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ESTABLISHING A SUSTAINABLE COMPETITIVE ADVANTAGE THROUGH E-BUSINESS: A CASE OF THE MANUFACTURING SECTOR IN ZIMBABWE

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ABSTRACT

Manufacturing firms, the world over, are confronted with the need to improve the quality of their products while at the same time containing costs (Barden, Whitaker and Mithas, 2013). This has driven most firms in the developed countries to adopt e-business in order to remain competitive (Rangathan, Dhaliwal and Teo (2004). However, there is little empirical evidence in developing countries linking e-business adoption and firm efficiency. The study investigates the factors affecting the adoption of e-business by the manufacturing firms in Zimbabwe. It further seeks to establish the consequences of e-business adoption on firm's business efficiency and sustainable competitive advantage. A pragmatic philosophical approach involving the use of the exploratory, descriptive and explanatory research designs is adopted to fully answer the research objectives. Quantitative data were obtained from 118 respondents using a survey. These were drawn from 170 manufacturing firms on the 2012 Confederation of Zimbabwe Industries (CZI) membership list using systematic random sampling method. The results from the quantitative phase were complimented by the qualitative data obtained using in-depth interviews. The results substantiate the significance of institutional factors, innovation orientation, financial resources, size of the firm, perceived usefulness and managerial attitudes as drivers of e-business adoption. In addition, number of e-business applications adopted by the firm and their usage rate are found to have positive impact on business efficiency and sustainable competitive advantage of the firm. Finally, the results show a positive relationship between the firm's business efficiency and its organisational and strategic sustainable competitive advantage. The study furthers current debate on e-business adoption by identifying the drivers of e-business adoption in the manufacturing sector in a developing country. Furthermore, the study makes a contribution to new knowledge by identifying the mediating variables in e-business adoption that generate e-business efficiency. It further develops a new e-business adoption model linking the antecedents of e-business adoption with business efficiency and sustainable competitive advantage.

Key words: e-business, e-business adoption, e-business applications, e-business efficiency, sustainable competitive advantage, manufacturing sector.

DEDICATION

This thesis is dedicated with love to my wife Ronicah and my three children, Anotidah, Munashe and Kuku. They are jewels in my life.

ACKNOWLEDGEMENTS

LIST OF ABBREVIATIONS

ADSL- Asymmetrical Digital Subscriber Line

ATU- African Telecommunication Union

B2B- Business to Business

B2C- Business to Customer

B2G- Business to Government

CAM- Computer-Aided Manufacturing

CIS- Community of Independent States

CRM- Customer Relationship Management

CVC- Composite Value Chain

CZI- Confederation of Zimbabwe Industries

DoI- Diffusion of Innovation

DSL- Digital Subscriber Line

EB- Electronic Business

e-business -Electronic Business

e-commerce- Electronic Commerce

e-CRM- Electronic Customer Relationship Management

EDI- Electronic Digital Interchange

Email- Electronic Mail

e-marketing- Electronic Marketing

e-operations- Electronic Operations

e-procurement- Electronic Procurement

ERP- Enterprise Resource Planning

ETAM- Extended Technology Acceptance Model

GNI- Gross National Income

HUG- Harvard University Guide

ICT- Information Communication Technology

IS- Information System

ISPs- Internet Service Providers

IT- Information Technology

ITU- International Telecommunication Union

MRP- Manufacturing Resource Planning

NEF- National Economic Forum

OECD- Organisation for Economic Cooperation and Development.

PEoU- Perceived Ease of Use

POTRAZ- Post and Telecommunication Regulatory Authority of Zimbabwe

PU- Perceived Usefulness

RBV- Resource- Based View

RBZ- Reserve Bank of Zimbabwe

SCA- Sustainable Competitive Advantage

SCM- Supply Chain Management

SHDSL-Single High Speed Digital Subscriber Line

TAM- Technology Acceptance Model

TOE- Technology-Organisation-Environment

UNDP- United Nations Development Programme

US- United States of America

VCM- Value Chain Model

VoIP- Voice Internet Protocol

WWW- World- Wide Web

ZAMPS- Zimbabwe All Media Products Survey

ZimStat- Zimbabwe Statistics

ZNCC- Zimbabwe National Chamber of Commerce

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CHAPTER ONE

BACKGROUND AND RESEARCH PROBLEM

1. INTRODUCTION

Manufacturing firms are globally facing challenges of increasing competition coupled with the simultaneous pressure on both the cost and quality of their products (Bardhen, Whitaker and Mithas, 2013). These firms are resorting to electronic business (e-business) as research suggests that e-business is an enabler of organisational competences (Ranganathan, Dhaliwal and Teo, 2004). As such, e-business is one of the most discussed topics in business today (Daniels, Wilson and Myers, 2002; Dube, Chitura and Runyowa, 2009; Tsokota and Solmes, 2013). It is argued that e-business has reshaped customer-supplier relationships and streamlined business processes and, in some cases, restructured the whole industry (Hsiu-Fen and Gwo-Gwaung, 2005). Consequently, the role of e-business is viewed as critical within the economic challenges faced by business, whether small or large (Li and Xie, 2012) although a few studies show that some firms have struggled to get value out of e-business (Caniato, 2009).

With e-business being the much talked about strategy at the end of the twentieth century, it was expected that its contribution to the global economy would reach US$400 billion by 2002 while the number of Internet users would be 400 million by the same period (Panther, 2006). These expectations were far surpassed and, by 2011, 33% of the world's population had access to the Internet (World Bank, 2012) and 14% of the total turnover of firms was

derived from e-business (Eurostat, 2011). In fact, the new projection for the European Union (EU) is that e-business will generate €578 billion and create 1.5 million jobs by 2018 (Eurostat, 2013).

1.1 Origins and evolution of e-business

Lauden and Trevor (2008) suggest that e-business started in the late 1970s with the use of electronic data interchange (EDI) and electronic fund transfer (EFT) which are the standard format for exchanging business data. As e-business continued to expand, its explosion was recorded in 1995 when the rapid diffusion of the Internet and World Wide Web (www) made the conducting of the business on the Internet cheaper and faster (Zhu, Kraemer, Dong, and Xu, 2006). Since 1995, the Internet has been extensively used as a key e-business strategy with firms, both large and small, displaying their marketing prows on the Internet and webpage.

The development of the Internet as an innovation has passed through various phases. First was the innovation phase. This was concerned with network technology (Laudon and Trevor, 2008).Then came the commercialisation phase with its focus being on application of the Internet to various sectors of the economy, including manufacturing. During this period, it is estimated that hundreds of billions of dollars were spent on e-business (Panther, 2006; Wang and Sarkis, 2010). During this phase, the number of Internet users reached 400 million (Panther, 2006). Statements like 'Get web or be dead!' were common, (Simmons, Armstrong, and Dunkin, 2008:380). Today, as Panther (2006:4) puts it, "Many firms are now in a position to focus on how they can effectively use the Internet on the web by integrating it with sound management practices to achieve business success." The current phase of the Internet no longer focuses on networking or commercialisation only, but puts more emphasis on creating an interface between ICTs and the skilled users. This interface will be the source

of sustainable competitive advantage for e-business-driven firms (Barney, Ketchen and Wright, 2011).

1.1.2   E-business success and measurement

The e-business literature indicates that the term, e-business, is difficult to define (Bengstein, 2007). This is because it involves all the traditional business processes using the electronic tools. Zhu *et al,* (2006) refer to e-business as the process of conducting business transactions along the value chain, including purchasing from upstream suppliers to selling products and services to downstream customers by using the Internet platform in conjunction with the existing information technology (IT) infrastructure. Oliviera and Martins (2010) simply define it as the use of Internet-related technologies to conduct business. For the purpose of this research, the definition by Rao and Decou (2003:239) is used. They define e-business as, "the undertaking of normal commercial, government or personal activities by means of computers and telecommunications networks and includes a wide variety of activities involving the exchange of information, data, or value-based exchanges between two or more parties." This broad-based definition brings the idea of doing business electronically using various tools such as the fax, telephone, cell phones, intranets, extranets and the Internet (Caniato, Cagliano, Kalchschmidt, Golini. Spina, 2009).This means that e-business processes stretch from e-procurement, e-operations, e-marketing to electronic customer-relationship management (e-CRM).

The success of e-business will depend on the definition and understanding of the e-business constructs (Chan and Chong, 2012) and how to measure them. As Choong (2013) observes, in the past many organisations made vast investments in developing websites without having clear knowledge of how to measure effects on e-business success. Given the scale of investment in e-business processes, it might have been expected that there would be concerns about whether such investment is yielding results in terms of generating a

competitive advantage for the companies. Measurements of e-business success have focused on e-business efficiency variables such as costs of production and transaction, coordination with supply chain partners, marketing and customer acquisition (Wu, Mahajan Balasubramanian, 2003), sales performance measures (market share, sales volume, number of new customers, customer retention), customer satisfaction and relationship development (Hinton and Barnes, 2009). As such, organisations that fail to have clearly defined e-business success measures find it difficult not only to invest in e-business but to manage the e-business processes (Oliviera and Martins, 2010).

The thesis underlying the e-business model is that, as a result of a number of push factors, the firm adopts e-business and then its performance improves. Ever since the e-bubble period towards the end of the twentieth century, a lot of studies have been conducted to ascertain the drivers of e-business adoption. These drivers have included perceived usefulness of e-business (Zhu and Kramer, 2005; Shih, Hung and Lin ,2009; Park and Kim, 2012), relative advantage (Steele and Murray, 2004), competitive pressure (Oliviera and Martins, 2010; Lin and Yi-Ching,2007), network pressure (Simmons, Armstrong, and Dunkin, 2008; Smith and Spiers, 2009), institutional pressure (both mimetic and normative, including the need to increase efficiencies and value) (Keramidou, Mimis and Fotinopoulos, 2013; Bakko and Sohal, 2010), organisational factors such as financial resources and size (Bayo-Moriones, Billon and Lera-Lopez, 2013; Oliviera and Martins, 2010; Askarany and Mal, 2008) and managerial attitudes (Huy, Rowe, Truex and Huynh, 2012; Li and Xie, 2012; Rosnafisah, Salbiah and Sharifuddin, 2010).

While much work has been done to understand the drivers of e-business and its adoption, the same cannot be said about its performance measurement. First, there is no agreement among the researchers on the unit of measurement to establish the success of e-business (Barnes and

Hilton, 2007; European Commission, 2013). Some have focused on the financial measures only (Biloslavo, Bagroli and Figelj, 2012) while others have included both financial and non-financial measures (Alvares, 2013, European Commission, 2013; Kumar and Peterson, 2005). Second, many companies do not have the expertise to measure e-business performance (Alvares, 2013; Ramdani, Chovers, and Williams, 2013). Consequently, there is patchy information on the economic benefits of e-business to the company (European Commission, 2013).

1.1.3 The extent of ICTs development in Africa

The success of the adoption of e-business hinges largely on the development of the ICT's infrastructure and capacity. The African Telecommunication Union (ATU) has observed that for increased Information Communication Technology (ICT) development to take place, which is necessary for e-business adoption and application, four priority areas are supporting infrastructure, networking mechanisms, human resource factors, and systems and structures (ATU, 2013). In all these areas, Africa has lagged behind the other continents. For example, as shown in Figure 1.1, the penetration of fixed landlines in Africa is almost twenty times less than that of Europe. According to Mhanga (2006), it is also less than that of Japan alone.

Figure 1.1 Fixed landline penetration
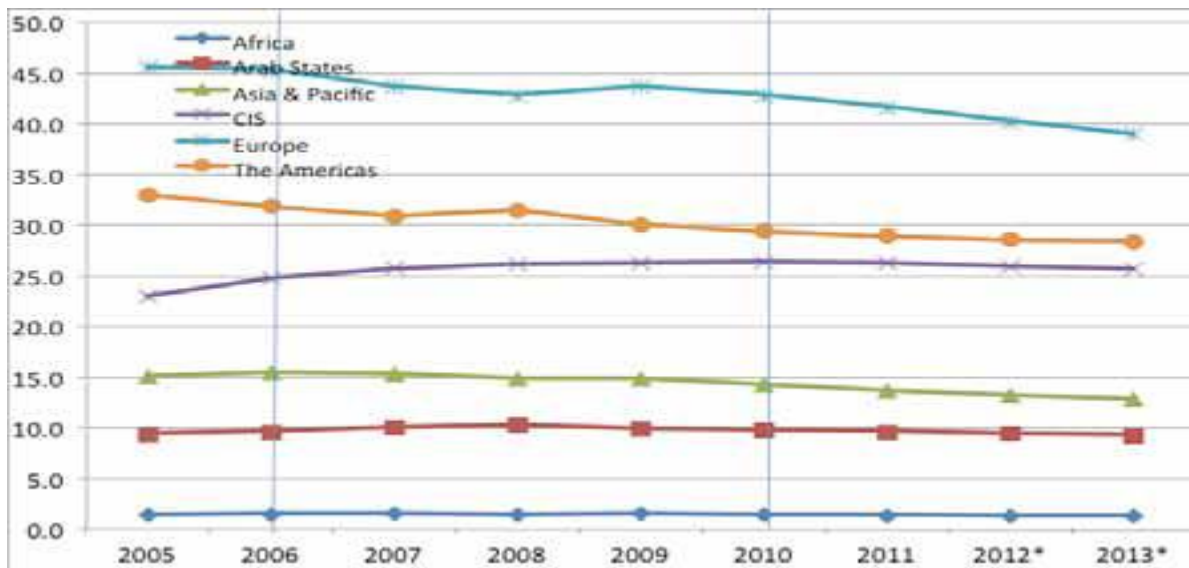
Source: ATU (2013)

Although the mobile cellular penetration for Africa trebled in the past five years, the gap has increased by more than 100% compared with Eastern Europe, which is the fastest growing region as far as mobile penetration is concerned. The gap with Western Europe has slightly decreased due to market saturation there. It is clear that Africa falls behind the other regions, thus giving her the space and mechanism to learn from them on how to increase connectivity (ATU, 2013).

The cost of the internet has remained a challenge, thereby affecting connectivity by households and individuals. With the cost of communication terminal and minimum data bundle close to 50% of the gross national income (GNI), many households will remain unconnected for the next several years (ITU, 2013). As shown in Figure 1.3, the household Internet penetration rate in Africa is still at single digit whereas it has reached more than 80% in Europe.

Figure 1.2 Mobile Cellular Penetration
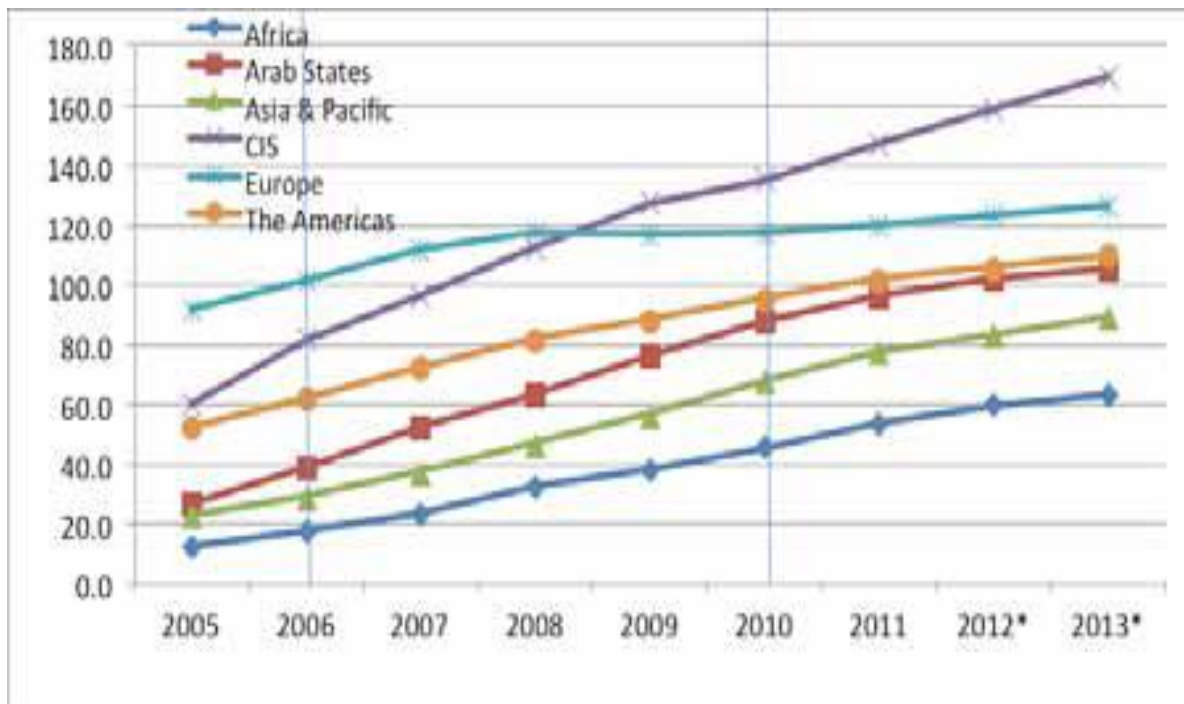
Source (ATU, 2013)

Sound broadband strategies are necessary if Africa is to connect to the rest of the world. The ATU has implemented strategic plans and will continue to craft new ones to increase connectivity of member states (ATU, 2013). According to the ATU (2013), there are 15 undersea cables which provide close to 24Tbps capacity. These are distributed as follows: West coast – 5 cables; East coast – 5 cables and Mediterranean – 5 cables. Figure 1.4 illustrates the positioning of these cables.

Figure 1.4 shows that West African, Southern African and East African countries are well-served by the undersea cables. Those that are landlocked are connected via the terrestrial cables connected to the sea.

Figure 1.3: Household Internet Penetration
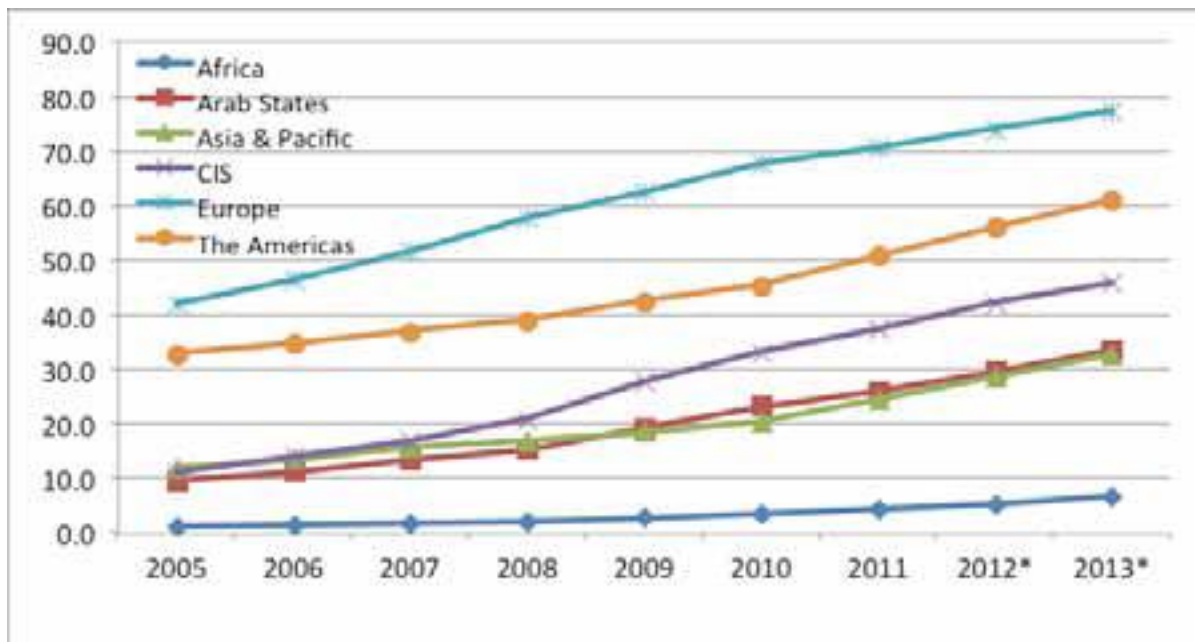
Source: ATU, 2013

Figure 1.4 Undersea and terrestrial cable network for Africa
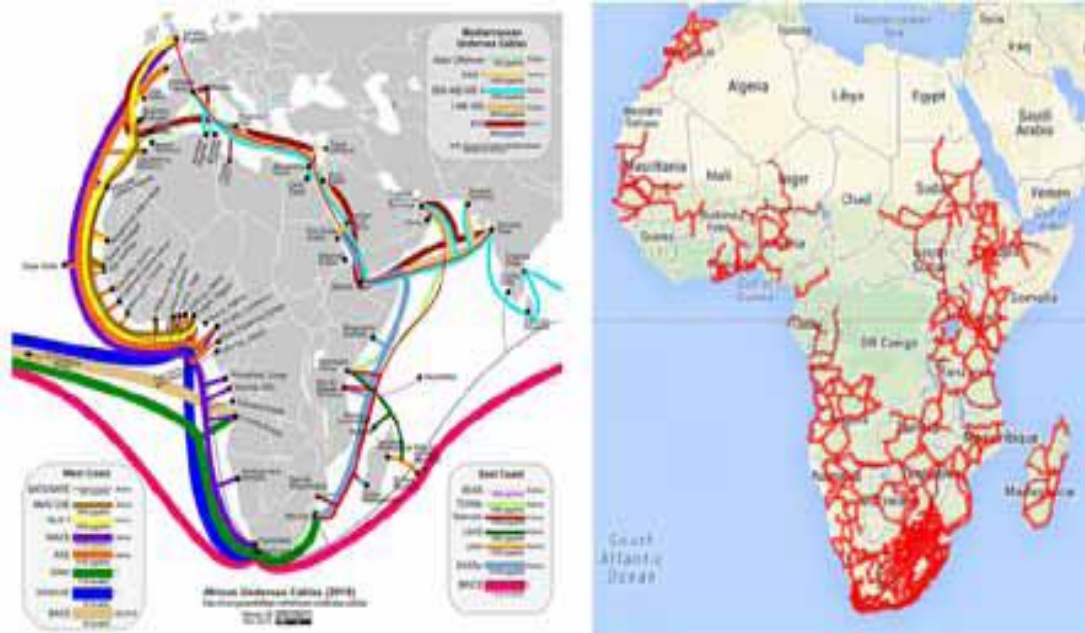
Source: ATU (2013)

1.1.4 E-business environment in Zimbabwe

Zimbabwe, officially the Republic of Zimbabwe, is a landlocked country in Southern Africa. The country is bordered by Zambia on the northwest, Mozambique on the east, South Africa on the south and Botswana and Namibia on the southwest. The total area of the country is 390 759 sq km. The capital city of Zimbabwe is Harare.

Zimbabwe has a total population of 13.6 million people of whom more than 40% are Internet users (International Telecommunication Union, ITU, 2013). There are currently 5.2 million Internet subscriptions in Zimbabwe, constituting 40% penetration (TechZim, 2014). The figure can be higher because in some institutions such as schools and families, a single subscription is used by more than one person. The bulk of the subscribers are mobile internet users. This service is primarily provided by five companies: Econet, Telecel, NetOne, Powertel and Africom which use a wide range of technology. The total number of subscribers per technology is shown in Table 1.1.

Table1.1 Technology and Internet penetration in Zimbabwe

Technology	Number of subscribers
Leased line	1.359
Dial up	8.902
XDSL	20.236
Wifi	9.632
CDMA	78.091
GPRS/2G,3G/HSDP	5,083,13
VSAT	334
Fibre	1.301

Source: TechZim, 2014

The Postal and Telecommunications Regulatory Authority of Zimbabwe (POTRAZ) cites reduced mobile broadband tariffs, increased access to mobile phones and availability of

social platform such as Facebook, WhatsApp or Twitter which bring in families and friends together as reasons for the high Internet penetration.

The computer industry in Zimbabwe has been characterised by huge growth in the past 20 years. There were only 10 computer companies in 1990, and today the country has more than 300 fully-fledged ICT companies and the number of Internet users increased from 50 000 in 2000 to 1,500,000 in 2011 and then 5.2 million in 2014 (ITU, 2014).

The number of Internet Service Providers (ISPs) increased from less than 6 in 2003 to 28 in 2011, with TelOne being the provider of Internet Service (IS) to others. Other large ISPs include Africa Online, Ecoweb, TelcoNet, Zimbabwe-Online, Tele Access, Zimweb, Com One, PowerTel, AgriTell and Net One (ITU, 2012).

The entry of mobile broadband technology in Zimbabwe in 2010 catalysed the Internet usage as many people access the Internet using their mobile phones. By 2011, 24 % of adults in Zimbabwe were now using the Internet and the sources of access were workplaces (80%), homes (18%) and mobile broadband (2%), according to Mhanga and Mpofu (2014). In 2014, as shown in Table 1.1, more than 80% of the subscribers had access to the Internet from the mobile broadband.

As for the fixed landline, TelOne is the country's sole bandwidth operator. The company offers asymmetrical digital subscriber line (ADSL) and single pair high speed digital subscriber line (SHDSL) which are variants of the digital subscriber line (DSL). These two differ in the amount of bandwidth allocated to upstream or downstream traffic. The asymmetrical digital subscriber line (ADSL) has much smaller upstream pipeline (from user to TelOne) while the single high speed digital subscriber line (SHDSL) maintains the same rate of data transfer, whether upstream or downstream (from Tel One to user). This makes it

very appropriate for business applications such as video conferencing, Voice Internet Protocol (VoIP) or enterprise resource planning (ERP).

The digital subscriber line (DSL) service uses the leased line tariffs and these are a bit on the high side. The tariffs may be a bit high for some manufacturing firms with a low financial capacity since, for 2 Mbps, the cost per month can be as high as USD 6.052.73. Usually, the leased line service is dedicated for use by Internet Access Providers (IAPs), mobile operators, the business, and government departments, especially the Police, Zimbabwe Electoral Commission and the Registrar General (TechZim, 2014).

1.1.5 E-business activity in Zimbabwe

While the whole world was gripped by the dot.com euphoria in the late 1990s (Panther, 2006), there were no known such dot.com developments in Zimbabwe. This implies that the business was slow to adopt e-business. The scepticism surrounding the adoption of e-business has continued to harmstring the country such that, even today, with such a high Internet penetration, many sectors of the economy and the manufacturing sector being at the top, are still reluctant to use the Internet beyond the e-mails and basic websites (Mupemhi and Mafuka, 2006).

The current e-business applications in Zimbabwe include internal communications, information dissemination via the websites, and limited customer relationship management (CRM), supply chain management using the electronic data interchange (EDI), Just-In-Time (JIT), Quick Response System (QRS) and computer-aided-manufacturing (CAM).

The e-business literature is abuzz with the e-business activities which are being applied elsewhere and are yet to be fully adopted in Zimbabwe. These include receiving payment (Huy, Rowe, Truex and Huynh, 2012)); taking and receiving orders online (Moodley, 2005); delivery (Poon and Swatman, 1999); networking and strategic alliances (Caniato, 2009); and

integration of manufacturing processes such as computer-numerical control (CNC), manufacturing resource planning (MRP), enterprise resource planning (ERP) and product data management system (Chaong, 2003).

1.1.6 Role of the Zimbabwean Government

The Government of Zimbabwe has been proactive in promoting the use of ICTs in the business arena. First, the Government in collaboration with the National Economic Forum (NEF) commissioned a United Nations Development Programme (UNDP) funded E-Readiness survey in 2005. The survey was necessitated by the absence of a coherent national policy on the coordination, harmonisation and full utilisation of the existing ICT infrastructure and capacity. The purpose of the survey was to assess the country's readiness to become a knowledge economy. Specifically, the variables of the survey were availability of ICT access (tele-density, infrastructure availability and capacity), ICT affordability, usage policy environment, barriers to increasing access, uptake of ICTs in all the sectors of the economy such as agriculture, commerce, education and training, manufacturing, governance, tourism, mining and small-to-medium enterprises (SMEs) (E-Readiness Report, 2005).

The survey which was undertaken on the basis of the Harvard University Guide (HUG) utilised five categories to assess overall e-readiness. These are network access, network learning, network society, networked economy and networked policy. This is called the pentagon approach (Mhlanga, 2006).

The survey revealed, among other findings, that the introduction of ICTs in agriculture, mining and manufacturing was likely to contribute towards poverty alleviation since mining contributed 5% of the gross domestic product (GDP) while manufacturing contributed 18%. The results also revealed that there was a high cost of acquiring ICT infrastructural and systems products. Then the lack of a clear legal framework to support electronic transactions

was identified as another drawback in utilising ICT products. The bandwidth capacity was observed to be low and the cost of improving it was prohibitive, thus limiting ICTs usage.

In response to the E-Readiness Survey Report, the Government then crafted a National ICT Policy in 2005. The policy statement, among other things, seeks to "make appropriate policy interventions to ensure ICT was equitably available to all sectors of society; develop a supportive and enabling infrastructure to ensure that access to ICT is realised by all citizens, especially those in the rural areas and marginalised communities; promote local production of ICT products; ensure relevance of contents and use of appropriate technologies; encourage full utilisation of existing communication infrastructure in order to minimise capacity underutilisation; establish institutional mechanism to coordinate inter-organisational planning, policy-making and implementation of strategies for introducing and developing ICTs; formulate and implement measures for the development, retention and employment of skilled human resources in order to curb brain drain in the ICT sector; rationalise and review the tariff structure with the intention of making the tariffs more affordable to subscribers so as to generate increased use of ICTs; and increase the available bandwidth of both national and international communication systems in order to enhance speed of operations" (ICT Policy Document, 2005:10).

