation ssecurity and cconfidentiality: The adopter's concern with issues relating to security, legal matters, and liability and is one of the most important factors hindering the adoption of e-commerce.

Perceived innovation trailablity: The degree to which an innovation may be experimented with on a limited basis and involves trying the new ideas on the implementation plan.

Technological-Organisation-Environment Framework: The generic theory of technology adoption/diffusion used in adoption studies by various firms including micro, small, and medium enterprises.

Theory of Reasoned Action (TRA): The theory of reasoned action provides a model that has potential benefits for predicting the intention to perform a behaviour based on an individual's attitudinal and normative beliefs. The model consists of attitudinal, social influence, and intention variables in order to postulate on behaviour.

Theory of Planned Behaviour (TPB): The Theory of Reasoned Action model extended to accommodate developments in the component variables and the resulting model named the Theory of Planned Behaviour (TPB). However, there is a primary difference between the two models. The TPB incorporates percieved behavioural control (PBC) as a determinant of behavioural intention to control existing beliefs.

Technology Acceptance Model: The Theory of Acceptance Model (TAM) is an adaptation of TRA- for modelling and understanding user acceptance of information systems. The primary goal of TAM is to guide the interpretation of the factors determining computer acceptance.

Integrated Innovation Adoption Model: A model that incorporates aspects of Theory of Reasoned Action (TRA), Theory of Planned Behaviour (TPB), and

Diffusion of Innovation (DIT) theories. This is the model recommended in this study.

ABSTRACT

Electronic commerce (e-commerce) offers considerable exploitable potential for micro, small, and medium enterprises (MSMEs). The innovation presents vast opportunities for business organisations to infuse efficiencies in their operations and processes in order to serve their customers more efficiently, enter new markets, and rationalise their business processes. Despite the potential, however, there is evidence of slow uptake of e-commerce by MSMEs in developing countries including Kenya. Failure to attain of an adoption level threshold continues to prevent firms from reaping the full benefits inherent in the use of the technology. Additionally, little is known about the e-commerce environment among Kenya's MSMEs, a situation that is likely to impact negatively on adoption decisions. Further, in spite of the heightened enthusiasm by academics and researchers, many of the studies conducted in the area of e-commerce have been scanty and general in coverage, with some even producing conflicting results.

The objectives of this study were to analyse the e-commerce environment within Kenya's MSMEs sector; analyse the effect of the determinants of slow e-commerce adoption against organisational, environmental, and technological factors among Kenya's MSMEs; and explain the interactive effect of the various determinants on the likelihood of e-commerce adoption. The study employed a mixed research design, proportionate stratified random sampling and simple random sampling procedures were used to select a sample of 540 firms from a population of 1,800 firms in Nairobi. Primary data were collected using a predesigned and tested questionnaire. Data were analysed using descriptive statistical techniques, non-parametric methods (chi-square), and logistical regression analysis.

The study established that the MSMEs e-commerce environment was characterised by small, non-manufacturing firms and the ICT capacity of the firms increased with firm size. The firms had relatively younger firm owners/managers with high levels of education and whose perception of innovation characteristics had a significant bearing on e-commerce investment decisions. The study also found that level of education, gender, and age; firm size, sector of operation, market focus, and supply and customer pressure perception of innovation significantly influenced the adoption of e-commerce. Using the logistic regression analysis, the study established that the likelihood of adoption was, either individually or interactively, significantly affected by organisational, technological and environmental factors. The study recommends that decisions regarding the adoption of e-commerce should take into account all critical technological, organisation, and environmental factors with the key objective of addressing the barriers inhibiting enhancement of the likelihood of adoption.

CHAPTER ONE

INTRODUCTION

1.1   Background to the Study

1.1.1   E-commerce

Electronic commerce (e-commerce) has transformed business processes in a number of organisations and will continue to do so in future (Al-Qirim, 2009).A number of scholars hold the view that innovations have positive impact on business operations and bring with them substantial benefits. Some of the benefits widely associated with innovations include the following: improvement in operational efficiency, access to a wider range of markets, greater potential for partnership with suppliers, improved customer services, accessibility and flexibility in administration, and partnership among others (Vaithianathan, 2010). Unfortunately, Micro, Medium and Small Enterprises (MSMEs) in Africa are lagging behind most of the world's economies in tapping into the possibilities linked to the emerging technologies and have, in effect, failed to realise the full potential benefits of e-commerce.

There is no consensus on the definition of e-commerce, but Turban *et al.* (2008) have defined e-commerce as the process of buying, selling, transferring, or exchanging products, services, and/or information via computer networks including the Internet. Turban *et.al*. (2008) further distinguish between Internet and non-Internet e-commerce whereby the latter includes buying and paying for services or products using, for example, the smart card through vending machines and/or transactions undertaken via

networks such as local area network (LANs), using intranets or even single computerised machines.

E-commerce has also defined as any economic or business activity that uses applications based on Information and Communication Technology (ICT) to enable the buying and selling of products and services and thus facilitating the transaction of business activities between and among businesses, individuals, governments, or other organisations (Huy and Filiatrault, 2006). McIvor and Humphreys (2004) perceive e-commerce as having two main roles. First, it is the use of ICTs to strengthen a company's internal operations such as logistics, procurement, and human resource and contracts management; information and data management; and communication functions. Second, e-commerce refers to using ICTs to facilitate the flow of products between businesses and consumers (e.g., marketing, ordering, payment, delivery, and finding suppliers). Some researchers see e-commerce in terms of Internet applications, such as intranet, extranet, website, and email (Drew, 2003). Yet other researchers view e-commerce as a combination of business processes and Internet technologies such as interactions with customers and suppliers. Nevertheless, there is consensus among researchers that the main components of e-commerce include website, email, intranet, extranet, LAN and wireless area network, and Voice over Internet Protocol (VOIP). E-commerce is, therefore, an umbrella concept referring to the integration of a wide range of existing and new applications.

Internet and e-commerce have the capacity to support all types of businesses and provide the capability for tremendous growth within and across borders to a seemingly

unbelievable extent. Despite this potential, there has been little activity in e-commerce especially among the MSMEs in developing countries.

Although it may appear as a relatively recent innovation, e-commerce has been around for several decades with its first application being in the early 1970s through the Electronic Funds Transfer (EFT) that enabled electronic re-routing of funds between financial institutions. The development of Electronic Data Interchange (EDI) in the late 1980s and of the Automated Teller Machines (ATM) for undertaking financial transactions over computer networks followed soon thereafter. Later in the 1990s, the Internet and World Wide Web (WWW) technology were commercialised leading to the introduction of the term "e-commerce". Since then, the technology has experienced tremendous growth within and across business enterprises (Turban, *et al*., 2005; Heng, 2003). Over the years, especially from the late 1980s, the adoption of e-commerce and related ICTs has shifted from using it merely as a means of creating a sustainable competitive advantage to being an essential competitive weapon for business survival.

Hinson and Sorenson (2006) affirms that in the earlier years for instance, business-to-business(B2B) e-commerce figures soared with estimates ranging between $200 and $600 billion globally for the year 2000 and was predicted to reach $12 trillion by 2006 (UNCTAD, 2004). The swift and incessant growth of e-commerce reportedly brought with it enormous benefits to organisations including MSMEs by providing them with the ability to access international markets hitherto difficult to penetrate due to high transaction costs and other market access barriers (UNCTAD, 2004). Despite an increase

in e-commerce revenues reported by a number of participating MSMEs, however, e-commerce growth for the sector was confined mostly to the industrialised countries (UNCTAD, 2004). Further, UNCTAD (2004) observes that over 95 per cent of e-commerce takes place in developed countries, with Africa and Latin America combined accounting for less than 1 per cent of the total. The highly skewed distribution of growth in e-commerce implies an unbalanced spread of benefits, yet globally MSMEs play an important role in the economies they are situated in with the MSMEs in Kenya being no exception.

1.1.2   MSMEs and E-commerce Adoption

The MSMEs are often regarded as vital for the growth and innovation of dynamic economies as they help to diversify economies. The MSMEs sector accounts for 60-70 per cent of jobs in most developed and developing countries, and for most of the new jobs created, several countries in Africa have prioritised their investment in MSMEs (Iddris, 2012). The MSMEs account for about 85 per cent of jobs in the manufacturing sector in Ghana, and are said to be a characteristic feature of the production landscape in that country (Iddris, 2012). In Kenya, MSMEs constitute over 75 per cent of the informal sector jobs (Mwangi, *et al*., (2012). The major advantage of the MSME sector is its employment potential at low capital cost. The labour intensity of the MSME sector is much higher than that of the large enterprises. According to UNCTAD (2004), MSMEs constitute more than 90 per cent of total enterprises in most economies and are credited with generating the highest rates of employment growth as well as accounting for a major

share of industrial production and exports. In recent years, the MSME sector in Kenya, just as in the other developing countries, has consistently registered higher growth rate compared with the overall industrial sector. With its agility and dynamism, the sector has shown admirable innovativeness and adaptability.

Although the MSMEs play an important role in the Kenyan economy, little research and scholarly studies have been conducted on the sector and this problem applies across many developing countries. The 1999 National Baseline Survey conducted by the Central Bureau of Statistics and K-Rep Holdings is perhaps, the most recent comprehensive picture of MSMEs in Kenya. Elsewhere, a number of researchers have provided both financial and/or non-financial (for example number of employees) categorisation criteria for the MSMEs sector Meredith (1994), for example, views the enterprises in terms of both their financial and non-financial profiles. In the United States, firms employing less than 500 employees fall in the MSMEs categorisation (Montasemi, 1988). In contrast, the Government of Kenya (GoK) under Sessional Paper no.2 (1992) indicates that firms employing 1 to 9 employees are micro enterprises, those with 10 to 49 employees are considered small, and those employing 50 to 250 workers are medium enterprises. United Kingdom.

Table 1.1: Categorisation of Micro, Small and Medium Enterprises

Firm Size	Number of Employees
Medium-	Less than 250
Small	Less than 50
Micro	Less than 10

Source: GoK, Sessional paper no.2 (1992)

Internet-based transactions are growing rapidly, but at varying rates in different developing countries. The spread of high-speed Internet within and among countries and the proliferation of e-commerce among businesses create both opportunities and challenges in urban and rural areas. Use of the internet in business reduces many of the disadvantages associated with an isolated location by decreasing the marketing, communication, and information costs; increasing access, and lowering the cost to suppliers and services.

Some studies have identified a number of enablers of Internet adoption by SMEs. Factors such as perceived benefits, organisational readiness, business characteristics, and external pressure should be considered in studies investigating the adoption of e-commerce at organisational level (Turban *et al*., 2005). External pressure refers to influential factors from outside the organisational environment, such as pressure from competitors, customers, and/or governmental agencies. Business characteristics or forces include business form, size, international exposure or experience, types and levels of Internet use, and number of years of access to the Internet. In an assessment of the adoption of e-commerce by SMEs in Botswana (Olatokun & Kebonye, 2010); Iran (Talebi1 & Tajeddin 2011), and Kenya (Wanjau *et al.* 2012) found that the factors that led to e-commerce adoption include the kinds of e-commerce technologies that are adopted and used as well as the services provided using these technologies. Other studies on the influence of technological compatibility on acceptance of innovation had found similar results (Orega, *et al*. 2007).

Although business-to-business (B2B) e-commerce is increasing in importance worldwide, particularly in the industrialised countries, there are indications that firms in developing countries may not reap the potential benefits of this innovation because of low levels of technological development and the relatively high cost of implementation (including network infrastructure and software, training, production process, and reorganisation). Little empirical studies, such as that by Al-Somali, *et al*. (2011), have been conducted to examine the experiences of B2B e-commerce adoption in developing countries. The sparse literature that does attempt to explain the difficulties faced by firms in developing countries when they try to implement B2B e-commerce suggests that a combination of factors constrain firms from taking full advantage of the new electronic means of trading (UNCTAD, 2004) . In addition, there appear to be a number of external constraints associated with the way B2B e-commerce solutions are being developed by firms in the industrialised countries with the distinctive characteristics of different products and the organisation of production and delivery to the market (Hinson & Sorenson, 2006; Ghobalkhloo, 2011).

Most of the recent researches on e-commerce in countries such as Malaysia have focused on the Business-to-Consumer segment (Khairul & Ahmad, 2005). This is understandable because the household Internet penetration rate has increased significantly in recent years. Recent statistics shows for instance, that the average growth rate of Internet penetration in that country between 2000 and 2009 was 356.8 per cent per year (Internetworldstats.com 2010) and in 2009 the total Internet users were 65.7 per cent that representing a total 16,902,600 Internet users. The greater potential in e-commerce has

encouraged companies to move from the traditional business method to online business worldwide. Thompson and Ranganathan (2004) argue that companies have much greater incentive to adopt e-commerce than consumers because of the many benefits to companies such as massive cost saving in transaction costs, improved efficiency, and strategic flexibility through development of more dynamic and flexible relationships with key business partners. Alam *et al*. (2007) and Cullen & Webster (2007) also report that researchers found tremendous growth in e-commerce globally as reflected in the enormous volume of goods and services traded between firms and especially so in the B2B arrangement. However, the African case was not very impressive despite the enormous potential and growing awareness of e- commerce as not much has taken place in the MSME sector in developing countries including Kenya. It is against this background that this study was undertaken.

1.2   Statement of the Problem

It is clear from the foregoing background that, unlike in the developed countries, little is known about both the e-commerce environment and the key factors affecting its adoption in developing countries such as Kenya. This lack of information has invariably led to non-alignment of the potential of e-commerce innovations with developments in business processes (Humphrey, *et al*., 2004). Available evidence also indicates that the MSMEs sector is particularly characterised by slow uptake of e-commerce thus hindering business operations development and efficiency. Kurnia (2006)) and Ignore (2009), for instance, observe that low investment in e-commerce innovations has led to a lag in business

transformation and hence growth. Given the above-cited low uptake status, developing countries, and indeed Kenya, have not been able to reap the full benefits derivable from investment in e-commerce.

Although studies have been conducted relating to the adoption of e-commerce by MSMEs around the world, most of these studies are concentrated in relatively well-developed economies such as China (Grandon & Pearson, 2012).; Thomas & Simmons, (2010); New Zealand (Al-Qirim, 2007). A few studies have also been undertaken in developing countries like Malaysia (Alam, 2009; Alam, *et.al*., 2007) and Ghana (Faisal, 2012). Only a handful of studies, however, have specifically focused on the e-commerce adoption by SMEs in a transition economy (Looi, 2005; Li *et a*l., 2010; Kapurubandara, 2009). Among the developing countries, Africa has not been sufficiently researched and even then, the available research activity is mainly concentrated on South Africa. In addition, available research is fragmented thus offering limited insight into the true position of the status of e-commerce adoption. Further, the existing studies report conflicting results, they have used incomprehensive key variables, and have taken a largely broad perspective in the context of business process and/or operations.

In view of the research gaps identified, the key issues investigated in this study were twofold. Firstly, the study sought to map out the current e-commerce environment (status) among Kenya's MSMEs. Secondly, the study sought to establish and analyse the factors responsible for the slow adoption of e-commerce against the organisational, environmental, and technological factors among Kenya's MSMEs. The study also

sought to contribute to the existing but limited body of literature in the area of e-commerce, especially in the context of developing countries.

1.3   Research Objectives

The main objective of the study was to investigate the determinants of e-commerce adoption by MSMEs. The specific objectives of the study were as follows:

1) Analyse the e-commerce environment within the MSMEs sector in Kenya;

2) Analyse the effect of individual determinants of the slow adoption of e-commerce against organisational, environmental, and technological factors among MSMEs in Kenya;

3) Explain the interactive effect of the determinants of e-commerce adoption on the likelihood of adoption of the innovation.

1.4   Research Questions

To achieve the outlined objectives, the study was guided by the following questions:

1) What is the nature of the e-commerce environment among Kenya's MSMEs and how do the factors characterising the e-commerce environment affect adoption status?

2) How do organisational, environmental, and technological determinants individually affect e-commerce adoption?

3) How does the interaction between the organisational, environmental, and technological determinants affect the likelihood of e-commerce uptake among MSMEs in Kenya's?

1.5 Research Hypotheses

In order to empirically evaluate the research questions, the following hypotheses were tested:

1. H_{a1}: There is a significant relationship between the demographic variables (age, gender, and level of education) of the owner/manager of the MSME and e-commerce adoption.

2. H_{a2}: There is a significant relationship between firm demographic variables (size, ICT capacity, and age of the firm) and e-commerce adoption.

3. H_{a3}: There is a significant relationship between environmental variables (supplier pressure, sector of operation, market focus, competition intensity, and customer pressure) and e-commerce adoption.

4. H_{a4}: There is a significant relationship between perceived innovation characteristics (relative advantage, compatibility, complexity, security/confidentiality, trailability, and observability) and e-commerce adoption.

5. H_{a5}: There is a significant relationship between the interaction of organisational, environmental, and technological factors and the likelihood of e-commerce adoption.

1.6   Significance of the Study

(a) Micro, Small and Medium Enterprises

A number of studies indicate that MSMEs are actively looking for suitable solutions and methods of adopting and integrating e-commerce into their business processes (Al-Qirim, 2007). Although there is a growing body of literature dedicated to the analysis of the technical and operational aspects of e-commerce, little empirical research exists on topics relating to the factors that would lead to the successful adoption of this emerging technological innovation and business practice. Similarly, little empirical research has been conducted to examine the success of e-commerce in light of the diversity of the organisational, environmental, and technological factors obtaining amongst Kenya's MSMEs. The study was further premised on the fact that despite the huge potential benefits for MSMEs from the adoption of new technology, there is evidence of slow uptake. Results of this study would therefore provide an incentive for stakeholders to develop appropriate interventions with the potential to enhance the uptake of e-commerce in a cost effective manner.

(b) Academicians and the student community

This study provides a theoretical and empirical framework for research in e-commerce and the area of technology diffusion within this key sector of the Kenyan economy. Academics and students alike should find the study methodology and subsequent results rich enough to guide future research. Further, the study will act as an impetus to reignite interest in this critical area of study.

(c) Public Sector and Government

An understanding of the determinants of e-commerce adoption is critical in designing policies and interventions that will help providers to deliver appropriate innovations that will more attractive to potential users in the MSME sector. The E-commerce infrastructure is increasingly being recognised as a key component in the growth of the MSME sub-sector, hence policy formulation arising from the results of this study would guide government, especially the Ministry of Trade, in instituting reforms that would make investment in the innovation more attractive.

1.7   Scope of the Study

The study focused on MSMEs operating in Nairobi. The firms of interest were registered legally and compliance with the taxation requirements of the Kenya Revenue Authority (KRA) at the time of the study. The key business sectors investigated were manufacturing, non-professional services, professional services, Information and Communications Technology (ICT), wholesale, and retail/hospitality. The study sample was drawn from a population of 686 firms in the non-professional services sector, 403 in manufacturing, 150 in wholesale, 327 in retail/hospitability, 70 in ICT/, and 163 in the professional services sector. In terms of the theoretical content, the study focused mainly on the factors pertaining to business process development and the operations/supply chain. The specific factors investigated were service delivery systems, production processes, inventory management systems, and supply chain management among others.