 As a result of this ICT Policy, tariffs on ICT products were reduced from 15% to 5 % in 2005 in order to increase ownership of computers through low prices. On the day of commemorating the World Telecommunications and Information and Information Society Day, the then Information Communication Technology Minister, Nelson Chamisa in response to the increase in mobile phone usage said, "The ICT products are getting into the country duty-free, after a change in supervision policy," (*Daily News*, 17 May 2011).

The second step that the government took to show its pro activity was that His Excellency, the President of the Republic of Zimbabwe, Robert Mugabe, launched a computer distribution programme in 2007. He distributed thousands of computers to schools and tertiary institutions. This resulted in increased computer literacy and subsequent utilisation of ICTs products.

The third step was a direct response to the e-readiness survey report which pointed to the challenge of Zimbabwe being a land-locked country. The government responded by permitting the setting of an ocular link from Harare to Mozambique and South Africa in a bid to upgrade connectivity in the country. According to Minister Chamisa, this international networking would permit massive amounts of mobile phone, television, internet and telecommunication signals to be transmitted (*Daily News*, 17 May 2011).

1.1.7. **The manufacturing sector and its global trend**

The manufacturing sector is the core driver of industrialisation of many economies. It is the source of strength and key sector for growth. Ambitions for economic independence remain a dream if the manufacturing sector is not growing. The role of the manufacturing sector in the current knowledge-based and technologically-driven world economy remains unquestionable. The manufacturing sector is not only a major foreign exchange earner but is also a stable and reliable source of foreign exchange earnings for major economies worldwide. It is on this account that nations should grant primary focus to anchoring manufacturing in the right position to drive the growth and development processes of economies. Leading nations have developed and adopted measures, including ICTs and e-business in response to the need to maintain this sector in pole position.

The global manufacturing landscape is becoming increasingly competitive as manufacturing firms standardise their operations and spread their presence. Value additions, customer

centricity, global networking, raw material outsourcing and supply chain management have received considerable attention in order to improve performance of this sector. Success will depend on how these firms integrate their operations with technology, particularly e-business.

The implications of these developments are that manufacturing firms need to utilise the latest technologies and processes and, more specifically, e-business, to ensure effective and efficient use of resources. They need to optimise the supply chain in order to gain a competitive advantage from the proximity to suppliers and customers. They should have systems in place to engender and manage customer centricity and closer relationships across the supply chain.

1.1.8 The state of the manufacturing sector in Zimbabwe

The manufacturing sector in Zimbabwe is fourth in terms of revenue generation. First is mining, followed by agriculture, and then services. Its growth and contribution to GDP have been on the decline since 2008 as shown in Table 1.2.

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Table 1.2 Contributions of manufacturing sector to GDP

Year	2000	2002	2004	2006	2008	2010	2011	2012
GDP growth	-11.5	-13.3	-10.2	1.7	17.9	2.8	10.4	4.4
Contribution to GDP	13	18	16	27	7	13	13	11
Contribution to exports	37	39	37	35	27	27	27	25

Source: ZIMSTAT, RBZ (2013)

The manufacturing sector has gone through different notable phases of economic growth. First is the 1965-1980 period. This was the era of international sanctions due to the Unilateral Declaration of Independence (UDI) by the then Prime Minister of Rhodesia, Ian Douglas Smith. The government responded by adopting an import substitution policy. This led to the unprecedented growth of the manufacturing sector.

The second period is between 1980 and 2000. This post-independence period was characterised by consolidation and steady growth of the manufacturing sector. The third period is from 2000 to 2008. In 2000, the government embarked on the land reform programme in which more than 60 000 small-scale farmers were allocated land for agricultural production, replacing close to 4000 white commercial farmers. The major western economies responded by applying economic sanctions to Zimbabwe. These economic sanctions coupled with hyperinflation led to the major decline in the manufacturing sector. Business growth was negative and most businesses had to adopt the survival strategies. Contribution to GDP by the manufacturing sector went down to as low as 7% in 2008 as shown in Table 1.2.

The last period stretches from 2009 to date. With the dollarisation of the economy in early 2009, the manufacturing sector had been expected, during this period, not only to recover but also to recapitalise, expand and use modern technology and processes. This is imperative to counter the effects of reliance on cheap imports from South Africa and the Far East. However, as observed by the Confederation of Zimbabwe Industries (CZI), the current state of the manufacturing sector is "precarious and tantamount to de-industrialisation." As Brains Muchemwa, CZI economist, remarks:

> *"It needs to be noted that some sections of the manufacturing industries can no longer stand the global competition and only those that are able to tap into our most*

competitive advantages will be able to remain relevant in the face of global competition and continue to see capacity rising. Zimbabwe's current state of importation of ready-made goods is tantamount to de-industrialisation," (CZI Report, 2011).

The manufacturing sector has performed woefully and failed to deliver on its high potential as reflected by the low capacity utilisation at 40% in 2012; minimal contribution to GDP which stood at 7 % in 2008 and lowest employment share in comparison to other major sectors. The major sector constraints are shortage of working capital, machine breakdowns, low product demand, influx of low priced inputs, high cost structures of producing goods and services compared to the region, and structural rigidities which are inherent in the production chain in Zimbabwe (CZI Report-2012). Table 1.3 shows the major capacity constraints for the manufacturing sector in Zimbabwe.

Table 1.3 Major capacity constraints for the manufacturing sector

Constraint	% of companies
Working capital	32
Low local demand	13
Machine breakdown	11
Competition from imports	9.5
Environment	8.4
High cost of doing business	8
shortage of raw materials	5.3
Others	12.8

Source: **CZI (2012)**

1.1.9 Scope of the manufacturing sector

Zimbabwe manufactures goods in the following categories, using international industrialisation classification:

Food, beverages and tobacco: beer, flavouring, starch and other miscellaneous food products; flour and grain milling; meat and fish; tea, coffee and other beverages; dairy products; fruit juices; tobacco; biscuits and bakery; animal feed; sugar; distillery and blending of spirits; vegetable and edible oil.

Basic metal, iron and steel and fabricated metal products: steel pipe; metal packaging; enamel wares; welding electrode; galvanised iron sheets; nail and wire.

Chemical and pharmaceutical: paints; vanishes and allied products; medical and specialised gases; soap and detergents; petrochemicals; agrochemicals; insecticides and aerosols; dry cell battery; printing ink; toiletries and cosmetics, and basic industrial chemicals.

Electricals and electronics: refrigerators and air conditioning; electric bulb lamps; accessories and fittings; cable and wire.

Non-metallic mineral products: glass; ceramics; asbestos; chalks; cement and cement products.

Pulp, paper and paper products: pulp; paper and paper products; printing, publishing and packaging materials.

Textile, wearing apparel, carpet and leather: textile and wearing apparel; leather products; carpet and rug; foot wear; cordage, rope and twine.

Domestic and industrial plastic rubber: rubber products; domestic and industrial plastics; foam rubber

Motor vehicle and miscellaneous assembly: boat/shipbuilding; automotive components; electric generator assembler; bicycle and motor cycles and motor assemblers.

Wood and wood products: wood products and furniture; plywood and particle board manufacturing.

1.1.10 Regional spread of the manufacturing sector

Manufacturing in Zimbabwe is concentrated in Harare and Bulawayo. The key considerations for manufacturers in identifying convenient location are good transportation, communication networks, reliable logistic facilities, concentration of skilled manpower, access to large market, basic infrastructural facilities and nearness to raw materials.

1.2 THE RESEARCH PROBLEM

The adoption of e-business applications in the manufacturing sector in Zimbabwe has been slow. A high number of firms have developed informational websites only (Mupemhi and Mafuka, 2006). In spite of the literature showing that e-business increases organisational competitiveness (Ranganathan, Dhaliwal and Teo, 2004; Tsokota and Solmes, 2013) by 2004, only three manufacturing firms, namely Delta Corporation, PG Industries and Cairns had developed transactional systems that allow them and their clients to buy equipment and supplies on-line. The bulk of e-business activities are e-mail related. High levels of e-business applications such as interactive websites, integration of business processes or highly integrated infrastructures linking customers, suppliers and other partners are still limited. This resulted in expensive production inputs, inability to manage the production and supply chain and having inadequate market, product and competitor information due to poor or total absence of networks. E-business literature shows that all this could be improved with the adoption of the appropriate e-business tools (Ranganathan, Dhaliwal and Teo, 2004; Kumar and Peterson 2005; Kao and Hwany, 2008).

Although much work has been done in both developing and developed countries to identify the factors that drive or retard e-business adoption (Fillis and Wagner, 2005; Peltier, Schbrowsky, and Zhao,2009), few studies have addressed the combined effects of environmental, organisational and managerial (EON) factors on e-business adoption. Most of the previous studies have treated e-business adoption as a one dimension-induced variable, thus failing to answer persisting questions by researchers and practitioners (Chitourou, and Souidan, 2010). To the best of the researcher's knowledge, there is dearth of knowledge of these in Zimbabwe. Little is also known about how these factors affect the adoption of e-business and its usage. Since the factors affecting the adoption and application of e-business vary from country to country and industry to industry, there is need for empirical evidence of these factors in the manufacturing sector in Zimbabwe.

Furthermore, while the e-business literature presents some benefits that can be accrued from the adoption of e-business (Bengtsson ,2007; Peltier, Schbrowsky and Zhao, 2009), only few studies have evaluated empirically the efficiency results of e-business in the manufacturing sector (Olivares, 2013; Epistein, 2004). The reason is that there is no research vigour in e-business performance measurement due to the lack of theories and frameworks as well as consensus among researchers on the e-business efficiency measurement unit (Choong, 2013; European Commission Report, 2013; Barnes and Hilton, 2007).

Therefore, this study seeks to determine the factors affecting the adoption of e-business in the manufacturing sector in Zimbabwe and to identify e-business efficiencies that firms in this sector could gain as a result of e-business adoption. As such, by studying the antecedents and consequences of e-business adoption at the same time, we consolidate the determinants of e-business sustainable competitive advantage.

1.3 THE MAIN RESEARCH QUESTION

The study investigates the factors affecting the adoption and growth of e-business in the manufacturing sector in Zimbabwe. The study further interrogates the effect of e-business adoption on firm efficiencies and how this impacts on efforts to create a sustainable competitive advantage by manufacturing firms.

1.4 THE RESEARCH OBJECTIVES

The objectives of the study are:

- To determine the level of e-business involvement by the manufacturing sector in Zimbabwe.
- To identify the environmental, organisational and managerial factors influencing the adoption of e-business in the manufacturing sector in Zimbabwe.
- To establish business efficiency factors associated with adoption of e-business by the manufacturing sector in Zimbabwe.
- To investigate the impact of adoption of e-business on the performance of the manufacturing sector in Zimbabwe.

1.5 RESEARCH QUESTIONS

- What is the current level of e-business involvement by manufacturers in Zimbabwe?

- What environmental, organisational and managerial factors influence the adoption of e-business by firms in the manufacturing sector in Zimbabwe?

- Which business efficiency factors are associated with the adoption of e-business by firms in the manufacturing sector in Zimbabwe?

- What is the impact of adoption of e-business on organisational performance?

1.6 SIGNIFICANCE OF THE STUDY

The study is of great significance to academia, the manufacturing sector, ICT service firms and Zimbabwe's economy as a whole. First, a lot of research has been done and many articles

published on e-business adoption. A survey in major e-business, business, marketing, operations management, management information system and innovation and new technology journals identified the e-business research themes to have been focusing on adoption of e-business, implementation of e-business strategies and competitive advantages gained from e-business. For example, factors that affect the adoption of ICTs (Hong, and Zhu, 2006; Hsu, Kraemer and Dunkle,2006), the implementation of e-business strategies in international markets (Smith and Spiers, 2009) and what e-business can do to the whole economy (Poon and Swatmann, 1999). Unfortunately, gaps still exist as no known study focused on the manufacturing sector. Most researches have not gone beyond adoption of e-business to measure results of that adoption. Furthermore, there is lack of empirical evidence of the combined impact of the various sets of variables on e-business adoption and the impact of the latter on firm competitive advantage. Therefore, this study will contribute to new knowledge in the area of e-business value.

Furthermore, conditions for the adoption and development of e-business may vary with industries and industry sectors. Barriers to e-business usage found elsewhere may not be applicable to the manufacturing sector. More so, all these studies were done outside Zimbabwe and the conditions may also vary from country to country. The study will, therefore, create new knowledge on the antecedents of e-business adoption, e-business efficiency gains and competitive advantage in the manufacturing sector in Zimbabwe.

Second, the manufacturing sector has been chosen because it is one of the key sectors of Zimbabwe's economy. During the past two decades, Zimbabwe used to be the bread basket of the Southern African Development Community (SADC) and this sector used to be the major foreign currency earner. In 2012, with a capacity utilisation of 40%, the sector was at its lowest level (CZI, 2012). This means that this sector needs to be revolutionised to improve the depressed economy. Currently, Zimbabwe is struggling to retain its position as Southern

Africa's second largest economy, hence a stronger e-business base would do well to improve this position as the level and quantity of intra and inter-regional trade could possibly increase. Therefore, the industry would benefit if the study gives answers to questions on how to increase e-business value.

Third, the world e-business revenue was expected to increase by 19% to US$ 680 billion in 2014 (Internet World Stats, 2008). Of this amount, US$ 170 billion is for the USA alone. The challenging question is: How much is for Zimbabwe from this amount? With the world now turned into a global village, if Zimbabwean firms do not manufacture and sell or buy online, their operational locus would soon become smaller and smaller as foreign firms sell to Zimbabweans online.

Fourth, there is need to cut distribution costs through disintermediation and, consequently, pass on the cost-saving benefit to the consumer. Manufacturing firms should, therefore, have two primary concerns: reducing operational costs and improving their communication capabilities. E-business provides solutions to both of these concerns, thus giving a competitive advantage to local firms in the face of seemingly dumped goods from other markets.

Fifth, e-business support firms would also benefit from the study as they would need to tailor-make the ICT products and applications to meet the needs of each manufacturing firm. As they provide the interface between the manufacturing firm and the user, the demand for their services is likely to increase.

Sixth, the study has a bearing on policy formulation and implementation as some decisions to implement e-business strategies by firms are largely influenced by existing policy frameworks.

Seventh, the study is expected to contribute to the body of knowledge on competitive advantage creation through use of endogenous resources such as e-business. It will therefore impact on current theories such as the resource-based view and the value chain.

1.7 SCOPE AND LIMITATIONS OF THE STUDY

1.7.1 Theoretical scope

The study falls within the field of innovation, e-business and marketing strategy. Within the context of innovation research, this study examines the effect of environmental factors, organisational factors and managerial factors on the adoption of an innovation which is electronic business. From the e-business research side, the study focuses on the level of e-business application or usage and measurement of e-business efficiencies. The marketing strategy component of the study focuses on the identification of sources of the firm's sustainable competitive advantage and the forms of this competitive advantage.

Studies have been undertaken on the adoption of an innovation by Rodgers (1995 and 2003); David and Malcolm (2008); Kyu-Nahm and Weary (2010) and Park, Kim, and Pobil (2012). Several theories were applied such as the innovation theory (Rodgers, 1995 and 2003), Technology Acceptance Model (TAM) (Davis, 1989), and the Technology, Organisation, Environmental (TOE) framework (Park and Kim, 2012). These models and theories provide insight into the conceptualisation of e-business adoption.

The e-business tools, their applications as well as the e-business levels have been widely studied and documented (Van der Veen, 2004; Moodley, 2005; Laudon and Trevor, 2008; Wang and Cheung, 2012) and form the basis of this study.

 The study focuses on the application of the Internet and related technologies on business to business (B2B), business to customer (B2C) and business to Government (B2G) interactions

such as online sales and purchasing, e-idea generation during new product development, e-procurement, e-payment, e-customer relationship management, and so on. While e-business involves doing business electronically, the study focuses on opportunities and competitive advantages presented by the Internet and related technologies.

1.7.2 Empirical scope

The research investigates firms in the manufacturing sector in Zimbabwe. Financial performance measures are not used in this study as criterion for establishing size as firms are not likely to divulge their positions for the sake of confidentiality. The firms that were sampled are those that have membership with the Confederation of Zimbabwe Industries (CZI). The CZI is a body that enlists most of the manufacturing firms. This allowed the use of a consistent and reliable sample frame from their data-bases. The focus of the study was on those firms that have already adopted e-business. According to Moodley (2005), these are technology leaders and technology followers and not technology laggards. The use of technology leaders and followers helps identify factors that have pushed them to adopt e-business and assess efficiencies gained as a result of the e-business adoption.

1.8 STRUCTURE OF THE THESIS

The thesis consists of six chapters. Chapter One outlines the background to the study, the research problem to be investigated, research questions and objectives, and the significance of the study.

Chapter Two reviews the literature on e-business adoption and competitive advantage. Various theories on innovation adoption and firm performance are reviewed. Studies conducted in other countries in the developed world and the developing world explaining drivers of innovation adoption and competitive advantage are analysed.

Chapter Three continues to review the literature to explain and support the conceptual framework. The research hypotheses are then formulated.

Chapter Four focuses on the research methodology used in this study. The justification for the research approaches and designs that are used are given. The research instruments that are employed to generate data are described and the manner in which constructs are operationalised is also explained.

Chapter Five presents the findings of the study and then discusses them in light of the literature. Furthermore, the research model developed in Chapter Three is modified in light of the study findings. The study model confirms the relevance of most of the issues identified in the literature review to the manufacturing sector in a developing country.

Finally, Chapter Six provides conclusions drawn from findings. It also discusses the implications of the study findings to both theory and practice, and ends with recommendations for further research.

LITERATURE REVIEW

2.0 INTRODUCTION

This chapter reviews existing literature on factors affecting the adoption of e-business. It further looks at the role of e-business in the creation of a sustainable competitive advantage. First, a brief description of the method used in reviewing the literature is given. After this, the results of the review are presented in **2.1**. In **2.2,** the researcher discusses the theoretical perspective to the adoption of e-business. Section **2.3** discusses the conceptual variables, the independent variables, mediating variables and the dependent variables of this study.

2.1 METHOD

First, the university librarian was consulted on the relevant search engines, electronic databases and academic journals that the university was subscribing to. A wide range of these were recommended and the list included databases such as Emerald Insight, Ebscohost, Ethos, Palgrave Journals, Proquest Central, and Oxford Journals, among others.

The researcher went on to search in the databases using the key words: e-business, e-commerce, Internet, adoption, usage, competitive advantage, sustainable competitive advantage, business efficiency, value creation and manufacturing sector. Though the search could be done by reference to authors or academic journals, the researcher preferred delimiting the search according to period of publication. The period of publication ranged between 1996 and 2013. The year 1996 was chosen because it was the period in which the first academic journals on e-business were published (Van der Veen, 2004) and 2013 was set

as the limit of the search to allow for the analysis of the results. Through this procedure, 202 e- business adoption studies focusing on SMEs and large firms in developing and developed countries were identified. Looking at the independent variables (organisational, managerial and environmental factors), mediating variable (level of adoption of e-business) and the dependent variable, (sustainable competitive advantage) the articles were trimmed to 60.

While there is no guarantee that the existing e-business adoption and e-business value creation literature was exhausted, these results show that a lot of research has been done on this subject within the past one and half decades. However, what is intriguing is that most of the studies have been conducted in developed countries. Furthermore, most of these studies focused on e-business adoption and very few have dealt with value creation or sustainable competitive advantage through e-business. This paucity of literature on e-business competitive advantage shows that, although strategy is an old discipline, its link to e-business is still at infancy.

2.2 E-BUSINESS ADOPTION AND SUSTAINABLE COMPETITIVE ADVANTAGE

To understand how individuals or organisations adopt an innovation, innovation adoption theories were revisited. These included the Technology, Environmental and Organisational (TOE) framework, Technology Acceptance Model (TAM) and the Diffusion of Innovation (DOI) theory. In order to link adoption of e-business to sustainable competitive advantage, the value chain model (VCM) and the Resource-Based View (RBV) theory were used.

2.2.1 Technological, Organisational and Environmental (TOE) framework

This technological, organisational and environmental framework was developed by Tornatsky and Fleischer (1990) to explain factors that influence the adoption of an innovation at the organisation level. Tornatsky and Fleischer (1990) identify three key features that influence the adoption of an innovation as (1) technological context or the existing technologies relevant to the firm, (2) organisational context or the salient characteristics of the firm such as scope, size and culture, and (3) environmental context or the atmosphere in which business is conducted, including the industry, competition and government regulation. These features are discussed in the following subsections.

2.2.1.1 The technological context

Tornatsky and Fleisher (1990) have proposed that the propensity of an organisation to adopt an innovation and e-business in particular, depends on the type of information technology (IT) infrastructure and the calibre of IT staff the organisation has. The IT infrastructure, on the other hand, is affected by relative advantage, complexity, trialability and observability (Rodgers, 2003). The level and nature of IT resources   of the firm must be sound and reliable to inspire confidence and change attitudes (Ramdani, Chevers and Williams, 2013). Therefore, it can be argued that firms with sound IT infrastructure are more likely to adopt e-business. Likewise, firms should have IT staff with the requisite skills if they are to adopt e-business.

Relative advantage as a construct in the technological context variable is defined by Rodgers (2003:229) as "the degree to which an innovation is perceived as being better than the one itsupercedes." The widespread view in the adoption literature is that when e-business is perceived to achieve better results than the traditional tools and strategies it is to be adopted.

Figure 2.1 The TOE model

Technical context	Organisational context	Environmental context
(Relative advantage, compatibility, complexity, trialability, observability & IT infrastructure)	(Top management support, organizational culture, organizational readiness, size and ICT experience)	(Regulation, customers, competitors and industry)

Technological Innovation Decision Making
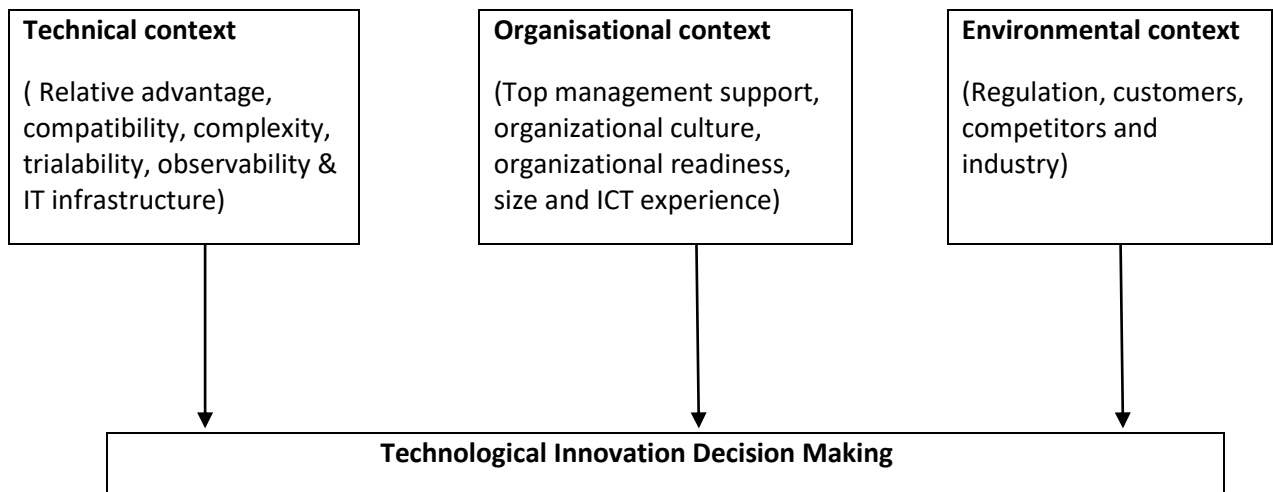
*Source***:   Tornatsky and Fleischer (1990)**

An innovation can readily be accepted if it is considered compatible with the current practices, values or strategies of the firm. According to Rodgers (2003:240), compatibility is "the degree to which an innovation is considered to be consistent with the current values, experiences and needs of the potential adopter." This idea is supported by Premkumar (2003) and (Ramdani, Chevers and Williams, 2013) who posit that any changes to strategy must be compatible with the infrastructure, values and beliefs of the organisation for it to be accepted, implemented and then yield better results.

Complexity is defined by Rodgers (2003:257) as "the degree to which an innovation is perceived as difficult to understand and use." The complexity of a technology increases the perception of the operational risk from the failure to utilise the technology. This leads to the financial risk when there is a feeling that the financial resources were not put to better use by investing in that innovation. Although empirical evidence from studies undertaken in Europe shows a negative association of this factor and adoption of ICTs (Ramdani, Chevers and Williams, 2013), there is no such evidence from the developing countries where financial resources are always limiting.

Trialability is defined as the "degree to which an innovation may be experimented with on a limited basis" (Rodgers, 2003: 258). When an innovation is tried without much cost to the potential adopter, the chances of adoption are high. In the case of e-business, many service providers offer free trial versions over limited periods to boost the confidence of the potential adopters.

Observability entails having the results of the innovation easily visible to others (Rodgers, 2003). The impact of e-business in the manufacturing sector must be observable for the potential adopters to accept and adopt it.

2.2.1.2 Organisational context

The organisational context is claimed to have high impact on e-business adoption (Ramdani, Chevers and Williams, 2013). This context includes top management support, organisational size, ICT experience and organisational readiness.

Top management support is one of the best predictors of e-business adoption Mnzebele, (2013). Top managers are the initiators of change and can communicate and inculcate values through a well-articulated vision of the firm. Resource allocation to specific projects is dependent on the amount of support provided to that project by top managers. Therefore, the adoption literature links top management support to adoption of an innovation (Wee and Quaz, 2005).

Organisational readiness is the extent to which resources (financial, technical, human or material) are made available for the adoption of e-business. Lack of adequate financial resources and limited technical expertise were found to limit adoption of e-business in small businesses (Ramdani, Chevers and Williams, 2013) and are likely to have the same effect even on large firms in developing countries.

Previous exposure to ICTs by employees determines how fast the firm can adopt an ICT innovation. Limited experience generates perceived risks. Sunderan, Schwaz, 'Jones and Chin (2007 observe that the technology already existing in the firm and the knowledge employees have influence the adoption of e-business.

The size of the firm has been identified as one of the best predictors of the adoption of an innovation Hong and Zhu (2006). The size of the firm can be described in terms of the financial resources available, the market served or number of people employed. All this reflects the resourcefulness of the firm. The adoption literature has found a positive association between size of a firm and adoption of e-business. The argument is that, the more resourceful a firm is, the more likely it is to adopt an innovation.

2.2.1.3 Environmental context

Government or institutional policy, the industry and competitive pressure are some of the environmental factors that influence the adoption of e-business by the manufacturing firms.

Government policies influence e-business adoption (Li and Xie, 2012) as they have a bearing on provision of IT infrastructure, IT human resource training, promotion and use of ICTs or tariffs in ICTs transactions. Grandson and Pearson (2004), and Zhu and Thatcher (2010) have observed a positive relation between government policy and e-business adoption in Singapore and China respectively.

The nature of the industry in which the firm operates influences adoption of e-business as ICT usage varies across sectors (Li and Xie, 2012). Manufacturing firms that rely more on enterprise resource planning (ERP) systems and involved in supply chain integration are likely to adopt e-business.

Competitive pressure is arguably an important factor that influences e-business adoption. For example, Cui, Zhang and Huang (2008) posit that the more competitive a market is, the higher the likelihood of e-business adoption. However, Rodriguez-Ardura and Meseguer-Artola (2010) and Hsu *et al*, (2006) argue that those firms with excessive competitive pressure do not have enough resources to adopt the innovation.

The TOE framework has been widely used in various Information System (IS) empirical studies (Zhu *et al,* 2003). It is an appropriate framework to study e-business adoption and usage as the propensity to adopt and use e-business is largely influenced by organisational, technological and environmental circumstances (Zhu and Kraemer, 2005).

This framework was successfully used in empirical studies of the adoption of e-business by Hsiu -Fen and Gwu-Guang (2005), Brown and Russell (2007) and Tsai *et al*, (2010). However, this framework is applicable only to the study of e-business adoption at the organisational level and not individual level. It does not concern with the managerial imperatives like the technological innovativeness, risk perception, attitudes, commitment and experience which in the researcher's view are important in adoption studies.

Furthermore, since the framework focuses on circumstances in which e-business is done, the gulf between the developed and developing countries is so wide such that it becomes very necessary to see how this framework applies in developing countries and Zimbabwe in particular. Most of the studies so far have focused on e-business adoption by enterprises in the developed countries.

2.2.2 Technology Acceptance Model (TAM)

This model was developed by Davis (1989) in order to explain computer usage behaviour. It was based on the theory of reasoned action (TRA) by Fishbein and Ajzen (1975). The model proposes that the adoption of an innovation is influenced by two cognitive belief constructs:

perceived usefulness (PU) and perceived ease of use (PEoU). According to Davis (1989: 320), "perceived usefulness is the degree to which a person believes that using a particular system would be free to effect, and perceived ease of use is the degree to which an innovation can easily be used or applied." According to this model, external variables such as technological factors, networks, competition, *et cetera*, influence the individual's perception of the usefulness or ease of use of the innovation and formation of attitudes towards the use of the innovation, behavioural intention to use it and, finally, the actual use. Figure 2.2 shows the relationships of these variables.