The study also focused on to establishing whether perception of the benefits of e-commerce among firm owner/managers had any influence on the decisions to adopt technology with the key technological benefits investigated being the relative advantage of the technology, compatibility, trailability, complexity, observability, and security/confidentiality. Similarly, both the organisational and environmental factors were investigated. On methodology, the study used quantitative, descriptive, and inferential approaches and specifically proportions, graphical/diagrammatical representation, chi-square analysis, and logistical regression techniques.

1.8   Limitations of the Study

It is recognised that this study had some limitations. Firstly, the study made cross-cultural references to studies undertaken internationally. Such reference may not have been entirely appropriate, but was inevitable due to the dearth of previous studies of e-commerce and its implications on business operations and operations management in Sub-Saharan Africa and specifically in Kenya. Differences in the results of this study and those obtained elsewhere may be explained partly by the cross-cultural differences in socio-economic settings and MSMEs practices.

Secondly, in terms of methodology, the study was designed to target a large number of e-commerce adopters across the sectors in Nairobi. Though the researcher attempted to attain as high a response rate as possible, lethargy and lack of trust led to a non-response

rate of 24 per cent. Further, the lack of understanding on the part of the respondents, especially among the micro and small enterprises, may have affected the accuracy of results as they relate to the concept of e-commerce and its place in the overall operations function within the firm.

Thirdly, the research design was cross-sectional rather than longitudinal which is more appropriate for adoption studies. However, the longitudinal research design could not have been possible in this study in the absence of relevant data. Finally, the study focused on factors that, in the opinion of the researcher, had implications on the management of operations in a business setting thus limiting the scope. Future studies should, therefore, investigate other factors not directly linked to e-commerce and management of operations.

1.9   Organisation of the Thesis

The thesis is organised into five chapters. Chapter one comprises of the background of the study, statement of the problem, research objectives, research questions, and hypotheses. The chapter also covers significance of the study, and the scope and limitations. Chapter two contains of a critical review of the theoretical and empirical literature including research gap and conceptual framework. Chapter three covers the research methodology including model derivation, while chapter four consists of the study findings and discussion. Chapter five presents a summary of findings, conclusions, and recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1   Introduction

In this chapter, both the theoretical and empirical literature is reviewed. The first section reviews the relevant theories and exposes the theoretical foundation underlying the effects of technological, organisational, and environmental factors on adoption of e-commerce. The second section covers the empirical literature, while the third section presents an overview of the literature and research gap. The final section is a discussion of the conceptual framework.

2.2   Theoretical Literature

The literature suggests that most research on adoption of e-commerce is based on any one or a combination of the following key frameworks:

   a)   Theory of Reasoned Action, TRA (Fishbein & Ajzen, 1975)

   b)   Theory of Planned Behaviour, TPB (Kuhl & Beckmann, 1985).

   c)   Technology Acceptance Model, TAM (Davis, 1989).

   d)   Diffusion of innovation, DIT (Rogers, 2003; Zhu & Kraemer, 2006).

   e)   Technology-Organisation-Environment Model, TOE (Zhu & Kraemer, 2005).

2.2.1   Theory of Reasoned Action

The theory of reasoned action was introduced in 1967 in an effort to understand the relationship between attitude and behaviour (Fishbein & Ajzen, 1975). The theory attempts to explain the relationship between beliefs, attitudes, intentions, and behaviour. It is based on the assumption that human beings are rational and make systematic use of available information: they consider the implications of their actions before making the decision to perform or not perform a given behaviour. According to this theory, the immediate determinant of behaviour (adoption) is behavioural intention (willingness to adopt). A schematic representation of the theory of reasoned action is shown in Figure 2.1.

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┌────────────────────────┐
│ Attitude towards action │
│ or behaviour (e-         │ ──┐
│ commerce adoption)       │   │
└────────────────────────┘   │      ┌──────────────────┐        ┌──────────────────┐
                              ├────► │ Behavioural       │        │ Behaviour         │
                              │      │ intention to adopt │ ─────► │ (e-commerce       │
┌────────────────────────┐   │      │ (e-commerce        │        │ adoption)         │
│ Subjective norm         │ ──┘      └──────────────────┘        └──────────────────┘
│                          │
└────────────────────────┘
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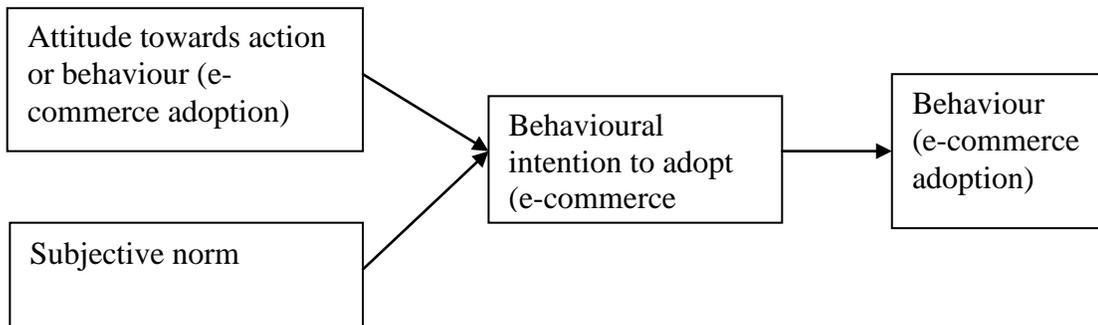
Figure 2.1: Theory of Reasoned Action (TRA)
              Source: (Fishbein and Ajzen, 1975)

The model consists of attitudinal, social influence, and intention variables in order to postulate on behaviour. The basic assumption of TRA is that the individual's behavioural intention (BI) to perform a behaviour (e.g., adopt e-commerce) is jointly shaped by attitude towards performing the behaviour (ATB) and subjective norm (SN) or overall

perception of what others think the person should or should not do. The limitation of TRA is that it does not mention the beliefs that are predictive for a particular behaviour. Whilst TRA has been widely used to evaluate a range of consumer behaviours, doubts have been raised about its suitability in evaluating decisions in an organisational context because of the dynamic and intricate multiphase, multi-person, multi-departmental, and multi-objective nature of decision processes in organisations. This argument, however, does not exactly apply to small businesses where decision processes tend to be the domain of a single individual. Consequently, the predictive capacity inherent in the theory of Reasoned Action may not have much relevance for evaluating decision-making within the small business environment.

In spite of the fact that TRA's power of predictability is strong across studies, some problems arise in situations where the behaviour under investigation is not entirely under volitional control. Ramsey, *et. al*. (2008) also identified two additional problems rooted in the theory. First, the theory does not distinguish between behaviours and intention and second, it does not make clear provisions for examining if the probability of failing to perform a behaviour is due to one's behaviour or intentions. In an effort to address these limitations, TRA was extended by adding the construct "perceived behavioural control". This construct was aimed at predicting behavioural intentions and behaviour and the resulting extended model is named the Theory of Planned Behaviour (TPB).

2.2.2 Theory of Planned Behaviour

Due to the limitations of the Theory of Reasoned Action, the model was extended to accommodate developments in the component variables resulting in a modified model named the Theory of Planned Behaviour (Fishbein and Ajzen, 1975). Figure 2.2 illustrates the relationships among the TPB constructs.
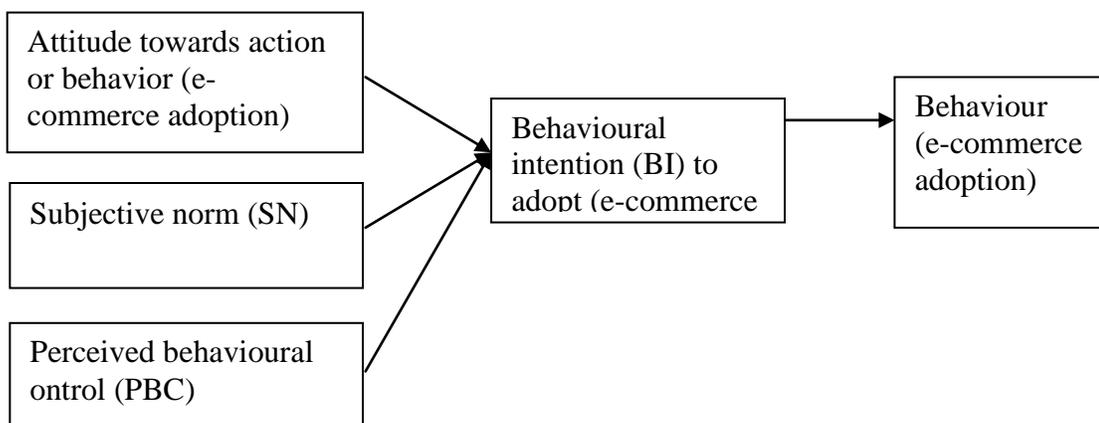
**Figure 2.2: Theory of Planned Behaviour (TPB)\
                    Source: Fishbein and Ajzen (1975)

According to Fishbein and Ajzen (1975), the attitudinal component in TPB refers to a person's attitude towards performing the behaviour under consideration; in this case adoption of e-commerce. The likelihood of performing a given behaviour will be strong if individuals hold a favourable attitude towards performance of that behaviour. Fishbein and Ajzen (1975) distinguish between attitude towards an object (for example attitude towards e-commerce) and attitude towards behaviour (for example attitude towards seeking an adoption process) in relation to an object. The authors further indicate that attitude towards behaviour (for example adoption process) is a much better predictor of

that behaviour than attitude towards the target of the behaviour. The determinants of attitude are those behavioural beliefs that are salient in the population under examination and an individual's attitude towards behaviour is determined by the evaluative implications of the total set of beliefs held and not just one belief.

The other determinant of behavioural intention, namely subjective norm, refers to a person's perception of the social pressures to perform or not perform a particular behaviour. The subjective norm is determined by whether important referents approve or disapprove of the performance of the behaviour in question weighted by the individual motivation to comply with those referents. Those beliefs that underlie a person's subjective norm are termed normative beliefs. Thus, a person who believes that important referents approve of the performance of a particular behaviour (for example condom use) and is motivated to comply with those referents will hold a positive subjective norm. The Theory of Planned Behaviour assumes a causal chain of behavioural and normative beliefs to behavioural intention and behaviour via attitude (towards behaviour) and subjective norm. This means that people are likely to perform a given behaviour when they evaluate it positively and believe that significant others think they should perform it (Ramsey, *et. al*, 2008).

The primary difference between TRA and TPB is that TPB considers perceived behavioural control (PBC) as the determinant of behavioural intention. In spite of the fact that it may be difficult to evaluate actual control before behaviour, it is asserted that TPB can provide this measure. Perceived behavioural control is added as an exogenous

variable, which is believed to have both a direct impact on actual behaviour and an indirect impact via intentions. Based on an empirical study, Ramsey, *et. al*. (2008) indicates that an individual's behaviour is largely affected by confidence in the ability to implement the behaviour. The structural causal relationship from PBC to BI presents the control's motivational influence on actual behaviour via intentions.

2.2.3 Technology Acceptance Model (TAM) and Unified TAM

A number of theoretical models have been proposed to facilitate the understanding of factors impacting the acceptance of information technologies (Davis, 1989). The Technology Acceptance Model (TAM), which is viewed as an adaptation of the Theory of Reasoned Action (TRA), is one of the most influential and robust models in explaining Information Technology (IT)/ Information System (IS) adoption behaviour (Park, 2009). The theory was originally designed to predict users' acceptance of IT and usage in an organisational context. Generally, the model can be used to explain user behaviour across a broad range of end-user computing technologies and user populations (Davis, 1989). Prior empirical studies strived to explicate the determinants and mechanisms of users' adoption decisions on the basis of the TAM with the conviction that the adoption process influences successful use of particular technology systems (Liao, *et al*., 2009).

The TAM focuses on two particular beliefs, namely, perceived usefulness (PU) and perceived ease of use (PEU) of innovation, which play an important role from the perspective of innovation acceptance behaviour (Figure 2.3). Perceived usefulness has

been defined as a user's subjective perception of the ability of a computer to increase job performance when completing a task. Perceived ease of use refers to a person's subjective perception of the effortlessness of using a computer system, which affects the perceived usefulness, and thus having an indirect effect on technology acceptance by the user.
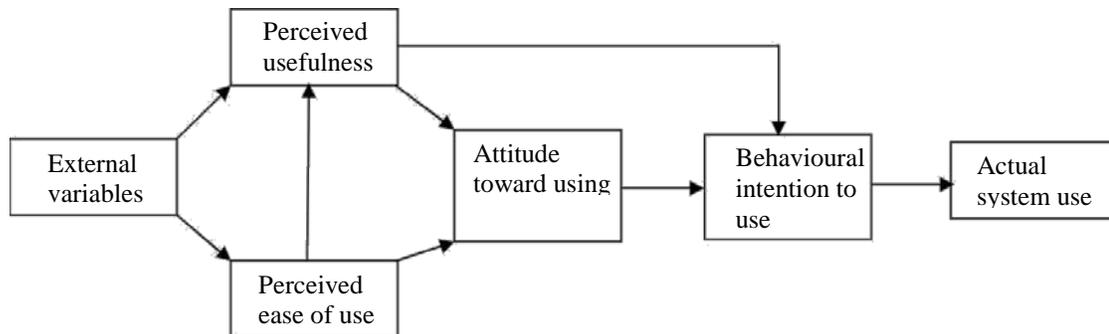
Figure 2.3: Technological Acceptance Model
Sources: Davis (1989) and Venkatesh, *et al.* (2003)

The TAM focuses on the attitude explanations of intention to use a specific technology or service and is a widely applied model for user acceptance and usage. Bertrand and Bouchard (2008) indicate that a number of meta analyses on the TAM have demonstrated that it is a valid, robust, and powerful model for studying user acceptance of innovation. The model is specifically aimed at building a foundation for understanding the effects of external factors on internal beliefs, attitudes, and intentions.

In their application of TAM to study adoption of M-Banking in Kenya, Lule *et.al.*, (2012) revealed that perceived ease of use, perceived usefulness, perceived self-efficacy, and perceived credibility significantly influenced customers' attitude towards usage of M-banking. However, the relationship between perceived usefulness and attitude towards adoption was not statistically significant. Other studies by, for example Park (2009)

revealed that in the context of behavioural intention, all the relationships among the TAM constructs were significant except parameter estimates from perceived usefulness, perceived ease of use, and system accessibility. Both perceived usefulness and perceived ease of use were found to be significant in affecting user attitude.

Due to the inherent limitations of the TAM model, Venkatesh, *et al.* (2003) and later Wu and Wang (2005) extended the model and developed the Unified (extended) Theory of Acceptance and Use of Technology (UTAUT) model by consolidating previous studies related to TAM. The UTAUT was aimed at explaining user intentions to use information systems (IS) and subsequent usage behaviour. The theory holds that four key constructs (performance expectancy, effort expectancy, social influence, and facilitating conditions) are direct determinants of usage intention and behaviour while gender, age, experience, and voluntariness of use act as controlling or moderating factors that impact innovation adoption (Venkatesh *et. al*., 2003; Laukkanen & Pasanen, 2008) [Figure 2.4].
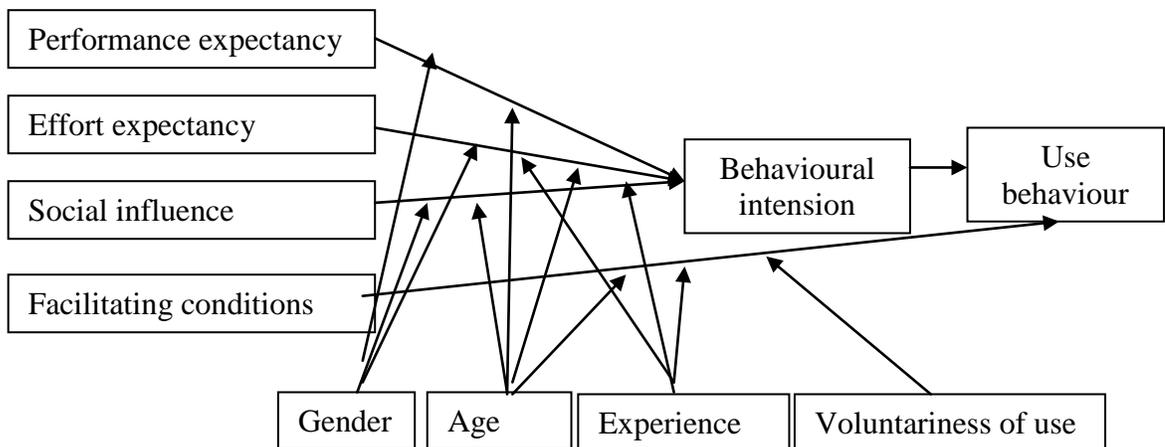
Figure 2.4: Unified Theory of Acceptance and Use of Technology (UTAUT)
         Source: Venkatesh *et. al*. (2003)

According to Kholoud (2009), performance expectancy is the degree to which an individual believes that using e-commerce will help him or her attain performance gains, while effort expectancy refers to the perceived amount of effort that the user needs to put into learning and operating e-commerce. Social influence, on the other hand, is the degree to which an individual perceives that important others (such as bosses, peers, and subordinates) believe that he or she should use e-commerce. Finally, facilitating conditions refer to the provision of support for users in terms of computer hardware and software necessary to work on e-commerce (Venkatesh *et. al.,* 2003).

Abdulwahab and Denali (2010) also proposed a conceptual model for modification of UTAUT by incorporating management effectiveness and programme effectiveness as determinants of behavioural intention in the context of user acceptance of telecentres. The study found a paucity of studies that broadly address the issues of incorporation of effectiveness into the UTAUT model. The study was, therefore, limited to proposing a UTAUT model based on literature review and recommended that subsequent researches should focus on the empirical validation of the conceptual model.

2.2.4 Diffusion of Innovation Theory (DIT)

Diffusion studies have investigated the extent to which e-commerce technology assimilates into the firm's operations or the degree of e-commerce intensity (Al-Qirim, 2005). The basis of these studies was Rogers' (2003) definition of an innovation as an idea, practice, or object, which is perceived as new by an individual or an organisation.

Diffusion refers to the process by which an innovation is communicated via certain channels over time among members of a social system thus the contention that DIT should concentrate mainly on interpreting how new ideas and concepts are widely adopted. The theory considers a number of attributes associated with technological innovations and which are believed to influence the rate of widespread adoption of the innovations. The attributes of innovation as discussed earlier, are relative advantage, compatibility, complexity, trailability, observability, and security/confidentiality (Rogers, 2003). It should be noted that among the aforementioned attributes, only relative advantage, compatibility, and complexity are consistently related to innovation adoption.
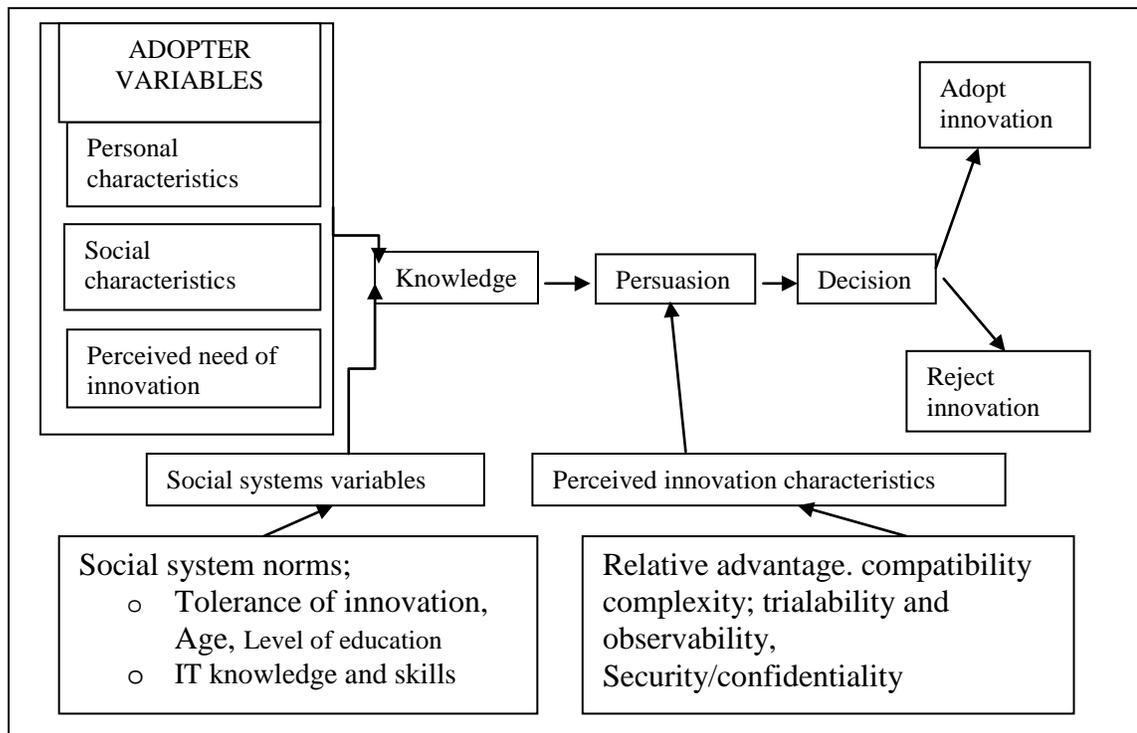
Figure 2.5: Diffusion of Innovation (DIT) Model

Source: Al-Qirim (2005); Rogers (2003)

Under the DIT model, the dependent variable is innovation adoption (accept or reject). The key explanatory variables that are assumed to affect this decision include perceived

innovation characteristics, selected social systems variables and adopters' personal characteristics. Despite, the strength of the DIT model over TRA, TPB, TAM, and Unified TAM, its limitation lies in determining how to measure adoption of innovation. This limitation can be addressed by integrating the model's key variables with organisational, technological, and environmental factors.

2.2.5 Integrated Diffusion of Innovation Theory and Technology Acceptance Model

The Technology Acceptance Model (TAM) and the Diffusion of Innovation Theory (DIT) share some constructs and complement each other in examining the adoption of IT and related technology. Researchers indicate that the constructs employed in TAM are fundamentally a subset of perceived innovation characteristics; thus, the integration of the two theories could provide an even stronger model than either theory alone (Wu & Wang, 2005). Some studies that integrated the two theories produced good results (Chen & Sherrell, 2000) and after reviewing the literature on technology acceptance, the authors synthesised the major theories and empirical research then proposed a model that blends the key constructs involved in innovation acceptance. The five constructs of innovativion characteristics, perceived ease of use, usefulness, and intention to adopt e-commerce were taken from the TAM and DIT. Figure 2.6 shows the context for e-commerce adoption studies.
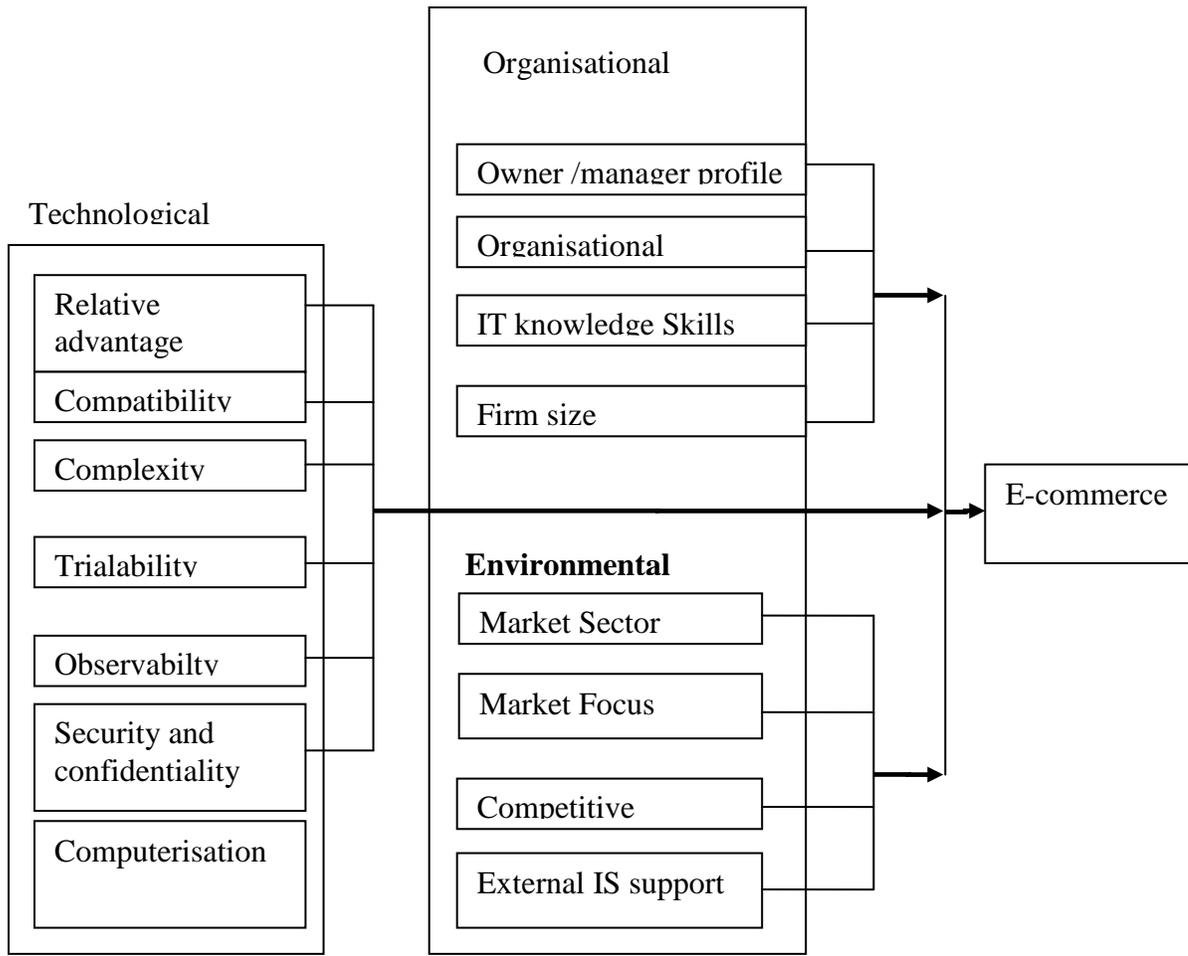
Figure 2.6: Context for E-commerce Adoption Studies

Source: Chen and Sherrell (2000)

Regarding the organisational context, Ramdani and Kawalek (2008) observe that factors such as support by top management, organisational readiness, experience with information systems, and firm size are critical to e-commerce adoption decisions. The two authors further contend that owner/manager profile is the most significant factor affecting e-commerce adoption. On ICT capacity, they found that firms without much experience may find it difficult to appreciate the value of adopting new technologies or may not want to take the risk of adoption. They rationale is that the incremental cost and knowledge required to adopt the Internet, for example, will be much smaller if a firm already owns a computer and a telephone. On the other hand, perceived set up and

ongoing costs, technical difficulties, and innovation complexity are likely to make innovations unattractive thus adversely affecting their adoption. In addition, the greater the IS expertise available in the organisation, the more likely that IS will be adopted by MSMEs (Kapurubandara & Lawson, 2008).

2.3 Empirical Literature

Huy and Filiatrault (2006) in their study on e-commerce adoption in micro, small and medium-sized enterprises (MSMEs) found that innovation adoption is influenced by organisational, environmental, and technological factors.

2.3.1 Organisational Factors

The empirical results supporting the influence of organisational characteristics suggest that the determinants of e-commerce adoption are employees' knowledge of e-commerce (Scupola, 2005) and the size of the enterprise (Zhu & Kraemer, 2005). These results are dissimilar to findings reported by Joen, *et al.* (2006) with regard to the employees' knowledge of e-commerce and to reported results by Vilaseca-Requena, *et al*. (2007) with respect to the resources of the enterprise.

Huy (2012), in a study on the significance of organisational determinants as factors of adoption also found that employees' knowledge of e-commerce, size of the enterprise, and attitudes of managers towards innovation were positive and statistically significant. Other findings also confirm the positive relationship between the attitude of managers

towards innovation and adoption (Al-Qirim, 2007), but the relationship is not significant regarding knowledge of the new information technologies of e-commerce.

According to Dubelaar et al. (2005), the level of education of the owner/manager has a positive and significant relationship with the likelihood of adopting an innovation. Similarly, Ramdani *et al*. (2009) found that lack of knowledge was the main barrier to the use of e-commerce and ICT among MSMEs. Chang and Tung (2006) found that the CEO's knowledge of technology has a significant relationship with e-commerce adoption among MSMEs Nguyen (2009) also found a statistically significant relationship between the status of e-commerce in the SMEs and the perception of lack of knowledge as a barrier. These results support the view that having adequate education level by the owners or managers of MSMEs alone is not a necessary condition for such firms to adopt e-commerce, but they must also have relevant knowledge in ICT use.

Lun et.al., (2012) found that organisational size, which is an indicator of the level of operational resources of the company, is positively and significantly related to e-commerce adoption. This is in line with earlier studies by, for example, Zhu and Kraemer (2002) and Adeyeye (2008). On ICT skills and experience by employees, Sparling *et al*. (2007) found that the higher the level of ICT skills, the higher the likelihood that a firm will adopt e-commerce. That is, previous IT experience has been observed to be an important factor influencing the success of e-commerce adoption. Filiatrault and Huy (2006) found a significant relationship between types of business (governmental, local, or foreign organisation; characteristics of products; and number of product categories) and the likelihood of e-commerce adoption.

2.2.2   Environmental Factors

Huy (2012) found a positive correlation between e-commerce adoption and the manager's perception of the intensity of competition, support of industry pressure, supplier and buyer behaviour, and sector of business operations. These findings conform to those of prior studies by Al-Qirim (2007) and To and Ngai (2007) but are inconsistent with those of Joen et al. (2006) and Vilaseca-Requena et al. (2007). It has widely been argued that the industry in which the firm operates influences the adoption of information systems, including e-commerce innovations. Service industries, retail industries, and the manufacturing industry were the key sectors that demonstrated a significant relationship with innovation adoption. The authors further established that usage of information systems varies not only across sectors but also within the constituent sub-sectors.

The role of market scope as a predictor of the adoption of e-commerce can be explained from two main perspectives. Firstly, internal coordination costs increase as firms expand their market reach due to increased administrative complexity and information processing. Secondly, external costs (search costs and inventory holding costs) would also increase with market scope; that is, when firms expand their market reach, they incur search costs, which include searching for consumers, trading partners, and distributors. Arguably, firms that serve broader markets are m ore likely to adopt e-commerce, thus SMEs with greater market scope are more likely to adopt e-commerce.

Vilaseca-Requena *et al*. (2007) has also established that there is a positive and significant relationship between competitive pressure and the adoption of e-commerce. The plausible argument for this observation is that if the innovation directly affects the competition, then the adopter will have an incentive to take up the technology. According to Vilaseca-Requena *et al*. (2007), the greater the competitive pressure, the more likely that MSMEs will adopt e-commerce. There is also evidence that the growth of third-party information systems support has a significant influence on the likelihood of e-commerce adoption whereby the greater the external support, the more likely they will be adopted by SMEs,

Porter (2008) has suggested that the adoption of IT will change the competitive environment in three ways: through changing the structure of the industry, changing the rules of competition, and giving businesses new methods by which to gain competitive advantage over the competition. According to Sandy and Graham ((2007), intensity of competition is associated with the degree of e-commerce adoption and that competitive pressure is a critical factor influencing the extent of e-commerce adoption among SMEs.

In contrast, Pan and Jang (2008) found that competition has very little influence on the adoption of new technologies or e-commerce in small enterprises. But a study by Thomas and Simmons (2010) produced contrary results. A relationship also exists between the intensity of competition in an industry and the degree of adoption of electronic commerce. According to Kinyanjui and McCormick (2002), ensuring competition and entry opportunities for other market players, particularly smaller ones,

must be an on-going policy priority. Intensity of competition is measured by the number of competitors in a given sub-sector category.

Regarding information intensity, MSMEs in a more information-intensive environment are more likely to adopt e-commerce technology (Pavic, *et al*., 2007). For instance, these authors found that MSMEs in service-oriented industries are more likely to have higher information content in their products and services in comparison to SMEs in manufacturing-oriented industries. Hence, MSMEs that are oriented to the service industry are more likely to adopt e-commerce technology. Al-Qirim (2007), who investigated the impact of information intensity on the adoption of e-commerce among MSMEs, found that the information intensity was influenced by the adoption of the technology.

2.2.3 Technological Factors

The decision to adopt a technology according to Cupolas (2009) is not only dependent on what is available on the market, but also on how the new technologies match with those that a firm already possesses. The key factors characterising such technologies include attributes such as relative advantage (perceived innovation benefits and impact), compatibility (both technical and organisational), and complexity (ease of use or learning e-commerce).

Regarding relative advantage, Joen *et al*. (2006) found that the extent of perception of the characteristics of the technology as measured by time saving and effort (To and

Ngai,2007), economic profitability, cost reduction, and production increase has a significant influence on e-commerce adoption. In contrast, Huy (2012) found that perceived relative advantage does not seem to play an important role in influencing the adoption of e-commerce by SMEs.

Compatibility has been found to be a significant determinant of adoption because it deals with perception of the importance of the innovation in performing various tasks presently and in future. For instance, if e-commerce is compatible with the traditional way of performing various activities of a business enterprises, with the existing values and mentality of the professionals, and with different communication parts involving day-to-day operations and their future development, them a higher rate of adoption will occur. Grandon and Pearson (2004) also found that compatibility with a firm's culture and values was a statistically significant determinant of e-commerce adoption, a result that is also in line with studies by To and Ngai (2007). The implication of this observation is that the management of the MSMEs consider compatibility of the innovation as an important pre-requisite for technology adoption.

Ratten and Ratten (2007) found a significant relationship between perceived observability and the adoption of e-commerce implying that the various beneficial operations of e-commerce may influence the decision by SMEs to adopt the technology. The findings of this study, nonetheless, contradict those by previous researchers, for example, To and Ngai (2007), that observability has no impact on the adoption of e-commerce.

Confidentiality and security have been discussed broadly both in academia and practice. Confidentiality is defined as the ability to control and manage information about oneself, while security refers to the ability to protect against potential threats. From the consumers' standpoint, security is the ability to protect consumers' information from information fraud and theft in the online banking business (Hua, 2009). Since the year 2000, online services security has become gradually noticeable as a critical issue, particularly, after a number of well-publicised attacks on prominent Internet sites. Due to such attacks, companies endeavour to base their e-commerce adoption decisions on the innovation's security and confidentiality. Therefore, heightened security concerns could stop potential damages ensuing from insecure transactions, hacking, or poor access control to important data. Hesson and Alameed (2007) and Belkhamza and Wafa (2009) found that security and confidentiality issues and the system risks of e-commerce are the major determinants of adoption behaviour.

A number of studies, for example, Lee et al. (2011) and Maha and Aqeela (2012) found a significant relationship between trailability and e-commerce adoption or intention to use. Trailability is defined as the degree to which an innovation could be tried out on a limited basis (Rogers, 2003). In other words, the test-drive of an innovation is provided by the technology's trailability and its ease of use. Trailability offers a chance for customers to evaluate an innovation such as e-commerce and its benefits. Thus, opportunities which allow latent adopters to have prior experience with a new innovation or product would reduce their fears and uncertainties. In addition, when a new idea or innovation is

trailable, any doubt or vagueness associated it will be dispelled and hence an increase in the level of confidence in its use.

According to Rogers (2003), complexity is the degree of difficulty associated with understanding and learning how to use an innovation. Grandon and Pearson (2004) and Mahazir and Mohd (2012) found that perceived complexity is a vital factor influencing the decision to adopt e-commerce and that the likelihood of adoption of the innovation is inversely related to the perceived complexity variable especially amongst the MSMEs. The introduction of new technology might require the employees to develop new skills in order to use the technology. Rogers (2003) contends that the new technology can be intimidating, particularly if it requires change in the existing businesses practices or acquisition of new skills. The measurement of perceived complexity or ease of use can be in the context of how e-commerce can be easily controlled, the degree of flawlessness, reasonableness, adaptablility to changes, user friendliness, and how easy it is for one to become skilful in using e-commerce.

2.3   Overview of the Literature and Research Gap

The literature reviewed so far suggests that the available theories of adoption of innovation focus mainly on organisational, technological, and environmental contexts. It is also evident from the literature that a number of studies have attempted to address the determinants of adoption from different perspectives. Alam and Ali (2011), for example, attempted to gain a deeper understanding of the factors that influence the adoption and

usage of ICT by SMEs in Malaysia. They found that ICT provides numerous opportunities for MSMEs to compete equally with large corporations.

In line with the studies on MSMEs, it is clear that the two models considered appropriate for the studies are those that integrate the DIT and TAM frameworks (McFarland & Hamilton, 2007). Theoretically, TAM is intended to apply to any specific domain of human–computer interactions (Davis et al., 1989). The TAM model considers two salient beliefs, namely, PU and PEU. In addition, the model indicates that both PEU and PU indirectly affect system usage (Liao, et.al., 2009).

Research on the diffusion of innovations has been widely applied to diverse disciplines. An innovation is "an idea, practice, or object that is perceived as new by an individual or another unit of adoption" (Rogers, 2003). Diffusion, on the other hand, is "the process by which an innovation is communicated through certain channels over time among the members of a social system" (Rogers, 2003). Therefore, the DIT theory argues that potential users make decisions to adopt or reject an innovation based on the beliefs formed about the innovation.