The model shows that adoption of an innovation depends on how the technology is adapted to provide utility to the organisation and whether the organisation is able to use the innovation in an easy and profitable way. In this model, the external factors are depicted as forces and actors within the arena in which technology is applied. These forces and actors influence the cognitive beliefs. An attitude is the user's preference when they actually utilise particular devices and technologies while the intention to use is the degree of the cognitive state of the users' minds to use specific devices and technologies (Kim, 2012).

Figure 2.2 Technology Acceptance Model (TAM)
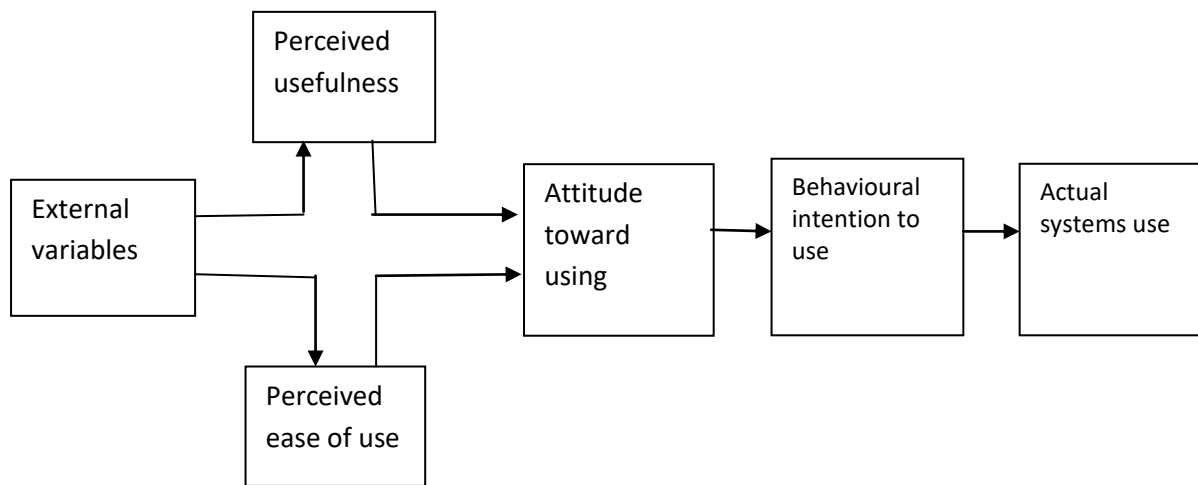
Source: **Davis, Bagozzi and Warsaw (1989)**

Perhaps the strength of this model is that, unlike the Technology, Organisation and Environment (TOE) contexts framework, TAM can be applied to both the individual and organisation level. It addresses the limitations of the TOE framework by focusing on adaptability, usefulness and ease of use at the individual as well as organisation level. However, the major criticism against TAM is its failure to describe perceived risk, particularly in the context of e-business and online transactions (Kim, 2012) and does not consider organisational and social factors to predict adoption (Van der Veen, 2004; Legris *et al*, 2003).

In spite of the critique aforementioned, TAM has been widely used in information Systems (IS) research. Then, with the inception of e-business research, the model has been used in a number of e-business adoption studies to assess the impact of perceived usefulness or perceived ease of use on adoption. Some of the studies are shown in Table 2.1.

Table 2.1: TAM studies and impact of TAM constructs on adoption

Researcher	Innovation	Impact on adoption
Grandon and Pearson (2004)	E-business	Significant
Zhu and Kramer (2005)	E-business	Significant
Shin (2007)	Internet	Significant
Thompson (2007)	Internet	Significant
Pen and Zhong (2008)	E-business	Significant
Kim (2012)	E-business	Significant
Park *et al*, ((2012)	E-commerce	Significant

Although the model has been widely used to predict user acceptance or rejection of e-business, there is paucity of literature of its use in the manufacturing sector. Furthermore, limited studies have applied this model to understand value creation and generation of a sustainable competitive advantage. Studies that applied this model to understand e-business adoption focused on firms in the USA, Europe and, of late, Asia. This leaves a gap to apply the model or some of its constructs to manufacturing firms in a developing country like Zimbabwe.

2.2.3 Diffusion of Innovation (DoI) Theory

In order to understand how individuals and organisations adopt an innovation, Rogers (1995) conceptualised an innovation as a process an individual or an organisation passes from a knowledge phase to an attitude forming phase. The next phase is the decision phase in which the individual or the organisation (adopter) makes a decision to adopt or reject the innovation. This is followed by the implementation phase and, finally, the confirmation of the innovation. The model is shown in Figure 2.3.

According to Rodgers, there are external conditions such as presence of a problem, past experience, social values, and then adopter characteristics such as innovativeness, personality traits, level of connectedness and socioeconomics, and, finally, the innovation characteristics such as relative advantage, compatibility, trial ability, complexity and observability which influence the evaluation of the innovation.

There are many empirical studies on the characteristics of an innovation which were carried out after Rodgers. These studies have focused on (1) relative advantage – the degree to which an innovation is perceived as better than the idea that, product or practice, it supercedes, Moon and Kim (2001); (2) compatibility – the degree to which an innovation is perceived to be consistent with the existing values, experiences and needs, Rosnafisah (2009); (3) complexity – the degree to which an innovation is perceived as relatively difficult to understand and use, Moon and Kim (2001); (4) trial ability – the degree to which an innovation may be tried on a limited basis and, (5) observability – the degree to which results of an innovation are visible to others Argarwal and Hurroyet (2004). Rodgers noted that an idea or practice which seems to be better than the one it supersedes, which is compatible with the organisation or individuals values, which is relatively easy to apply, and can be easily experimented and the results are easily visible, is more likely to be adopted than one with contrasting effects.

Figure 2.3 Diffusion of innovation model
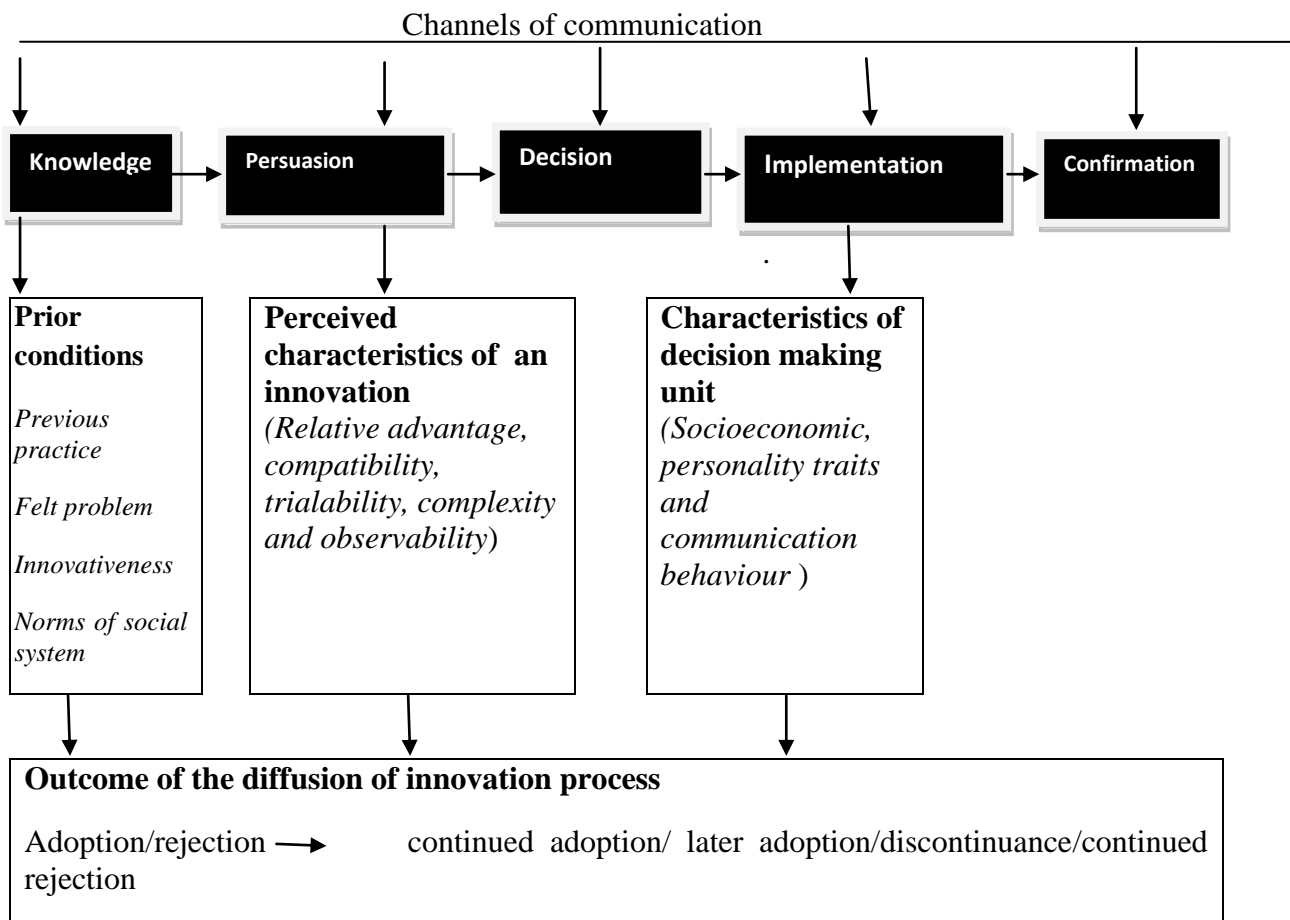
Source: Steele and Murray (2004)

E-business is a new idea or practice, so it is regarded as an innovation. To study its adoption, many researchers have used the DoI model by Rodgers. Table 2.2 shows some of the e-business adoption studies that applied the DoI model.

Table 2.2 Studies that applied the Diffusion of Innovation Model.

Researcher	Innovation	Perceived innovation characteristic	Impact on adoption
Moon and Kim(2001)	Internet	Relative advantage	Significant
Gibbs and Kraemer (2004)	Internet		Significant
Rosnafisah *et al*, (2009)	Website	Compatibility	Significant
Moon and Kim (2001)	Internet	Complexity	Insignificant
Chong *et al*, (2005)	Internet		Insignificant
Rodgers (2003)	E-commerce	Trial ability	Significant
Agarwal and Hurroyet (2004)	WWW	Observability	Significant
Kendall *et al*, (2001)			Significant

The findings from randomly picked studies that used the diffusion of innovation model and shown in Table 2.2 above confirm that relative advantage, compatibility, trial ability and observability are significant in the adoption of e-business while complexity is not. Ninety-five percent of these studies were from the developed countries while only 5% were from the developing countries. From the point of view of the TOE framework presented in section 2.1, the contexts in which the studies were done could be different so the findings cannot be generalised to all countries and business sectors, including manufacturing.

 The diffusion of an innovation theory presented the diffusion of an innovation as a process of sequential, interacting and interdependent stages (Rothwell, 2004; Rodgers, 1995). This theory is criticised for the discrete approaches as innovation is not static but is a continuous process and requires a holistic approach. This theory also does not explain how the specific firm requirements can impact on the development of new technologies as it presents information flow in one direction. There is little of dialogue between the adopter and

developer of the innovation. Such a stance reduces the role of managers in a firm to passive recipients of the innovation.

There is no doubt that, in spite of the critiques against the TOE, TAM and DoI frameworks, these, to some extent, help managers in predicting the adoption rate and scope of the innovation. A combination of these models could bring incredible insights into the adoption of e-business in the manufacturing sector, with the limitations of one model being overcome by the strengths of the other.

2.2.4 The Resource-Based View (RBV) Theory

A widely accepted theory that explains why firms are different in terms of competitive advantages is the resource-based view (RBV) theory. The following subsections give an explanation of the origins, applications and critiques of this theory.

2.2.4.1 Origins and explanation of the Resource-Based View (RBV) theory

The resource-based view model of a firm was posited by Penrose (1959) and then Winerfelt (1984) as a theory of the firm. It was then popularised through the works of Barney (1991), Peteraf (1993), Barney *et al*, (1995) and Teece (1997). Since then, there have been numerous publications in support of it (Wade and Hulland, 2004; Stephane, 2007; Kraaijenbrink, Spender and Groen, 2009) or making a critique (Weick, 2001; Foss and Knudsen, 2003; Bromiley, 2005).

The theory tries to explain the role of the firm's internal resources in generating competitive advantages. It explains why businesses in the same industry and environment might have different competitive advantages and performance levels. This counters the role of external factors in firm performance as posited by Porter (1985) when discussing industry attractiveness and firm performance.

The RBV theory argues that firms possess resources and capabilities which enable them to achieve a competitive advantage. These then become the primary source of profit for the firm (Grant, 1991). In this theory, a resource is defined as the asset that is tied semi-permanently to the firm and includes financial, human, marketing, operational, technological or organisational assets (Barney, 1991). The firm's capability, on the other hand, is defined as the firm's capacity to deploy resources. So the firm's resources are deployed as it implements strategies to achieve efficiency and effectiveness. Thus, a competitive advantage is gained if this deployment of resources leads to superior differentiation and/ or lower costs by comparison with a marginal competitor in the product market (Stephane, 2007).

If the firm's resources are to generate a sustainable competitive advantage (SCA), which by definition is a superior differentiation which cannot be duplicated by competitors, then the resources must be heterogeneously distributed across the industry and it should be difficult to move them from one firm to the other. So resource heterogeneity and immovability differentiate firms, thus generating a competitive advantage to those firms with the valuable resource and a competitive disadvantage for those without it. This means that firms cannot have a competitive advantage if strategic resources are evenly distributed and highly mobile across all competing firms. The RBV literature identifies critical attributes of resources that generate competitive advantages. These are rareness, value, imitability and substitutability (Barney, 1991; Stephane, 2007; Kraaijenbrink, Spender and Groen, 2009).

Rareness of the strategic resource implies that the uniqueness of the resource which is inherent to a particular firm in the industry such that when it is deployed in executing a particular value enhancing strategy, the benefits accrued are only unique to that firm (Barney, 1991). Therefore, rare resources are needed to generate a sustainable competitive advantage.

The second attribute of the firm resource which generates a sustainable competitive advantage (SCA) is that it should be imperfectly imitable, that is, firms that do not have the resource cannot duplicate it (Barney, 1991). The RBV literature identifies three reasons why the resource might not be duplicated. These are: 1) the unique historical conditions of the firm: some firm resources depend on time and space advantages such that firms which could not acquire the resource at the given time or place might not be able to do so anymore. 2) Causal ambiguity: this means making it difficult for firms that may want to duplicate the resource to know what actions to take in order to gain the SCA because there is no clear link between the resource and the SCA. 3) Social complexity: some resources may be difficult to imitate due to complex social relations, culture or traditions involved.

The third attribute is substitutability. The firm resources are not substitutable if there is no any other strategically equivalent resource, that is, any other resource that can be exploited separately to achieve the same goal.

The fourth attribute of the firm resource which generates a sustainable competitive advantage is value. A firm resource has value if it can be used to exploit opportunities and/ or neutralise threats in the firm's environment.

2.2.4.2 Critique of the Resource Based View theory

The RBV theory generated a lot of debate with some scholars strongly arguing that it cannot be a theory of the firm. Some of the notable critiques are from Weick (2001), Foss and Knudsen (2003), Bromiley (2005) and Stephane (2007). The major weakness of this theory was identified as its lack of a unity of analysis as it focused on resources rather than activities as sources of competitive advantage. Porter (1985) had identified the firm's activities as sources of competitive advantage. So it looks like this model is countering Porter's propositions but without offering proper definition of the constructs of the theory (Foss and

Knudsen, 2003). Furthermore, it ignores the constraints that the environment may impose to the firm desiring to generate a competitive advantage. For a long time, scholars in strategic management have known that competitive advantage depends on a match between the firm's internal strengths and environmental opportunities (Hart, 1995). The RBV's focus on the internal factors only   has generated debate.

The other critique is that the theory views firms as a bundle of resources instead of a collection of people trying to make sense out of what is happening around them (Weick,2001; Stephane, 2007).

In spite of these critiques, the RBV remains a useful model for explaining sustainable competitive advantage and performance in firms, hence it has continued to be applied in many empirical studies, including the areas of information systems (IS) and e-business (EB) (Zhu and Kraemer, 2002; Straab *et al*, 2002; and Hulland, 2004; Zhu and Kraemer, 2005; Hafeez, Keoy and Hanneman, 2006; Soni and Kadali, 2011; Golgeci and Ponomorov, 2013;Wang and Sarkis, 2013).

2.2.4.3 RBV and e-business

RBV assumes the presence of unique resources and capabilities in firms which become the primary source of competitive advantage and performance of the firm. The theory further proposes that if the competitive advantage is to be sustained, then these firm resources should be costly to imitate, thus making them rare. They should be valuable, thus contributing to operational cost reduction and, hence increasing profitability. The question now is: *How does e-business contribute to rareness, value or imperfect substitution in the firm? Can it be used to generate competitive advantages and improve performance?*

Zhu and Kraemer (2005) applied the RBV in a study of value creation in retail firms across ten countries in Europe. The study was to show how actual usage of e-business might be an important link to e-business value creation. The study found that technical competence, firm size, financial commitment, competitive pressure and regulatory support are important antecedents of e-business adoption and value creation.

In a study of 143 British firms to evaluate e-business as strategic capability, Hafeez, Keoy and Hanneman (2006) have observed that e-business adoption was key in boosting firm performance. The study analysed a number of firm e-business-related capabilities such as organisational and technological infrastructure and found that these were necessary for e-business adoption which was also critical in influencing performance. The study concluded that e-business is a strong determinant of firm performance.

In a related study, Caniato *et al*, (2013) found that e-business can create and coordinate processes in a manner that cannot be matched by competitors. The social complexity arising from the intrinsic network among system users makes imitation difficult. This renders e-business a source of sustainable competitive advantage.

Many studies have been undertaken to assess whether e-business is a valuable process to the firm. The results have not been consistent. For example, Gimenez and Lourenco (2008) found that the Internet reduces operational costs, increases satisfaction, improves forecasting and planning; and also improves product flow through manufacturing facilities. These results are consistent with those from Cagliano, Caniato and Spina (2005),Yin and Khoo (2007),Wang and Sarkis (2013), Caldwell, Harland, Bwell and Zheng (2013), among others. However, some other researchers such as Power and Sigh (2007) have argued that e-business has no direct impact on performance but only enables particular forms of cooperation along the supply chain. In spite of some arguments against e-business, there seems to be more

empirical evidence to support that it is a valuable process and so can generate a sustainable competitive advantage.

2.2.5 The Value Chain model

The value chain model (VCM) was coined by Porter (1980) to explain how firms can enhance organisational competitiveness through the management of the firm's key activities. Porter argues that the value chain consists of nine strategically important activities which when broken down help to understand the firm's cost behaviour and potential sources of differentiation. He regards differentiation as one of the sources of the firm's competitive advantage. The nine activities of firms are then categorised as five primary activities (inbound logistics, operations, outbound logistics, marketing and sales) and four secondary activities (procurement, technology development, human resource management and firm infrastructure).

Since 1980, the value chain has been modified. For example, Wagner *et al* (2004) have incorporated procurement as a primary value-creating activity while inbound and outbound logistics have been combined in distribution. Baker (2006) has added other dimensions such as organisational learning, innovation and imagination, organisational entrepreneurship, cross-functional synergy and core-competence building. Figure 2.4 shows Porter's Value Chain model.

Figure 2.4 The Value Chain Model
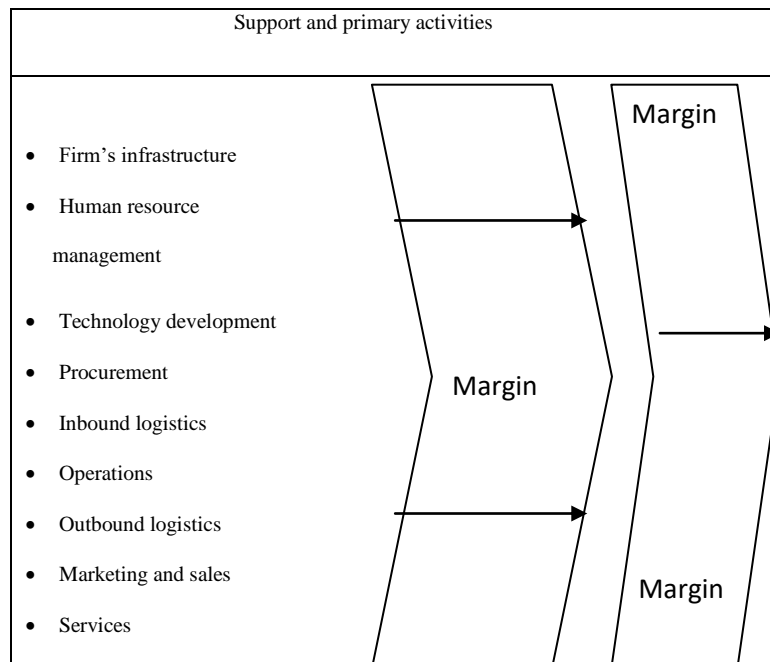
Source: Porter (1980)

The primary activities in Porter's Value Chain model increase the margin or the firm's performance when properly managed. According to Porter, in- bound logistics are activities through which the firm brings in materials of production. Properly coordinated in- bound logistics ensure that the firm's operations are uninterrupted as a result of supplies shortages. Furthermore, inventory levels are properly managed to reduce unnecessary costs from overstocking of materials.

Operations are those activities through which raw materials are converted into finished or semi-finished goods. Efficient operations management reduces the down tool time and rework costs; improves the quality of goods that are produced and ensures that there is a constant supply of the goods. The outbound logistics are concerned with the storage of the produced goods and their subsequent transport to the market. Focus of outbound logistics is on lowering costs associated with storage and distribution and ensuring product availability in the correct amounts and assortments at the right time. Marketing activities involve managing

relationships with the customers to ensure that there is always a need for the product. The right needs are identified and the dormant ones are aroused through marketing communication strategies. This ensures that there is always a demand for the firm's goods. Finally, the services in the value chain are those activities designed by the firm to enhance relationships with customers, thereby increasing their level of satisfaction. When properly managed, these activities increase the firm's customer lifetime value and, hence brand equity.

The role of the secondary activities is to support the primary activities by ensuring that the right skills have been identified, brought to the firm and are well-motivated; the right technology and processes have been adopted; the necessary infrastructure is in place and the correct systems and procedures are implemented.

The composite value chain (CVC)

Baker (2006) argues that apart from the traditional value chain activities, firms can enhance their margins or performance by becoming more entrepreneurial to meet the ever changing customer needs. He further posits that those firms which deliberately put an effort to adapt to the ever changing environment by being willing to learn are likely to improve their value chain activities. In the same vein, innovative and imaginative firms as well as those with coordinated functions have better results from their value chain activities. Figure 2.5 shows the Composite Value Chain by Baker (2006).

By managing the value chain as a whole, a firm is able to gain a competitive advantage through cost reduction, differentiation and eventually maximisation of sales (Yilmaz and Bititciu, 2006).

Figure 2.5 The Composite Value Chain model

Value enhancement activities	Support and primary activities
• Organizational Entrepreneurship • Organizational learning • Cross-functional synergy • Core-competence building • Organizational innovation And Imagination	• Firm's infrastructure • Human resource management • Technology development • Procurement • Inbound logistics • Outbound logistics • Marketing and sales • Services

Source: Baker (2006).

2.2.5.2 The Value Chain and E-business

Porter's Value Chain model is becoming widely accepted and used in supply chain studies (Yilmaz and Bititciu, 2006). Numerous studies in supply chain (SC) have focused on how e-business enhances the value chain activities (Cagliano, Caniato and Spina, 2005; Yin and Khoo, 2007; Gimenez and Lorenco, 2008; Shih, Hung and Lin, 2009; Caldwell, Harland and Bwell, 2013; Wiengarten, Humphrey and Mckittrick, 2013).

Recent studies have focused on level of application of e-business in managing the value chain activities. For example, Harland and Bwell (2013) have categorised e-business roles in the value chain as coordinating and integration. Coordination activities include monitoring and analysing supplier performance electronically; monitoring and analysing the quality of procured materials electronically; tracking the order electronically and managing the supplier contracts electronically. The integration activities include transmission, integration and

processing of data from suppliers; automatic order change reflection in downstream and upstream processes and e-procurement systems.

In this highly connected society, the Internet and related technologies have changed the behaviour of organisations (Miquel-Romero and Adame-Sanchez, 2013). Organisations are using advanced technology to leverage costs. Consequently, they are using this technology to reduce costs associated with the value chain activities while at the same time increasing effectiveness. E-business tools are being used to do supplier selection (Choi and Chong, 2006) and to manage supplier relationships (Wu *et al,* 2006; Tessarolo, 2007). Specific e-business activities in the supply chain include e-procurement, e-operations, e-commerce and e-collaboration (Cagliano, Caniato and Spina, 2005).

E-procurement involves acquiring the product from the suppliers online. The process of identifying products and their suppliers, supplier assessment and the actual sourcing and procurement is done online.

E-operations involve using the Internet to coordinate and integrate the production process. Right from idea generation to full scale production of the product the Internet can be used. The Internet has allowed many manufacturing concerns to move from single site manufacturing facilities to geographically dispersed networks of resources that collectively create value for customers (Yin and Khoo, 2007). Internet facilitates knowledge sharing in manufacturing flow management. Therefore, different facilities of the same firm at different locations can collaborate and improve planning and production. Collaboration can also be done with external manufacturing partners with surplus capacity (Caldwell, Harland and Bwell, 2013).

E-commerce involves buying and selling online. It includes generating, communicating, entering, processing, picking and delivering the orders using the Internet or related

technologies (Gimenez and Lorenco, 2008).When customers place their orders online, the selling firm does not only have to fulfil the order, but this should be done in a manner which satisfies the customer. Therefore the good use of information technology is necessary to generate the desired level of satisfaction. Internet allows customers in the supply chain to see orders in real time or near real time leading to reduction in costs and stock-outs. This allows firms to manage demand efficiently (Gimenez and Lorenco, 2008; Caldwell, Harland and Bwell, 2013).

E-collaboration involves sharing information and knowledge about products and markets with the supply chain members. Baker (2006) has identified collaboration as a higher order ability which generates a sustainable competitive advantage. In a networked society, the Internet becomes an important tool for collaboration. The Internet is used in collaborative sales forecasting, Just-In-Time (JIT) purchasing, joint decision making and coordinating physical activities (Devaraj *et al,* 2007).This allows the firms to compete on the basis of speed and flexibility (Caniato,Cagliano and Kalchschmidt, 2009) .

E-Customer Relationship Management (e-CRM) describes how customer relationships are established, enhanced and maintained using the Internet. Customer identification, screening, segmentation, and product specification is done using the Internet. The Internet also allows what is called 'the downstream effect' as business units can access same information about the customers (Gimerez and Lorenco, 2008). Data about customers is collected as they visit the website. Feedback from customers can be obtained online. This information can then be used to develop new tailor made services to meet the specific needs of customers.

2.2.2.6   Empirical findings on the effect of e-business on the value chain

Numerous studies have been undertaken to establish how e-business affects the value chain activities and the overall company performance. Although mixed results have been obtained,

generally e-business seems to have a direct impact on the value chain activities. Some of the studies with salient results are presented in the paragraphs below.

Cagliano, Caniato and Spina (2005) have undertaken a study of 338 manufacturing firms in Europe with the objective of investigating the use of the Internet by manufacturing firms to integrate process along the supply chain and to analyse relationships among Internet adopters. The study has found that there is a low adoption of the Internet, that is, there is a limited number of firms that have adopted it to a high extent where every process is integrated using the Internet (e-integrators). The study has also found that firms that use the Internet are mainly e-sellers, e-purchasers while the e-integrators constituted only 7% of the sample. However, the e-integrators have the highest payoffs from the Internet use. The study concluded that extensive use of the Internet along the supply chain is superior in terms of payoffs and should be coupled with close collaboration relationships.

When a similar study was undertaken in 2009 with some of the firms that had participated in 2005, a slight increase in the number of adopters was observed. However, what was significant was that the firm clustering changed from e-sellers, e-buyers or e-integrators to low, partial and full adopters of e-business to reflect level of integration of the Internet in the supply chain as more and more firms gradually perceive benefits.

In another study, Wiengarten, Humphrey, Mckittrick and Fynes (2013) have investigated the impact of e-business on supply chain collaboration in the German automotive industry focusing on manufacturers. The choice of the automotive sector was motivated by the fact that these are early adopters of information technology in Germany. The study specifically has sought to assess the effect of e-business applications, coordination and integration on buyer-supplier coordination in terms of operational performance. A sample size of 867 companies was used and sequential equation modelling (SEM) and confirmatory factor

analysis (CFA) was applied. The results have shown that interaction and integration applications have a significant positive relationship on buyer collaboration and increase operational performance in terms of quality, cost, flexibility and innovativeness. However, the study has not found any positive relationship between the coordination application and buyer-supplier collaboration. This therefore suggests that in the presence of interaction and integration applications, the extent of the coordination application should be controlled to cut costs since it does not have a significant impact on performance.

E-business applications in the supply chain have evolved gradually over the past two decades. Croom (2005) has undertaken an exploratory study to assess the various stages businesses have gone through in applying e-business in supply chain management. In this study, a combination of qualitative and quantitative approaches has been used to collect data through semi-structured telephone interviews and case studies. The research has shown that e-business application on the supply chain has evolved through four stages. These are the customer acquisition stage which is typified by use of the email and website to gain new markets. In this study 84% of the surveyed firms have gone past this stage. The next stage is the customer management stage where the Internet is used for the purpose of building and keeping relationships with customers. The results have shown that 54 % of the surveyed firms had gone past this stage. The third stage is where e-business is used to support the operations management using enterprise resource planning (ERP). Only 37% of the firms had gone past this stage. The final stage comprise those firms that integrate e-business with the supply chain management and carry activities such as fulfilment, order tracking and joint decision making using the Internet. A small group of only 12 % of the firms surveyed were at this stage.