Theoretically, DIT has been found to have an explicit relationship with the TAM as both models share some key constructs. The relative advantage construct in DIT is similar to the notion of the PU in TAM and the complexity construct in DIT captures the PEU in the technology acceptance model, although the sign is the opposite. Additionally, in terms of the complexity construct, TAM and DIT propose that the formation of users'

36

intention is partially determined by how difficult the innovation is to understand or use. In other words, the less complex the innovation is to use, the more likely an individual will accept it. Compatibility is associated with the fit of a technology with prior experiences, while the ability to try to observe is associated with the availability of opportunities for relevant experiences. These constructs relate to prior technology experience or opportunities for experiencing the technology under consideration. Compatibility and the ability to try to observe can be treated as external variables, which directly affect the constructs in the technology acceptance model. After the initial adoption, the effects of these three constructs could be diminished with continuous experience and reduced over time (Liao, *et.al*, 2009). Thus far, numerous studies successfully integrated DIT into TAM to investigate users' technology acceptance behaviour (Chang & Tung, 2008). Few studies have attempted to examine all DIT characteristics with the integration of TAM. The current study therefore proposed an improvement of TAM by combining it with DIT characteristics and selected organisational factors and environmental constructs.

2.4   Conceptual Framework

Figure 2.7 shows the proposed integrated innovation adoption model derived from DIT

and TAM in the context of organisational, environmental, and technological factors.
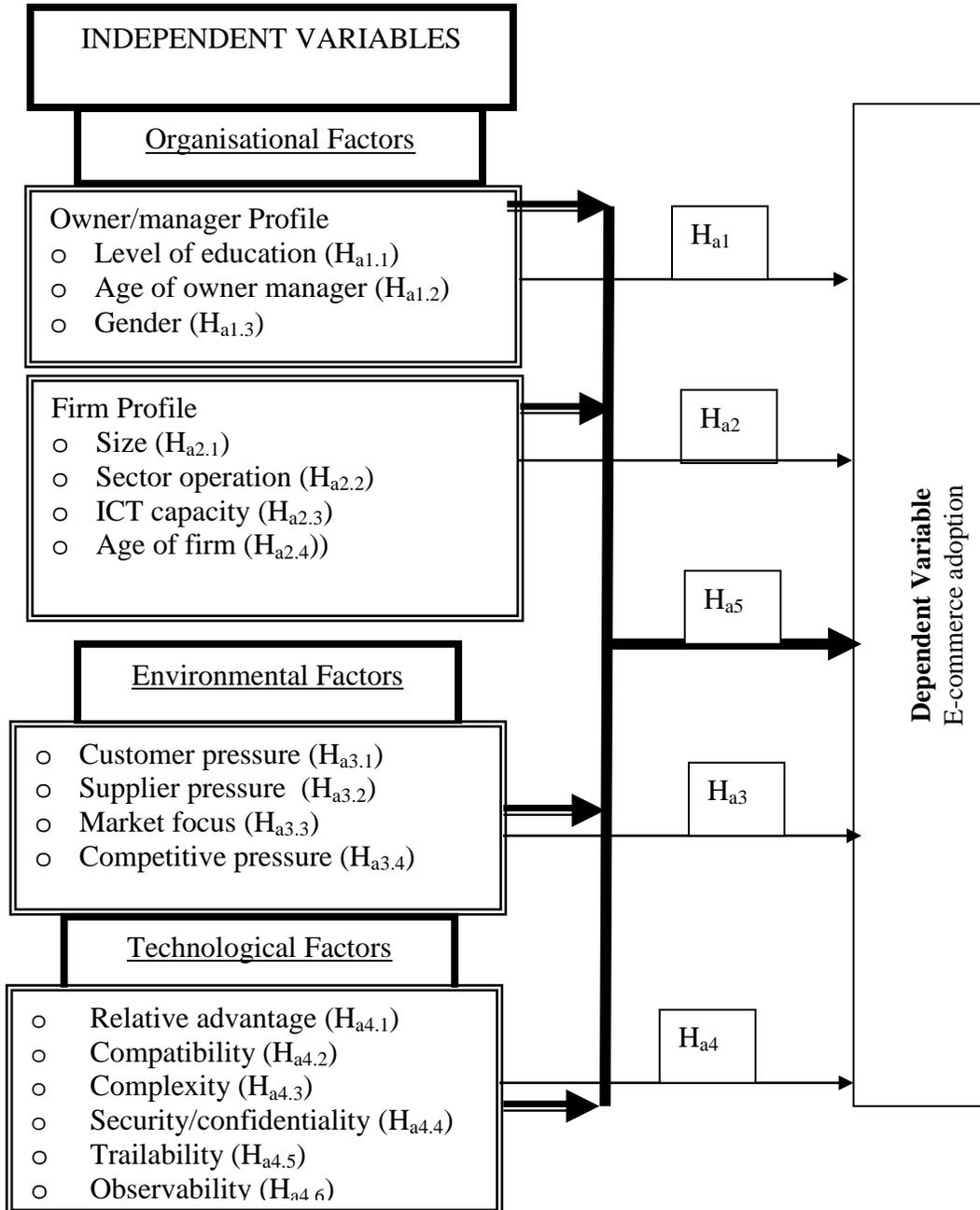
Figure 2.7: Conceptual Framework of Integrated Innovation Adoption Model

Source: Adopted from Al-Qirim, 2007; Rogers, 2003

This conceptual framework illustrates the relationships between e-commerce adoption by firms and the independent and interactive effect of organisational, technological, and environmental factors. Regarding owner/manager profile, the focus was on owner/manager and firm profiles. On organisational factors, the focus was on owner/manager profile and firm profiles. Although a number of studies such as Laukkanen and Pasanen (2008) and MacGregor and Vrazalic (2006) found that males were more likely than females to adopt e-commerce, Palvia (2009) found the reverse to be true. In other studies, younger and more educated owners/managers were more likely to adopt new technology (Wanjau, *et al*., 2012). The current study therefore tested the following hypothesis:

H_{a1}: *There is a significant relationship between the demographic variables (age, gender, and level of education) of the owner/manager of the MSME and e-commerce adoption.*

The effect of business characteristics on e-commerce adoption, as investigated by a number of researchers, is that business sector and age of the firm are significantly associated with the level and type of IT use in MSMEs (MacGregor *et al* 2002). These studies revealed that the manufacturing and retail sectors tend to adopt e-commerce far more quickly than professional or service-related MSMEs. A study by Karakaya and Khalil (2004) revealed that firm size and age are critical factors affecting e-commerce adoption among MSMEs. These factors not only influence a firm's ability and readiness to adopt e-commerce, but also the extent to which technology is adopted (Al-Qirim, 2007). Larger but less older firms have a higher propensity to adopt the technology at higher levels, while smaller firms are inclined to adopt technology at lower levels (Al-Qirim, (2007). and Mpofu *et al*. (2011) found that the MSME characteristic that may be

considered critical for e-commerce adoption is the level of ICT readiness of the firm. It

has been widely stated that lack of ICT skills and inadequate infrastructure negatively

affects the likelihood of e-commerce adoption. The current study, therefore, tested the

following hypothesis:

H_{a2}: *There is a significant relationship between firm demographic variables (size, ICT*

capacity, and age of the firm) and e-commerce adoption.

On environmental factors, Grandon and Pearson (2004) demonstrated that both supplier

and customer pressure significantly affect e-commerce adoption decisions in small

businesses since these enterprises are dependent on the customers to survive in the

industry. Further, Grandon and Pearson (2004) found that competition in the industry

had a strong bearing on e-commerce adoption decisions. Porter (2008) also found that

firms with global orientation (market focus) had a higher likelihood of adoption of e-

commerce to enhance their competitive advantage. In this regard, the study tested the

following hypothesis:

H_{a3}: *There is a significant relationship between environmental variables (supplier*

pressure, sector of operation, market focus, competition intensity, and customer pressure)

and e-commerce adoption.

Regarding the technologies factors, Scupola (2009) states that the decision to adopt a

technology depends not only on what is available on the market, but also on how such

technologies are perceived by the users. As indicated earlier, Rogers (2003) identified

the key innovation characteristics to include relative advantage (perceived commerce

benefits and impact), compatibility (both technical and organisational), and complexity

(ease of use or learning e-commerce), trailability, security/confidentiality, and observability. The extent of relative advantage is generally measured in terms of saving time and effort, economic profitability, cost reduction, and increased production. According to Looi (2005), perception of relative advantage, compatibility, security/confidentiality, trailability, and observability positively affects the likelihood of adoption.

On the other hand, Al-Qirim (2007) and Al-Gahtani (2003) found an inverse relationship between the likelihood of adoption and perception of innovation complexity. Hesson and Alameed (2007) on their part found a significant and positive relationship between security/confidentiality and observability and the likelihood of e-commerce adoption. The apparent dependence of decision to adopt on perception of innovation characteristics leads to the following hypothesis that was investigated in this study:

H_{a4}: There is a significant relationship between perceived innovation characteristics (relative advantage, compatibility, complexity, security/confidentiality, trailability, and observability) and e-commerce adoption.

The final hypothesis tested in this study related to the effect of technological, organisational, and environmental factors on the likelihood of adoption as stated below:

H_{a5}: There is a significant relationship between the likelihood of e-commerce adoption and the interaction between organisational, environmental, and technological factors.

41

CHAPTER THREE

RESEARCH METHODOLOGY

3.1   Introduction

This chapter covers the research methodology used in the study. It begins by describing the research design and the justification of the selected design. The chapter then outlines the sampling strategy including sample selection criteria. Finally, the chapter describes the data types, data collection techniques and tools, and methods of data analysis.

3.2   Research Design

According to Yin (2003), scientific research has three main investigation design purposes, namely, exploratory, descriptive, and explanatory. Yin (2003) further contends that the goal of descriptive study is to develop a careful description of different patterns. Creswell and Plano (2011) indicate that exploratory studies enable researchers to determine and demonstrate the character of the research problem through collection of information by exploration. Explanatory studies are useful when the interest is in relations. Since the purpose of this study was both descriptive and explanatory, a mixed studies design was used. Mixed methods research is the type of research in which a researcher or team of researchers combines elements of various designs for the purpose of achieving breadth and depth of understanding and corroboration (Creswell & Plano, 2011).

3.3   Study Population

The target population in this study consisted of legally registered firms that conformed to KRA tax compliance requirements at the time of the study. The firms were categorised as micro (1 to 9 employees), small-sized (10 to 49 employees), and medium-sized (50 to 250 employees). Following the two requirements, 1,800 firms formed the target population of the study as shown in Table 3.1.

Table 3.1: Target Population by Size

Firm size	Number	Percentage
9 employees and below	680	38
10-49 employees	959	53
Above 49 employees	161	9
Total	**1,800**	**100**

3.4   Sampling Strategy

Due to the impracticality of collecting data from the entire population, samples are usually used. McDaniel and Gates (2002) state that the basic issue when defining the study population of interest is to specify the characteristics of the individuals you intend to collect data from. In this study, a sample size of 540 was determined using the model below in which an acceptable standard error (S.E.) term of 5 per cent was assumed.

Given Standard Error (S.E) where $S.E = \dfrac{SD}{\sqrt{n}}$, the sample size, n, then takes the form

$$n = \frac{SD^2}{(S..E.)^2}.$$

In this study, the Standard Deviation (SD) of the population variable was derived from the annual revenue reported by various firms. Hence, from a population of size N = 1,800 and using gross revenue generated by the firms, the SD of Ksh. 100, 000 was derived with S.E. being Ksh.4,303. Hence, *n*, the sample size, was calculated to be 540.

The proportionate stratified random sampling procedure followed by simple random sampling of elements within the respective strata were used to generate data collection units, which in this case were the firms and hence owners/managers. Stratified random sampling was appropriate for the study because of the heterogeneous nature of the MSME sector. Table 3.2 shows the population and derived sample sizes grouped by firm size.

Table 3.2: Study Populations and Corresponding Sample Sizes

Firm size	Number	
	Population	Sample
Micro	680	204
Small	959	288
Medium	161	48
Total	**1,800**	**540**

Source: Survey data, 2005

3.5   Data Types and Data Collection Methods

In this study, both secondary and primary data were collected. The secondary data were collected through a review of literature relevant to the study area and specifically that targeting the broad area of determinants of the adoption and integration of e-commerce in business processes and operations function. The main source of this data type was the print and electronic journals.

Primary data were collected using a self-administered questionnaire, but in a few (9 per cent) cases an e-mail questionnaire was applied. The questionnaire items included variables pertaining to the following factors among others:

1. Firms' owner/manager profile including age, level of education, and gender.
2. Firms' profile including size, turnover, number of employees, business type, sector, and number of years in operation.
3. Measurements of the perceived innovation characteristics (relative advantage, compatibility trialability, complexity, observability, and security/confidentiality).
4. Measurement of the benefits due to e-commerce adoption
5. The ICT capacity of the firm
6. Sector of operation, customer pressure, market focus, competitive intensity, and supplier pressure

The measurements were both qualitative (mostly Likert Scale) and quantitative in nature. The details of the questionnaire are shown in Appendix 1. The questionnaire was pre-tested through a pilot approach in Thika town and the necessary review undertaken. Pre-testing enabled the researcher to determine the potential of the instrument to collect the required data and also the instrument's consistency, reliability, and validity.

3.6   Validity, Consistency and Reliability of Scales

In order to ascertain the validity of the measurement scales, a critical evaluation of each of the constructs was conducted by reviewing theories and research findings relevant to the construct under consideration. The item content for the target construct was adapted either from existing scales reported in the literature or by designing a new one which was then pre-tested. The measures were then assessed for content validity. To ensure consistency and reliability, the standard definition of e-commerce as used in this study given to on the target group before the questions in the questionnaire. The internal consistency and reliability of the variables were verified by computing Cronbach's alpha. It has been widely suggested that a minimum alpha value of 0.6 will suffice for any research. Table 3.3 shows the computed Cronbach's alpha for each of the explanatory variables.

Table 3.3: Computed Cronbach's alpha

Variable	Cronbach's alpha
Relative advantage	0.811
Compatibility	0.867
Complexity	0.821
Security and confidentiality	0.877
Observability	0.845
Reliability	0.822
Stages of development of e-commerce	0.797
Digital delivery of goods and services	0.854
Dichotomous e-commerce adoption	0.889

Source: Survey data, 2005

Since all the Cronbach's alpha values were greater than 0.6, the constructs were considered to have internal reliability.

3.7 Data Analysis Methods

The study undertook the three concurrent activities that constitute data analysis. First, data reduction allowed the researcher to sharpen, sort, focus, and organise the data to enable conclusions to be drawn. Second, data verification enabled the display of data in a reduced form making it possible to draw conclusions/verify results. The data analysis methods used for each study objective are now outline.

Objective 1: This objective was analysed using mainly descriptive statistical techniques of tables, frequencies, and percentages.

Objectives 2 and 3: the two objectives involved determining the significance of the effect of factors that influence e-commerce adoption. The study used the nonparametric chi-square test of independence for objectives 2 and 3. The chi square test was employed to test the difference between the actual sample and another hypothetical or previously established distribution such as that which may be expected due to chance or probability. The following basic computational equation was employed:

$$X^2 = \sum \frac{(\text{Observed frequencies} - \text{Expected frequencies})^2}{\text{Expected frequencies}}$$

$$= \sum \frac{(Fo - Fe)^2}{Fe}$$

Objective 3: This objective was analysed using logistical regression analysis (LRA). Firstly, the conceptual model (Equation.1) was presented where the variables were grouped into two sets constituting of first and second order constructs. A logistic regression model was then used since it satisfies the characteristics of this study where the dependent variable was binary while the explanatory variables were nominal, ordinal, and interval/ratio. In addition, the logistic regression model was appropriate for this study because it is not constrained by the normality requirement or restrictions of missing values in data. In this model, the explanatory variables were subjected to incremental addition to determine their individual and collective effect on adoption of e-commerce.

By letting Y = e-commerce adoption, where Y is a binary variable such that Y = 1 if the technology is adopted and Y = 0 otherwise. Consider a collection of $\underline{n}$ explanatory variables denoted by $X^{//} = \{X_1, X_2, X_3, X_4 \ldots \ldots X_i \ldots X_n\}$ as defined in Figure 2.7. Specifically, the X_i takes the values of the disaggregated organisational, technological,

and environmental explanatory variables. Let the likelihood (probability) of a firm adopting e-commerce be denoted by:

$$P(Y=1 \mid x_i) = \pi (Y)\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(1)$$

where $\pi (Y)$ is a nonlinear function of the best combination of the explanatory variables. The logit of the multiple regression model is then given by:

$$Z = \beta_0 + \sum_{i=1}^{n} \beta_i X_i + \varepsilon \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(2)$$

where Z is defined as follows:

$$z = In(\frac{p}{(1-p)}) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(3)$$

Based on equation 2, the logistic regression model is given by the following relationship:

$$\pi(Y) = P[Y=1] = \frac{e^{\beta_0 + \sum_1^{18} \beta_i X_i}}{(1+e^{\beta_0 + \sum \beta_i X_{i=}})} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots.4$$

From equation 4, the probability that Y=0, that is, the likelihood that a firm will not adopt e-commerce given the effect of one or a combination of the explanatory variables = 1- $\pi(Y)$ or simply:

$$P[Y=0] = \frac{1}{(1+e^{\beta_0 + \sum \beta_i X_{i=}})} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(5)$$

Noting that for theoretical and mathematical reasons, **_is_** based on a linear model of natural logarithm of the odds (the log.odds) in favour of $Y_i = 1$, then the log of the ratio of adoption and non-adoption of e-commerce is shown below:

$$In\left[\frac{P(Y=1/X_1, X_2....X_n)}{(1-P(Y=1/X_1, X_2.....X_n)}\right] = In\left[\frac{\Pi(x)}{1-\Pi(x)}\right] \dots\dots\dots\dots\dots\dots\dots\dots(6)$$

From the theory of LRA equation 1 and equation 6 can be combined to produce:-

$$In\left[\frac{\Pi}{1-\Pi}\right] = \beta_0 + \beta_1 X_1 + \dots + \beta_n X_n \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(7)$$

and rearranging the results in the odd ratio:

$$\left[\frac{\Pi}{1-\Pi}\right] = \frac{e^{\beta_0+\beta_1 X_1+\dots+\beta_n X_n}}{1+e^{\beta_0+\sum \beta_i X_i}} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots.(8)$$

In summary, testing the hypotheses stated earlier takes place through the following steps:

Step1: Derive the logistic regression model for the dependent variable Y where Y is a dichotomous (binary) variable taking the value 1 if e-commerce is adopted and 0 otherwise.