Although this study generated new knowledge in terms of the evolution of firms with respect to application of e-business on the supply chain, it has the limitation of using several sectors

at the same time instead of focusing on a particular sector at a time. As it was a cross-sectional study, the time taken for firm behaviour to change and the motives of the behaviour change could not be established.

2.3 CONCEPTUAL FRAMEWORK VARIABLES

An analysis of the theoretical frameworks in section 2.2 helped refine a conceptual framework for the study of factors affecting adoption of e-business and establishment of sustainable competitive advantage by the manufacturing firms. In this framework, some constructs have been borrowed from each of the models presented in 2.2 in order to assess their combined effects. The ensuing sections discuss how each of the variables affects the adoption of e-business and gaining of a sustainable competitive advantage.

2.3.1 Environmental factors and adoption of e-business

Perhaps one of the major factors that distinguish the firms in developed and developing countries is the arena in which they do their business transactions. This factor occupied a central position in Tornatsky and Fleischer (1990) Technology, Organisation and Environment (TOE) model, Davis (1989) Technology Acceptance Model (TAM) framework and Rodgers (1995) Diffusion of Innovation (DoI) model. In the study of how the environmental factors affect the adoption of e-business, the competitive, technological and institutional factors have had a great impact as explained below.

2.3.1.1 Competitive factors

One of the key competitive factors in e-business adoption studies is the competitive pressure. This is the degree of pressure felt by the firm from its direct and indirect competitors (Oliviera and Martins, 2010; Zhu and Kraemer, 2005). There is a large body of studies on the effect of competitive pressure on adoption of IT and e-business (Oliviera and Martins, 2010; Lai *et al*, 2007; Al-Qirim, 2007; Zhu and Kraemer, 2005; McCole and Ramsey, 2005; Cata,

2005). The studies have been undertaken in different environments and industries and the impact of competitive pressure on   e-business adoption has been found to be inconsistent. For example Cata (2005) found that online competition had a significant impact on e-business adoption. Zhu and Kraemer (2005) have observed that competitive pressure is one of the important factors in e-business adoption. McCole and Ramsey (2005) have identified competitive pressure as one of the five reasons why firms in New Zealand adopt e-business. However, studies by Wu *et al*, (2003) in firms in USA showed that competitive pressure did not affect overall e-business adoption.

It is clear from the studies listed above that most of the studies were done in Europe, the USA or Australia and New Zealand and not developing countries. Even in the developed countries, there is no consensus on the effect of competitive pressure on the adoption of e-business. The effect of this variable on adoption of e-business in the manufacturing industry in developing countries is yet to be examined. This would be an interesting area given the presence of multinational companies (MNCs) with a strong resource base and locally owned firms with limited resources.

 As observed by Porter and Miller (1985), firms seeking to gain a competitive advantage must find new ways of outperforming their rivals and/ or collaborating with their partners. As such, e-business is a way of leveraging those new ways.

2.3.1.2 Network pressure
Network pressure is the degree of pressure by individuals and organizations that are connected to one another (Liu, Madhavan and Sudharshan, 2005) to adopt e-business. The components of this variable include external pressure from trading partners, customers and suppliers. Empirical evidence suggests that trading partners, customer or suppliers who have

already adopted e-business are likely to force the firm to adopt and use e-business (Lai *et al*, 2007; Lin and Lin, 2008).

Network literature suggests that there are many reasons why firms seek to network. In a study of 22 South African firms De Klerks and Kroon (2007) identified the benefits of networking as shared knowledge, shared resources, pooled bargaining power, coordinated strategies, pooled risk, vertical integration and alliances. Mei-Mei and Moon (2008) carried a qualitative study involving five manufacturing firms in Hong Kong to evaluate the importance of strategic networks. He has observed that a strategic net work is necessary to maintain certain transaction specific investments.

Studies by Van der Veen (2004) and Tsai and Ghoshal (1998) have showed that networks provide a valuable resource for the conduct of social affairs and so appear to be a valuable source of new ideas, knowledge, support and other resources.

An enterprise's competitiveness is dependent on the collective performance of the partners and agents in the network (Gadde *et al,* 2003). According to Mei-Mei and Moon (2008) networking works better in organisations with the same cultural orientation, that is, same values, level of commitment, technology and innovation orientation) therefore is seen as a driver of technology and e-business adoption.

The importance of networking in the adoption of e-business by manufacturing firms was studied by Tatiachi *et al*, (2012). They carried a longitudinal study of Italian manufacturing firms and observed that networks have become increasingly important to circumvent the increasing competition due to globalisation. They observed that manufacturing firms are encouraged to offshore processes and activities to exploit comparative labour costs, secure access to critical resources and seek world class competences. As a result, the need to

network with enterprises across the world has become a driver to adopt advanced information technology and e-business in the developed world.

Literature has shown that there is need for organisations in both developed and developing countries to network due to globalisation. However, there is lack of empirical evidence in developing countries that links networking and adoption of e-business. Studies in developing countries have only identified the reasons for networking by organisations and not how they have benefitted from the networking.

2.3.1.3 Technological factors

Technological factors are forces that are related to the existence of certain equipment, processes or innovation in the firm and impact on the firm's performance. Tornatsky and Fleischer (1990) identified technological factors as the existing technologies in use and new technologies relevant to the firm. These technologies revolutionise the way firms do business by increasing the organisation's responsiveness and effectiveness.

The general information technology infrastructure and the ease with which these technologies can be acquired and used are drivers of e-business adoption. According to the Davis (1989) TAM, the general acceptance of a technology depends on its perceived usefulness or advantage.

2.3.1.4 Institutional factors

Institutional factors are variables that influence the definition and focus of the firm's legitimacy and include the mission, values and goals of the firm. A review of the institutional theory literature reveals that organizations face pressure to become isomorphic with the environment as they compete for the dwindling resources and the more discerning customers. This environmental isomorphism is needed to sustain legitimacy and the ability to secure more resources (Jeyaraj *et al*, 2004). Literature categorises this pressure as coercive pressure,

normative pressure and mimetic pressure (DiMaggio and Powell, 1983; Jeyaraj *et al*, 2004; Bakko and Sohal, 2008).

Coercive pressure emanates from the regulatory bodies, industry associations or resource-dominant organizations compelling their affiliates, partners or resource constrained organizations to adopt a particular innovation, and in this case e-business. Normative pressure results from expectations of professionals regarding how work should be conducted (Jeyaraj *et al,* 2004). For example, the appointment of a senior IS executive in the organization legitimizes e-business adoption.

Mimetic pressure arises as a result of the need to emulate what the other organizations are doing either because of 'peer pressure' or the organization simply wants to follow what the leaders are doing. This 'bandwagon' effect may influence the adoption of e-business instead of the perceived potential benefits. This was the case of the late 1990s-early 2000s period when most organizations in Europe and USA adopted websites (Wu, Mahajan and Balasubramanian, 2003).

E-business adoption due to institutional pressure can also arise as a result of the threat of lost legitimacy because a large number of businesses have already done so. Therefore adoption of e-business is on the account of fear of loss of legitimacy and not potential efficiency and returns, (Wu *et al*, 2003).

Studies by Jeyaraj *et al*, 2004 confirmed that institutional pressure is closely associated with the organisation's identity. This means that organisations that are more customer centric or innovative tend to be more responsive to institutional pressure from stakeholders for the adoption of e-business.

2.3.2 Organisational factors and adoption of e-business

There are many factors which may affect the intention, speed and scope of e-business adoption and usage. These factors according to the e-business literature adoption include the organisation's innovation orientation, financial resources, information technology resources, perceived usefulness of e-business and size.

2.3.2.1 Innovation orientation

Innovation orientation is the disposition of the organisation towards new ways of doing things in the hope of serving the customers better (Hult *et al*, 2004). Innovation oriented organisations asset that customers will prefer those products and services that will provide the greatest quality, performance and features (Berthon *et al*, 2004). Few studies have categorically linked innovation orientation with adoption of e-business, more so in the manufacturing sector.

2.3.2.2 Financial resources

Financial resources are unique assets that the firm can employ to meet its financial obligations. According to the resource-base view (RBV) theory (Barney, 1991), financial resources can give the firm a competitive advantage since they are unique and inimitable assets.

Literature on e-business adoption identifies the financial resources as one of the critical factors (E-Business Watch, 2007; Fillies, 2002; Van Berveley and Thompson, 2007). Limited financial resources have been linked to low e-business adoption in the European food sector (E-Business Watch, 2007). Contrastingly, in a qualitative study of five agri-food firms in Greece, Matopoulos, Vlachopoulou and Manthou (2010) observe that lack of financial resources was not a significant constraint to e-business adoption. Since a case study was used

the methodological weakness would not allow the findings to be generalised to the manufacturing sector in Greece, Europe or the entire world.

2.3.2.3 Firm's IT resources

The firm's IT resources consist of the technology infrastructure and the requisite IT human skills. Zhu and Kraemer (2005) describe these as the platform on which the Internet and related technologies can be established. If e-business is to be an integral part of the firm, these resources are needed (Oliviera and Martins, 2010). Since each firm can acquire them in a unique manner depending on other factors like availability of financial resources and level of support by top management, the firm's IT resources are a source of sustainable competitive advantage according to the resource-based view theory. Oliviera and Martins (2010) also observe that firms with a less developed IT infrastructure and poor IT human resources may perceive e-business as risky and may not adopt it.

In a study of 267 manufacturing SMEs in Spain to determine the effect of ICT on dimensions of firm performance, Bayo-Moriones, Billon and Lera-Lopez (2013), the findings show positive relationship between the adoption of ICT and firm performance measured as market share, profits and margins.

2.3.2.4 Size of the firm

The innovation and adoption literature shows that size of the firm is one of the most studied factors of e-business adoption. However, empirical studies reveal contrasting effects of this variable on e-business adoption. Table 2.3 shows the impact of size of the firm on adoption of an innovation. For example, Askarany and Mal (2008) and Levenburg (2005) found that size of the firm was significant in the adoption of IT. To the contrary, Oliviera and Martins (2010) and Martins and Oliviera (2007) found that size of the firm has an insignificant effect on the adoption of e-business.

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Table 2.3: Impact of firm size on adoption of an innovation

Researcher	Innovation	Impact on adoption.
Askarany and Mal (2008)	IT	Significant
Levenburg (2005)	IT	Significant
Thompson (2007)	Internet	Significant
Teo and Tan (1998)	Internet	Significant
Tigre (2003)	Website	Significant
Aquaila-Obra and Padilla-Mendez (2006)	Internet	Insignificant
Oliviera and Martins (2010)	E-business	Insignificant
Martins and Oliviera (2007)	E-business	Insignificant

Size of an organisation comprises measures such as annual sales, total assets, total revenue or number of employees. However, for most businesses size refers to the number of employees as the other measures change more frequently than changes in the number of employees (Askarany and Malcom, 2008). Therefore, defining size using such volatile factors may result in the firm classification each year.

The size of a firm is perceived differently from one country or region to the other. In Europe, small enterprises employ between 5 and 50 people, medium enterprises engage 50-100 people and large enterprises engage above 500 people. In Australia, entities must have more than 600 employees to be considered large, 200-600 employees to be medium and 50-199 to be considered small (Askarany and Malcom, 2008). In Zimbabwe, firms with 100 or more employees are considered large, 50-99 are medium and 10-49 are small (SEDCO, 2010).

The issue of country or region becomes important when we want to evaluate the effect of size on the adoption of e-business, hence the need to assess its impact in each country in spite of some empirical findings from other countries.

The impact of the difference in size of firms on e-business adoption has been widely discussed in literature. Large firms have the advantage of greater ability to afford capital, better managerial and technical capability (Askarany and Malcom, 2008). However, small firms offer less bureaucracy, more motivation, and more innovativeness.

3.2.5 Perceived usefulness of e-business

Perceived usefulness (PU) is one of the key constructs in the Technology Acceptance Model (TAM) by Davis (1989) and has been used in many studies involving TAM or extended TAM models. PU is defined as the extent to which using a particular innovation will enhance the job.

Many empirical studies have examined the impact of perceived usefulness of e-business on the adoption of e-business and most results have confirmed a positive relationship between these variables. For example, Smith and Spiers (2009) and Smith (2008) observe that perceived usefulness was significant in the adoption of the website. Savitskie *et al*, (2007) and Morosan and Jeosang (2008) using a modified TAM have found that perceived usefulness was significant in the adoption of e-business. Other empirical studies that found perceived usefulness to be significant in the adoption of e-business were done by Park *et al,* (2012), Kim (2012), Thompson (2007), Shin (2007) and Grandson and Pearson (2004).

2.3.3 Managerial factors

2.3.3.1 Experience

The ability to acquire outside knowledge is a function of previous knowledge or experience (Van de Veen, 2004). Therefore previous experience with IT or e-business is a basis for judging the added value of e-business. Studies by Lai (2002), Nambisan and Wang (2000), and Gragg and Mills (2001) have shown a positive relationship between experience and e-business adoption.

2.3.3.2 Managerial attitudes

An attitude is a predisposition to respond favourably or negatively towards an idea, person, object or situation. It influences the individual's choice of actions (Business Dictionary, 2012). In studies of managerial behaviour towards IS innovations, attitudes have been seen to play a critical role in influencing the adoption. For example, Li and Xie (2012) have observed that two firms with the same level of resources and operating in the same context might have different adoption decisions due to influences of managerial attitudes. However, few empirical studies have investigated the role of attitudes in e-business adoption in manufacturing firms.

Most of the studies on managerial attitudes and adoption of an innovation used the TOE framework only (Almoawi and Mahmood, 2012; Huy, 2012 and Li and Xie, 2012) and very few studies have used the TAM or DoI models. It can be hypothesised that perceived usefulness, perceived ease of use which are the constructs in the TAM model should have an impact on attitude development. Mndzeke (2013) applied the TAM to the study of attitudes of 332 hotel managers towards e-commerce in South Africa. He wanted to examine what determines managers to have a positive attitude towards e-commerce and the extent to which attitudes affect possibility of an organisation adopting e-commerce. He used a quantitative design and observed that there was a significant positive relationship between manager's attitudes and extent of e-commerce adoption. This research can be replicated for the manufacturing sector and focusing on e-business since it is broader than e-commerce.

Rosnafisah, Salbiah and Sharifuddin (2010) have studied managerial factors affecting e-business adoption in Malaysia. Their study revealed that negative attitudes affect adoption of e-business. They also revealed that attitudes are affected by lack of knowledge and skill, lack of awareness, perception and inadequate infrastructure. The study used quantitative and

qualitative designs which may allow for the generalisation of the results. The study focused on small firms only and so may not be of significance to large manufacturing firms.

In studies of e-commerce adoption in Vietnamese SMEs, Huy (2012) used the TOE framework to determine the role of managerial attitudes in 926 firms. He observed that positive attitudes towards an innovation positively impact e-commerce adoption. This was a large scale study to get a comprehensive view which would allow generalisation of results. The study also demonstrated that the TOE framework provides a basis to determine adoption factors. Study was carried in a developing country and whose economy was in transition from socialism to capitalism.

Other studies were carried in Australia (Gani and Toleman, 2006) and Saudi Arabia (Almoawi and Mahmood, 2012) and confirmed that managerial attitudes are a major barrier in adopting e-business.

2.3.3.3 Managerial commitment

The role of top management commitment for the successful adoption of an innovation has been widely studied across industries and different countries. Thatcher, Foster and Zhu (2006) in a qualitative study of High-Tech manufacturing firms in Taiwan have observed that management commitment does not only influence the adoption of the innovation but the extent and type of technologies adopted. Management commitment has been linked to resource commitment and deployment, (Sull, Tedlow and Rosenbloom, 1997). Studies on commitment show that once managers are committed, they weave a wave of implicit and explicit social commitment to employees, customers and communities such that breaking of the commitment bruises the manager's social ego.

In a study of ICT adoption and implementation in the construction industry, Peansupap and Walker (2006) have also observed that management commitment is critical in the adoption of

ICT. They have further noted that the individual and organisational level of adoption rests with top management level of commitment.

In a related study of the Tour and Travel firms in Kenya, Wanjau, Macharia and Ayogo (2012) have observed that managerial commitment influences adoption of   e-commerce. In the large scale manufacturing sector in Kenya, Mose, Njihia and Magutu (2013) have carried a cross-sectional survey of 46 manufacturing firms and observed that management commitment was among the key success factors of e-procurement adoption.

The above studies on role of commitment in the adoption of an innovation have shown that managerial commitment influences the adoption and usage of an innovation. Most of the studies focused on role of managerial commitment on the adoption of ICT, IS, e-procurement or e-commerce. Since e-business is broader that e-commerce or ICT application and may require more resources, it becomes necessary to assess the extent of the role of managerial commitment towards the successful adoption of e-business. Furthermore, very few studies have focused on the role of managerial commitment in the adoption of e-business in manufacturing firms. A special focus on the manufacturing sector is necessary since it is unique in that it has specific back- end and front-end e-business activities which are not applicable in other sectors.

2.3.3.4 Perceived risk

Risk is defined as the probability of an adverse future multiplied by the magnitude (Oltedal, Moen, Klempe, and Random, 2004). Factors which influence the perception of risk include familiarity with the technology (Oltedal *et al,* 2004) and socio-cultural issues, (Salam, Rao and Pegels, 2003). This means that the perception of risk as a social phenomenon is dependent on the individual manager, organisation, industry and country experiences.

Most of the studies on the effect of perceived risk on adoption of an innovation have focused on consumer perceived risk (Salam, Rao and Pegels, 2003; Featherman and Fuller, 2003; Choi and Lee, 2003; Snoj, Korda and Mumel, 2004) and very few have focused on the manager's perceived risk (Noy and Ellis, 2003; Scott, 2004). For example, studies by Noy and Ellis have focused on whether managers consider risk as part of strategy formulation. They have used both quantitative and qualitative approaches to gather data from 93 top Israeli executives from various sectors of the economy. The study has found that 82 % of the managers consider risk an important component of strategy formulation while 13% are indifferent. The study therefore concludes that managers consider the aspect of risk in their decision making and are not prepared to take any risk. On the other hand, Scott (2004) in a study of 200 participants has identified dimensions of perceived e-business risk as strategic risk, policy risk and organisational risk. Although he has contributed in raising awareness of the types of e-business risks, he has not clarified the extent to which the risk influences the adoption of e-business. He has also not clarified why one technology is feared in one society or social context and not in the other Rippe (2002). This is because the studies have not been linked to the cultural theory.

The study of risk can be linked to the fields of Psychology and Culture through the cultural theory (Douglas, 1978) if we are to explain perceived risk as a social phenomenon. The cultural theory explains perceived risk as closely tied to culture and social learning. According to this theory, people choose what to fear and how much to fear depending on the newness of the technology, control over risk and immediacy of effect (Oltedal *et al*, 2004) voluntariness of risk and benefits of taking the risk (Schmidt, 2004). Therefore, previous studies linking perceived risk and e-business adoption have not considered how these elements of the cultural theory could be used to explain adoption or non adoption of e-business.

The main factors in the perception of risk identified by Schmidt (2004) in his study of genetically modified organisms (GMOs) are 1) *voluntariness*- the chance of the risk (e-business) being chosen voluntarily because of perceived usefulness, 2)-*controllability*-how controllable the (e-business) activities are. The presence of appropriate skills engender trust and a feeling of control over the situation, 3) *familiarity*-how perceived risk from (e-business) activities is reduced due to habituation. E-business related perceived risk decreases with exposure to e-business practices and 4) *benefits*- (e-business) related risks perceived to have clear benefits are more likely to be accepted than those perceived to have little benefits. The benefit becomes the 'risk compensation'.

It is clear, therefore, that with increased voluntariness, controllability, familiarity and perceived benefits, genetically modified organisms (GMOs) were adopted. These variables were adopted to assess whether perceived e-business risk is not reduced leading to adoption of e-business if there is voluntariness, controllability, familiarity and perceived benefits. This is what previous studies on e-business adoption have not empirically tested.

2.4 THE FIRM'S COMPETITIVE ADVANTAGE

*2.4.1*Concept of Competitive Advantage

Since 1980 when the concept of competitive advantage (CA) was coined and popularised by Michael Porter, there has been a wide publication and debate on this concept. Topical issues have been on how to assess an organisation's competitive advantage (Christensen, 2010), sources of competitive advantages (Heywood and Kenley, 2008; Morabita, Themistocleons and Serrano, 2009; and Christensen, 2010), levels of competitive advantage (Ren, Xie and Krabbandom, 2010) and how to sustain the competitiveness of the organisation (Ren, Xie and Krabbendam, 2010). These debates show the criticality of this concept in management and that competitive advantage (CA) is a central theme in the achievement of long term goals of the organisation.

It is therefore important to make an analysis of this concept. Scholars and researchers agree that organisations need to have a competitive advantage for them to do better than the competition.

Christensen (2010:22) views competitive advantage as "whatever value a business provides that motivates its customers (or end users) to purchase its products or services rather than those of the competitors and that poses impediments to imitations by actual or potential direct competitors." Three critical issues image from this definition. First, competitive advantage is seen as an external measure. It is the perception of the outsiders which determines the organisation's competitive position. Passemard and Kleiner (2000) support this position when they say that 'a firm creates a competitive advantage by optimising and coordinating its existing external relationships'. Second, it focuses its attention on the customer's decision to purchase, that is, enables a better way of transacting. Third, it focuses on both tangible and intangible aspects that drive business performance. Usually attention is given to tangible performance characteristics such as profit, (Christensen, 2010). Fourth, it focuses attention on customer's decision to purchase. This means that the bottom line of any competitive advantage is its ability to enable a satisfactory or better level of sales.

Heywood and Kenley (2009) view competitive advantage from two perspectives. The first is a market-based position which defines competitive advantage as the organisation's ability to generate performance superior to other organisations with similar value offerings in the market. This definition is also supported by Hamel and Prahalad (1994). Even Christensen's definition discussed above brings out this market-based perspective when he states, "... whatever a business provides which motivates customers to purchase its products..."

The second perspective of competitive advantage by Heywood and Kenley (2009) is where competitive advantage is equated to the organisation's sustainable growth relative to its

competitors, that is, it is competitor-based. According to this perspective, an organisation outperforming its competitors is said to enjoy a competitive advantage over them. This is echoed by Bartol and Martin (1994: 37) who say, "A tall tree in a low forest is bound to be lucky in getting more sunlight and air and grow further. It is said to have competitive as well as selective advantage. Similarly, Christensen (2010: 24) summarises it by saying, "some of the business world's greatest successes are enabled by poorly-performing competitors." The competitor-based perspective focuses on the organisation's internal environment, that is, how the resources and capabilities are used to account for the organisation's competitive position. This position supports the resource-based view proposed by Barney (1991).

Therefore, if an organisation has a practice, resource or asset which it can employ to improve its competitive position in the marketplace, is said to have a competitive advantage. In this 21st century competitive advantages have been established through mergers, acquisitions, strategic partnerships, supply and distribution channel management (Hamel and Prahalad, 1994) as well as continuous improvement and innovation (Han *et al*, 1998).

However, not every practice, resource or asset can create a competitive advantage. As Ren, Xie and Krabbendam (2010) observe, these resources, assets and practices must not be capable of being imitated or replicated successfully by a competitor. This was premised on assertions by Barney (1991) that the firm's resources needed to have some form of rareness, value and the inability to be substituted if a sustainable competitive advantage is to be created.

2.4.2 Sources of Competitive Advantage

Porter (1980) identified cost and differentiation as primary sources of competitive advantage. Porter's classic model identifies overall cost leadership with focus on organisational

efficiency, tight cost control and cost minimisation as tributaries of the entire competitive strategy. As alluded to earlier in section 2.2.5, the main focus by the organisation in controlling the costs are its inbound logistics, operations, outbound logistics, marketing and services. Therefore, effective cost control measures along the supply chain increase the organisation's competitive advantage. E-business has the propensity to cut costs along the supply chain through enhanced integration and coordination of supply chain activities (Gimenez and Lorenco, 2008; Yin and Khoo, 2007; Cagliano, Caniato and Spina, 2005).

Differentiation as a source of competitive advantage arises from the perceived uniqueness of goods and services in the entire industry. This uniqueness stems from product unique benefits, branding, new technology acquisition, tailor-made customer service and so on. Since manufacturing firms are no longer providing goods only, but services as well, servitisation has become a source of competitive advantage because services are difficult to imitate (Graham and Smart, 2010). Services are also becoming highly digitised and this lowers production and distribution costs (Bryne, 2012). The high margins associated with the specialised services and differentiation make them a source of shareholder value (Bustinza, Parry and Herrero, 2013).

While the competitive advantage can be cost (price) or differentiation-based, Christensen (2010) suggests that a business strategy can combine these two, for example, a differentiated product can be offered at a low cost. Alternatively, an undifferentiated product can be offered at a high price to recoup developmental costs. This means that, regardless of the production costs as suggested by Christensen (2010: 24), "Products should be priced based on the customer's perception of the value created."

2.5 E-BUSINESS INVOLVEMENT AND APPLICATIONS

2.5.1 E-business involvement

From the social judgement theory perspective, which has its roots in social psychology (Sherif and Sherif, 1967), involvement entails change of an individual's attitude towards an object when a benefit is perceived. In the case of an organisation, acceptance of a position of change occurs when there is a discrepancy between its current position and the anticipated position when using the object (Beatty, Homer, and Kahle (1988). Involvement in marketing has been seen as overlapping with terms such as commitment, importance and cognitive effort (Coulter *et al*, 2003).

Involvement literature has paucity of information on the concept of e-business involvement. However, by inferring to the earlier discussions in social psychology and consumer behaviour, e-business involvement can be defined as the degree to which an organisation adopts and uses e-business applications. This involvement is goal-directed and is aroused by a particular cause such as perceived risk or perceived benefits Beatty *et al,* (1988).Thus, the more an organisation perceives benefits from e-business, the more committed it becomes to adopting e-business applications and the more the resources it allocates for that purpose.

2.5.2 E-business applications

Since the adoption of the Internet and its related technologies by the industry in 1996, its applications in business have increasingly become diversified, ranging from industrial system automation (ISA), supply chain management (SCM), customer relationship management (CRM) to collaboration for competitiveness (Laudon and Trevor, 2008). In relation to e-business, the major applications have been taking orders, receiving payment, delivery, after sales service, inventory and non-inventory purchasing, recruitment, internal communication, external information search, connectivity and interactivity (e-Business Watch, 2005; 2006; 2009; Vlaucho, 2003; Laudon and Trevor, 2008).

With respect to the manufacturing sector, specific e-business applications include the enterprise resource planning (ERP), procurement and supply chain management, online invoicing, e-marketing and sales, e-integration of the marketing process and online cooperation and collaboration (e-Business Watch, 2009). Table 2.4 presents the major categories of e-business application.

Table 2.4   Categories of e-business activities

E-BUSINESS APPLICATION	ACTIVITIES
E-mail	Online communication via the mail
Website	Web access, extranets, online product display, access to online company information, receiving orders, sending orders.
Enterprise Resource Planning (ERP)	Online product planning, management of inventory, new product development (NPD), human resource planning.
Customer Relationship Management (CRM)	Accessing online database, online customer feedback, online cooperation and collaboration.
Supply Chain Management (SCM)	Online ordering, invoicing, payment and delivery. E-procurement, online auctions and materials handling.
Intra-firm communication and collaboration	Intranets, online information sharing, cooperation and collaboration.
Online Marketing	Online marketing intelligence, information gathering, new product development, distribution, promotion, buying and selling.

Source: **e-Business Watch, 2006.**

2.5.1 Enterprise resource planning (ERP)

Enterprise resource planning systems are software systems that help to integrate all major business activities within the firm (e-Business Watch, 2006). The activities include product planning, purchasing and the management of inventory, human resources, project and finances. The systems link the business processes across functions and thus help to improve

operational efficiencies. Due to the high cost and expertise involved, there is a higher ERP application in larger manufacturing firms than smaller ones (e-Business Watch, 2006).

2.5.2 **E-procurement and supply chain management**

E-procurement involves making orders from the supplier's website. This may be the first step towards e-business as it does not require integration with other systems (e-Business Watch, 2006). In a study of the European Union (EU) manufacturing firms, the e-Business Watch has observed that 76% of the surveyed firms invite suppliers to quote prices online, 69% place orders online and 15% do online auctions, particularly for maintenance, repair and operating (MRO) supplies. However, the study has observed that e-procurement is highly dependent on product complexity.

2.5.3 **E-invoicing**

In e-invoicing, the manufacturer generates and sends the invoice to the buyer electronically. The buyer would then receive, process and file the invoice. The method is faster compared to the traditional or manual invoices. The process can also be integrated with ERP thereby increasing efficiency. In a study of 1268 EU manufacturing firms, the e-Business Watch has found out that 61% of the firms use e-invoicing.

2.5.4 **E-marketing and sales**

The main activities in e-marketing and sales are new product development, selling online, communication with customers by means of online channels and online display of products (e-Business Watch, 2006). In new product development, new ideas are collected from various sources through the online means. This increases the number of sources and the value of the

information collected. Once the product has been produced, the firm displays its products online and then receive orders from the customers online. By 2006, about 64% of the EU manufacturing firms enabled customers to receive orders online (e-business Watch, 2006).