Step 2: On the basis of the derived model in Step 1, test the hypotheses relating to the independent variables and e-commerce adoption variable using the following criteria:

1. Overall model evaluation using Likelihood Ratio Test.

2. Statistical tests of the individual predictors or explanatory variables;

3. Goodness-of-fit test using the Hosmer – Lemeshow (H-L) test.

4. Nagelkerke R^2 test to explain the extent to which variation is explained by the derived model.

3.8   Ethical Considerations

Prior to the study, the researcher reviewed the ethical requirements related to academic research in order to ensure full compliance. The researcher also sought and obtained

informed consent from the respondents before they completed the questionnaires. Specifically, the researcher explained the objectives of the study and assured the respondents that the data obtained from them would be used only for the purpose of the study. The respondents were also assured of confidentiality.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1   Introduction

This chapter presents and discusses the study findings in line with the objectives of the study as follows: (a) analyse the e-commerce environment within Kenya's MSMEs sector; (b) analyse the effect of the determinants of slow e-commerce adoption against organisational, environmental, and technological factors among Kenya's MSMEs; and (c) explain the interactive effect of the determinants on the likelihood of e-commerce adoption using Logistic Regression Analysis (LRA).

4.2   Response Rate

The overall response rate was 72 percent as per the distribution shown in Table 4.1.

Table 4.1: Response Rate

Firm size	Sample	Response	Response rate(%)
Micro	204	149	74
Small	288	203	70
Medium	48	34	71
Total	**540**	**386**	**72**

Source: Survey data, 2005

4.3   E-commerce Environment in Kenya's MSMEs sector

4.3.1   Distribution of Firms by Sector

Table 4.2 shows the distribution of selected firms by sector. The study disaggregated the firms into knowledge-and non-knowledge based sectors. The knowledge-based sector was further categorised into non-professional services, wholesale, ICT, and professional services firms. The non-knowledge based group consisted of manufacturing and retail/hospitality firms. The adopted basis for disaggregation was considered appropriate due to its implications on e-commerce adoption.

Table 4.2: Distribution of Firms by Sector

Sector	Frequency	Percent
Non-professional service	126	33
Manufacturing	101	26
Wholesale	15	4
Retail/hospitality	78	20
ICT	17	4
Professional service	49	13
Total	**386**	**100**

Source: Survey data, 2005

The results shown in Table 4.2 indicate that 54 per cent of the firms investigated were in the knowledge-based sector whose composition was as follows: 33 per cent of the firms were in non-professional services; 4 per cent each in wholesale and ICT and 13 per cent in professional services. These results are in line with the findings by Hessonn and Alameed (2007) that services, retail, and hospitality-oriented firms are more amenable to e-commerce adoption.

53

4.3.2   Distribution of Firms by Size

Table 4.3 shows the distribution of the targeted, firms according to size of enterprises. The results indicate that 38 per cent of the firms belonged to the micro enterprises category; 53 per cent were in the small enterprises category and 9 per cent were in the medium category. The majority of MSMEs in the study were in the small sector category.

The results indicate that the majority (53 percent) of the owners/managers of the firms investigated had technical qualification, 22 per cent had high school education, and 20 percent had undergraduate qualification. Similarly, 1 percent, 3 percent, and 5 percent of the firm owners/managers had no academic qualification, possessed primary level certificate, and possessed postgraduate qualification respectively

Table 4.3. Distribution of Firms by Firm Size

Firm size	Frequency	Percent
Macro (9 employees and below)	144	38
Small (10-49 employees)	203	53
Medium (Above49 employees)	34	9
Total	**381**	**100**

Source: Survey data, 2005

4.3.3   Owner/manager's Level of Education and Firm Size

Table 4.4 shows the distribution of level of education of the owner/manager analysed by firm size.

54

Table 4.4: Owner/Manager's Level of Education and Firm Size

	Firm size			
	Micro	Small	Medium	Total
Level of Education	Frequency (percent)	Frequency (percent)	Frequency (percent)	Frequency (percent)
None	4 (3)	1 (1)	1(3)	6(2)
Primary	2 (1)	1(1)	0 (0)	3(1)
High school	28(19)	53(27)	1(3)	82(22)
Trade/technical qualification	90 (63)	95(48)	6(18)	191(51)
Undergraduate	10(7)	40(20)	24(73)	74(20)
Postgraduate	10(7)	7(4)	1(3)	18(5)
Total	**144**	**197**	**33**	**374**

Source: Survey data, 2005

Further, 63 percent and 44 percent of the firm owners/managers in the micro and small enterprises respectively had trade/technical qualifications. Among the medium size enterprises category, majority or 73 percent of the firm owners/managers had undergraduate qualification. Nguyen (2009) found that the firm owner/manager's level of education is critical for appreciating the value of innovation adoption within an organisation and that this factor is especially significant when the individual has both an appropriate level of education and ICT knowledge and skills. Nguyen (2009) further showed that educational levels impacted positively on the level of entrepreneurship growth and the internal development practices of the firm, including e-commerce adoption.

4.3.4   Owner/manager's Age and Firm Size

Table 4.5 shows the study results regarding owner/manager's age and firm size. Overall, the majority or 74 percent of the owners/managers were under 45 years of age. This result has implications for e-commerce adoption as was elucidated by, for example, Thomas and Simmons (2010) who established that the age of the firm owner/manager is a critical input into e-commerce adoption decisions.

Table 4.5: Firm Owner's/Manager's Age and Firm Size

	Firm Size			
	Micro	Small	Medium	Total
Age	Frequency (percent)	Frequency (percent)	Frequency (percent)	Frequency (percent)
Under 40	65(46)	65(33)	1(3)	131(35)
41-45	52(82)	80(74)	12(38)	144(74)
45- 50	20(96)	35(92)	20(97)	75(94)
51 and above	5(100)	15(100)	1(100)	21(100)
Total	**142**	**195**	**34**	**371**

 Source: Survey data, 2005

When analysed within and across firm sizes, the results indicate that 82 percent and 74 percent of firm owners/managers in the micro and small enterprises respectively were aged upto 45 years compared with 38 percent of firm owners/managers among the medium enterprises who belonged to the same age category. The results imply that most MSMEs in Kenya are owned or managed by persons who are in the younger age bracket. These results are in line with existing theoretical discussions, which advocate that innovation adoption is most likely in firms run by younger owners/managers. According to Alam and Ali(2007), younger owner/managers are more inclined to take risks such as adoption of innovations than older ones.

4.3.5 Firm Owner/Manager's Gender and Firm size

The impetus behind the determination of the firm owner/manager's gender in this study was based on the assumption that there is an association between e-commerce adoption and gender. The findings of the status of firm owners/manager's gender classified by firm size are presented in Table 4.6.

Table 4.6: Firm Owner/Manager's gender and firm size

Gender	FIRM SIZE			Total
	Micro	Small	Medium	
	Frequency (percent)	Frequency (percent)	Frequency (percent)	Frequency (percent)
Female	78 (54)	44 (22)	5 (15)	127 (34)
Male	66 (46)	153 (78)	29 (85)	248 (66)
Total	144	197	34	375

Source: Survey data, 2005

The study findings indicate that majority (54 percent) of microenterprises were owned or managed by females compared to 22 percent and 15 percent of the small and medium enterprises respectively. Overall, 66 percent of the firm owners/managers were males. These findings seem to support earlier studies which indicate that majority of larger enterprises are owned by males. A number of studies have examined the role of gender and the ownership/management of small businesses. MacGregor and Vrazalic (2006), for instance, established that gender is a critical factor influencing e-commerce adoption and that females are more inclined towards the view that e-commerce is unsuitable for their business, while males are more concerned about the difficulty of implementing e-commerce.

4.4   Environmental Factors and Firm Size

This section presents and discusses an assessment of the perception of respondents regarding the significance of customer pressure, supplier pressure, sector of operation, and business focus on e-commerce adoption in the context of firm size.

4.4.1   Perception of Customer pressure and Firm size

Table 4.7 shows results of the respondents' assessment of the significance of customer pressure on e-commerce adoption. Seventy one percent of the respondents (24 percent said not at all and 47 percent indicated less significant) in the microenterprises category of firms did not rate customer pressure as a significant factor for e-commerce adoption. Similar results were observed among the small and medium enterprises even though the proportions seemed to decrease with increasing firm size.

Table 4.7: Customer pressure and firm size

Significance of Customer Pressure	FIRM SIZE			Total
	Micro	Small	Medium	
	Frequency (percent)	Frequency (percent)	Frequency (percent)	Frequency (percent)
Not at all	35 (24)	55 (28)	5 (20)	95 (26)
Less significant	67 (47)	75 (38)	10 (40)	152 (42)
Significant	35 (24)	50 (26)	5 (20)	90 (25)
Very significant	6 (4)	15 (8)	5 (20)	26 (7)
Total	**143**	**195**	**25**	**363**

 Source: Survey data, 2005

Organisations conduct their activities within a certain environmental context. Past innovation scholars, for example Scupola (2009), found that the external environment presents opportunities and constraint for business enterprises. External pressure from customers has, for instance, been recognised as playing a critical role in encouraging firms to adopt ICT and Internet–based technologies. In fact, customer pressure on firms to adopt e-commerce technologies is regarded as an important determinant of adoption with such pressure increasing with firm size (Al-Somali, *et.al*., 2011).

4.4.2 Supplier pressure and Firm size

Table 4.8 shows the results of the respondents' assessment of the significance of supplier pressure on e-commerce adoption in the context of firm size.

Table 4.8: Supplier pressure and firm size

	FIRM SIZE			
	Micro	**Small**	**Medium**	**Total**
Supplier Pressure	Frequency (Percent)	Frequency (Percent)	Frequency (Percent)	Frequency (Percent)
Not at all	30 (21)	35 (20)	4 (24)	69 (21)
Less significant	34 (24)	45 (26)	5 (29)	84 (25)
Significant	70 (49)	65 (37)	3 (18)	138 (41)
Very significant	10 (7)	30 (17)	5 (29)	45 (13)
Total	**144**	**175**	**17**	**336**

Source: Survey data, 2005

The findings show that 37 percent and 17 percent of the respondents among the small enterprises sector consider supplier pressure as a significant and very significant decision-making factor influencing e-commerce adoption respectively. The

59

corresponding figures are 49 percent and 7 percent among the microenterprises. These results are in line with past studies. Jeyaraj, *et al*. (2006) and Scupola (2008), for example, identified the two major sources of external pressures for MSME firms to adopt e-commerce such as trading partners (customers and supplier) and competitive pressure. The implication of these results is that as part of the larger business system, MSMEs will be subjected to external pressure in order to conform to technologies used by suppliers for optimisation of transactions.

4.4.3   Sector of Operation and Firm size

Table 4.9 shows the results of the respondents' assessment of the significance of sector of operation in e-commerce adoption in the context of firm size.

Table 4.9: Sector of operation and firm size

	FIRM SIZE			
	Micro	**Small**	**Medium**	**Total**
Significance of sector of operation	Frequency (percent)	Frequency (percent)	Frequency (percent)	Frequency (percent)
Not at all	65(33)	25(14)	5(25)	95(24)
Less significant	55(28)	50(27)	2(10))	107(27)
Significant	55(28)	75(41)	2(10)	132(33)
Very significant	20(10)	35(19)	11 (55)	66(17)
Total	**195**	**185**	**20**	**400**

 Source: Survey data, 2005

For example, only 10 percent of the respondents among the microenterprises perceived sector of operations as a very significant factor influencing e-commerce adoption compared to 19 percent and 55 percent among the small and medium enterprises respectively. Huy (2012) found similar results which posited that sector of operation is a

critical factor in adoption of e-commerce since different sectors attract different players especially among the larger enterprises.

4.4.4 Market Focus and Firm size

Results in Table 4.10 illustrate the respondents' assessment of whether market focus was a significant factor in firm decisions to adopt e-commerce in the context of e-commerce adoption.

Table 4.10: Market focus and firm size

Significance of market focus	FIRM SIZE			
	Micro	Small	Medium	Total
	Frequency (percent)	Frequency (percent)	Frequency (percent)	Frequency (percent)
Not at all	35 (25)	30 (15)	3 (15)	68 (19)
Less significantly	25 (18)	45 (23)	3 (15)	93 (26)
Significantly	65 (46)	65 (33)	4 (20)	114 (32)
Very significantly	15 (11)	55 (28)	10 (50)	80 (23)
Total	**140**	**195**	**20**	**355**

Source: Survey data, 2005

Among the microenterprises, 57 percent of the respondents indicated that market focus was important in influencing organisation decisions to adopt e-commerce. Similarly, among the small and medium enterprises 61 percent and 70 percent of the respondents respectively considered market focus as an important determinant of e-commerce adoption. Scupola (2009 similarly found that the market focus is a more significant factor influencing e-commerce adoption among the larger enterprises in the MSME sector.

4.4.5 ICT Capacity and Firm Size

The ICT capacity of the firms was measured in terms of whether there was none, low, medium, or high levels (Table 4.11).

Table 4.11: ICT capacity and Firm Size

	FIRM SIZE			
	Micro	Small	Medium	Total
ICT capacity	Frequency (percent)	Frequency (percent)	Frequency (percent)	Frequency (percent)
None	55 (28)	30 (15)	0 (0)	85 (23)
Low	66 (47)	90 (46)	5 (16)	161 (44)
Medium	14 (10)	65 (33)	5 (17)	84 (23)
High	8 (6)	10 (5)	20 (67)	38 (10)
Total	**143**	**195**	**30**	**368**

Source: Survey data, 2005

The results indicate that majority (85 percent) of microenterprises had either none or low levels ICT capacity (38 percent and 47 percent indicating none and low respectively).

4.5 Technological Factors and Firm size

The study investigated the perception of respondents regarding the significance of technological factors on e-commerce adoption.

4.5.1 Relative advantage and Firm Size

As described earlier, relative advantage is defined as the degree to which an innovation is perceived as being better than the idea it supersedes. Given the potential of this attribute in influencing the owner/manager's decision to adopt e-commerce, the study determined

the respondents' perception of the significance of an innovation's relative advantage attribute in influencing e-commerce adoption decisions (Table 4.12)

Table 4.12: Perception of relative advantage and Firm size

	FIRM SIZE			
	Micro	Small	Medium	Total
Assessment rating	Frequency (percent)	Frequency (percent)	Frequency (percent)	Frequency (percent)
Strongly Disagree	45 (12)	20 (10)	0 (0)	65 (18)
Disagree	20 (14)	25 (13)	2 (6)	47 (13)
Neutral	10 (7)	15 (8)	10 (31)	35 (10)
Agree	35 (35)	85 (44)	12 (38)	132 (36)
Strongly Agree	32 (23)	48 (25)	8 (25)	88 (24)
Total	142	193	32	367

Source: Survey data, 2005

The study revealed that among the microenterprises, 12 percent and 14 percent of the respondents strongly disagreed or disagreed that the attribute was significant for e-commerce adoption decisions. In the small enterprises category, 10 percent and 13 percent of the respondents respectively had similar views compared to 0 percent and 6 percent among the medium enterprises. The emerging pattern is that in larger firms, the attribute of relative advantage is a more significant adoption decision factor.

4.5.2   Innovation complexity and firm size

Table 4.13 shows the results of the assessment of the significance of innovation complexity for e-commerce adoption decisions.

The results indicate that 33 percent of the respondents within the microenterprises category agreed (19 percent) or strongly agreed (14 percent) that innovation complexity was a significant factor for e-commerce adoption decisions. In contrast, more respondents in the small (65 percent) and medium (54 percent) firm categories perceived complexity as a significant adoption factor for e-commerce.

Table 4 13: Perceived Complexity and Firm size

Assessment rating	FIRM SIZE			Total
	Micro	Small	Medium	
	Frequency (percent)	Frequency (percent)	Frequency (percent)	Frequency (percent)
Strongly Disagree	20 (14)	27 (14)	0 (0)	47 (13)
Disagree	10 (7)	31 (16)	5(15)	46 (12)
Neutral	65(46)	10 (5)	10 (30)	85 (23)
Agree	27 (19)	55 (28)	7 (21)	89 (24)
Strongly Agree	20 (14)	73 (37)	11 (33)	104 (28)
Total	142	196	33	371

Source: Survey data, 2005

4.5.3   Trailability and firm size

Trailability characteristics of an innovation refer to whether adopters would have access to a free trial assurance before making a decision to adopt e-commerce or whether the adopting firm has the opportunity to try several e-commerce applications before making a decision. The respondents' attitude towards trailability of the innovation willingness to adopt was rated by firm size as shown in Table 4.14.

Table 4.14: Perceived Trailability and Firm size

| Assessment rating | FIRM SIZE | | | Total |
| | Micro | Small | Medium | |
	Frequency (percent)	Frequency (percent)	Frequency (percent)	Frequency (percent)
Strongly Disagree	5 (4)	15 (8)	2 (6)	22 (6)
Disagree	5 (4)	53 (27)	5 (15)	63 (17)
Neutral	80 (57)	10 (5)	2 (6)	92 (25)
Agree	40 (29)	47 (24)	13 (39)	100 (27)
Strongly Agree	10 (7)	70 (36)	11 (33)	91 (25)
Total	140	195	33	368

Source: Survey data, 2005

The study results indicate that the respondent's assessment of the significance of the trailability attribute for e-commerce adoption increased with increasing firm size. Among the microenterprises, 8 percent of the respondents "disagreed" that trailability was an important e-commerce adoption factor compared to 35 percent and 21 percent amongst the small and medium sized firms respectively. In contrast, 36 percent, 60 percent, and 71 percent of the respondents from the micro, small, and medium enterprises respectively agreed that trailability was a significant factor in e-commerce adoption decisions.

4.5.4 Innovation compatibility and firm size

The perception of owners/managers regarding compatibility of the innovation with existing business processes and technologies is a critical factor for e-commerce adoption or uptake. Table 4.15 shows results of the assessment of the significance of the attribute as a decision making factor.

Table 4.15: Perceived Compatibility and Firm size

| Assessment rating | FIRM SIZE | | | |
| | Micro | Small | Medium | Total |
	Frequency (Percent)	Frequency (Percent)	Frequency (Percent)	Frequency (Percent)
Strongly Disagree	5 (3)	10 (5)	3 (9)	18 (5)
Disagree	24 (17)	35 (10)	6 (18)	65 (17)
Neutral	70 (49)	7 (4)	0 (0)	77 (21)
Agree	26 (18)	67 (34)	10 (29)	103 (28)
Strongly Agree	18 (13)	77 (39)	15 (44)	110 (29
Total	**143**	**196**	**34**	**373**

Source: Survey data, 2005

Overall, over **55** percent of the respondents agreed that compatibility was a critical factor in making e-commerce adoption decisions. Among the respondents who either agreed or strongly agreed, 31 percent were from the micro enterprises, 74 percent were from the small enterprises, and 73 percent from the medium enterprises.

4.5.5   Observability and firm size

Table 4.16 shows results of the assessment rating of observability perception by the respondents as a significant factor for e-commerce adoption.

Overall, the study results indicate that only 7 percent of the respondents disagreed that e-commerce observability was a significant adoption decision factor. Analysed by firm size, 19 percent of the respondents amongst the micro enterprises sub-sector were in the

"agreed" continuum compared to 68 percent and 85 per cent amongst their counterparts in the small and medium enterprises respectively.

Table 4.16: Perceived Observability and Firm size

	FIRM SIZE			
	Micro	Small	Medium	Total
Assessment rating	Frequency (percent)	Frequency (percent)	Frequency (percent)	Frequency (percent)
Strongly Disagree	3(2)	20 (10)	1 (3)	24 (7)
Disagree	24 (17)	34 (17)	4 (12)	62 (16)
Neutral	90 (63)	10 (5)	0 (0)	100 (27)
Agree	17 (12)	53 (27)	8 (24)	78 (21)
Strongly Agree	10 (7)	80 (41)	20 (61)	110 (29)
Total	144	197	33	374

Source: Survey data, 2005

4.5.6 Security and confidentiality and firm size.

As previously stated, several studies have revealed that organisations are relevant to embrace e-commerce because of concerns over security issues and lack of confidentiality due to the innovation. Table 4.17 shows results of the assessment of respondents' perception of the security/confidentiality attribute as a significant e-commerce adoption factor.

Table 4.17: Perceived Security/Confidentiality and Firm size

	FIRM SIZE			
	Micro	Small	Medium	Total
Assessment rating	Frequency (percent)	Frequency (percent)	Frequency (percent)	Frequency (percent)
Strongly Disagree	12 (9)	14 (7)	0 (0)	26 (7)
Disagree	35 (25)	25 (14)	6 (18)	66 (18)
Neutral	42 (30)	10 (5)	2 (6)	54 (15)
Agree	36 (26)	68 (34)	10 (29)	114 (31)
Strongly Agree	16 (11)	80 (41)	16 (47)	112 (30)
Total	141	197	34	372

Source: Survey data, 2005

It is clear from the results that firm owners/managers perceived the security and confidentiality issue as a significant adoption factor among the small and medium enterprises as indicated by 75 percent (34 percent agreed and 41 percent strongly agreed) and 76 percent (29 percent agreed and 47 percent strongly agreed) of the respondents respectively. Among the microenterprises, only 37 percent (26 percent agreed and 11 percent strongly agreed) of the firm owners/managers viewed security/confidentiality as a significant adoption decision factor significant. Overall, 61percent of the respondents rated the attribute as a significant adoption decision factor (31 percent agreed and 30 percent strongly agreed).

The foregoing results on perception of the significance of innovation characteristics with regard to adoption decisions agreed with a number of previous studies. To and Ngai (2007), for example, established that the significance of relative advantage as an adoption

factor is more critical in larger MSMEs given the complexity of their structures. Compatibility of an innovation is more critical among small and medium enterprises than in microenterprises (Grandon & Pearson, 2003). Ratten and Ratten (2007) similarly established that observability a decision factor on adoption is only critical in firms with complex business operations. Regarding trailability, Ramdani and Kawalek (2008) found observability to be a key input in influencing the willingness of MSMEs to adopt new technology. The authors found similar results regarding the complexity and security/confidentiality attributes of innovations.

4.6   Relationship between E-commerce Adoption and Organisational, Technological, and Environmental Determinants

This section presents results of the chi-square tests used to determine the effect of organisational, technological, and environmental factors on e-commerce adoption.

4.6.1   E-commerce Adoption and Organizational factors

This section presents results of chi-square tests to determine whether organisational variables influence e-commerce adoption. The following key variables were analysed: age of firm owner/manager, level of education, and gender. The other variables were firm size, ICT capacity of the firm, and age of the firm

The study hypothesised that there is a significant relationship between age of the firm owner/manager and the likelihood of e-commerce adoption. Table 4.18 shows results of the chi-square test for this relationship.

Table 4.18: Chi-square test results for age and e-commerce adoption

| Owner/Manager's Age | Adoption of e-commerce | | | | Total |
| | Adopt | | Not Adopt | | |
	f_{obs}	f_{exp}	f_{obs}	f_{exp}	
Under 40	103	90	8	21	111
41-45	92	101	32	23	124
45- 50	84	90	26	20	110
51 and above	27	25	4	6	31
Total	306		70		376

f_{obs} –Observed frequencies; f_{exp}-Expected frequencies; Calculated Chi-square = **16.265** (Chi – square table value = 12.838 at alpha = 0.05, DF=3)
Source: Survey data, 2005

Results from the study (calculated chi-square value = 16.265 compared to the chi-square table value of 12.838 at alpha = 0.05, DF=3) show that the hypothesis of relationship between age of the firm owner/manager and the likelihood of e-commerce adoption should be accepted. Based on this finding, the study concluded that the younger the owner/manager of a firm, the higher the likelihood of e-commerce adoption by the firm. This result is consistent with findings by Talebi and Tajeddin (2011) that revealed an inverse relationship between age of the firm owner/manager and the likelihood of e-commerce adoption.

The study also investigated the effect of education on e-commerce adoption. In this regard, the study sought to test the hypothesis that there is a significant relationship between level of education of the firm owner/manager and the likelihood of e-commerce

adoption. Table 4.19 shows the observed and expected frequencies as well as the resultant p-value and the calculated Chi-square value.

Table 4.19: Level of Education and E-commerce Adoption

| Level of Education | Adoption of e-commerce | | | | Total |
| | Adopt | | Not Adopt | | |
	f_{obs}	f_{exp}	f_{obs}	f_{exp}	Total
None	5	5	1	1	6
Primary	2	2	1	1	3
High School	65	67	17	15	82
Trade/Technical Qualification	158	156	33	35	191
Undergraduate	70	60	4	14	74
Postgraduate	5	15	13	3	18
Total		305		69	374

f_{obs} –Observed frequencies, f_{exp} - Expected frequencies; Calculated Chi-square = 34.594 (Chi – square table value = 16.750 at alpha = 0.05, DF=5)
Source: Survey data, 2005

From the findings (calculated Chi-square = 34.594 compared to Chi – square table value = 16.750 at alpha = 0.05 and DF=5), the study concluded that the level of education of the firm owner/manager had a significant effect on the likelihood of e-commerce adoption thus accepting the stated hypothesis of relationship between the two variables. This finding is consistent with observations by Dubelaar, *et al*. (2005) and Ramdani, *et a*l. (2009) that the firm owner/manager's level of education has a significant effect on innovation adoption. Another hypothesis tested in this study was that there is a significant relationship between gender of the firm owner/manager and the likelihood of e-commerce adoption. Table 4.20 shows the chi-square test results for this relationship.

Table 4.20: Gender and E-commerce Adoption

| Gender | Adoption of e-commerce | | | | |
| | Adopt | | Not Adopt | | |
	f_{obs}	f_{exp}	f_{obs}	f_{exp}	Total
Female	72	55	59	68	127
Male	102	146	115	133	248
Total		174		201	375

f_{obs} –Observed frequencies, f_{exp} - Expected frequencies; Calculated Chi-square = 8.180 (Chi – square table value = 7.879 at alpha = 0.05, DF=1)
Source: Survey data, 2005

The derived chi-square value of 8.180 compared with chi – square table value of 7.879 at alpha = 0.05, DF=1 confirmed the hypothesis of a significant relationship between the firm owner/manager's gender and the likelihood of e-commerce adoption. This result is consistent with that of Alam *et al*. (2007) which showed that the gender and age of the owner/manager significantly affects the likelihood of e-commerce adoption. The influence of gender on the likelihood of e-commerce adoption can be explained by the difference in the concerns expressed by males and females on this issue. Whereas males have been shown to be more concerned with organisational issues, their female counterparts worry about technological issues

The study further tested the hypothesis that there is a significant relationship between firm size category and the likelihood of e-commerce adoption. Table 4.21 shows the chi-square test results for this hypothesis.

Table 4.21: Firm Size and E-commerce Adoption

Firm Size	Adopt f_{obs}	Adopt f_{exp}	Not Adopt f_{obs}	Not Adopt f_{exp}	Total
	Adoption of e-commerce				
9 and below (Micro)	44	64	100	80	144
10-49 (Small)	99	89	102	112	201
50 and above (Medium)	25	5	8	18	33
Total		168		210	

f_{obs} –Observed frequencies, f_{exp} - Expected frequencies; Calculated Chi-square = 26.237
(Chi – square table value = 10.597 at alpha = 0.05, DF=2)
Source: Survey data, 2005

The chi-square test results revealed existing of a significant relationship between firm size and adoption of e-commerce as earlier hypothesised. This result confirmed findings by Karakaya and Khalil (2004) that firm size is one of the most important determinants of e-commerce adoption among MSMEs. Thus, larger firms tend to adopt technology at higher levels, while smaller firms are inclined to adopt technology at lower levels (Alam, *et al.,* 2007).

Similarly, the study analyse, the relationship between ICT capacity and the likelihood of e-commerce adoption. Technological capacity was assessed by the level of investment in both technological knowledge and skills. Table 4.22 shows results of the chi-square test for the hypothesis that there is a significant link between ICT capacity and the likelihood of e-commerce adoption.

Table 4.22: ICT Capacity and E-commerce adoption

| ICT Capacity | Adoption of e-commerce | | | | |
| | Adopt | | Non Adopt | | |
	f_{obs}	f_{exp}	f_{obs}	f_{exp}	Total
None	20	26	13	6	13
Low	45	53	21	12	34
Medium	145	140	26	30	177
High	97	88	10	19	153
Total		307	67		377

f_{obs} –Observed frequencies, f_{exp} - Expected frequencies; Calculated Chi-square = 22.184
(Chi – square table value = 12.838 at alpha = 0.05, DF=3)
 Source: Survey data, 2005

The study established that the level of ICT capacity significantly influenced the likelihood of e-commerce adoption given the calculated chi-square value of 22.184 compared with the chi-square table value of 12.838 at alpha = 0.05, DF=3. These results were consistent with those from studies by Tetteh and Burn (2001) and O'Donnel et al. (2001) that ICT capacity significantly affects e-commerce adoption.

Table 4.23 shows results of the chi-square test to determine whether age of the firm affects the likelihood of e-commerce adoption. The findings indicate that at the 5 percent level of significance, there was a relationship between the likelihood of e-commerce adoption and age of the firm. The age of firm variable had a positive coefficient, indicating that the older the firm, the higher the level of e-commerce adoption. This observation confirmed the findings of Freeman, Caroll and Hannan (2003).

Table 4.23: Age of firm and Adoption of E-Commerce.

| Age of firm | Adoption of e-commerce | | | | Total |
| | Adopt | | Not Adopt | | |
	f_{obs}	f_{exp}	f_{obs}	f_{exp}	
Up to 5 years	97	125	57	29	154
6 – 10	96	87	11	20	107
11 – 15	45	38	2	9	47
16 -20	19	15	0	4	19
21 and above	48	39	0	9	48
Total		305		70	375

f_{obs} = Observed frequency; p-value = 0.000; Calculated Chi-square = 60.905 Chi-square (4 0.05) = 9.488)
Source: Survey data, 2005

From the perspective of the newness liability, it was argued that older organisations have an advantage over younger ones because reliability and accountability tend to increase with age and failure rates tend to decrease as a firm's number of years in operation increases.

4.6.2   E-commerce Adoption and Environmental factors

This section presents results of chi-square tests to determine whether environmental variables influence e-commerce adoption. The key environmental variables analysed were supplier pressure, firms sector of operation, market focus, competition intensity, and customer pressure. Table 4.24 shows the analysis of the relationship between supplier pressure and e-commerce adoption.

Table 4.24: Supplier Pressure and e-commerce adoption

| Supplier Pressure | Adoption of e-commerce | | | | Total |
| | Adopt | | Not Adopt | | |
	f_{obs}	f_{exp}	f_{obs}	f_{exp}	
Highly	140	127	15	28	155
Moderately	40	47	17	10	57
Low	78	80	20	18	98
Not at all	50	53	15	12	65
Total		**308**		**67**	**375**

f_{obs} –Observed frequencies, f_{exp} - Expected frequencies; Calculated Chi-square = 14.272
(Chi – square table value = 12.838 at alpha = 0.05, DF=3)
Source: Survey data, 2005

The results indicate that at 5percent level of significance, the likelihood of e-commerce adoption is influenced by supplier pressure as the calculated chi-square value of 14.272 was greater than the table value of 12.838. According to Jeyaraj, *et al.* (2006), two major elements of external pressure influence the adoption of e-commerce by SMES, namely, trading partners (customers and suppliers) and competitive pressure. The reason for the significant effect of the variables cited is that MSMEs, being part of the larger business system, are subjected to external pressure to conform to technologies used by suppliers and customers for optimisation of transactions. Scupola (2009), while analysing SMEs in Demark and Australia, also revealed that customer and supplier pressure are significant factors in e-commerce adoption.

Results of an analysis to determine whether MSME sector of operation had a significant effect on the likelihood of e-commerce adoption. are as shown in Table 4.25.

Table 4.25: Sector of Operation and e-commerce adoption

Sector of operation	Adoption of e-commerce Adopt f_{obs}	Adopt f_{exp}	Not Adopt f_{obs}	Not Adopt f_{exp}	Total
Nonprofessional services	110	105	16	21	126
Manufacturing	92	84	9	17	101
Wholesale	10	13	5	2	15
Retail/hospitality	60	65	18	13	78
ICT	10	14	7	3	17
Professional services	40	41	9	8	49
Total		**322**		**64**	**386**

f_{obs} –Observed frequencies, f_{exp} - Expected frequencies; Calculated Chi-square = 18.641
(Chi – square table value = 16.750, at alpha = 0.005, DF=5)
Source: Survey data, 2005

A chi-square test at 5 percent level of significance led to acceptance of the hypothesis
that there is a significant relationship between sector of operation and the likelihood of e-
commerce adoption. Similarly, a study by Iddris (2012) revealed that overall, the
operations management function of any firm is affected by type of operations. The results
further revealed that apart from firm size, sector of operation has a significant effect on
the likelihood of technological uptake. A test of the relationship between market focus
and e-commerce adoption was also undertaken (Table 4.26).

Table 4.26: Market focus and e-commerce adoption

Market Focus	Adoption of e-commerce Adopt f_{obs}	Adopt f_{exp}	Not Adopt f_{obs}	Not Adopt f_{exp}	Total
Local	120	124	30	26	150
Regional	158	147	20	31	178
International/global	30	37	15	8	45
Total		308		373	377

f_{obs} –Observed frequencies, f_{exp} - Expected frequencies; Calculated chi-square = 13.344;
(Chi – square table value = 12.838 at alpha = 0.05, DF=3)
Source: Survey data, 2005

The hypothesis that market focus significantly affects e-commerce adoption was accepted given the chi-square test result of 13.344 (DF=3 and alpha = 0.05). This result corroborates the findings by Huy (2009), in a study of Vietnamese MSMEs, that a firm's globalisation orientation helps speed up the adoption process in the enterprise. Zhu and Kraemer (2005) observe that global reach of the Internet enables cost-efficient means of reaching out to new markets, attracting new customers, delivering products and services, and improving coordination with suppliers and business partners.

Finally, the study investigated whether customer pressure significantly affects e-commerce adoption (Table 4.27).

Table 4.27: Customer Pressure and e-commerce adoption

Customer Pressure	Adopt		Not Adopt		Total
	f_{obs}	f_{exp}	f_{obs}	f_{exp}	**Total**
High	148	136	15	27	163
Medium	80	85	22	17	102
Low	55	56	12	11	67
Not at all	25	32	13	6	38
Total	**308**		**62**		**370**

f_{obs} –Observed frequencies, f_{exp} - Expected frequencies; Calculated Chi-square = 16.725
(Chi – square table value = 12.838 at alpha = 0.05, DF=3)
Source: Survey data, 2005

The hypothesis that external pressure significantly affects e-commerce adoption was accepted given the chi-square test result of 16.725 compared with the chi-square table value = 12.838 at alpha = 0.05, DF=3. This result is consistent with that from a study by Jeyaraj, et al. (2006), which established that customer pressure has a significant effect on MSMEs e-commerce adoption. This observation is supported by the argument that being

78

part of a larger system, MSMEs are subjected to customer pressure in order to conform to technologies used by customers for optimisation of transactions (Scupola, 2009).

4.6.3 E-commerce Adoption and Technological factors

This section contains results of an evaluation of the effect of technological variables, including perception of relative advantage, compatibility, complexity, trailability, observability and security/confidentiality on e-commerce adoption. The first hypothesis tested in this regard was that there is a significant relationship between the likelihood of e-commerce adoption and perception of the innovation's relative advantage. The test results are shown in Table 4.28.

Table   4.28: Perception of Relative Advantage and E-commerce Adoption.

| Rating of Relative Advantage Perception | Adoption of E-commerce | | | | Total |
| | Adopters | | Non Adopters | | |
	f_{obs}	f_{exp}	f_{obs}	f_{exp}	Total
Strongly Disagree	55	60	17	12	72
Disagree	86	77	6	15	92
Neutral	72	65	6	13	78
Agree	50	50	10	10	60
Strongly Agree	45	57	23	11	68
Total		308		62	370

f_{obs} –Observed frequencies, f_{exp} - Expected   frequencies; Calculated Chi-square = 28.129 (Chi – square table value = 14.860 at alpha = 0.05, DF=4)
Source: Survey data, 2005

The test obtained a chi-square value of 28.129 compared to a chi-square table value of 14.860 at alpha = 0.05 and DF=4 indicating that perception of the relative advantage of e-commerce had a significant effect on the likelihood of adoption of the innovation.

Similarly, Ghobakhloo *et. al*. (2011) established that perceived relative advantage has a significant effect on e-commerce adoption by SMEs.

Table 4.29 shows results for the test of association between perceived compatibility and e-commerce adoption.

Table 4.29: perception of Compatibility and E-commerce Adoption

Rating of Compatibility Perception	Adoption of e-commerce				
	Adopters		Non Adopters		
	f_{obs}	f_{exp}	f_{obs}	f_{exp}	**Total**
Strongly Disagree	39	35	4	8	43
Disagree	80	71	7	16	87
Neutral	56	62	19	13	75
Agree	52	62	24	14	76
Strongly Agree	58	54	8	12	66
Total		285		62	347

f_{obs} **–Observed frequencies, f_{exp} - Expected frequencies;** Calculated chi-square = 21.939, (Chi – square table value = 14.860 at alpha = 0.05, DF=4).
Source: Survey data, 2005

The calculated chi-square value of 21.939 is greater than the chi-square table value of 14.860 at alpha = 0.05, DF=4 demonstrating that there is a significant relationship between perception of compatibility and the likelihood of e-commerce adoption. This result is consistent with findings by Ghobakhloo et. al. (2011) which established that e-commerce adoption within SMEs is significantly affected by perceived compatibility of the innovation.

The study further tested the hypothesis that there is a significant relationship between the likelihood of e-commerce adoption and perception of the complexity of the innovation. Table 4.30 contains the chi-square test results for this relationship.