2.5.5 Customer Relationship Management (CRM)

This e-business application allows firms to use ICTs in customer relationship management (CRM) (Vlachos, 2004). CRM is a broad range of activities designed to manage relationships with customers in a well-coordinated way through the use of a database (e-Business Watch, 2006). Thus, we have *operational CRM* which supports the front office by providing basic data on customer characteristics, attitudes and behaviour; *analytical CRM* which analyses data gathered through operational CRM in order to understand the markets, and *collaborative CRM* which facilitates interface with customers through online channels (e-Business Watch, 2006). The study by the e-Business Watch has revealed that 41% of large firms and 33% of small firms in the EU use CRM. If firms in the developed world have such a low application of CRM, it would be interesting to see the status of firms in the developing countries. However, there is paucity of information on specific applications of e-business, tools that are applied and the benefits of that application to firms in developing countries given the different levels of development of these firms even those in the same sector.

2.5.6 Online cooperation and collaboration for competitiveness

 The cooperation and collaboration take place within the value chain system among the industry players (e-Business Watch, 2006). Players in the industry collectively and collaboratively participate in information sharing, design and forecasting. According to Baker (2006), this is collaboration at the highest level and is a source of a sustainable competitive advantage.

2.6 FIRM PERFORMANCE MEASURES

Business processes are implemented at a cost to the firm. It is, therefore, important to assess how such processes can create value for the firm. As such, firms are increasingly becoming interested in measuring their performance.

Performance measurement "is the development of indicators and collection of data to describe, report and analyse performance" (Julnes, 2007:7). It is concerned with quantifying the efficiency and effectiveness of business processes (Chong, 2013). The US Department of Energy has viewed performance measurement as the process of measuring performance of a firm, a programme, function or process (US DOE, 2012).

Performance indicators are variables developed to measure outcome or output from various processes. They are useful in determining the level to which a firm has achieved set objectives. Trochin (2006) says that the indicator must be relevant to the process, be easily understood by any person involved in the project and must be easily measured. This must be capable to measure qualitative or quantitative aspects of the process.

2.6.1 E-business performance measurement

Once e-business applications have been adopted, it is necessary to measure their contribution to the overall growth of the firm and to assess their value to the business. E-business performance measurement focuses on efficiency and effectiveness of the e-business processes (Chong, 2013).

2.6.1.1 **E-business efficiency**

E-business efficiency is the speed of performing a task or how cost-effective the processes are in achieving a particular task using the Internet (Chong, 2013). It can be defined as the ratio of output to input. Therefore, e-business applications or processes are said to be efficient if they maintain the output with less than appropriate increase in inputs or alternatively, they

produce more without a corresponding increase in inputs. This can be achieved by reducing inefficiencies in the processes.

The effect of e-business on operational efficiency has had inconsistent results largely because of lack of clear e-business efficiency measures among the practitioners and scholars (Kumar and Peterson, 2005). Various e-business efficiency measures have been used in different e-business studies. For example, Wu *et al* (2003) and Minocha *et al* (2004) have used performance of the website, performance of e-business processes, performance of customers and link between business performance and strategy as measures of e-business efficiency. A study by Biloslavo, Bagnoli and Figeli (2012) has used productivity (with focus on asset productivity ratio, labour productivity ratio and material productivity ratio) and profitability (focusing on return on sales and return on total assets). Devemuto (2013) has adopted a broader perspective to e-business efficiency measures and has used traffic metrics, financial metrics and marketing metrics.

Traffic metrics are concerned with the measurement of the number of visitors to a particular website per given time and the web-pages viewed while on the website. This measure helps to identify traffic at given times such as per day, week or month. Specific marketing-mix strategies can then be adopted to align the business to the characteristics of each period.

Marketing metrics measure any change in customer behaviour as marketing campaigns are done and may include customers acquired, number of customers retained, sales volumes, and so on.

Financial metrics focus on revenue generated as a result of the business processes. These include return on investment (ROI), return on assets (ROA), return on capital employed (ROCE), sales revenue, and so on.

The Devemuto (2013) approach to e-business efficiency measures, although described as broad, it overlooks the intangibles such as customer services and internal processes. The Norton and Kaplan (1992) and the Balanced Score Card (BSC), when applied to e-business efficiency measurement, they appear to cover all the critical measures by focusing on financial, customer, internal processes and learning and growth metrics as shown in Table 2.5.

Table 2.5: **E-business efficiency measures using the Balanced Score Card**

Financial metrics	Customer metrics	Internal process metrics	Learning and growth metrics
Online revenue per customer Cost per customer online Cost efficiency of e-business	Number of satisfied customers Number of customers retained Number of new customers reached Number of customers visiting website	Availability of systems Volume of transactions processed Transaction processing time Transaction processing accuracy	Staff productivity Number of staff trained in new services Value delivery per employee

Source: Kaplan and Norton (1996)

Firms adopt an innovation to improve their performance and gain a sustainable competitive advantage. A sustainable competitive advantage is defined as a prolonged unique benefit accrued from the deployment of the firm's resources in a unique manner (Morabito, Themistocleous and Serrano, 2010). It cannot be duplicated by competitors.

Although firm e-business efficiency is largely measured in financial and marketing terms (Wu *et al*, 2006; Ranchold, 2006; Benitez-Amando, Llorens-Montes and Perez-Anostegui, 2010), these financial and marketing variables are diverse and their interpretation may vary

from industry to industry and country to country (Ranchold, 2006). The e-business efficiency financial measures commonly used include the return on investment (ROI), return on equity (ROE), return on assets (ROA), total profit, total margin, liquidity index and debt index (Morabito, Themistocleous and Serrano, 2010; Benitez-Amando, Llorens-Montes and Perez-Anostegui, 2010; Koo, Song, Kim and Nam, 2007; Zhuang, 2005). However, financial measures in as much as they are important in assessing performance, their use comes with challenges. First, the information is considered confidential and may not easily be available (Morabito, Themistocleous and Serrano, 2010). Second, the interpretation of the information is not consistent across industries and countries (Ranchold, 2006).

To overcome some of the limitations of the e-business efficiency financial measures, commercial or marketing measures are used. Marketing performance is the degree to which a firm is superior to the competition in terms of sales growth and market share (Wu *et al*, 2006). The specific sales growth and market share variables used to measure marketing performance include return on sales (ROS), new customer acquisition, customer retention, customer satisfaction and product adaptability.

The adoption of e-business by manufacturing firms should confer some unique efficiency gains to the firms in terms of both financial and marketing performance measures.

2.7 ADOPTION OF E-BUSINESS AND FIRM PERFORMANCE

Given the cost of adopting and implementing e-business in firms, there is increasing interest to understand the impact of e-business on firm performance. If e-business is to be perceived as a tool for competitive advantage, it should have impact on efficiency and effectiveness of the firm operations. A considerable number of studies have been undertaken to assess the impact of e-business on firm efficiency (Morabito, Themistocleous and Serrano, 2010; Hinton and Barnes, 2009; Koo, Song, Kim and Nam, 2008; Militaru and Romanoschi, 2008;

Zhuang, 2005; Moreno-Cerdan and Solo-Acosto, 2005; Hinton *et al,* 2003; Barnes and Vidgen, 2001). The findings of these studies are varied as there was no consistency in the use of efficiency measures; the industry sectors used were different and the countries in which the researches were conducted had different levels of economic development.

2.7.1 **E-business adoption and firm performance in developed countries**

Morabito, Themistocleous and Serrano (2010) and Barnes (2009) in studies to identify effective performance measures for e-business have observed process and customer metrics as key performance measures for e-business. In process measures, their focus was on production cost, transaction time, transaction volume, cost per transaction, response time and order fulfilment time. On customer metrics, they identified customer satisfaction, conversion rates, customer retention, sales volume and sales values as key variables. Merono-Cerdan and Solo-Acosto (2005) and Hinton *et al* (2003) had earlier identified process measures such as efficiency, transaction cost, coordination with chain partners and customer acquisition. Barnes and Vidgen (2001) in assessing e-business performance, they focused on website performance with focus on access, ease of navigation, efficiency, flexibility, reliability, responsiveness, trust, security, relationship development and customer experience. In all these studies, e-business efficiency measures appear to be associated with e-business adoption. However, their studies have not focused on whether efficiency changes with the increase in frequency of use of e-business tools or the variety of tools used (spread of application).

Although these studies have used different variables, it is important to note that there was a mixture of financial and marketing performance measures. This allowed for a fair assessment of the impact of e-business on firm performance since each measure has its inherent limitations. These studies, though carried out in developed countries, they have only shown that e-business adoption increases firm performance and, in particular, efficiency.

Other studies have linked e-business to sustainable competitive advantage. For example, in an empirical study of the relationship between IT and competitive advantage in manufacturing companies, 1,344 Japanese manufacturing firms listed on the Stock Exchange were surveyed (Makido, Kimura and Mourdoukourtas, 2003). The companies included Sony Corporation, Denso Corporation, Toyota Motor Corporation, Yamaha Motor Co, Epson, NEC, Shizouka Ltd and Nippon Sharyo.

It was observed that the adoption of ICTs alone did not give a firm a sustainable competitive advantage, particularly if the IT systems are transferable stand-alone technologies. Transferable stand-alone technologies as described by Makido *et al*, (2003) are those technologies which can be moved from one company to the other and which can be implemented without the internal and external corporation. Such systems include computer-aided manufacturing (CAM), computer-integrated manufacturing (CIM), hardware technology or telecommunication networks and can be easily imitated, and so cannot be a source of competitive advantage. Japanese firms which applied the CAM or CIM in the early 1990s to produce memory chips with low defect rates had a competitive advantage only for a few years because their US competitors caught up with them.

The study also showed that IT systems contribute to innovation and sustainable competitive advantage if they are fully integrated with all the company's operations, thus generating the causal ambiguity effect. They should accommodate empowerment and strategic alliances. By empowerment, business decision-making is decentralised and is placed on teams that are close to the customer. This ensures rapid response to customer needs, quality advantages, customer satisfaction and loyalty. On the other hand, strategic alliances ensure that there is creation of synergies among partners, leading to core-competence building, organisation imagination and creativity, and finally, organisational entrepreneurship (Baker, 2006). This stage creates sustainable competitive advantages for the firm and increased performance.

2.7.2 **E-business adoption and firm performance in developing countries**

The performance of firms as a result of e-business is affected by several factors which include the number of e-business applications, the usage rate of the e-business tools and the readiness of the market to use e-business tools. Since there is a gulf between the developed and developing countries with regards to these factors, it is important to assess how e-business adoption has affected the performance of manufacturing firms in developing countries. The first challenge is the limited number of studies that focused specifically on the manufacturing sector. Most studies have focused on the process of e-business adoption and not on the result of that adoption (e-business efficiency).

In an empirical study of 132 manufacturing firms in South Africa, Moodley (2005) has observed that most firms were still on the 'functional orientation'. At this stage, the firm's main focus is to improve efficiency and support existing business processes. According to Magretta (1998), this does not create a sustainable competitive advantage.

Moodley (2005) argues that only a few firms are using e-business to increase the organisation's effectiveness. These firms have clear e-business objectives and strategies. However, 68.2% had basic websites, 18.9% had an interactive website, 18.9% had a web-based customer service; 15.2% implemented the payment system and 20.5% applied supply chain logistics, and these figures are almost similar to EU figures for 2006 that were published by the e-Business Watch.

The stages of e-business development in a firm that were identified by Moodley are: (1) firm uses e-mail and general data exchange, (2) firm has a basic website in place, (3) firm has an interactive website established for two-way communication, (4) firm has a transactional website (used for transactions), (5) firm establishes a value-enhancing website for workers,

customers and suppliers, (6) firm has an integrative website (customers, suppliers and other stakeholders are connected through highly networked infrastructures).

From the study by Moodley (2005), although no firm South Africa had reached Stage 6, 8.3% were on Stage 5 while 15.2% were on Stage 4. Given the time that has elapsed after Moodley's findings, it is highly probable that some of these firms are now in Stage 6 and a higher number in Stage 5.

Moodley (2005) does not attribute the way most businesses are conducted on day to day basis to e-business evolution in South Africa. Instead, he strongly agrees with Miller *et al,* (2001) that there has been a tremendous adoption of value-added networks (VANs) and Electronic Data Interchange (EDI) in South Africa. According to (ITU, 2011), South Africa is the most networked society in Africa and has the highest level of ICT integration into existing work practices. This means that most developing countries may not have the e-business status as South Africa, and the performance of their firms may not be at the same level as South Africa.

South Africa can be seen to have reached 'maturity' in terms of telecommunication coverage, ISP connection, ICT educational programmes and adoption of value-added networks (VANs) as well as electronic data interchange (EDI). All these are precursors of successful electronic business application.

In a related study, Kumar and Peterson (2005) have examined the impact of e-commerce in lowering operational cost, and raising customer satisfaction. In other words, their study focused on the relationship between e-commerce and firm efficiency. The study involved surveying 58 firms in India and, used logistical regression. The findings have shown that e-commerce is becoming a driving force in improving customer service, particularly in large firms with substantial amounts of money to set up infrastructure that supports web-based

interactions. This study has concluded that there is a direct relationship correlation between the use of e-commerce and improved service. In other words, it suggests a direct link between e-business and business efficiency. However, this study has not focused on the link between the usage rate and e-business efficiencies nor the spread of e-business applications and e-business efficiencies.

The number of studies undertaken in developing countries linking e-business adoption and firm efficiencies is still very low to warrant conclusive generalisations about firm efficiencies that may be gained as a result of e-business adoption.

2.8 E-BUSINESS EFFICIENCY AND SUSTAINABLE COMPETITIVE ADVANTAGE

Literature on competitive advantage shows that firms that have gained a competitive advantage have higher profitability levels, bigger market shares and sales volumes than their direct competitors in the same industry. The competitive advantage stems from the external forces of Porter's five forces model (Porter, 1980) and internal factors in line with the resource-based view (Barney, 1991). The competitive advantage can only be sustainable if the resources used to generate it are rare, inimitable, unsubstitutable and have value (Barney, 1991). By gaining efficiencies through e-business, do firms automatically gain the sustainable competitive advantage?

There are inconsistencies in the findings of various studies undertaken to examine the relationship between business efficiency and the firm's sustainable competitive advantage. These inconsistencies are perhaps a result of different business efficiency measures that are used in different studies. The other explanation could be that different industries and countries have been used and these are influenced by different uncontrollable variables from the operating environment. In some cases, different methodological approaches have been used, leading to different results. For example, Keramidou, Mimus and Fotinopoulous (2013),

using a data decomposition approach to determine the relationship between efficiency and profitability in Greek meat processing firms, have not found a strong relationship between these variables. However, Kao and Hwany (2008) had previously used a data envelopment analysis (DEA) model in a similar study and had found a strong relationship between profitability and efficiency.

2.9 CHAPTER SUMMARY

The adoption of an innovation has been explained using various theories such as diffusion of innovation (DoI), Technology Acceptance Model (TAM) and Technological, Organisational and Environmental (TOE) framework that presented the predictors of innovation. Mixed results have been obtained to explain the relationship between these predictors and e-business adoption.

With respect to competitive advantage, the resource-based view (RBV) and the value chain (VC) models have been used to explain why some firms can gain a competitive advantage while others do not. Few studies have linked e-business adoption to sustainable competitive advantage.

CHAPTER 3

THE THEORETICAL MODEL

3.0 INTRODUCTION

In Chapter 2, an explanation on theories of adoption was given. The theories helped to identify some factors characteristic of the firm (DoI Theory), the environment (TOE framework) and both the environment and the firm (TAM) which help explain the adoption of e-business. In the same chapter, factors which are drivers of e-business adoption were identified. These are categorised as environmental, organisational and managerial (EOM) factors.

In this chapter, the main elements of the theoretical model of e-business adoption and sustainable competitive advantage are presented in Section 3.1. Then, in Section 3.2, the propositions to explain the relationships are posited. Finally, an overview of the propositions is given in Section 3.3.

3.1 E-BUSINESS ADOPTION MODEL

The study aims to identify the factors which explain e-business adoption and how a sustainable competitive advantage can be established in the manufacturing sector. The general proposition then is that, if a firm understands the factors that drive the adoption of e-business, a deliberate effort would be made to meet these. Furthermore, gaining of a sustainable competitive advantage is enhanced through knowledge of application of the right type of e-business tools. The competitive advantage and the innovation literature show that the number of processes applying the innovation, usage rate of the innovation and how the

innovation becomes part of the overall firm business strategy are important in gaining a competitive advantage which then can only become sustainable if it is inimitable and long-lasting.

From the review of the adoption literature, although there is no consensus on variables that affect e-business adoption, three major categories of variables emerge, namely *environmental, managerial and organisational (EOM)* (Rothwell, 2004; Steele and Murray, 2004; Zhu and Kraemer, 2005; Brown and Russel, 2007; Tsai, 2007; Kim, 2012). Therefore, in the proposed e-business adoption model, these were incorporated as the independent variables, and level of adoption of e-business becomes the mediating variable while the sustainable competitive advantage variable becomes the dependent variable. Previous studies have looked at the effect of these factors on   e-business adoption separately. Table 3.1 shows the overview of the selected managerial, organisational and environmental characteristics.

Since the second part of the research focuses on how e-business adoption can help establish a competitive advantage, the second part of the model shows the relationship between e-business adoption and competitive advantage. Studies on competitive advantage have shown that the competitive advantage gained from e-business adoption can vary from firm to firm, depending on usage rate, number of e-business applications adopted, knowledge of how to apply the innovation, and so on. In this case, the e-business adoption level as a mediating variable has an impact on the firm's competitive advantage.

Table 3.1: EOM characteristics which influence e-business adoption

Factor	Constructs
	Network pressure
Environmental	
	Technological factors
	Institutional factors
Organisational	Financial slack
	Firm's IT resources
	Perceived usefulness of e-business
	Size
	Innovation orientation
Managerial	CEO's perceived risk
	Managerial attitudes
	Experience
	Managerial commitment

Studies on competitive advantage have identified organisational competitive advantage and strategic competitive advantage as the major types of competitive advantage (Van der Veen, 2004) and may be gained sequentially in that order. Table 3.2 shows an overview of the identified mediating and dependent variables.

Table 3.2: Selected mediating and dependent variables

Mediating variable (e-business adoption level)	Dependent variable (Competitive advantage)
1. Number of e-business applications used.	**Organisational CA** (superior value related to time, cost and communication)
2. Usage rate (Intensity with which the e-business tools are used)	**Strategic CA** (superior value related to markets, products and services)
3. The spread of e-business tools in the firms business units.	

The literature review has given a provisional answer to the question: *Which factors explain the adoption of e-business and the gaining of a competitive advantage by manufacturing firms?* However, since no such research has ever been conducted in Zimbabwe, a theoretical model is presented to give answers to the same question for the manufacturing firms in Zimbabwe. Fig 3.1 shows the constructs and their proposed relationships in this theoretical model.

In Figure 3.1, the number between the brackets represents the proposition. The plus (+) sign indicates that the assumed relationship is positive.

This theoretical framework that was developed, basing on several adoption and competitive advantage studies of small and large firms (Daniel *et al*, 2002; Rothwell, 2004; Steele and Murray, 2004; Zhu and Kraemer, 2005; Sheath and Sharma 2005; Brown and Russel, 2007; Tsai, 2007; Oliviera and Martins 2010; Kim, 2012 and Peltier *et al*, 2012), has also drawn contributions from disciplines such as Strategic Management, Information Technology, Organisational Behaviour and Marketing.

In this framework, the independent variables or those variables that cause, influence or affect the outcome (Creswell, 2009) are the environmental factors (institutional pressure, technological factors, legal factors and competitive factors); organizational factors (innovation orientation, financial slack, availability of information technology resources, perceived usefulness of e-business, and size of the firm), and managerial factors (CEO's risk-taking propensity, managerial commitment, experience of the CEO and the CEO attitude-related factors. The intervening or mediating variable is the level of adoption of e-business and mediates the effect of the independent variables on the dependent variable. The level of adoption of e-business can be low, moderate or high, depending the number

of e-business applications that are adopted, the spread of the applications of e-business in the firm and their usage rate in the firm.

The dependent variable is the sustainable competitive advantage (SCA) and is the outcome of the influence of level of e-business adoption. This sustainable competitive advantage can be organisational (speed and cost of doing business; level or extent of communication with customers) or strategic (level of firm's profitability, market share, sales volume, perceived image, customer acquisition and retention) (Van der Veen, 2004). Figure 3.1 shows the relationship of all the aforementioned variables.

Figure 3.1: The e-business adoption and competitive advantage model

Environmental factors

- Network pressure
- Technological factors
- Institutional factors

+ (1a, 1b, 1c,)

Organisational factors

- Innovation orientation
- Financial slack
- Firm's IT resources
- Size
- Perceived usefulness of e-business

+(2a, 2b, 2c, 2d,2e)

Managerial factors

- Attitude related factors
- CEO's perceived risk
- Experience
- Managerial commitment

+(3a, 3b, 3c, 3d)

E-business Adoption

# of e-business applications

Spread

Usage rate

4a,4b,4c

E-business efficiency

5b

Sustainable competitive advantage

Network pressure

Networks are composed of individuals and organisations that are connected to one another (Liu, Madhavan and Sudharshan, 2005). Forces and actors in the firm's network may exert influence on the firm to adopt e-business (der Veen, 2004). The components of this variable include external pressure from trading partners, customer and supplier pressure as well as the competitive pressure (Sadowski *et al*, 2002). On the basis of the preceding evidence from network literature, the researcher posits that network pressure positively influences adoption of e-business in the manufacturing sector.

1(a): There is a significant positive relationship between network pressure and level of adoption of e-business.

Technological factors

Technological factors are forces that are related to the existence of certain equipment, processes or innovation in the firm and impact on the firm's performance. Changes in technology revolutionise the way firms do business by increasing the organisation's responsiveness and effectiveness. The Internet, for example, allows firms to save money and time for both providers and users of products (Rudall and Mann, 2008). This results in the proposition that the existence of favourable technological factors is positively related to the adoption of e-business in the manufacturing sector.

1(b): There is a significant positive relationship between the existence of favourable technological factors and level of e-business adoption.

Institutional factors

Institutional factors are variables that influence the definition and focus of the firm's legitimacy and include the mission, values and goals of the firm. Organisations should be seen to respond positively to the demands of their stakeholders such as customers and

suppliers. Pressure based on social, industry or regulator expectations operate strongly in the adoption of an innovation (Kyu-Nahm and Weare, 2010). As such, institutional pressure can come from outside powerful entities such as governmental bodies, industry associations, business media, buyer and supplier associations (Wang and Cheung, 2004). Firms with a high desire to attain an institutional legitimacy are likely to be early adopters of an innovation. In accordance with prior research, the following proposition is given: Institutional factors positively influence the adoption of e-business in the manufacturing sector.

1(c): There is a significant positive relationship between institutional factors and the level of adoption of e-business.

Innovation orientation

An innovation is an idea, practice or object that is perceived as new by an individual or other unit of adoption (Roders, 1995). Linder *et al* (2003: 44) define an innovation as "the implementing of new ideas that create value". This means that our current desires and needs cannot be fully satisfied with yester-year solutions. There is need to think of new solutions and new ways of achieving them. Without innovation, firms would find it difficult to compete in this rapidly changing and increasingly complex environment (Simmons and Sower, 2012).

Innovation orientation is the tendency of the firm to adopt and implement new ideas, and the leadership of the firm is held responsible for the level of the firm innovation (Becker, 2006). Our next proposition is that the firm's innovation orientation is positively related to the e-business adoption in the manufacturing sector.

2(a): There is a significant positive association between innovation orientation and level of adoption of e-business.

Financial slack

The size of the firm's budget and its liquidity level are contextual variables that determine the success of e-business adoption by firms (Wang and Cheung, 2004). The kind of investment a firm can make and the type of strategy the firm can adopt is largely dependent on its ability to mobilise financial resources to finance the investment or the strategy. Therefore, the next proposition is that the firm's financial slack is positively related to the adoption of e-business in the food manufacturing sector.

2(b): There is a significant positive association between the firm's financial resources and level of adoption of e-business.

Firm's Information Technology (IT) resources

The firm's IT resources include the technical and the human component (Wang and Cheung, 2004). The technical component comprises the IT infrastructure installed by the firm while the human component consists of the knowledge and skills related to IT which the employees have acquired. As observed by Morrison and King (2002) and Seabra, Abrantes, and Lages (2007), inadequate IT infrastructure and low levels of IT-related knowledge and skill have a negative impact on ICT adoption. Adequate IT facilities and high levels of IT-related knowledge are likely to be drivers of e-business adoption. Therefore, the study proposes that the firm's information technology (IT) resources have a positive relationship with e-business adoption in the manufacturing sector.

2(c): There is a significant positive association between the firm's information technology resources and the level of adoption of e-business.

Perceived usefulness

Perceived usefulness is the degree to which the user of a new innovation believes the task and or the work performed is enhanced by specific technologies or processes. Studies by Davis

(1989) and Van der Veen (2004) show a positive relationship between perceived usefulness and the intention to use the innovation. Therefore, based on these studies, the study posits that perceived usefulness is positively related to the adoption of e-business by firms in the manufacturing sector.

2(d): There is a significant positive association between perceived usefulness and the level of adoption of e-business.

Firm size

The firm size has often been regarded as one of the main determinants of the adoption of Information Communication Technologies (ICTs) in firms (Bordonaba-Juste, Lucia-Palacios and Polo-Redondo, 2012; Thompson, 2007; Prekumar, 2003). However, microenterprises, small and medium enterprises as well as large enterprises, cannot adopt e-business at the same rate due to differences in financial limits and inertia levels. Microenterprises, for example, are likely to be more constrained by financial resources when it comes to e-business adoption but appear to be more decisive than the large enterprises (Kundi and Shah, 2009). Therefore, it follows that the firm size exerts an influence on the firm's e-business adoption in the manufacturing sector.

2(e): There is a significant positive association between the firm size and the level of adoption of e-business.

Attitude-related factors

 An attitude is a predisposition to behave in a consistently favourable or unfavourable way towards an object (Schiffman and Kanuk, 1997). The attitude towards e-business is influenced by several factors such as prior experience or knowledge of ICTs, availability of resources and perceived benefits. Therefore, it is posited that attitude-related factors have a positive influence on the adoption of e-business by firms on the manufacturing sector.

3(a): There is a significant positive association between attitude-related factors and the level of adoption of e-business.

CEO's/ manager's perceived risk

Perceived risk is the uncertainty that companies face when they cannot foresee the consequences of e-business adoption. These risks, according to the research by Liebermann and Stashevsky (2002), are technological, security, social, financial and lack of physical conduct. In large firms, the risk-taking propensity of the CEO is mitigated by other senior managers since decision-making is not centred on one person (Wang and Cheung, 2004). It is proposed, therefore, that the CEO's perceived risk is positively associated to e-business adoption in the manufacturing sector.

3(b): There is a significant positive association between the CEO/manager's perceived risk and the level of adoption of e-business.

Managerial experience

The term, managerial experience, may be taken to refer to the contact with the real-world practice of setting goals and targets, coordinating the work of others, undertaking the responsibility to improve performance of people, processes and technology and having the responsibility for meeting financial budgets. Managerial experience makes the firm more innovative (Bayo-Moriones and Lera-Lopez, 2007). High knowledge of ICTs is positively correlated to the adoption of information technology (IT) systems (Bertschek and Fryges, 2002). If managerial experience is positively correlated to IT adoption, then they could have an impact on e-business adoption and firm performance through establishment of a firm's sustainable competitive advantage. Therefore, our proposition is that managerial experience positively influences the level of e-business adoption and, consequently, performance of the firm in the manufacturing sector.

3(c): There is a significant positive association between the managerial experience and the level of adoption of e-business.

Managerial commitment

Managerial commitment has been defined in many different ways by different authors. The definitions include the following: "binding of an individual to behavioural acts" (Salancik, 1997); "psychological state which defines the relationship between the individual and the organisation" (Meyer and Allen, 1997); "persistence of strategies" (Ghemawat, 1991). Managerial commitment literature shows that commitment can be affective, continuance or normative (Lamsa and Savolainen, 2000). Affective commitment is the emotional attachment to the project or task by the manager. Thus a manager with an affective commitment for e-business adoption is identified with the project and commits resources to it until it succeeds. Contiuance commitment is related to the awareness of costs of abandoning a project or task (Lamsa and Savolainen, 2000). Thus managers with a continuance commitment will not abandon the task or project until it is complete. Finally, normative commitment is the moral obligation of the manager to be involved in activities that improve the performance of the firm. Commitment literature identifies a correlation between commitment and performance of the firm, though this correlation can be negative or positive, depending on what the manager is committed to. The eighth proposition is that managerial commitment to innovation positively influences e-business adoption and performance of the firms in the manufacturing sector.

3(d): There is a significant positive association between managerial commitment and the level of adoption of e-business.

Having identified the factors affecting e-business adoption through the literature review, the second part of the research focuses on the relationship between e-business adoption and

sustainable competitive advantage. The e-business adoption literature identifies many variables that enhance the establishment of a competitive advantage. However, this study focuses on the number of e-business applications adopted by the firm, their spread in the firm and their usage rate.

Number of e-business applications/ technologies

Firms adopt e-business to meet certain needs within the organisations. Given the high investment cost associated with e-business, involvement in e-business is driven by the desire to achieve set goals. It then follows that with high business targets, the firm involvement in e-business will be high and the number of e-business applications that are adopted will be high as well. Therefore, we posit that the number of e-business applications increase the firm's business efficiency.

4 (a) There is a significant positive relationship between the number of e-business applications adopted by the firm and e-business efficiency

Spread of e-business applications

Competitive advantage is a result of the firm's overall business strategy. E-business may be adopted by certain functions or units of the firm and not the entire firm. The spread of e-business in the firm is measured by the number of units within the firm that have adopted e-business. Therefore, another proposition is presented is that the spread of e-business is positively related to the organisational and strategic competitive advantage of the firm.

4 (b) There is a positive relationship between the spread of e-business in the firm and e-business efficiency.

Usage rate of e-business applications and competitive advantage

Efficiency is how well the deployed resources are utilised to meet the organisational goals. A firm might have adopted e-business but the questions that ought to be asked are: How well

are the e-business tools utilised? How often are they utilised?'In view of these questions, the researcher posits that the usage rate of e-business applications is positively related to organisational and strategic competitive advantage.

4 (c) Usage rate of e-business applications is positively related to organisational efficiency

4 (d) The usage rate of e-business applications is positively related to the firm's strategic efficiency.

Business efficiency and sustainable competitive advantage

After gaining some business efficiencies, the firm is then expected to establish some sustainable competitive advantages, which are either organisational, strategic or both, hence the study posits the following:

5 (a): There is a significant positive relationship between the firm's business efficiency and organisational sustainable competitive advantage.

5 (b): There is a significant positive relationship between the firm's business efficiency and strategic sustainable competitive advantage.

3.2 CHAPTER SUMMARY

This chapter has examined factors which can drive the adoption of e-business by a firm and these can be environmental, organisational and managerial. The adoption of e-business should lead to business efficiency. However, this efficiency is dependent on the number of e-business applications that are adopted, usage rate of these business applications and their spread in the firm. The firm's business efficiency is linked to its sustainable competitive advantage. A model has been developed in this chapter to show the relationships existing among these variables.

CHAPTER 4

METHODOLOGY

1.0 INTRODUCTION

The purpose of this study is to examine the factors that influence the adoption and growth of e-business in the manufacturing sector in Zimbabwe as well as suggest how firms in this sector can use e-business strategies to gain a sustainable competitive advantage. The chapter details the methodology adopted for the study, that is, the research philosophy, research design, population and sample, instruments and measurement, data collection procedures and data analysis.

4.1 RESEARCH PHILOSOPHY

In order to give answers to the research question at hand, a thorough knowledge and understanding of the problem is needed. The way the researcher views the world shapes the way of researching it (Cotty, 1998). As such, the researcher's philosophical assumptions and beliefs guide the selection of the research design, methodology and research instruments (Cresswell, 2009). In other words, the research paradigm directs the researcher in defining the ontological, epistemological and methodological assumptions of the study (Guba and Lincoln, 1994). Ontology refers to perceptions of what constitutes knowledge or nature of reality (Bryman, 2011) while epistemology is the belief system that informs the researcher what constitutes acceptable or valid knowledge in a study (Wahyuni, 2012). As such, ontology and epistemology are the main philosophical assumptions that distinguish research paradigms (Saunders, Lewis and Thornhill, 2009).The ontological and epistemological positions to choose from are positivism, interpretivism and pragmatism (Creswell, 2009).

Positivism, also termed empirical science (Creswell, 2009), is the world view that is cause-and-effect oriented, deterministic and has emphasis on empirical data collection (Creswell, 2007). Proponents of this approach rely on the strength of quantitative research methods.

Interpretivism, also termed social constructivism (Creswell, 2011) is based on the notion that individuals seek to understand the world in which they live or work and, therefore, develop subjective meanings or theories to explain the phenomenon. This approach relies on qualitative analysis of data as the proponents argue that numbers or statistical tests do not bring to the open the social actors involved as would be done by their experiences (Panther, 2006).

Pragmatism is the world view that focuses on the problem and, therefore, uses all the approaches available to understand the problem (Morgan, 2007; Creswell, 2009). The inquirer uses both quantitative and qualitative methods to answer the 'what' and 'how' of the problem and is free to employ different forms of data collection and analysis. The major contributors to this mixed-methods approach include Paton (1990), Morse (1991), and Creswell (1994).

In line with the objectives of this study, a pragmatic approach was adopted. According to Creswell (2009), pragmatism as a research philosophy arises out of situations and consequences rather than antecedent conditions. As such, researchers use all approaches available to understand the problem. Pragmatic approaches are the underpinnings for mixed methods and, as Bryman (2006) notes, a combination of both qualitative and quantitative approaches are used.

Pragmatism was seen to be relevant in this study because the objective, scientific and statistical analyses were needed to understand the antecedents of e-business adoption and

competitive advantage. Hypothesis testing was needed to accept or reject existence of the identified relationships. On the other hand, to understand fully the identified relationships, there was need to interact with and tap from the work experience of IS managers and other senior managers with e-business experience. In short, pragmatism has the strength of integrating objective and subjective data sets to answer the research questions at hand (Wahyuni, 2012).

In relation to methodology, pragmatism resonates with the mixed methods approach (Denscombe, 2011). This approach uses both the quantitative and qualitative methods. First, the quantitative approach was used to determine the number and frequencies of e-business applications by firms in the manufacturing sector. Second, to determine the factors influencing the adoption and growth of e-business and their spread in the manufacturing sector in Zimbabwe the quantitative approach was used. This is why traditional surveys typical of quantitative methods were used. Third, to explore the factors that can enhance and sustain e-business activities in the manufacturing sector in Zimbabwe, participatory approaches involving managers of the participating firms were required. The mixed-method approach was sufficient not only in finding the number of firms with e-business applications but in explaining as well why certain firms have adopted certain applications while others have not. There was a need to explain the quantitative results. Numbers on their own have no definite meaning and someone had to speak to those numbers. Therefore, the quantitative phase of the study addresses the number of e-business applications and their spread, identification of factors affecting the adoption and growth of e-business. The qualitative phase focused on getting explanations through interviews of any observed patterns of the quantitative results. Mixed methods provided a bridge between qualitative and quantitative methods and provided strengths that offset the weaknesses of both methods. As observed by Carson *et al* (2011: 12), "it is practical because individuals tend to solve problems using both

numbers and words, combine deductive and inductive thinking and employ skills in observing people as well as recording behaviour."

Although the use of mixed methods have had criticisms by authors such as Howe (2004), Giddings (2006) and Freshwater (2007) for marginalising non-positivist methodologies and privileging the positivist tradition, many studies have been conducted that combined surveys and interviews or quantitative and qualitative methods (Morse, 1991; Creswell, 1994; Morgan,1998; Green, 2007; Creswell, 2011) and their findings have been accepted.

4.2 RESEARCH DESIGN

A research design is a blueprint that is followed in completing a study (Abu Bakar, 2004). Saunders *et al,* (2003) identify four types of research design as exploratory, descriptive, explanatory or analytical and predictive.

Exploratory research is conducted where there is limited or no earlier studies (Hair, Bush and Ortinau, 2003; Collins and Hussey, 2003). Through exploratory research, new insights are sought. The aim of this design is to identify patterns and ideas or generate hypotheses instead of testing them. Identification of a research problem is always exploratory (Creswell, 2009).

Descriptive research design is used to obtain information on characteristics of a particular issue or phenomenon. The objective is to profile as accurately as possible the phenomenon (Saunders, Lewis and Thornhill, 2009). Data is collected using statistical techniques and is often quantitative.

Explanatory or analytical research seeks to explain why or how the phenomenon is happening. Therefore, it goes beyond the statistical numbers. The focus is to understand the relationship between the variables (Creswell, 2009).

Finally, predictive research goes beyond the explanatory by focusing the likelihood of a similar situation occurring elsewhere (Saunders, Lewis and Thornhill, 2009).

This study combines three designs which are exploratory, descriptive and explanatory or analytical. The exploratory phase was the initial phase when the researcher sought to understand the nature of the problem affecting the application of e-business in the manufacturing sector. Extensive literature review involving the use of journals, textbooks, and industry and business publications was carried to understand the problem.

After the literature review and establishment of the research problem, a descriptive design was adopted to help answer the 'what?' in research questions 1-4. E-business adoption and competitive advantage is not a completely new phenomenon as there is abundant literature on e-business in the developed world. Therefore, related variables have been identified elsewhere and much focus is on testing them for their generalisability. Thus, a descriptive research design involving the use of a survey was adopted.

Then an explanatory design was adopted to address research question 5 which required explaining how a sustainable competitive advantage could be gained from the use of e-business applications. Furthermore, as observed by Morse (1991) that any unexpected result from a quantitative study can be explained in qualitative data collection, explanatory design helped to understand the observed relationships obtained through hypotheses testing. This is supported by Creswell and Clark (2011) who argue that findings from the qualitative study explain findings of the quantitative study.

In short, the study adopts a three-stage sequential explanatory research design. First is the explanatory design to develop the research problem. This was followed by the descriptive design to quantify the e-business applications adopted by firms and to test relationships between variables. Finally, the explanatory design was adopted to explain the relationship

between variables. Literature reviews and in-depth interviews were used to give explanations and interpretations to the observed patterns of results. The sequential explanatory design is typically used to explain and interpret quantitative results by collecting and analysing follow-up qualitative data (Creswell, 2009).This approach is best suited to explain and interpret relationships. More specifically, the study adopts a QUANTITATIVE + qualitative notation (Creswell, 2009) where the qualitative component is a less dominant approach than the quantitative component.

4.3 RESEARCH METHODS

Two significant research methods that can be used are the deductive and inductive research methods (Johnson and Chritensen, 2004). A deductive research focuses on developing a conceptual or theoretical model which then can be tested later through empirical approaches (Abu Bakar, 2004; Carson et al, 2005). Therefore, particular issues or characteristics are inferred from general patterns. On the other hand, the inductive method starts with empirical observations from which theory is developed (Creswell, 2009). Thus, general inferences are induced from specific issues.

This study adopted a deductive-inductive method. It started with hypotheses of relationships between variables developed from the literature. These relationships were tested using the data that was collected from surveys of manufacturing firms. Conclusions were reached from the findings of the tests which are generalised to the manufacturing sector in Zimbabwe. As the researcher continued to seek explanation of the results, an inductive method was employed to build an understanding of how a sustainable competitive advantage can be gained through e-business, thus a refined model was produced as asserted by Carson *et al* (2005:12) says, "theory is the outcome of an inductive research."

4.4 QUANTITATIVE AND QUALITATIVE METHODS

The nature of the research questions of this study allowed using the theory or assumptions to assess generalisability of these. Therefore, empirical evidence from surveys was needed. This means quantitative methods were needed to collect and analyse the data. Quantitative methods are referred to as approaches to understand the human experience using numbers and statistics, experiments, correlation studies by surveys, simulations and supportive materials (Corbetta, 2003). The surveys provide numeric description of trends, attitudes or opinions of the population by studying a sample of that population (Creswell, 2009). Quantitative methods focus on the deductive component of the research as its emphasis is on theory testing.

On the other hand, qualitative methods consist of a set of interpretive practices that make the world visible through a series of presentations, interviews, conversations, photographs, recordings and memos (Denzin and Licoln, 2005). This means that qualitative researches study things in their natural settings or interpret phenomena in terms of the meanings people bring to them. The researcher collects rich and soft data through examining documents and interviewing participants. In qualitative research, the researcher is not bound by the cause-effect relationship between variables, but rather by identifying the complex interactions of factors in any situation (Creswell, 2007).

This study, because it adopted a pragmatic world view, used both quantitative and qualitative research methods in a way that the resulting mixture has a complementary strength and non-overlapping weakness (Hamed, 2009). Combining both quantitative and qualitative methods appears to be more powerful than a single approach (Steward and Cash, 2006). For this study to fully answer the research questions and achieve the objectives, a mixed research method was used. A closed questionnaire was used as the data collection instrument for the quantitative phase while a semi-structured in-depth interview was used to gather data from

selected managers who have e-business experience. This means that quantitative and qualitative data were gathered sequentially.

4.5 PRIMARY AND SECONDARY DATA

The purpose of this study was to identify the factors that affect adoption and usage of e-business in the manufacturing sector. These factors were identified through a large-scale survey using questionnaires. Interviews were also conducted to get in-depth understanding of these factors from people who deal with the situation daily. Their opinions and logic were sought through the in-depth interviews to give an explanation to any observed patterns. The anticipated challenges in obtaining primary data included the unwillingness of the respondents to cooperate, and more time and financial resources were needed to collect the data.

On the other hand, secondary data is the information which already exists in other sources such as journals, books and reports which can be extracted for the specific purpose of the study. It is information that was gathered for some specific purpose other than the study at hand. The availability of this data offered the researcher the time and cost advantages. The researcher was able to use this data to compare with the primary data thereby checking the reliability of the primary data. The major weakness of this data is that if no careful selection is done, irrelevant data, 'the chunk', may be collected.

For this study, secondary data was collected mainly from subject area journals which constituted the critical mass for the literature review. One hundred e-journal articles were selected first but were screened to sixty. These were complemented by research methods textbooks and publications from CZI and ZIMSTAT. Through the analysis of the secondary data, the researcher was able to develop the research problem, questions and the theoretical framework.

4.6 **POPULATION AND SAMPLING**

4.6.1 Population

 In this study, the population consisted of the large manufacturing firms in Zimbabwe. The 2012 Confederation of Zimbabwe Industries (CZI) membership list was used as the sampling frame. This list covers the four CZI chambers, namely Mashonaland, Manicaland, Matabeleland and Midlands. The advantage of the CZI membership list is that it covers large firms in all the manufacturing categories throughout the country.

The companies were drawn from all the manufacturing categories which are outlined in Section 1.4.6. Due to the differences in the nature of these sectors, leading to differences in e-business application, stratified sampling was necessary to ensure that all the sectors and their subpopulations are represented in the samples.

The unit of inquiry was the strategic business units (SBUs) as the constructs under study (e-business adoption and sustainable competitive advantage) involve decision-making by a group. There is evidence of a similar approach in related technology adoption studies (Hult *et al,* 2003; Wu *et al*, 2003). At each strategic business unit, information systems (IS) managers or other senior managers with e-business knowledge constituted the unit of analysis.

4.6.2 Sampling frame

The sampling frame, as a list of all elements in a study population, was drawn from the 2012 CZI database for both quantitative and qualitative phases. This database provided information on company name, address, telephone number, website, contact person and types of products that are manufactured. The CZI list has 170 firms, arranged alphabetically in each chamber list. This sampling frame was used because most manufacturing firms have membership with

this confederation. The fact that membership is decentralised to respective chambers made it easier to access their database.

4.6.3 Sampling design

A sampling design describes the way units are selected from a sampling population. In conducting the survey, a sample of 118 firms was selected. The Krejecie and Morgan (1970) sample estimation table was used. A population size of N=170 in the table gave a sample size of 118. Since the firms are in different sectors which behave differently as far as e-business applications are concerned, stratified sampling was done. Stratification means the specific characteristics of the firms are represented in the sample and the sample reflects the true proportion of individuals within certain characteristics (Fowler, 2002; Creswell, 2009). In this study, the firms were stratified on the basis of business activities, technologies used and type of customers served. Within each stratum, systematic random sampling was carried out. Table 4.1 shows the number of units from each sector.

Table 4.1: Manufacturing category and sample size

Manufacturing category	Number	Sample size
Food, beverages and tobacco	32	22
Chemical and pharmaceuticals	24	17
Electricals and electronics	17	12
Wood and wood products	21	14
Leather and textiles	26	18
Rubber, plastic and non-metal products	20	14
Motor vehicle and miscellaneous assembly	13	9
Metal fabrication	17	12
Total	**170**	**118**

Proportionate stratified sampling was used in selecting the sampling units. The selected number of firms from each stratum was proportional to the total population. The procedure for selecting a stratified sample is informed by Kumar (2011) and involves the following:

1. Identification of the sampling units in the sampling population.

2. Identification of the different strata.

3. Placement of each firm in the relevant stratum.

4. Numbering of each firm in each stratum.

5. Deciding the total number of sample size (n).

6. Determining the number of firms to be selected from each stratum, that is, sample size x (p).

7. Determining the proportion of each stratum in the study population (p) = elements in study population/total population size.

8. Selecting the required elements in each stratum with systematic random selection (SRS) technique.

4.6.4 **Justification of sample size and sampling procedure**

This sample size is a fair representation of the manufacturing firms in Zimbabwe given the population size from which the sampling frame was drawn. This is because, firstly, a statistically proven and scientifically acceptable approach by Krejcie and Morgan (1970) was used to produce the sample size estimation table the researcher used. Secondly, the systematic random sampling used in the selection of the sample for the study was aimed at getting a balanced representation of the firms from the target population. Thirdly, given the national spread in areas of economic activity of CZI, this population is quite representative of manufacturing firms in Zimbabwe.

4.7 DATA COLLECTION INSTRUMENTS

4.7.1 The descriptive phase

To adequately address the concerns of the descriptive phase, a self-administered survey (SAS) was used. This technique has the advantage of low cost, less time needed and less interviewer bias (Kumar, 2011). Its major limitation is the absence of the interviewer to probe for a deeper response. To overcome this weakness, some open-ended questions were included to allow for the expression of feelings or attitudes by the respondents which would not be exposed if only closed-ended questions are used. In this study, two major types of surveys were used to collect data: the drop-off and e-mail surveys.

4.7.1.1 Drop-off surveys

According to Hair, Bush and Ortinau (2003), these are self-administered questionnaires that a representative of the researcher hand delivers to selected respondents and the completed surveys are returned by mail or picked up by the representative. Given the high cost of distributing the questionnaires, this technique was only used to collect data from those respondents who could not be contacted via the e-mail or who were not willing to use the email.

4.7.1.2 E-mail survey

An e-mail survey is a self-administered data collection technique in which the survey is delivered to and returned from the respondent by e-mail. This technique has the advantage of speed, ability to collect data from many respondents within a short period of time and low cost per respondent. This technique allowed the collection of data from the 118 target respondents at a low cost and within a short space of time, particularly if these research participants are motivated to respond. In order to motivate the respondents, the research objectives and benefits of the research outcome were clearly explained to the respondents in a covering letter requesting consent of the respondent. The letter also solicited for correct information when completing the questionnaires and assured them that the information would be kept confidential.

Questionnaire design

The design and structure of the questionnaire is critical in determining the rate of response, validity and reliability of data collected (Saunders, Lewis and Thornhill, 2009). Following the suggestions by Saunders *et al*, (2003), Creswell (2007) and Kumar (2011), the questionnaire contained categorical and scale questions.

The questionnaire had two sections. The first section captured the detailed profile of the respondents (qualification, position) and their firm (nature of business, age of the firm and years of experience, *etc*). These were incorporated to get insight into the profile of respondents and the participating firms. The second section covered the level of e-business involvement, e-business applications used, role of competitors and other stakeholders, institutional factors, innovation orientation, financial and IT resources, attitudes, commitment and risk perception of managers, annual turnover and other efficiency gains from adoption of e-business.

Some questions, particularly in the last section of the questionnaire, were open-ended in nature. This gave some flexibility to the respondents to express their opinions and feelings and show some degree of originality and objectivity.

The questionnaire items for the independent and mediating variables were adopted from previous researches (der Veen, 2004; Kyu-Nahm and Weare, 2010; Wang and Cheung ,2004; Thompson, 2007; Lamsa and Savolainen, 2000) and then adapted to meet the content validity requirements. As for the dependent variables, the questionnaire items were developed by the researcher.

The researcher encouraged the respondents not to show their identities nor of their organisations as a way to remove bias, fear of reprimand by bosses and a feeling that the information collected might be used by competitors or for tax purposes. Attempts were made to make the questions short, straightforward and easy to answer by adopting a scale approach. Respondents were asked to put a tick or X on the most appropriate option of the five options given which ranged from strongly disagree to strongly agree. This helped to reduce the drudgery usually associated with completing questionnaires to the barest minimum.

Pilot testing

A wide-ranging questionnaire aimed at eliciting the right responses was pilot-tested in Gweru with 10 managers. The pilot sample was also drawn from the CZI membership in Gweru, using stratified random sampling. The purpose of this testing was to validate the content by detecting and correcting any ambiguities or inherent problems and to help extract some emerging themes and issues which were then incorporated in the questionnaire.

The other objective of the pilot test was to ascertain the average time respondents would take to complete the questionnaire which, according to literature, should be around 15 minutes.

There were minor modifications made to the questionnaire after the pilot test. The modifications involved reducing the number of some items to allow completion of the questionnaire within stipulated time and rephrasing some statements to improve clarity.

4.7.2 The explanatory phase

To give explanations to salient outcomes of hypotheses testing in the initial descriptive phase, personal semi-structured interviews were conducted with five managers with considerable e-business knowledge and experience. The sample size for the qualitative phase was influenced by the nature of responses from the interviewees. The researcher was to continue to pick respondents until 'technical saturation' was achieved. This is when the interview reaches a stage where no more new information emerges from additional interviewees. This was achieved with only five respondents.

The interviews were grounded on the theoretical foundations of phenomenology with the aim of drawing insights as far as possible from the experiences and knowledge of the participants who were exposed to the phenomenon under study (Giorgi, 2009). The semi-structured interviews had the advantage of providing rich information about the phenomenon,

explanations to observed outcomes and interpretations of any unexpected pattern. The disadvantage stems from the need for great skill in interpreting the data to prevent subjectivity.

The interview guide was pre-tested with two people to ascertain duration of the interview and suitability of questions. Some minor refinements were made.

An interview guide was used in all the interviews though the researcher varied the sequence of the questions, depending on the need. The topics covered were derived from the outcome of the descriptive phase.

4.7.3 Justification of data collection instruments used

The use of the questionnaire was believed to give the best participation and responses from a large pool of respondents, particularly if it has been carefully designed. A questionnaire allowed respondents to give solicited information at their own time and space. Busy and shy respondents could do the job at their own time and in closed circuits respectively.

The fact that the questions were both open-ended and closed-ended gave room for probing, getting the feelings, opinions and attitudes of the respondents on the subject at hand.

The personal interviews, on the other hand, gave the researcher the platform to interface with the respondents, thereby enabling him to get data that could not have been obtained through the questionnaire. The personal interviews helped to validate the results of the hypotheses tests obtained in the initial descriptive phase of the study.

4.8 DATA COLLECTION PROCEDURES

4.8.1 The questionnaire

4.8.1.1 Selecting the respondents

The survey respondents were selected through a systematic random sampling method. This involved randomly selecting the starting point and then picking every ith element in succession from the sampling frame. The sampling interval i was determined by dividing the population size by the sample size and rounding off to the nearest integer (Kumar, 2011). In this study, the population size was 170 while the sample size was 118. This gave the sampling interval of 2. Using the CZI membership list of 2012, where the companies were arranged in alphabetical order in each manufacturing category, the companies selected were 2, 4, and 6… in that order up to the total sample size for that category. The total sample size for all the categories was equivalent to 118.

4.8.1.2 Distribution of the questionnaires

Once the companies to be sampled were identified, a telephone call was made to each company and to the senior person managing the e-business operations or the most senior manager in the organisation. The aim of the call was to introduce the researcher and to explain the purpose of the call, asking time to conduct the interview through e-mail or drop-off surveys. They would then complete the questionnaires at their convenience.

Respondents to the e-mail and self-administered questionnaires received an introductory letter attached to the questionnaire, explaining the purpose of the research and a request for their participation. The 'confidentiality clause' was included in this letter as well.

Self-administered questionnaires were personally delivered by the researcher. This allowed the researcher to ask when the respondents would be through with the questionnaire or, in

some cases, whether the respondents were free to answer the questionnaire while the researcher waited. This had the possibility of increasing the response rate.

4.8.1.3 Measures to increase response rate

In line with recommendations by Patton (1990) and Punch (2003), this research adopted various strategies to increase the response rate. These include designing the questionnaire in such a way that it is easy to read and to follow, providing clear instructions on how to complete and return the questionnaire, giving respondents enough time to complete the questionnaire (at least seven days) and sending them reminders while, at the same time, thanking those who had returned the completed questionnaire.

4.8.2 The semi-structured interviews

4.8.2.1 Selecting the interview respondents

Purposive sampling was used to identify the 5 respondents who were contacted for the semi-structured interviews. A key feature of the qualitative phase is the use of a small number of respondents who are purposively selected (Babbie and Mounton, 2001). The number of respondents was determined by the point at which technical data saturation was realised. In this study, this point was arrived at after five interviews.

4.8.2.2 Making the initial contact

Telephone or e-mail appointments were made with each one of the executives. During this stage, the researcher introduced himself and explained the objective of the research and then made a request to interview the respondent at his own place and time of convenience. This follows the emphasis by Fantana and Frey (1994) on the importance of a good rapport for the success of an interview.

4.8.2.3 The interview process

The interviews started with a brief outline of the purpose of the research to assure the respondent that the research was important and had some benefit for them. After assuring the interviewee of the confidentiality of the information given, consent was then sought to see if the interviewee was still interested to continue with the interview. The researcher then asked for permission to tape record the conversation using an iPhone. Literature recommends taking notes to compliment tape recording during the interview. In this research, no note taking was done in order to make the conversation as formal as possible and also that the phone could record very efficiently.

Following guidelines from qualitative research literature, the first question of the interview proper involved asking the respondent to talk about his or her experience in relation to e-business. The respondent was directed to specific issues of e-business and competitive advantage, always probing for in-depth information. Probing allowed participants to explain further to give a true meaning of the phenomenon under study.

The recommendations by Carson *et al,* (2005) which include using the respondent's terms, not interrupting the respondent, not introducing own ideas in the conversation, not evaluating an answer from the respondent, asking non-directive questions, using active listening techniques and maintaining eye contact during the interview were followed. The conversation ended with the researcher thanking the interviewee for according him the precious time.

4.8.3 Transcription of the interviews

The phone recordings were transcribed soon after each interview. This involved producing a word version of the recorded information. After the transcription, the recorded information on the phone was played again whilst the researcher read the transcription. This helped to ensure

accuracy. A friend was also asked to play the phone whilst the researcher read the transcribed information.

4.9 Validity and reliability of the measuring instruments

The nature and contents of the measuring instruments greatly contribute to the overall integrity of the research findings. Validity and reliability of the measuring instruments are critical in giving this integrity to the research results.

4.9.1 Validity

Research instruments need to demonstrate validity. This is the extent to which the instrument is able to measure what it intends to measure (Golafshani, 2003), or the soundness and effectiveness of the measuring instrument (Leedy, 1997). It is a measure of how truthful the results are. As noted by Joppe (2000), through validity we should be able to ask whether the instrument allows the researcher to hit 'the bull's eye' of the research object, that is, whether we get the best available approximation of the reality.

Joppe (2000) identifies different types of validity which include conclusion validity, internal validity, construct validity and external validity.

- Conclusion validity describes the extent to which the conclusions are accurate by examining the relationship among the variables in the study.

- Internal validity focuses on the conclusions based on the observed results from the study.

- Construct validity is a measure of the extent to which the content of the study is covered by the measurement instrument. It assesses how concepts in the study have been operationalised to reflect the causal relationships the study is trying to cover. In

other words, construct validity assesses the relevance of the concepts covered in the research instruments to the study.

- Content validity describes the extent to which the instrument used is accurate in measuring the factors under study.

- External validity is the extent to which the conclusions from the study can be generalised or applied to the bigger group of related subjects.

In this study, the issue of validity was addressed through the following approaches: 1) use of triangulation and mixed methods. Creswell and Miller (2000) explain triangulation as a validity procedure in which the researcher searches for convergence of information from multiple sources in a study. The use of descriptive and explanatory designs in the study allowed for the use of different data collection and analysis techniques, which triangulation is all about. Mixed methods allowed confirmation and generalisation of results at the same time. This is supported by Patton (2001:247) who advocates "the use of triangulation and use of several kinds of methods and data, including mixed methods to strengthen validity." 2) The conducting of extensive literature reviews on related studies which helped in the development of e-business adoption frameworks assisted in establishing construct validity.3) The pilot test conducted in Gweru with managers assisted in assessing the instrument for its readability, clarity and comprehensiveness, thus ensuring content and construct validity.

4.9.2 Reliability

Reliability is the consistency with which the measuring instrument delivers accurate results (Miller, 2009; Leedy, 1997). It is a measure of the extent to which the measuring instrument produces the same results if applied repeatedly to the same population under the same conditions. The important aspects of reliability in research include equivalence, stability and internal consistency.

Equivalence is the amount of agreement between two or more elements of an instrument administered at the same time. In this study, some items measuring the same construct and asking for the same response were asked differently and given different numbers in the measuring instrument. This helped assess consistency in dealing with certain concepts.

Stability is said to occur when the same scores are obtained after a test-retest procedure with the same group of respondents and the same instrument (Miller, 2009). Stability of the research instrument was not applied in this study since it was a cross-sectional survey.

Internal consistency when measuring reliability refers to the extent to which items on the measuring instrument are measuring the same thing or are highly correlated. The more correlated the items, the more reliable the measuring instrument is (Miller, 2009). A coefficient alpha index or Kuder-Richardson formula 20 (KR-20) can be used to estimate this internal consistency (Cronbanch, 1951). Coefficient alpha is used to assess reliability during scale development with items having response options ranging from strongly disagree (1) to strongly agree (5). KR- 20 is used to estimate reliability for dichotomous response scales such as Yes/No or True/False. Nunnally and Bernstein (1994) advocate for a reliability value of not less than 0.70 for the research instrument to be considered reliable. According to Miller (2009), reliability values increase with increase in the number of scale items. This means, the more the scale items an instrument has, the more reliable that instrument is. However, a very high number of scale items may make the measuring instrument too long – a condition which may discourage the respondents from completing answering the questionnaire.