Table 4.30: Perception of Complexity and E-commerce Adoption

| Rating of Compatibility Perception | Adoption of e-commerce | | | | |
| | Adopters | | Non Adopters | | |
	f_{obs}	f_{exp}	f_{obs}	f_{exp}	Total
Strongly Disagree	59	58	13	14	72
Disagree	90	77	6	19	96
Neutral	52	59	21	14	73
Agree	58	57	13	14	71
Strongly Agree	24	31	15	8	39
Total		283		68	354

f_{obs} –**Observed frequencies, f_{exp} - Expected frequencies;** Calculated Chi-square = 23.938, (Chi – square table value = 14.860 at alpha = 0.05, DF=4)
Source: Survey data, 2005

The calculated chi-square value of 23.938 is greater than the chi-square table value of 14.860 at alpha = 0.05, DF=4 indicating that the perception of the complexity of e-commerce has a significant effect on adoption of the innovation. This observation was in line with another previous study which established that there is a significant and strong correlation between ease or difficulty of use and e-commerce adoption (Balushi & Lawati, 2012). This study investigated the hypothesis that there was a significant relationship between e-commerce adoption and its trailability. Table 4.31 shows the chi-square test results for the stated hypothesis.

Table 4.31: Perception of Trailability and E-commerce Adoption

| Rating of **Trailability** Perception | Adoption of e-commerce | | | | |
| | Adopters | | Non Adopters | | |
	f_{obs}	f_{exp}	f_{obs}	f_{exp}	Total
Strongly Disagree	48	43	5	10	53
Disagree	85	76	8	17	93
Neutral	70	74	21	17	91
Agree	61	69	23	15	84
Strongly Agree	38	40	11	9	49
Total		302		68	370

f_{obs} –Observed frequencies, f_{exp} - Expected frequencies; Calculated Chi-square = 29.770, (Chi – square table value = 14.860 at alpha = 0.05, DF=4)
Source: Survey data, 2005

A chi-square value of 15.171 compared to the table value of 14.860 (DF=4 and alpha = 0.05) indicates that there was a significant relationship between the owner/manager's perception of trailability and the likelihood of adoption e-commerce. Lin and Lee (2006) similarly established that there is a significant relationship between e-commerce adoption and trailability. Trailability assumes that individuals who have had the opportunity to try out an innovation are more likely to adopt it than those who have not tried it because trial of the innovation enables the potential adopters to become confident that the results of using the innovation will meet their expectations.

This study tested the hypothesis that the more observable the innovation of e-commerce, the higher the likelihood of adoption. Table 4.32 shows the chi-square test results for the relationship.

Table 4.32: Observability Perception and E-commerce Adoption

| Rating of Observability Perception | Adoption of E-commerce | | | | Total |
| | Adopters | | Non Adopters | | |
	f_{obs}	f_{exp}	f_{obs}	f_{exp}	**Total**
Strongly Disagree	13	19	10	4	23
Disagree	60	55	7	12	67
Neutral	51	45	4	10	55
Agree	98	97	21	22	119
Strongly Agree	77	84	26	19	103
Total		299		68	367

f_{obs} **–Observed frequencies, f_{exp} - Expected frequencies;** Calculated Chi-square = 20.136, (Chi – square table value = 14.860 at alpha = 0.05, DF=4)
Source: Survey data, 2005

A chi-square value of 20.136 compared with the table value of 14.860 confirmed the hypothesis that there was a significant link between the owner/manager's perception of e-

commerce observability and adoption of the technology. Huy (2007) also found a significant relationship between perceived observability and the adoption of e-commerce by. This result implies that the various beneficial operations of e-commerce influences decision making by MSMEs' to adopt e-commerce technology. Nonetheless, the finding of this study contradicted with that of some previous researchers who established that observability does not affect the adoption of e-services (Ratten & Ratten, 2007). Rogers (2003) has defined observability as the degree to which the results of an innovation are visible to others (Rogers, 2003). The author also proposes that innovations with high observability, relative advantage, and less complexity would be adopted more quickly than other innovations without these characteristics. Finally, the study analysed the significance of the relationship between perception of security/confidentiality and e-commerce adoption. Table 4.33 shows the chi-square test results of the stated hypothesis.

Table 4.33: Security/Confidentiality Perception and E-commerce Adoption

| | Adoption of E-commerce | | | | |
| | Adopters | | Non Adopters | | |
Rating of Security/Confidentiality Perception	f_{obs}	f_{exp}	f_{obs}	f_{exp}	**Total**
Strongly Disagree	15	23	13	5	28
Disagree	45	45	10	10	55
Neutral	70	64	9	15	79
Agree	93	94	23	22	116
Strongly Agree	56	53	9	12	65
Total		279		64	343

f_{obs} **–Observed frequencies, f_{exp} - Expected frequencies** Calculated Chi-square = 18.080, (Chi – square table value = 14.860 at alpha = 0.05, DF=4)
Source: Survey data, 2005

A chi-square value of 18.080 compared to the table value of 14.860 confirmed the hypothesis that there was a significant link between perception security/confidentiality

and the likelihood of e-commerce adoption. Similarly Alam and Ali (2011) had earlier established that concern about security was perceived as the most important barrier to the use of e-commerce by businesses especially among MSMEs.

4.7   Logistic Regression Analysis (LRA) Results

In this study, e-commerce adoption was taken to be the dependent variable, Y. For purposes of LRA, let Y = 1 for adopters and Y=0 otherwise. The objective was to derive a logistic equation for each set of dependent and independent variables leading to the derivation of five logistic regression analysis results.

The objective of logistical analysis was to determine the direction and statistical significance of the effect of the explanatory variables on the likelihood of adoption of the innovation, in this case e-commerce. The following sets of explanatory variables were regressed on Y:

1. Owner/manager profile including level of education, age, position in firm, and gender.

2. Firm profile including age of firm, ICT capacity, business type, and business focus.

3. Rogers' perceived innovation characteristics of relative advantage; compatibility; complexity; trailability; security and confidentiality; and observability.

4. Environmental factors including information intensity, competition intensity, customer pressure, and sector of business operation.

5. Technological, organisational, and environmental factors and the likelihood of e-commerce adoption.

By undertaking the five regression analyses, the intention was to determine which factors individually or interactively contributed most significantly to the likelihood that a firm would adopt the e-commerce technology.

4.7.1 Logistical Regression Analysis 1 (LRA 1): E-commerce Adoption and Owner/manager Demographic Profile

The study tested the hypothesis that the owner/manager demographic variables (age, gender, and level of education) were statistically significant predictors for e-commerce adoption. Table 4.34 shows the findings.

Table 4.34: LRA 1: E-commerce Adoption and Owner/Manager Demographic Profile.

Explanatory Variable:	Estimated Coefficient	Standard Error	P value
Position in firm (owner or manager)	+2.296	0.374	0.000
Level of education	-1.393	0.240	0.000
Age	-0.715	0.241	0.003
Gender	+0.142	0.857	0.020
Model Statistics			
N	337		
Nagelkerke R-Square	0.351		
Model Chi – Square (6df)	91.22		0.000

Source: Survey data, 2005

The resulting equation from the above logistic regression are as shown in Box 1 below,

Box 1: Owner/manager demographic profile

Predicted Logit (Adoption) = +2.296*(Position in Firm) - 1.393* (Level of Education) - 0.715*(Age) + 0.142*Gender

From the results, Nagelkerke R-Square of 0.351 confirmed that the model was a good fit for the data since this value implies a low variability between the predicted values and the actual values. Results of the Wald's chi-square test (p-value) showed that owner/manager in the firm (+β=2.296, p = 0.000) and gender (β=+0.142, p = 0.020) were positive, statistically significant, and strong predictors of e-commerce adoption. On the other hand, level of education (β=-1.393, p = 0.000) and age (β=-0.715, p = 0.003) were negative but statistically significant and strong predictors of e-commerce adoption at 5 percent level of significance.

The study finding on gender was consistent with the results from a study by Alam *et al*,. (2007) who established that there is higher likelihood of female-managed MSMEs adopting an innovation than those headed by their male counterparts. The explanation for this was that males were more concerned with organisational issues whiles their female counterparts focussed on technological issues. Laukkanen and Pasanen (2008), however, established that males are more likely than females to adopt e-services due to cultural factors.

On education level, results of this study were inconsistent with findings by Dubelaar, *et al*.(2005) and Ramdani, *et al*. (2009) that the owner/manager level of education has a positive and significant relationship with innovation adoption. This departure may be because a higher level of education without the requisite technical ICT knowledge and skills may not adequately provide the necessary motivation for investment in e-commerce. The inverse relationship observed in this study between age of the owner/manager and the likelihood of e-commerce adoption was in line with findings by Talebi and Tajeddin (2011), in their study of Iranian MSMEs, that factors such as age and

levels education had a significant effect on innovation adoption and business growth. The reason provided for this observation was that firms founded or managed by younger owners/managers with higher educational levels were more likely to invest in new technology.

4.7.2 Logistical Regression Analysis 2 (LRA 2): E-commerce Adoption and Firm Demographic Profile

The study tested the hypothesis that there was a significant relationship between firm demographic variables (size, age, business type, business focus, and ICT capacity) and e-commerce adoption. Table 4.35 shows results of the logistic regression analysis.

Table 4.35: LRA 2: E-commerce Adoption and Firm Profile.

Explanatory Variable	Estimated Coefficient	Standard Error	P-value
Age of Firm	+0.125	0.075	0.020
Business type	-2.110	0.952	0.045
Size of Firm	+2.108	0.912	0.000
ICT Capacity	+1.547	0.555	0.000
Business focus	-2.610	0.122	0.097
Model Statistics			
N	298		
Nagelkerke R-Square	0.657		
Model chi-square (6df)	47.957		

Source: Survey data, 2005

From the above analysis, the resulting logistic regression model is shown in Box 2.

<u>Box 2: Firm Demographic Profile</u>

Predicted Logit (Adoption) = +0.125*(Age of Firm) -2.110*(Business type)+1.0421*(size of Firm)+1.547*(ICT Capacity)-2.610*(Business focus)

The Nagelkerke R-Square of 0.657 confirmed that the model was a good fit for the data. The p-value at 5 percent level of significance showed that age of firm (β=+0.125, p = 0.020), size of the firm (β=+2.108, p = 0.000), and the firm's ICT capacity (β=+1.547, p = 0.000) were positively statistically significant and strong predictors of e-commerce adoption. On the other hand, business type (β=--2.110, p = 0.045) and business focus (β= **-2.610**, p = 0.097) were inversely related to e-commerce adoption with the latter not being statistically significant.

Results on firm size and age of the firm were consistent with findings by Lun and Quaddus (2011) that organisation size has a positive and significant effect on e-commerce adoption. The results were also similar to those in the study by Sparling, *et al*. (2007) who established that the higher the ICT capacity of a firm in terms of infrastructure, the higher the likelihood of e-commerce adoption. On business type and focus, the study results confirmed findings by Filiatrault and Huy (2006) only in terms of direction of the effect. However, the study did not find statistical significance in the relationship between business focus and e-commerce adoption. The explanation for this finding is that the focus of majority of MSMEs in Kenya, like their counterparts in other development countries, is largely local.

4.7.3   Logistical Regression Analysis 3 (LRA 3): E-commerce Adoption and

Perceived Innovation Characteristics

A logistical regression model was used to analyse the effect of perceived innovation characteristics and e-commerce adoption. The six independent variables of innovation characteristics were perceived relative advantage, perceived compatibility, perceived complexity, perceived security/confidentiality, perceived trailability, and perceived observability. Table 4.36 shows the result of the analysis.

Table 4.36: Logistical Regression Results 3

Explanatory Variable	Estimated Coefficient	Standard Error	P value
Relative Advantage	+0.036	0.133	0.046
Compatibility	+0.286	0.142	0.044
Complexity	-0.322	0.138	0.019
Security/Confidentiality	-0.141	0.129	0.043
Trailability	+0.368	0.145	0.011
Observability	+0.285	0.124	0.022
Model Statistics			
N	253		
Nagelkerke R-Square	0.168		
Model Chi – Square (6df)	26.877		0.000

Dependent Variable: Adoption of E-commerce (1 = Adopted, 0 = Non-Adopters
Source: Survey data, 2005
The resulting logistic regression equation is as shown in Box 3.

Box 3: Perceived Innovation Characteristics

Predicted Logit (Adoption) = 0.036*(Relative Advantage) + .286*(Compatibility) – 0.322*(Complexity)–0.141*(Security/confidentiality)+0.368*(Trailability) +0.285*(Observability)

The study conducted an evaluation of the overall soundness of the model in terms of power of the individual predictors, goodness-of-fit, and validity of the predicted

probabilities overall power. The Wald's chi-square test was used to evaluate the overall power of predictors due to its power and dependability of the result obtained. The Nagelkerke R-Square descriptive measure was used to assess the goodness-of-fit. A Nagelkerke R-Square value of 0.168 was obtained leading to the acceptance of the null hypothesis that the model was a good fit for the data. The analysis revealed that the variables of relative advantage [β = +0.036, p = -0.046 (<0.05)], compatibility [β = 0.286, p = 0.044 (<0.05)], trailability [β = +0.368, p = 0.011 (<0.05)] and observability [β = 0.285, p = -0.022 (<0.05)], were statistically significant at 5 percent level of significance and had a positive effect on the likelihood of e-commerce adoption. On the other hand, the relationships between e-commerce adoption and complexity [β = -0.322, p = 0.019 (<0.05)] and security/confidentiality [β = -0.141, p = 0.011 (<0.043)] was negative but statistically significant. In this case the hypothesis was accepted.

The above results are in line with earlier studies, which found a significant relationship between the perception of the six innovation characteristics and the likelihood of e-commerce adoption. For example, relative advantage is one of the best predictors that is positively related to an innovation's rate of adoption (Alam *et al.* 2007). The advantages of e-commerce are viewed in terms of overall reduction in operating cost, market expansion, increase in customer base, and improvement of public relations. Similarly, Alam *et al*. (2007) established that an innovation is more likely to be adopted when it is compatible with the individuals' job responsibility, value system, previous ideas, and existing business operations. Thus, when an innovation is perceived as relevant, both technically and financially, then the likelihood of adoption by the MSMEs will be higher.

Results from this study on complexity (perceived ease of use, PEU) and security/confidentiality were also consistent with those from studies by Pavic, *et.al*. (2007) and Alam *et al.* (2007) who found an inverse but statistically significant relationship between the two sets of variables and the likelihood of e-commerce adoption. The explanation for these results is that the more complex and insecure an innovation is perceived to be, the less likely it will be adopted. Thus, higher levels of perceived insecurity and lack of confidentiality are associated with decreased intentions to adopt e-commerce.

The results of this study on observability and the likelihood of adoption of e-commerce contradict those by Ratten and Ratten (2007) who found that observability does not affect the adoption of e-services. The immaturity of e-comerce among Kenya's MSMEs could explain the difference in result. On the other hand, the result on the relationship between perceived trailability or the degree to which an innovation is capable of being tried on a limited basis was consistent with earlier studies. Rogers (2003) found that trailability had a significant effect on using and adopting the innovation.

4.7.4   Logistical Regression Analysis 4 (LRA 4): E-commerce Adoption and Environmental Factors

The study hypothesised that there is a significant relationship between selected environmental variables (supplier pressure, sector of business operations, competition intensity, and customer pressure) and e-commerce adoption. Table 4.37 shows the results of the analysis.

Table   4.37: E-commerce Adoption and Environmental Factors Dependent

Explanatory Variable	Estimated Coefficient	Standard Error	P- value
Supplier pressure	+1.152	0.542	0.001
Sector of business operation	+2.119	0.891	0..068
Competition intensity ,	+3.215	0.112	0.017
Customer pressure	+1.001	0.215	0.025
Model Statistics			
N	355		
Nagelkerke R-Square	0.750		
Model Chi – Square (6df)	25.12		0.025
-2log likelihood	251.012		

Variable: Adoption of E-commerce (1 = adopted, 0 = non- adopters)
Source: Survey data, 2005

The resulting logistic regression equation is as shown in Box 4.

Box 4: Environmental Factors

Predicted Logit (Adoption) = +1.152*(Supplier pressure) +3.215*(C competition intensity) +1.001*(Customer pressure) +2.119*(Sector of business operation)

The hypothesis on overall soundness of the model in terms of power of the goodness-of-fit was accepted given Nagelkerke R-Square of 0.750. This indicates low level of variability between predicted and actual values. On the individual predictors, the results indicated that there was a significant and positive relationship between e-commerce adoption and information intensity [β = +1.152, p = -0.000 (<0.05)], competition intensity [β = +3.215, p = 0.017 (<0.05)], and customer pressure [β = +1.001, p = 0.015 (<0.05)]. On the other hand, sector of business operation [β = +2.119, p = 0.068 (<0.05)] was not statistically significant at 5 percent level.

The results on information intensity, competition intensity, and customer pressure were consistent with findings from studies by Pavic, Koh, Simpson and Padmore, (2007), Al-Qirim (2007) and To and Ngai (2007). These findings suggest that there is a higher likelihood of e-commerce adoption by firms operating in a business environment characterised by intense information needs and high customer and supplier/competitive pressure (Joen *et a*l. 2006). On the other hand, even though it has been argued that the industry in which a firm operates influences e-commerce adoption (Al-Qirim, 2005), this study produced a contrary result. The nature of Kenya's MSME environment where firms operate in more than one sub-sector can be used to explain this observation.

4.7.5   Logistical Regression Analysis 5 (LRA 5): E-commerce Adoption and Interaction between Technological, Organisational, Environmental Factors

A logistic regression analysis was used to test the hypothesis that there is a significant relationship between the likelihood of e-commerce adoption and the interaction between the organisational, environmental, and technological factors (Table 4.38).

Table 4.38: E-commerce Adoption and Interaction between Technological,

Organisational, and Environmental Factors

Explanatory Variable	Estimated Coefficient	Standard Error	P value
Position in firm (owner or manager)	+1.122	0.450	0.011
Level of education	+1.451	0.325	0.000
Age	-0.225	0.475	0.066
Gender	+0.268	0.321	0.019
Age of firm	+0.012	0.671	0.049
Business focus	+2.112	0.450	0.550
Business type	+2.001	0.711	0.035
Size of firm	+3.212	.0.333	0.000
ICT Capacity	+1.050	0.151	0.001
Relative Advantage	+2.102	0.101	0.041
Compatibility	.-2.080	0.111	0.020
Complexity	-2.129	0.200	0.012
Trialability	-1.101	0.222	0.030
Observability	-1.610	0.341	0.011
Security/confidentiality	-2.101	0.124	0.043
Supplier pressure	+2.221	0.751	0.022
Sector of business operation	+1.111	0.515	0.000
Competition intensity	+2.000	0.270	0.012
Customer pressure	+1.010	0.212	0.015
Model statistics			
N	351		
Nagelkerke R-Square	0.872		
Model Chi – Square (6df)	131.275		0.010
-2log likelihood	67.125		

Dependent Variable: Adoption of E-commerce (1 = adopted, 0 = non- adopters)
Source: Survey data, 2005

From the resulting Logistic regression and based on the model in Box 5.

Predicted Logit (Adoption) = +1.122* (Position in Firm) +1.451* (Level of education-0.225*(Age) +0.268*(Gender) +0.012* (Age)+2.112*(Business Market Focus)+2.001* (Business type) +3.212*(Size)+1.050*(ICT Capacity) +2.102* (Relative Advantage).-2.080*(Compatibility) -2.129*(Complexity)-1.101*(Trailability)-1.610*(Observability)-2.101*(Security/Confidentiality)+ 2.221*(Supplier pressure)+1.111*(Sector of business operations)+2.000*(Competitive intensity) +1.010*(Customer pressure)

The interactive effect of the e-commerce environment has improvement effect on the explanatory effect of the derived model (Nagelkerke R-Square = 0.872 compared with model derived from the organisational, technological, and environment explanatory factors independent). On the individual predictors, the results from Table 4.39 show the effect on organisational results due to the interaction.

Table 4.39: Effect on organisational results due to interaction

Explanatory Variable	Without Interaction		With Interaction	
	Estimated Coefficient	P-value	Estimated Coefficient	P-value
Position in firm (owner or manager)	+2.296	0.000	+1.122	0.011
Level of education	-1.393	0.000	+1.451	0.000
Age	-0.715	0.003	-0.225	0.066
Gender	+0.142	0.020	+0.268	0.019

Source: Survey data, 2005

The results indicate that when the organisational, technological, and environmental factors are combined, there is improvement in the level of statistical significance of the owner/manager's position on the likelihood of e-commerce adoption. Similarly, the direction of the effect of level of education of the firm owner/manager changes from inverse to direct. Table 4.40 shows the results of the effect of the interaction of firm demographic factors on e-commerce adoption.

Table 4.40: Effect on Firm demographics results due to interaction

Explanatory Variable	Without Interaction		With Interaction	
	Estimated Coefficient	P-value	Estimated Coefficient	P-value
Age of firm	+0.125	0.020	+0.012	0.049
Business focus	-2.610	0.097	+2.112	0.550
Business type	-2.110	0.045	+2.001	0.035
Size of firm	+2.108	0.000	+3.212	0.000
ICT capacity	+1.547	0.000	+0.012	0.001

Source: Survey data, 2005

The results indicate that the interaction of firm demographic variables improves the level of statistical significance of the effect of firm size and business type on e-commerce adoption. On the other hand, the level of significance of the age of the firm, business type, and ICT capacity decreases slightly. Table 4.41 shows results of the effect of the interaction of technological factors on e-commerce adoption.

Table 4.41: Effect on technological factors results due to interaction

Explanatory Variable	Without interaction		With interaction	
	Estimated Coefficient	P-value	Estimated Coefficient	P-value
Relative advantage	+0.036	0.046	+2.102	0.041
Compatibility	+0.286	0.044	.-2.080	0.020
Complexity	-0.322	0.019	-2.129	0.012
Trailability	+0.368	0.011	-1.101	0.030
Observability	+0.285	0.022	-1.610	0.011
Security/confidentiality	-0.141	0.043	-2.101	0.043

Source: Survey data, 2005

Several observations can be discerned from the table. First, the level of significance of the effect of relative advantage, compatibility, complexity and operability is enhanced. Second, there is a slight decrease in the level of significance of trailability but no change in the effect of security/confidentiality. Third, there is change in the direction of the effect of compatibility, trailability and observability on the likelihood of e-commerce adoption. Table 4.42 shows results of analysis of the effect of the interaction of environmental factors on e-commerce adoption.

Table 4.42: Effect on environmental factors results due to interaction

Explanatory Variable	Without interaction		With interaction	
	Estimated coefficient	P-value	Estimated coefficient	P-value
Supplier pressure	+1.152	0.001	+2.221	0.022
Sector of business operation	+2.119	0..068	+1.111	0.000
Competition intensity	+3.215	0.017	+2.000	0.012
Customer pressure	+1.001	0.025	+1.010	0.015

Source: Survey data, 2005

The results indicate that there was an improvement in the level of significance of the effect of sector of business operation, competition intensity, and customer pressure on the likelihood of e-commerce adoption, while that of supplier pressure showed a slight decrease. These results suggest that while determining the effect of technological, environmental, and organisational factors on the likelihood of e-commerce adoption by MSMEs, closer attention should be paid to the effect of their interaction. Earlier studies by, for example, Chang *et al*. (2009) have questioned whether organisational readiness was a sufficient condition for e-commerce adoption or would it be more prudent to take a comprehensive view of the entire e-commerce environment. Similarly, Grandon and Pearson (2004) established that small businesses are affected by a number of factors including those external to the firm such as customer pressure and industry-wide variables. The results of the current study, therefore, reinforce a systems view of e-commerce adoption factors.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1   Introduction

This chapter presents a summary of the study, conclusions, and recommendations. Section 5.2 summarises the study findings, section 5.3 draws conclusions from the findings, and section 5.4 presents the recommendations.

5.2   Summary

Several empirical studies have investigated the effect of organisational, environmental, and technological factors on e-commerce adoption using the DOI or TOE frameworks. Many of these studies, however, are concentrated in developing countries or they have invariably produced conflicting results as discussed in chapter one. Although, these studies attest to the fact that key organisational, environmental ,and technological factors influence e-commerce adoption by different magnitudes, few have attempted to demonstrate the effects of these factors against the background of existing MSME environment. This study, therefore, was conducted to investigate the impact of key determinants of the e-commerce adoption in order to explain the reasons for the slow uptake of the innovation in the MSME sector in Kenya.

The specific objectives of the study were i) analyse the e-commerce environment of Kenya's MSMEs sector; ii) analyse the effect of the determinants of e-commerce adoption against organisational, environmental, and technological factors among Kenya's MSMEs; and iii) investigate the effect of the interaction of the various determinants on the likelihood of e-commerce adoption. Primary data were collected from a sample of MSMEs operating in Nairobi, Kenya.

In order to address the first objective of analysing the e-commerce environment within Kenya's MSMEs sector, the study derived frequency distribution tables to capture the organisational, environmental, and technological factors characterising the e-commerce environment in the context of firm size. On organisational factors, the results revealed that the MSME sector was characterised by young owners/managers (with majority being less than 45 years) mostly male, with at least high school/technical education. The sector was also characterised by firms with significant levels of ICT capacity, which increased with firm size.

The major environmental factors of the MSME sector in the context of e-commerce adoption were that a greater proportion of the small and medium enterprises experienced the effect of customer pressure, competitive intensity, and supplier pressure. The analysis of technological and organisational factors indicated that e-commerce was associated with better relative advantage, innovation complexity, trailability, compatibility, observability, and security/confidentiality. The level of significance of the factors for innovation adoption increased with increasing firm size.

The second objective of the study was to analyse the effect of the determinants of the slow adoption of e-commerce against organisational, environmental and technological factors in Kenya's MSMEs sector. Regarding organisational factors, the study found the existence of a significant relationship between e-commerce adoption and owner/ manager's age, level of education, gender, age of firm, firm size, and ICT capacity. On environmental factors, the study found that e-commerce adoption was significantly affected by supplier pressure, sector of business operation, market focus, competition intensity, and customer pressure. The study further showed, with regard to technological factors, that there was a significant relationship (directly and inversely) between e-commerce adoption and perceived compatibility, perceived complexity, perceived observability, perceived trailability, and perceived security/confidentiality.

The third objective of the study was to investigate the effect of organisational, environmental, and technological factors on e-commerce in terms of direction or nature of impact and statistical significance. Logistical regression analysis was used to derive five equations. The first equation addressed the adoption variable with firm owner/manager profile variables of position in firm, level of education, age, and gender. The coefficients of position in firm and gender were positive and significant while those for level of education and age were negative and significant. The second equation took firm profiles as independent variables and regressed the variables on e-commerce adoption variable. The coefficients of age of firm, size of firm, and ICT capacity were positive and significant while business type had a negative coefficient that was also not

significant. The coefficient for business focus (internal or global) was, however, negative and not significant.

The third equation resulted from a logistical regression of technological factors (relative advantage, compatibility, complexity, security/confidentiality, trailability, and observability) on the adoption variable. The coefficients of relative advantage, compatibility, trailability and observability were positive and significant. The coefficients of complexity and security/confidentiality were negative and not significant. In the fourth equation, environmental factors were regressed on the e-commerce adoption variable. The coefficients of supplier pressure, sector of business operation, competition intensity, and customer pressure were positive and significant. The coefficient for sector of business operation, although positive, was not statistically significant.

The fifth equation was a regression of the interaction between organisational, technological, and environmental factors as the independent variables on the e-commerce adoption variable. The objective of the analysis was to determine the effect of the interaction of the various factors on the significance of the coefficients and direction of the influence of independent variables. The results showed that interacting the owner/manager profile with technological and environmental factors resulted in no change to the direction of the influence of position in the firm, age, and gender variables on e-commerce adoption. However, the influence of level of education changed from inverse to direct. The study showed an improvement in the statistical significance of the

coefficients of the gender variable, no change for the position in firm and level of education variables, and a reduction in the significance of the age variable.

Additionally, the results showed that among the variables under firm profile, there was a change in the direction of the influence of business focus and business type variables. There was, however, an improvement in the statistical significance of the ICT capacity variable, a reduction in age and business type variables, and no change in the business focus variable.

Regarding the effect of interaction of the technological factors, the results showed that there was no change in the direction of the influence of perceived relative advantage, complexity, and security/confidentiality, but the direction of influence of trailability, observability, and compatibility changed from direct to inverse. Finally, the findings revealed that, due to interaction of the variables, there was no change in the direction of the effect of supplier pressure, sector of business operation, competition intensity, and customer pressure. The study, however, showed an improvement in the statistical significance of the sector of business operation, competition intensity, and customer pressure.

5.3   Conclusion

The study made several conclusions on objective one. First, the e-commerce environment in Kenya's MSME sector had more knowledge-based than non-knowledge-based firms

102

and that a greater proportion of these firms belonged to the small enterprises subsector. Second, majority of the owners/managers were young and had relatively higher educational levels. Third, the external environmental factors obtaining in the e-commerce environment, namely, customer pressure, supplier pressure, ICT capacity, and a competitive environment were considered as significant factors influencing decision-making especially so among the small and medium enterprises. Finally, the technological factors of perception of relative advantage, compatibility, complexity, trailability, observability, and security/confidentiality were considered as critical decision factors involving e-commerce adoption in Kenya's MSME sector.

On the second objective, the study concluded that the likelihood of e-commerce adoption was significantly affected by owner/manager's age, level of education, gender, age of firm, size of firm, and the firm's ICT capacity. Similarly, supplier pressure, sector of business operation, market focus, competition intensity, and customer pressure had a significant effect on e-commerce adoption decisions. The study further concluded that there was a significant relationship between e-commerce adoption and the technological factors of perceived compatibility, complexity, observability, trailability, and security/confidentiality.

Following results from the regression analysis, the study concluded that organisational factors (position in firm, age, level of education, firm size, age of firm and ICT capacity); environmental factors (supplier pressure, competitive intensity, sector or business operation, and customer pressure); and technological factors (perceived innovation characteristics) affect e-commerce adoption in different ways. For example, while level

of education, age of owner/manager, business focus, perceived complexity and perceived security/confidentiality were inversely related to the likelihood of e-commerce adoption, a direct relationship existed between the likelihood of e-commerce adoption and gender, firm size, age of firm, perceived relative advantage, perceived compatibility, perceived trailability, and perceived observability. Similarly, a direct relationship was observed between the likelihood of e-commerce adoption and supplier pressure, sector of business operation, competition intensity, and customer pressure.

The study further concluded that interaction of the organisational factors with technological and environmental factors enhanced the magnitude of significance of the owner/manager's position without altering the direction of the effect. However, the direction of the effect of level of education changed from inverse to direct. The study concluded that interaction with technological factors enhanced the magnitude of significance of the effect of firm size and business type on likelihood of e-commerce adoption but there was a decrease in the significance of the effect of age of firm, business type, and ICT capacity on e-commerce adoption.

According, the study the magnitude of the significance of the effect of relative advantage, compatibility, complexity, and operability increased while that of trailability diminished slightly. Further, there was a change in the direction of the effect of compatibility, trailability, and observability on the likelihood of e-commerce adoption while that of relative advantage, complexity, and security/confidentiality remained unchanged.

5.4   Study Recommendations

5.4.1   Recommendations for Practice

From the practitioner's perspective, the study has highlighted the critical factors that influence e-commerce adoption. Because owner/manager's age, level of education, and gender are key factors for e-commerce adoption, the management and/or owners of MSMEs should take cognisance of such factors when designing organisational policies.

Regarding the perception of technology by the owners/managers, intervention programmes targeting attitude change should be instituted to enable firms to eliminate barriers to e-commerce adoption while at the same time enhancing the impact of the drivers of innovation uptake. The study indicates that for sustainable e-commerce adoption, emphasis must be placed on enabling firms to grow, creating relevant capacity building programmes for owners/managers and employees, and improving the ICT infrastructure while at the same time taking cognisance of the effect of environmental factors.

5.4.2   Areas for Further Research

This study sought to assess e-commerce adoption among Kenya's MSMEs in Nairobi. The study was limited to the use of the adoption model using longitudinal data. Due to this, limitation, it is recommended that future research be undertaken using extended diffusion models in the context of Kenya's MSMEs to enable the actual performance of the firms to be determined as a function of the extent of e-commerce adoption.

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114

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APPENDIX 1: DATA COLLECTION INSTRUMENT

<u>Questionnaire on Adoption of e-Commerce</u>

Instructions for filling the questionnaire: Please, where choice are provided, tick your preferred selection in the box provided under the heading "response". Where your opinion is required, candidly state your views as precisely and honestly as you can. Any opinion expressed shall be used ONLY for purposes of this research and any errors or misunderstanding therefore shall be the responsibility of the researcher and not your own or those of your firm.

1.   Position in the firm

Position in Firm	Response
Employee manager	
Primary owner	
Other (Specify)	

2.   Gender

Gender	Response
Male	
Female	

3.   Level of Education

Qualification	Response
Primary	
High school	
Trade qualification	
Undergraduate	
Postgraduate	
PhD	
None	

4.   Age

Age of Owner (years)	Response
Under 21	
21 – 30	
31 – 40	
41 – 50	
51 – 60	
Over 60 years	

5.   Which sector does your firm undertake business?

Sector	Response
Manufacturing	
Service	
Wholesale	
Retail/hospitality	
IT/Communication	
Construction/property	
Professional services	
Others (specify)	

6.   Please indicate the number of employees in your firm.

Size (Number of employees	Response
9 and below	
10 – 49	
50 and above	

7.   Indicate the value of your firm's current annual turnover.

Turnover (Ksh. 000)	Response
Less than Ksh. 10,000	
Ksh. 10,000 – 20,000	
20,001 – 30,000	
30,001 – 40,000	
40,001 – 50,000	
More than Ksh. 50,000	

8.   What is your business market focus?

Focus	Response
Local	
Regional	
National	
International	

9.   Indicate the level of ICT capacity in your firm.

Level of computerisation	Response
High	
Medium	
Low	
None	

10. What is the level of Information Technology (IT) skills in the firm?

Skill level	Response
None	
Low	
High	
Expert	

11. Which of the following business activities are you undertaking through Information Communication Technology (ICT)?

Business Activity	Tick
Provision of information on firm	
Provision of information on goods and service	
Taking orders	
Receiving orders	
Digital delivery of goods and services	
Communication with clients via e-mail	
After sale service	
Identification of new suppliers	
Ordering and paying for purchases	
Non-inventory purchases e.g. travel	
Internal communication	
Document exchange with customers / suppliers	
External information search e.g. suppliers	
Advertising	
Communication with shareholders	
Trading with other business	
Business transactions with other customers	
Payment processing	
Others (Specify)	

12 Which of the following e-commerce technologies are using currently or are in the process of using?

E-commerce techniques in use	Response	
	Yes	No
Simple e-mail		
Complex e-mail e.g. attachments		
Newsgroups, bulletin boards, and chat rooms		
Information database (stand-alone or simple regular updates)		
Software applications (stand-alone or simple regular updates)		
Website (brochure ware, simple)		
Web-based applications (product ordering, hip tracking)		
Voice over Internet Protocal (VOIP)		
Others (specify)		

13 Which of the following was/is a key factor, which influenced your decision to adopt e-commerce? (You may tick more than one)

	Response	
Environmental Factors	**Yes**	**No**
Customer pressure		
Pressure from competition		
Pressure from suppliers		
Sector of business operation		
Business focus		

14 Indicate how significantly the following factors would influence or influenced you decision to adopt e-commerce (4 = very significantly, 3 = significantly, = less significantly, 1=Not all)

	Response			
Benefits from e-commerce adoption	**1**	**2**	**3**	**4**
Customer pressure				
Pressure from competition				
Pressure from suppliers				
Sector of business operation				
Business focus				

15. Indicate which of the following e-commerce characteristics would be most critical to your e-commerce adoption decision (you may tick more than one);

	Response	
E-commerce Characteristics	**Yes**	**No**
Brings with it advantages over its non-use		
Ease of use		
Allows for **trailing** of business transactions/processes		
Is compatible with existing business processes		
Can be trusted in terms of security		
Observable results in the business operations		

16 Indicate how significantly the following factors would influence or influenced your decision to adopt e-commerce (4 = very significantly, 3 = significantly, = less significantly, 1=Not all)

	Rating			
E-commerce Characteristics	**1**	**2**	**3**	**4**
Brings with it advantages over its non-use				
Ease of use				
Allows for **trailing** of business transactions/processes				

Innovation Characteristics (cont.)				
Is compatible with existing business processes				
Can be trusted in terms of security				
Observable results in the business operations				

17   Indicate the extent to which you agree with the following statements using 1=strongly disagree.....5= strongly agree.

Innovation Characteristics	Response (Tick)				
	1	2	3	4	5
Adoption decision is affected by the fact that it brings with it advantages over its non-use					
Adoption decision is affected by the fact that it is easy to use					
Adoption decision is affected by the fact that it allows for trailing of business transactions/processes					
Adoption decision is affected by the fact that it is compatible with existing business processes					
Adoption decision is affected by the fact that it can be trusted in terms of security					
Adoption decision is affected by the fact that it has observable results in the business operations					

18   Indicate the extent to which you agree with the following statements using 1=Strongly disagree.....5= Strongly agree

Environmental Factors	Response (Tick)				
	1	2	3	4	5
Customer pressure is a critical adoption factor					
Pressure from competition is a critical adoption factor					
Pressure from suppliers is a critical adoption factor					
Sector of business operation is a critical adoption factor					
Business focus is a critical adoption factor					

19   Complete the following table by rating your perception of the disadvantages of using e-commerce in your firm with 1 being the least rating and 7 the highest rating (Tick).

Disadvantages of e-commerce adoption	Rank						
	1	2	3	4	5	6	7
Deterioration of relations with customers							
High costs							

Computer maintenance							
Doubling of work							
Reduced flexibility of work							
Security							
Dependence on e-commerce							

20. Complete the following table by rating the extent to which the following constraints affects e-commerce use in your firm (Use 5 = Highly Significant, 4 = Significant, 3 = Least significant, 2 = Not significant 1 = Not applicable).

Constraints to E-commerce Adoption	Rating				
	1	2	3	4	5
Does not fit with existing products and services					
Does not fit with the way we do business					
Does not fit with the way our customers work					
Do not see the advantage of using e-commerce					
Security risks					
Cost too high					
Not sure what to choose					