Drawing on the recommendations by Miller, a scale was developed that completely measured the constructs of interest in a parsimonious and economical manner. The extensive literature

review helped identify the items that were included in the instrument while the pilot test helped gauge the length of the instrument.

After data collection was completed, the Cronbanch alpha coefficients were calculated and are shown in Table 4,2. The coefficients for all the variables are above 0.69, suggesting high reliability of the measuring instrument.

Table 4.2 **Cronbanch alpha coefficients**

Construct	Number of items	Cronbanch coefficient
Network pressure	5	0.691
Technological factors	6	0.89
Institutional factors	5	0.93
Innovation orientation	5	0.92
Financial slack	3	0.7
Firm's IT resources	5	0.95
Perceived usefulness	5	0.95
Managerial qualifications	4	0.92
Managerial attitudes	3	0.93
CEO's perceived risk	5	0.94
Managerial commitment	5	0.94
Efficiency gains	7	0.96
SCA factors	7	0.96

Source: Research data

4.10 DATA ANALYSIS PROCEDURES

4.10.1 Analysis of quantitative data

The process of quantitative data analysis started with the validation of data in which each questionnaire was examined to assess whether it should be included in the survey analysis or discard. This followed the recommendations by Wiid and Diggins (2011). After this process, six questionnaires were discarded, leaving 30 questionnaires to be analysed. The next step involved editing the data to rectify possible errors or irregularities arising from data

collection. The data were scrutinised for uniformity, consistency and accuracy (Bardwaj, 2008). Next, the data were coded and a data file created.

After data collection was completed, the constructs identified in the conceptual framework were converted into or operationalised to measurable variables. Existing scales recommended in the adoption literature were used for most of the constructs. For the e-business adoption level, number of e-business tools adopted, usage rate and spread of the e-business tools, new scales were developed.

Network pressure

To measure network pressure, a five-item scale that was developed and used by Sundaravej (2006) was adapted. The items assessed whether the trading partners have online activities; put pressure on the firm to adopt e-business and that the transfer of e-business knowledge from partners to the firm was easy. The Cronbanch alpha coefficient for these items was 0.69 and it can be concluded that the items show consistency and are reliable.

The respondents were then given a network pressure statement and then asked to show the extent to which they agreed or disagreed with it by putting a tick on the best option from those ranging from strongly disagree (SD) to strongly agree (SA). Each option was then given a score, and these scores ranged from 1 for strongly disagree to 5 for strongly agree. For each item, a mean score and standard deviation was calculated. This finally helped calculate the mean score for the network pressure for each firm. For N=30, the network pressure ranged from 2 to 3.8 as shown in Table 4.1.

Technological factors

The technological factor variable was operationalised by adopting and adapting six items which were recommended and used by Woodside and Biemans (2005) as well as Huy *et al*, (2012). The items focused on whether the technology was: 1) easy to acquire; 2) easy to use;

3) easily affordable; 4) had relative advantage; 5) easy to transfer from partners and 6) network partners easily understood it. A Cronbanch alpha coefficient of 0.93 was obtained, suggesting a very high consistency and reliability of the values.

The respondents were asked to choose from strongly disagree to strongly agree on each item. A score for each response was assigned, ranging from 1 for strongly disagree to 5 for strongly agree. The mean score for each respondent was calculated. For N=30, the mean rating on technological factors ranged from 2 to 5 with a modal value of 5.

Institutional factors
The measurement scale for institutional factors consisted of five items as informed by Azadegan, Napshin and Oke (2011) and Kyu-Nahm and Weer (2010). The items measured whether e-business was adopted to "achieve the firm's mission", "to meet stakeholder expectations", "to establish own identity", " to compliment the current business strategy" and " respond to pressure from the industry and government." These items, when tested for consistency and reliability, produced a Cronbanch alpha coefficient value of 0.93. Respondents completed the Likert-scale questions on institutional factors by choosing options that ranged from strongly disagree to strongly agree. When the scores were aggregated, the mean scores for each respondent ranged from 2 to 5 and the modal value of 5 was obtained.

Innovation orientation
A five-item measurement scale was used to measure innovation orientation. Huy *et al* (2012) used a related scale and their results were acceptable**.** The items measured whether the adoption of e-business by the firm was: 1) due to the problems it was facing; 2) a new way of doing business; 3) due to the need for better results; 4) due to the need to adapt to changes in the environment; 5) the firm was happy with the status quo. These items, when tested for consistency and reliability, produced a Cronbanch alpha coefficient value of 0.92. This value shows a high reliability and consistency of the items.

Respondents selected the best option to describe their situation from those ranging from strongly disagree to strongly agree. Each option was given a score from 1 for strongly disagree to 5 for strongly agree. A mean score for each respondent was then calculated. The mean scores ranged from 1 to 5 and the modal value was 4.2.

Perceived usefulness

Davis (1989) developed the initial measurement scale for perceived usefulness. This was then modified by Smith and Spiers (2009) and, later, by Park and Kim (2012). The researcher adopted and fused the measurement scales by Smith and Spiers (2009) and Park and Kim (2012). The modified measurement scale has five items measuring whether managers perceived e-business to: 1) improve firm performance; 2) increase productivity; 3) increase perceived image; 4) improve product and service quality; and 5) improve coordination with suppliers and customers. The items produced a Cronbanch alpha coefficient of 0.95, showing a very high consistency and reliability level.

Financial resources

This construct was measured using three items that assessed: 1) whether the firm had enough financial resources to meet the ICT needs; 2) whether the firm went ahead to adopt e-business in spite of the inadequate financial resources; and 3) whether e-business strategy was a priority for the firm. The measurement items were adapted from the works of Theodosiou and Katsikea (2010). The internal consistency reliability coefficient was 0.70. Respondents were asked to indicate the degree to which they agree or disagree with each of the statements about the firm's financial slack. The scale used in the study ranged from strongly disagree to strongly agree and the values ranged from 1 to 5 respectively.

IT resources

IT resources were measured using four items that were developed by Bhatt and Varum (2005), and Ashurst, Cragg and Herring (2011). The items assess the adequacy of IT infrastructure, the requisite technical skills and the knowledge level of e-business.

Respondents were asked if their adoption of e-business was due to adequate IT infrastructure, presence of the requisite technical skills or sufficient knowledge of e-business. Respondents were given a five-point Likert scale ranging from totally disagree (value 1) to totally agree (value 5). The internal consistency reliability test was done with Cronbanch alpha and produced a value of 0.95.

Firm size

To measure the firm size, annual sales figures in United States Dollars were used. The annual sales figure ranges used are 0 to 99 000; 100 000 to 999 000; 1000 000 to 1 999 000 and; 2 000 000 and above. This range was not adopted from literature but developed to meet the specific conditions of the manufacturing sector in Zimbabwe where annual sales appear to be low. Respondents were asked to indicate the range that best described their firm's annual sales.

Managerial experience

This construct was measured using four items to assess whether key managers had e-business experience, relevant IT qualifications or had received any basic IT training. If they had an IT qualification or had received some basic training, another item was used to assess the level of their IT skills. The respondents were given a five-point scale, ranging from totally disagree to totally agree with values from 1 to 5 respectively. The items were tested for consistency and reliability and produced a Cronbanch alpha value of 0.92.

Managerial attitudes

To measure this construct, the scales used by Mndzebele (2013), Huy *et al*, (2012) and Rosinafisah, Salbiah and Shaarifuddin (2010) were modified and adopted. The scales were used in various e-business adoption studies and the results were accepted. The modification produced a three-item scale, assessing what managers think about e-business in terms of producing better results, ease of use or its desirability compared with the traditional business

approaches. The respondents were given a five-point scale from strongly disagree (value 1) to strongly agree (value 5).

Managerial commitment

Managerial commitment was operationalised by using a five-item measurement scale, following recommendations from literature. The items used in this study were a modification and adoption of those used by Chan and Chong (2012), Wanjau, Macharia and Ayodo (2012) and Mose, Njihia and Maguta (2013). The five items that were used measured the extent to which managers committed resources for e-business activities; how managers identified with e-business projects and how managers supported e-business training and use of e-business technologies. The specific items were:

"Management commits resources to the e-business activities"

- Management identifies with e-business activities

- Management commits itself to e-business project until it is completed

- Management supports e-business training

- Management supports e-business use

The items were measured for internal consistency and reliability and produced an alpha value of 0.94. Respondents used a Likert-type scale with five points, ranging from strongly agree (value 1) to strongly disagree (value 5).

CEO perceived risk

To assess the CEO's perceived risk, the measurement items were adopted from Peansupap (2006) and Woodside (2005). A total of five items were identified and these measure the CEO's level of risk perception. The types of risks identified are financial loss, time loss, opportunity loss, functional loss and social loss. The internal consistency of these items is 0.94. Respondents used a five-point Likert-scale with values ranging from 1 to 5 or from strongly disagree to strongly agree.

E-business adoption level

The construct e-business adoption was converted into a measurable variable 'e-business adoption or involvement level' by using three specific measurement sub-variables which are number of e-business applications the firm had adopted, the spread of the e-business tools across the business units of the firm and the usage rate of the e-business tools by the firm.

The e-business literature identifies the following as the most common e-business applications: email, website, supply chain management (SCM), customer relationship management (CRM), enterprise resource planning (ERP), communication and collaboration among business units in the firm or intranet and online marketing. To measure the level of e-business adoption, the respondents were asked to choose from a list of seven those e-business applications their firm had adopted. Each e-business application that was adopted was given a value of 1. Thus, a firm which had adopted one application was given 1; that which had two was given 2, and so on. Thus, the adoption level using number of e-business applications was ordinally scaled. Firms were then classified according to the number of e-business applications adopted as having low e-business involvement (if they had 1-2 e-business applications only), moderate e-business involvement (for those with 3-4 e-business applications) and high e-business involvement (if they had 5-7 e-business applications). This approach follows the analysis of a definition of involvement (for example, Michaelidou and Dibb, 2008; Beatty, Kahle and Homer, 1988. Here, involvement is seen as the degree to which an object, idea or process is centrally related to the value system of the organisation. It is measured in terms of the resources the organisation commits itself in order to buy or use the object or idea. Therefore, e-business involvement is 'the level of interest, motivation or arousal' (Michaelidou and Dibb, 2008) in using e-business application. It is reflected by the level of resource commitment and number of e-business applications adopted.

The spread of e-business applications in the firm was also used to measure e-business adoption or involvement level. The respondents were asked to indicate how many of their business units had adopted the e-business applications. They were given options of 0-25%, 26-50%, 51-75% and 76-100%. The intervals were given scores or values of 1, 2, 3 and 4 respectively.

With respect to usage rate, the respondents were asked to indicate the frequency of use of the e-business application on a semantic scale from 'seldom' to 'very often'. Corresponding values ranging from 1 to 5 were given, with 1 being for 'seldom' and 5 for 'very often'.

Efficiency gains

The construct 'efficiency gains' was measured using seven items that were developed by Wu *et al,*(2006). These were also used by Biloslavo, Bagnoli and Figeli (2012) and Devemuto, (2013). The items measure the extent to which 1) transaction processing time decreased; 2) transaction accuracy increased; 3) volumes of transactions increased; 4) transaction cost per customer decreased; 5) order fulfilment time decreased; 6) coordination with suppliers improved; and 7) number of satisfied customers increased as a result of e-business adoption. The items were assessed for internal consistency and reliability and produced a Cronbanch alpha of 0.96. Respondents were asked to indicate on a five-point Likert scale the extent to which they agreed or disagreed with the fact that their firm had gained the listed efficiencies. Their responses were given scores ranging from 1 (strongly disagree) to 5 (strongly agree).

Sustainable competitive advantage

The sustainable competitive advantage was operationalised using seven items that assessed whether the firm had increased sales volumes, customer retention, market share, margins, service quality, perceived image and communication with customers. Respondents indicated with a tick on a five-point Likert scale ranging from totally disagree to totally agree to show

the extent to which their firm had gained each of the listed competitive advantages. The internal consistency and reliability value of 0.96 was obtained.

4.10.2. Statistical analysis of quantitative data

Descriptive statistics

The 30 questionnaires that were returned and usable were statistically analysed using STATA 11. Descriptive statistics allowed the researcher to tabulate and summarise profiles of the respondents. The demographic profiles of the research objects included education level, work experience, size of the organisation, e-business experience and sales turn over. The descriptive statistics used in the study include frequencies, mean and standard deviation.

Measurement model

The relationship between variables in the proposed model was measured using absolute fit indices. These included the p-value, R-squared, adjusted R-squared and root mean square error of approximation (RMSEA). In terms of interpretation, a p-value above 0.05 implies the model misfit (Barret, 2007). Conversely, if the p-value is less than 0.05, then the model is deemed fit. RMSEA is one of the most used indices to complement chi-squared. It describes the extent to which the model fits with the covariance matrix of the sample (Hooper, 2008). A minimum threshold of 0.06 is acceptable while 0.08 is the recommended upper limit (Steiger, 2007; Hu and Bentler, 1999).

The data collected were ordinal and continuous. Regression analysis using STATA 11 was used to determine the linear relationship between the variables. The key elements of the regression analysis results using STATA 11 are described below:

Number of obs: This is the number of observations used in the regression analysis. In this study, 30 observations were used.

Df: this is the degree of freedom associated with the sources of variance.

Coefficient: is the value for regression equation for predicting the dependent variable from the independent variable. For example, for every unit change in independent variables such as network pressure, financial resources or attitude of senior managers, we expect some changes in the level of adoption and/ or business efficiency gains if all other variables are held constant.

Prob>F or P>|t|: is the p-value associated with the F-statistic. It is used in testing the null hypothesis that all of the model coefficients are 0. Using an alpha of 0.05, the statistic is significantly different if it is less 0.05 or not significantly different if it is greater than 0.05. A t-statistic above 2 or below-2 is considered significant at 95% confidence level.

95% Confidence Interval: The confidence interval is related to the p-value of 0.05 or significance level of 5%. It means that there is 95% chance that the results we get would have come up in a random distribution, so we can say that, with 95% probability of being correct, the variance is having some effect assuming that the model is specified correctly.

R-Squared: is the proportion of variance in the dependent variable which can be explained by the independent variables. It is an overall measure of the strength of the association but does not show the extent to which any particular independent variable is associated with the dependent variable. Therefore, it is a measure of the overall fit of the model.

Adjusted R-Squared: is a measure of goodness of fit that penalises for using extra independent variables. It adjusts for the degree of freedom used in using extra variables.

Root MSE: is the root mean standard error and measures the standard deviation of the residual in the model.

Standard error: refers to the standard errors associated with the coefficients.

4.10.2 Qualitative data analysis

Qualitative data was generated by means of phenomenological in-depth interviews. As recommended by Braun and Clark (2006), the analysis of the data involved a five-stage process.

First, the researcher reads through the transcribed notes and listened to the interview replay to familiarise with the data. This was repeated three times to allow the researcher to capture all key aspects of the phenomenon raised in the interviews.

Second, the interview transcripts were then open-coded through clustering them into categories and subcategories if they had similar ideas. This followed the recommendations by (Braun and Clarke 2006)

Third, themes and sub-themes were created after open- coding. This entailed grouping fragments of ideas or experiences that make sense of the data in line with the research objectives (Glesne, 2011).

Fourth, axial coding was done. This involved the refinement of the themes and sub-themes in order to understand possible relationships amongst them (Noble *et al*, 2009:619). The fifth and final stage involved relating the identified themes with the research questions and then inferring conclusions.

4.11 Ethical considerations

The integrity of the research depends on the trust generated between the researcher and the research participants or respondents (Creswell, 2009). Thus, ethical considerations at every stage of the research, from problem formulation to dissemination of findings, become critical in every research. These considerations include transparency, participant's right of privacy, participant's right to refuse to answer all or certain questions, anonymity, confidentiality, participant and researcher's reactions as well as the participant's consent.

4.11.1 Ethical consideration during problem definition stage

Literature identifies several ethical considerations during the problem definition stage. First, it is important to ensure that the problem identified will clearly benefit the respondents and the sponsor of the study should also be specified. Second, the study should not make use of vulnerable groups nor put the participants at risk, be it physical, economic, social or legal.

In this study, the participating organisations would benefit from the recommendations of the study, including the influence on e-business policy formulation. The respondents were business executives with a broad knowledge of e-business operations, thus the issue of vulnerable groups was avoided.

4.11.2 Ethical consideration during data collection stage

Creswell (2009) identifies nine procedures that are critical at the data collection stage which the researcher complied with. These are listed as follows:

- Identification of the researcher.

- Identification of sponsoring institution.

- Identification of purpose of research.

- Identification of level and nature of the participant's involvement.

- Notation of risks to the participant.

- Guarantee of confidentiality to the participant.

- Assurance that the participant can withdraw anytime.

- Provision of names to contact if questions arise.

A cover letter was produced which clearly spelt out the purpose of the research, the institution supervising the research and a guarantee that the results of the study were confidential.

4.11.3 Ethical issues in data analysis

The study protected the anonymity of respondents. In the qualitative phase, pseudo-names were used.

4.11.4 Ethical issues in writing and dissemination

In this study, all efforts were taken to avoid the temptation of falsifying or inventing results. Journals of the transcription of the qualitative data as well as participants' completed questionnaires are kept as evidence of the research. Participants are free to inspect and interrogate the findings.

4.12 CHAPTER SUMMARY

The research philosophy, design and approach have been discussed and justified. A mixed-method approach involving the use of quantitative and qualitative researches has also been described and justified. The sample size and the sampling method have been specified. Finally, the data collection instruments and data analysis procedures have been selected and justified.

CHAPTER 5

DATA PRESENTATION AND ANALYSIS

5.0 INTRODUCTION

This chapter presents data collected through the surveys and structured interviews. First to be presented are the data from the surveys and the hypotheses tests, and then, finally, qualitative data from the interviews are presented to give explanation to the quantitative results.

5.1 DATA COLLECTION PROCEDURES AND RESPONSE

Each respondent was asked to indicate whether he/she was comfortable to complete the questionnaire online or offline. Those who opted to complete the questionnaire offline had the paper version dropped off at their premises at the appointed times. Of the 118 questionnaires dispatched (drop-off or emailed), 36 were returned and 30 were usable, giving a response rate of 25%. According to literature, this response rate is acceptable (Kumar, 2011). This response rate is comparable with what was obtained in other studies by Ranganathan, Dhaliwal and Teo (2004) and was accepted as accurate and useful. Although a high response rate would ensure that the results are more accurate and useful, literature states that response rate as low as 8% can produce accurate results. For example, Hsu, Kraemer and Dunkle (2006), in a study of 3987 US firms to identify the determinants of e-business use, had 294 questionnaires returned, giving a response rate of 8%. The results were accepted and published in the International Journal of E-Commerce.

 The e-mail accounted for 25 out of 100 or 25% of the returned questionnaires while the drop-offs were five out of 18 or 28%. This shows that the e-mail has become an important and effective tool for data collection as it matches the traditional approaches such as the drop-offs.

Table 5.1 shows the response rates of the various categories of the manufacturing sector. The results show that respondents who completed online had a higher response rate than those who opted to complete the paper version. This could be due to lack of balance between pressing work schedule and the need to complete the questionnaire in office whereas those who completed online could have done that at any location as long they had internet access.

Table 5.1 Distribution of sample and response rates

Industrial sector category	Size of sample	Respondents	Response rate
Automotive	9	3	33
Chemical and pharmaceutical	10	4	40
Electrical	18	5	27
Food and beverages	27	8	26
Leather and textile	14	3	21
Metal fabrication	15	2	13
Plastic, rubber and non-metals	14	3	21
Wood and wood products	11	2	18
Total	**118**	**30**	**25**

Source: **Survey data**

5.2 CHARACTERISTICS OF PARTICIPATING FIRMS

This sub-section describes the characteristics of the respondents by focusing at the size, age and e-business experience of the firms that participated in the survey as well as the positions and qualifications of the respondents.

5.2.1 Nature and size of participating firms

The sample was drawn from manufacturing companies in the following industrial categories: automotive, chemical and pharmaceuticals, electrical and electronics, leather and textiles, food and beverages, metal fabrication, rubber and plastics, and wood and wood products. The

size of the firms was measured in terms of their annual sales in United States dollars (USD) since this is the main currency in the multi-currency regime in Zimbabwe.

The number and size of firms per category are shown in Table 5.2. The results show that food and beverages had the highest number of respondents (26.6%), followed by electrical and electronics (16.7%) and the least number was from metal fabrication and wood and wood products both with 6.7%.

The size of the firms in each category was measured using annual sales in United States dollars (USD). This ranged from nil annual sales to 99 000; 100 000 to 999000; 1000 000 to 1 999 000 and, 2000 000 and above. More than 60% of the firms had annual sales above or equal to USD 2000 000 while 13.3% were below USD1000 000 per annum. This suggests that these firms could have been driven by abundance of financial resources to adopt e-business. These results are not consistent with the findings by Hsu, Kraemer and Dunkle (2006) which show that financial resources have an insignificant effect on the adoption of e-business.

Table 5.2 Size of participating firms

Category	Annual total sales in thousands dollars					
	0-99	100-999	1000-1 999	2000 ≥	**Total**	**%**
Automotive	0	0	0	3	**3**	**10**
Chemical and pharmaceutical	0	0	1	3	**4**	**13.3**
Electrical and electronics	2	1	0	2	**5**	**16.7**
Leather and textiles	0	0	2	1	**3**	**10**
Food and beverages	1	0	1	6	**8**	**26.6**
Metal fabrication	0	0	1	1	**2**	**6.7**
Rubber and plastics	0	0	2	1	**3**	**10**
Wood and wood products	0	0	1	1	**2**	**6.7**
Total	**3**	**1**	**8**	**18**	**30**	**100**
%	**10**	**3.3**	**26.7**	**60**	**100**	

*Source***:** Survey data

5.2.2 E-business experience of the firms

Table 5.3 shows that 26.7% of the firms have 11 years or more of e-business experience. The same number of firms has between 0 and 2 years of e-business experience, suggesting that many firms are still in the adoption phase. The fact that 73.3% of the firms have 10 years or less of e-business experience shows that most of the firms adopted e-business after 2004. This is the period the country drafted and adopted an ICT Policy. The establishment of the policy may therefore had impact on adoption rate.

Table 5.3 Firms' years of e-business experience

	Years of e-business experience				
Category	**0-2**	**3-5**	**6-10**	**11+**	**Total**
Automotive	2	1	0	0	**3**
Chemical/pharmaceutical	1	0	1	2	**4**
Electrical / electronics	1	0	2	2	**5**
Leather and textiles	0	1		1	**3**
Food and beverages	1	3	3	1	**8**
Metal fabrication	2	0	0	0	**2**
Rubber and plastics	1	2	0	0	**3**
Wood and wood products	0	0	0	2	**2**
Total	**8**	**7**	**7**	**8**	30
%	**26.7**	**23.3**	**23.3**	**26.7**	**100**

Source: Survey data

5.2.3 Education level and positions of respondents

Figure 5.1 shows that 48% of respondents had a Bachelor's degree, 40% with Masters and 12 % with professional qualifications. This shows that the respondents had an adequate educational background to understand the questionnaire. The respondents held senior positions in their organisations and 38% were operations or production managers, 40% were

sales managers, 20% were Information Systems managers and 2% were Managing Directors. This means that these respondents understood very well the company policies and had access to important information such as sales records.

Figure 5.1 Educational qualifications of respondents
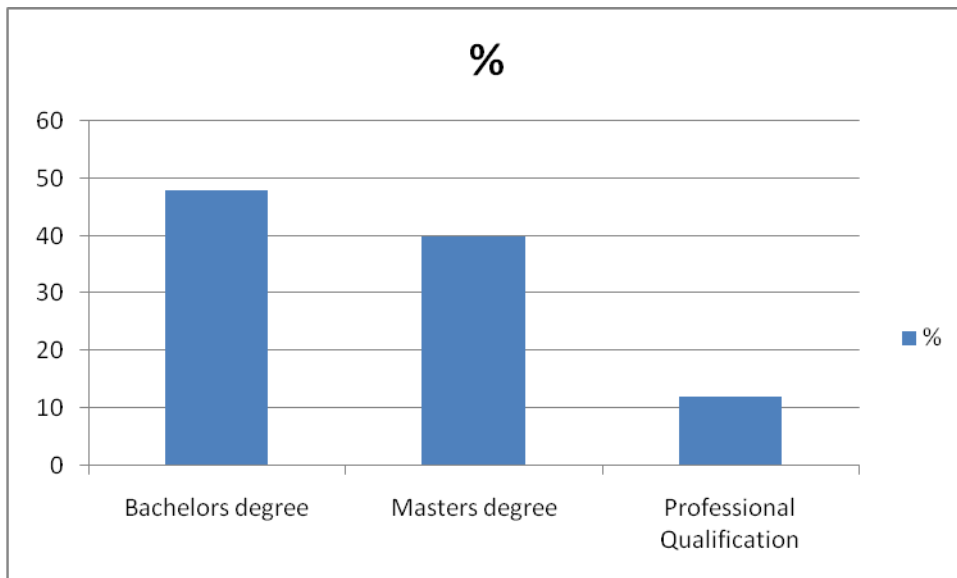
*Source***:** Survey data

5.2.4. E-business applications/technologies adopted

Respondents were asked to indicate the e-business applications which their firm had adopted. A full range of e-business activities has been presented in **Table 2.4**. Results show that all the respondents have adopted e-mail and websites applications**.** Twelve respondents said they apply e-business in supply chain management while thirteen confirmed using various forms of e-business through enterprise resource planning. According to the IBM model of stages and states of e-business (Stone, 2003), the surveyed firms are still at the early stages as they still have to integrate internally, externally and dynamically (Ashurst, Craggs and Herring, 2012).

Table 5.4 E-business applications adopted

Category of e-business applications adopted	Number of firms
e-mail	30
Website	30
Supply chain management	12
Customer relationship management	17
Enterprise resource planning	13
Intra-firm communication and collaboration	22
Online marketing	14

Source: Survey data

5.2.5 Level of e-business involvement

Using the number of e-business applications adopted as criteria for measuring level of the firm's involvement with e-business, firms were classified as having low e-business involvement (if they had 1 to 2 e-business applications only), moderate e-business involvement (for those with 3 to 4 e-business applications) and high e-business involvement (if they had 5 to 7 e-business applications). The participating firms were found to be at different levels of e-business involvement. Although they have adopted e-business, twelve firms (40%) have low levels of involvement while it is moderate for 33% and high for 27% of the firms. Figure 5.2 shows the level of e-business of the participating firms.

Figure 5.2 Level of e-business involvement
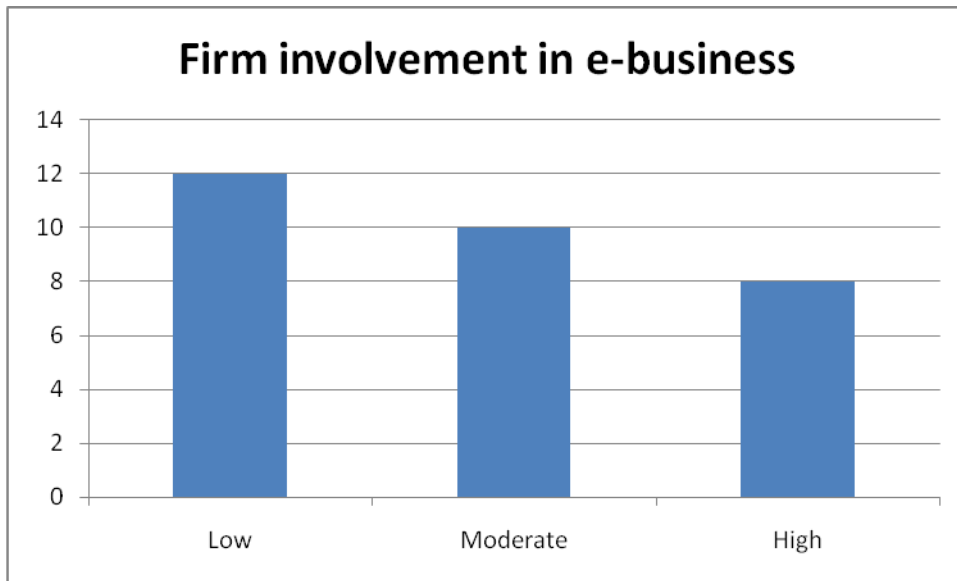
If involvement is synonymous with 'commitment' or 'value system' ((Michaelidou and Dibb, 2008), these results imply that firms which adopted more e-business applications placed high value on e-business which may suggest having e-business as the central strategy. These results corroborate related studies by Raw and Bajwa (1997) who found that top management commitment was significantly related to information system (IS) use levels.

5.3 RESULTS OF THE SURVEY

5.3.1 Descriptive statistics of variables

The constructs for this study had very high Cronbanch values, suggesting consistency and relationship among the various items used. The items ranged from 3 to 7 and the Cronbanch values from 0.69 to 0.96. According to validity and reliability literature, these are considered high values and, therefore, acceptable (Nunally and Beirnsten, 1994). The lowest mean score was 2.98 while the highest was 4.83 out of the highest possible mean score of 5. The highest standard variation was 0.94. This shows that the responses given were very close and had almost the same values. Table 5.5 shows the descriptive statistics of these constructs.

Table 5.5 Descriptive statistics of variables

Construct	Items	Cronbanch alpha	Mean	Std. deviation
Network pressure	5	0.69	3.38	0.69
Technological factors	6	0.89	3.4	0.7
Institutional factors	5	0.93	3.85	0.83
Innovation orientation	5	0.92	3.95	0.73
Financial slack	3	0.7	3.24	0.73
Perceived usefulness	5	0.95	3.51	0.88
IT resources	5	0.95	4.23	0.82
Managerial Experience	4	0.92	3.42	0.87
Managerial attitudes	3	0.93	3.51	0.86
CEO perceived risk	5	0.94	2.98	0.88
Managerial commitment	5	0.94	3.71	0.89
Adoption	7	0.81	4.83	0.58
Efficiency gains	7	0.96	3.81	0.9
SCA	7	0.96	3.77	0.94

Source: Survey data

5.3.2. Results for e-business efficiencies

Respondents were given seven items measuring e-business efficiencies and were asked to indicate the extent of disagreement or agreement with each statement of the item. The items which were assessed and the responses given are shown in Table 5.6, where **SD**=strongly disagree; **D**= disagree; **N**=neutral; **A**= agree and **SA**=strongly agree. The results show that, at least, 85% of the respondents confirm that e-business increases efficiency by reducing transaction time and cost per customer and increasing transaction accuracy, volumes and number of satisfied customers. These results are not consistent with the findings by Brown and Locket (2004) who argue that some businesses struggle to get value from e-business. Therefore, these results provide some empirical evidence linking e-business and business efficiency.

Table 5.6 Responses on e-business efficiencies

Construct	Items	SD	D	N	A	SA	Total
		SD	**D**	**N**	**A**	**SA**	**Total**
		%	%	%	%	%	
	Transaction time decreased	0	0	3	46	51	100
	Transaction accuracy increased	0	6	3	52	39	100
E-business efficiency	Volumes transacted increased	0	6	6	42	46	100
	Transaction cost decreased	0	3	12	44	41	100
	Order fulfilment time decreased	0	3	12	44	41	100
	Improved coordination	0	3	16	33	46	100
	More satisfied customers	0	3	12	37	48	100

5.3.2 Results for sustainable competitive advantage

The respondents were given five-point Likert-type questions on sustainable competitive advantage and were asked to indicate the extent to which they disagree or agree with each item statement, where **SD**=strongly disagree; **D**= disagree; **N**=neutral; **A**= agree and **SA**=strongly agree. The responses shown in Table 5.7 show that 94% of the respondents confirmed to have gained a sustainable competitive advantage as a result of adoption of e-business.

Table 5.7 Results for sustainable competitive advantage

Construct	Items	SD	D	N	A	SA	Total
		Responses					
		%	%	%	%	%	%
	Increased sales volume	0	3	21	33	43	100
	Increased market share	0	6	21	27	46	100
SCA	Increased customer retention	0	3	27	33	43	100
	Increased profit margins	0	3	21	30	46	100
	Improved perceived image	0	3	15	33	49	100
	Improved communication with customers	0	3	0	42	55	100
	Improved product and service	0	3	3	45	49	

Source: **Survey data**

5.4 EMPIRICAL RESULTS

In Chapter 3, a theoretical model was developed based on e-business adoption literature. The various constructs and the relationships that exist among them were discussed. This resulted in sixteen propositions being formulated. Then, in Chapter 4, the propositions were converted into measurable variables. In this section, the theoretical model which establishes the relationship between variables is reiterated. Next, the formulated hypotheses are tested to see if there is a causal relationship between the variables. Figure 5.3 presents an overview of the hypotheses.

5.4.1 Theoretical model revisited

The model in Figure 5.3 shows that the environmental factors (*network pressure, technological factors and institutional factors)*, organisational factors *(innovation orientation, financial slack, IT resources, size and perceived usefulness)* and managerial factors *(CEO's perceived risk, managerial attitude, managerial experience and managerial commitment)* influence, firstly, the adoption of e-business; secondly, the number of e-business applications adopted; thirdly, the number of business units adopting e-business (the spread); and fourthly, the usage rate of these e-business applications (hypotheses 1a-1c; 2a-2e and 3a-3d respectively).

Figure 5.3 The e-business adoption and competitive advantage model
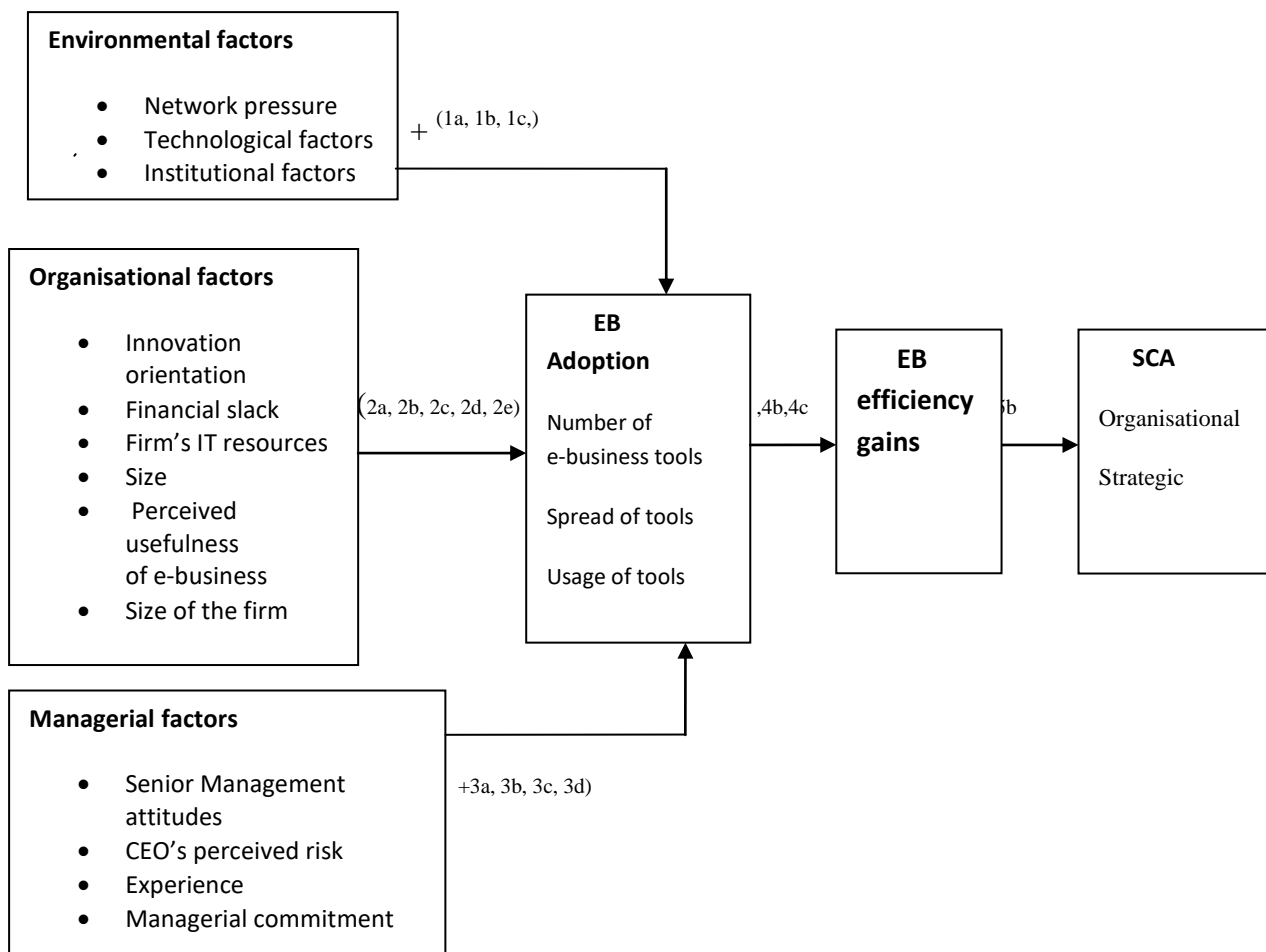
The model also hypothesises that e-business adoption (number of e-business applications, spread and usage rate are positively related to e-business efficiency (speed and reduced cost), hence we have hypotheses 4a-4c. Finally, e-business efficiency is hypothesised to be associated with the firm's sustainable competitive advantage which can be organisational or strategic (hypotheses 5a-5b).

5.5.1.1 Environmental factors

In this section the researcher made a closer inspection of the three hypotheses under environmental factors. The data obtained was ordinal and continuous, so regression analysis was used to determine the relationships between variables.

Hypothesis 1a: *There is a significant positive relationship between network pressure and adoption of e-business*.

Regression between network pressure and adoption of e-business

To test the hypothesis that there is a significant positive relationship between network pressure and level adoption of e-business, the two variables were regressed as shown in Table 5.8.

Table 5.8 **Network pressure and adoption of e-business**

Source	SS	df	MS		# of obs=30	R-squared=0.0123	
Model	0.0592	1	0.592		F (1, 28) =0.35	Adj R-Sq=0.0229	
Residual	4.7407	28	0.169		Prob>F=0.5589	Root MSE=0.4148	
Total	4.8	29	0.1655				
Adoption	Coef.	Std.error	t	P>|t|	[95% confidence]		
Network	0.1481	0.2504	0.59	0.559	-0.3648	0.6611	
Constant	1.518	0.4816	3.15	0.004	0.5318	2.503	

Results show that, from the 30 observations made, the relationship between the adoption level of e-business and network pressure is not statistically significant at 0.05 significance level (p=0.559 and t=0, 59). The p-value needs to be less than 0.05 and the t-value above 2 or below -2 for the relationship to be statistically significant. Therefore, the hypothesis that there is a significant positive association between network pressure and adoption of e-business is rejected.

This result is against our expectations as it is not consistent with literature. For example, the findings by Zhu and Kraemer (2005); McCole and Ramsey (2005); Hsu, Kraemer and Dunkel (2006); Lin and Lin, (2008) and Tatiach *et al,* (2012) have shown a positive relationship between network pressure and adoption of an innovation. We expected that a powerful supplier or customer such as government would pursue strategies to induce its partners to adopt e-business. For example, Kuan and Chau (2001) have observed a positive relationship between government pressure and adoption of e-business in Singapore because government sets e-business requirements for firms. In another case, IBM had to tell its partners to do business electronically if they wanted to do business with them (Hsu, Kraemer and Dunkle, 2006).

The observed results could be due to the limited number of institutions in the value chain that are using e-business applications. This corroborates the observations by Armstrong and Sambamurthy (1999) that when supply chain players begin to use web technologies, other firms respond to the pressure to adopt the technologies. This assertion is supported by results of the qualitative phase of the research as evidenced below by two excerpts from interview transcripts.

"There is no significant e-business activity in the manufacturing sector and in the value chain. We cannot talk of any network pressure if customers and other stakeholders are not

involved in e-business. How can they push the firms to adopt e-business if they are not using it themselves?"

"There is no network pressure because the same stakeholders have not adopted e-business. If I have got WhatsApp, I will force my mother to have one so that we are always communicating. Most of the players are still in their zone of comfort and doing everything manually. The other factor is that no one is certain about the economy, therefore people are hesitant to invest."

The above excerpts demonstrate that network pressure is not pushing firms in the manufacturing sector to adopt e-business. The phrase 'there is no network pressure' is inferred in the statements by all the respondents. The major reason why there is no network pressure seems to be that the key players in the supply chain have not yet moved to high levels of e-business involvement themselves.

Hypothesis 1b: *There is a significant relationship between the existence of favourable technological factors and adoption level of e-business.*

A regression of the technological factors and the adoption level of e-business produced the results shown in Table 5.9.

Table 5.9 Technological factors and adoption of e-business

Source	SS	df	MS		# of obs=30	Rsqd=0.012
Model	0.05932	1	0.592		F (1, 28) =0.35	AdjRsq=0.023
Residual	4.7407	28	0.169		Prob>F=0.5589	RMSE=0.4148
Total	4.8	29	0.1655			
Adoption	Coef.	Std.error	t	P>|t|	[95% confidence]	
Technological factors	0.1481	0.2504	0.59	0.559	-0.3648	0.6611
Constant	1.518	0.4816	3.15	0.004	0.5318	2.503

Results show that, from the 30 observations made, the relationship between adoption level of e-business and technological factors is not statistically significant at 0.05 significance level (p=0.559 and t=0, 59). The p-value needs to be less than 0.05 and the t-value above 2 or below -2 for the relationship to be statistically significant. Therefore, the hypothesis that there is a significant positive association between technological factors and adoption of e-business is rejected.

Results are not consistent with the majority of the innovation adoption literature. We expected a positive relationship in line with Tornatsky and Fleischer's 1990 TOE model which proposes that firms with sound IT infrastructure and staff are more likely to adopt e-business. Furthermore, results show that there is an R-squared value of 0.0123. This means that only 1.23% of e-business adoption level by the manufacturing sector in Zimbabwe is accounted for by technological factors. This is contrary to our expectations as literature suggests that technological factors such as technical expertise are predictors of e-business adoption (Tornatsky and Fleischer, 1990; Rodgers, 2003; Hsie-Fen and Gwo-Guang, 2005; Ramdani, Chevers and Williams, 2013). In a qualitative study of United Kingdom firms, Ashurst, Cragg and Herring found that IT competence was a predictor of innovation adoption.

The observed results in this study could be a result of lack of knowledge of the perceived benefits of e-business and difficulties in acquiring and using the e-business technology. The excerpts below from interview transcripts demonstrate that people are a key technological factor that compliments the physical IT infrastructure. If the managers do not have the knowledge of e-business applications, this will retard adoption of e-business.

"There is lack of exposure to the new technologies, hence if one is not aware of any new technology available, how can one think of acquiring it? In my view, managers need to be

exposed to the new applications of e-business, understand their benefits and, surely, they will adopt it."

"The ease of use of e-business applications, their availability or low cost was not the push factor for the adoption of e-business. In the case of our company, the grand plan was to computerise and network all our units. This took a period of over 15 years to implement as resources were being gradually mobilised and people acquainting themselves with the new technology."

It seems that the technological factors are not pushing firms to adopt e-business as manage*r*s are not aware of the e-business applications available and the benefits they can derive from their use. This means that firms need to expose their managers to the most recent e-business applications. A culture of innovation would need to be established in firms so that managers would not need to wait for the formal exposure to an innovation but rather take it serendipitously.

Hypothesis 1c: *There is a significant positive relationship between institutional factors and adoption of e-business.*

When institutional factors and adoption of e-business adoption values were regressed, the results presented in Table 5.10 show a statistically significant relationship between institutional factors and adoption of e-business at 0.05 significance level. The p- value of 0.043 is less than the significance level and the t-statistic (2.72) is greater than 2, implying that the null hypothesis should be rejected and then accept the alternate hypothesis.

On the other hand, the coefficient value of 0.827 indicates that there is a strong positive relationship between e-business adoption and institutional factors.

Furthermore, the R-squared value of 0.1374 suggests that 13.74% of the e-business adoption is a result of the effect of institutional factors. The root mean square error of approximation (RMSEA) of 0.3884 indicates that the institutional factor as a construct fits well in the proposed model since this value is between 0 and 1 (Hu and Bentler, 1999).

The above results demonstrate that firms are more responsive to institutional factor changes such as expectations of government, industry, professionals or other regulatory bodies. The response is needed to legitimise their existence through the definition of their mission, values and goals (Bakko and Sahal, 2008). The findings are consistent with observations by Wu, Mahajan and Balasubramanian (2003) that adoption of e-business may be due to fear of loss of legitimacy rather than the need to gain the actual e-business efficiencies. However, these results are not consistent with findings from the Travel and Leisure sector. Wang and Cheung (2004), in a study of 500 travel agencies in Taiwan, found a statistically insignificant relationship between institutional pressure and adoption of an innovation (Mobile e-Business).

Table 5.10 **Institutional factors and e-business adoption**

Source	SS	df	MS		# of obs=30	R-quared=0.1374
Model	0.662	1	0.662		F (1, 28) =4.48	Adj R-sq=0.1071
Residual	4.137	28	0.1477		Prob>F=0.0433	Root MSE=0.3884
Total	4.8	29	0.1655			
Adoption	Coef.	Std.error	t	P>|t|	95% confidence interval]	
Institutional factors	0.827	0.39	2.72	0.043	0.2666	1.6285
Constant	0.172	0.772	0.22	0.825	-1.409	1.254

There was evidence in all the five interview reports that institutional factors underpin the adoption of e-business, thus supporting the findings from the quantitative phase. From the field interviews, it was evident that the need to achieve the institutional goals could be the major reason for the positive relationship between institutional factors and e-business adoption.

Conclusion on environmental factors

In this section, it is observed that, of the environmental factors that were under study, network pressure and technological factors have no statistically significant effect on e-business adoption, a result that was not expected as it is not consistent with literature. However, institutional factors have been found to have a strong positive relationship with e-business adoption, a result which corroborates e-business adoption literature.

5.5.1.2 Organisational factors

In this section, five hypotheses were tested to assess whether there is an association between the identified independent variables and level of adoption of e-business.

Hypothesis 2a: *There is a significant positive association between innovation orientation and adoption of e-business.*

The results of the regression between innovation orientation and adoption level of e-business shows existence of a statistically significant relationship between these two variables at 0.05 significance level. As shown in Table 5.11, a p-value of 0.043 and t-statistic of 2.72 show that we can reject the null hypothesis and accept the alternate hypothesis which states that there is a positive association between innovation orientation and adoption of e-business. A coefficient value of 0.827 shows a strong relationship between these two variables. R-squared value of 0.1374 and RMSEA of 0.3884 show that 13.74% of e-business adoption is accounted for by the firm's innovation orientation while innovation orientation fits well with the model.

The salient aspect from the narrative phase is the confirmation that innovation orientation is related to e-business adoption. This is evidenced by the excerpt below.

"This factor affects adoption to a very large extent since in the manufacturing sector there is so much communication with customers. The need to get better results can push firms to think outside the box and adopt e-business."

As was expected, results show that the firm's innovation orientation is positively associated with adoption of e-business. This finding is consistent with previous studies by Rodgers (2003), Linda *et al* (2003) and Simmons and Soner (2012). This means that manufacturing firms need to always find new ways of solving their problems and e-business adoption is one such solutions. Furthermore, firms need to inculcate a culture of receptivity to change in adopting and accommodating new technology (Abu Bakar, 2004). There is need to build a culture of innovation to drive internal change.

Table 5.11 Innovation orientation and adoption of e-business

Source	SS	df	MS		# of obs=30	R-quared=0.1374
Model	0.662	1	0.662		F (1, 28) =4.48	Adj R-sq=0.1071
Residual	4.137	28	0.1477		Prob>F=0.0433	Root MSE=0.3884
Total	4.8	29	0.1655			
Adoption	Coef.	Std.error	t	P>|t|	[95% confidence]	
Innovation Orientation	0.827	0.39	2.72	0.043	0.2666	1.6285
Constant	0.172	0.772	0.22	0.825	-1.409	1.254

Hypothesis 2b: *There is a significant positive association between financial resources and adoption of e-business*

A regression between the financial resources and adoption level of e-business shows existence of a statistically significant relationship at 0.05 significance level. As presented in Table 5.12, the probability of accepting the null hypothesis (0.0344) is less than the significance level (0.05), therefore, the null hypothesis is rejected and the alternate hypothesis

stated above is not rejected. The R-squared value of 0.1512 shows that 15.12 % of e-business adoption observations are accounted for by the presence of robust financial resources to support e-business. Furthermore, the coefficient value of 0.519 shows that there is a moderate strength of the relationship between these two variables.

Interesting results have been observed in the qualitative phase where some respondents suggest that financial resources affect directly e-business adoption while others have a contrasting view as evidenced by the excerpts below from the interview transcription.

"Financial resources are critical in E-business investment. However, for financial resources to limit adoption, it depends on size of the company. What one company regards as expensive, others might see it as not. It also depends on the level of adoption and the kind of technology involved."

However, other respondents, while acknowledging the importance of financial resources, opine that where resources are limiting, adoption of e-business can be done gradually. The following two excerpts provide evidence to that assertion.

"These can limit adoption in IT-based firms which require robust technologies. In a manufacturing concern, we can start with basic e-business applications and gradually move on. So we may start with very small amounts invested in e-business and increase this with time."

"Our experience is that financial factors do not impede the adoption of e-business because our firm did that before the recapitalisation process which it embarked on around 2009. The firm can implement e-business by starting with those processes which do not need huge financial investment."

The notion of financial resources influencing e-business adoption has been a subject of interesting discussion among scholars, especially resource-based view theorists as they argue that financial resources give a firm a competitive advantage (Barney, 2003). Furthermore, the adoption literature has linked financial resources to e-business adoption since firms need a strong financial base to meet the costs of IT infrastructure. Our quantitative findings have also strengthened that notion by showing that there is positive relationship between financial resources and e-business adoption in the manufacturing sector. However, our qualitative

results show that while financial resources may enhance the adoption of e-business, scarce financial resources may not limit the process as firms can start by adopting those applications which do not need huge financial investments. This assertion supports the work by Hsu, Kraemer and Dunkle (2006) in the USA, and Wang and Cheung (2004) in Taiwan, which shows a statistically insignificant relationship between financial resources and e-business use.

Table 5.12 **Financial resources and e-business adoption**

Source	SS	df	MS		# of obs=30		R-squared=0.151
Model	0.726	1	0.726		F (1, 28) =4.99		AdjR-quared=0.1209
Residual	4.07	28	0.1455		Prob>F=0.0337		RMSE=0.381
Total	4.8	29	0.1655				
Adoption	Coef.	Std.erro	t	P>|t|	[95% confidence		
Financial Resources	0.519	0.232	2.23	0.0344	0.43	0.994	
Constant	0.814	0.446	1.82	0.079	-0.998	1.73	

Hypothesis 2c: *There is a significant positive association between the firm's Information Technological (IT) resources and adoption level of e-business.*

The study sought to establish whether there is a positive association between the firm's information technology (IT) and adoption level of e-business. The test was achieved by regressing the firm's information technological resources mean scores and those on adoption level of e-business. The results show that at 0.05 significance level, there is no statistically significant relationship between these two variables since a p-value of 0.433 and a t-statistic of 0.8 obtained. Therefore, the alternate hypothesis is rejected and the null hypothesis is accepted.

The R-squared value of 0.0221 and the RMSEA of 0.8824 show that although the firm's information technological resources fit as a construct in the e-business adoption model, its contribution to the overall e-business adoption is very small (only 2.21%).

Interview results suggest that the IT infrastructure should not be a limiting factor to the adoption of e-business given the growth of the national IT backbone and the number of IT skills available on the market. Furthermore, where firms do not have these specialised IT skills, out sourcing can be an option. The following excerpt from the qualitative phase provides this evidence.

"Firm's IT resources are not limiting factors, especially in firms which are not IT-based. It's a resource that can be out sourced. It's a support service."

Contrary to the e-business adoption literature and our expectations, results showed that the firm's IT resources are not positively associated with e-business adoption. According to the resource-based view theory, the firm's IT infrastructure becomes a source of competitive advantage. Wang and Cheung (2004) observed that travel agencies needed a robust IT infrastructure to adopt and use e-business. In another empirical study, Zhu, Kraemer and Xu (2002) found a strong relationship between IT resources and organisational innovation. The quantitative findings can be explained by our qualitative results in which respondents argued that, where a firm does not have the IT infrastructure, particularly the human resource, adoption of e-business can still be done through outsourcing or sub contracting.

Table 5.13 Firm's IT resources and adoption of e-business

Source	SS	df	MS		# of obs=30	R-squared=0.0221
Model	0.493	1	0.493		F (1, 28)=0.63	Adj R-sq=-0.128
Residual	21.8	28	0.778		Prob>F=0.433	Root MSE=0.8824
Total	22.2	29	0.7687			
Adoption	Coef.	Std.error	t	P>|t|	[95% confidence]	
Firm's IT Resources	0.826	0.104	0.8	0.433	-0.13	0.295
Constant	3.11	0.527	5.91	0	2.03	4.19

Hypothesis 2d: *There is a significant positive association between perceived usefulness and level of adoption of e-business.*

In order to test whether there is a significant positive association between perceived usefulness and level of adoption of e-business, a regression between these two variables was performed. Table 5.14 presents the results of the test. The results show that there is a significant positive association between perceived usefulness and level of adoption of e-business at 0.05 significance level. Results show a p-value of 0.043 and a t-statistic of 2.72, thus the null hypothesis should be rejected and the alternate one stated above accepted.

Furthermore, results show that the value of R-squared is 0.1374, implying that13.74% of the e-business adoption level is accounted for by perceived usefulness. The intensity of the association between these variables is also strong as evidenced by a high coefficient value of 0.827.

The following statement by one of the interviewees is evidence that when the firm perceives benefits from the e-business applications, then it can do everything to adopt the technology.

This supports the existence of a strong positive relationship between perceived usefulness and adoption of e-business.

"Technological factors have an impact on adoption of e-business. User-friendly technology is easier to adopt. Firms that perceive a cost-benefit from the technology see more value in getting it, particularly if business is done with externals."

One of the most debated factors by scholars in e-business adoption is perceived usefulness. It has been used as a construct in the Technology Acceptance Model (TAM) and Extended Technology Acceptance Model (ETAM), for example, by Davis (1989); Smith and Piers (2009). The adoption literature has found perceived usefulness to be significant in the adoption of e-business (Park *et al,* 2012; Kim, 2012; Thompson, 2007; Shin, 2007; and Grandson and Pearson, 2004). As expected, our findings further strengthen this notion by showing that perceived usefulness is positively associated with e-business adoption in the manufacturing sector. The implication of this result is that e-business service providers and other supply chain players need to make the e-business benefits known by top managers or other decision-makers in the manufacturing sector to increase rate of adoption and use.

Table 5.14 **Perceived usefulness and adoption of e-business**

Source	SS	df	MS		# of obs=30	R-sq=0.1374	
Model	0.662	1	0.662		F (1, 28)=4.48	Adj R-sq=0.1071	
Residual	4.137	28	0.147		Prob>F=0.043	RMSE=0.388	
Total	4.8	29	0.165				
Adoption	Coef.	Std.erro	t	P>|t|	[95% confidence]		
Perceived Usefulnes	0.827	0.39	2.72	0.043	0.266	1.628	
Constant	0.172	0.772	0.22	0.825	-	1.254	

Hypothesis 2e*: There is a significant positive association between firm size and level of adoption of e-business*

Results of the hypothesis test on whether there is a significant positive association between firm size and level of e-business adoption show a statistically significant association between these two variables at 0.05 significance level. As shown in Table 5.15, the test produced a p-value of 0.025 and a t-statistic of 2.37. These values are less than 0.05 and bigger than 2 respectively. This implies that the null hypothesis is rejected and we accept the alternate one stated above.

The results also show that firm size accounts for 16.74% of the firm's e-business adoption level given that R-squared is 0.1674 and the strength of the association is high as indicated by a coefficient of 0.79. A Root MSE of 1.464 indicates a high fit index value, suggesting that the construct size fits very well in the overall model.

The adoption literature shows that one of the most studied factors of e-business adoption is size. However, there are still mixed results of its impact on adoption of an innovation. For example, Askaranya and Mal (2005), Levenburg (2005) and Thompson (2007), and Bordonaba-Juste *et al,* (2012) have found size to have a significant relationship with adoption of e-business. On the other hand, Oliviera and Martins (2010), Hsu, Kraemer and Dunkle (2010) and Aguila-Obra and Padilla-Mendez (2006) have found contrasting results. The different results can be explained by the fact that size can be measured differently, using number of employees, sales revenue, sales volumes, and so on. Furthermore, the size of the firm can be perceived differently from one country to the other.

Results have shown that there is a significant positive relationship between size and e-business adoption in the manufacturing sector when sales revenue is the measurement parameter. It follows then that the more revenue the firm generates, the bigger it is and the

more money it has for e-business. Conversely, small firms generate less money and, in turn, have little for e-business investment.

While previous findings contrasting the relationship are not flawed, these findings provide clarification on the relationship in the manufacturing sector in a developing country and when sales revenue is used as the measurement parameter.

Table 5.15 **Size of firm and adoption of e-business**

Source	SS	df	MS		# of obs=30	R-squared=0.167
Model	12.077	1	12.078		F (1, 28)=5.64	Adj R-sq=-0.137
Residual	60.089	28	2.1460		Prob>F=0.0248	R MSEA=1.464
Total	72.166	29	2'4848			

Adopt	Coef.	Std.err	t	P>|t|	[95% confidence]	
Size	0.7877	0.3320	2.37	0.025	0.1075	1.467
Const	0.1027	1.1816	1..78	0.086	0.3171	4.523

Conclusion on effect of organisational factors on e-business adoption

This section has focused on the relationship between organisational factors, namely innovation orientation, financial resources, firm's technological resources, perceived usefulness and firm size, and adoption of e-business. Interesting findings, some consistent and others inconsistent with the literature have been obtained. For example, innovation orientation, financial resources, perceived usefulness and size of the firm as expected and consistent with literature have been found to be positively associated with e-business

adoption. On the other hand, it was found that technological resources did not have a statistically significant relationship with e-business adoption. This is not consistent with the literature and, in particular, the resource-based view (RBV) theory. Overall, organisational factors have been found to be significantly associated with e-business adoption.

5.5.1.3 Managerial factors

In this section, four variables related to managerial factors (senior management attitudes, CEO's perceived risk, managerial experience, and managerial commitment) were tested to find out how they are associated with e-business adoption level.

Hypothesis 3a: *There is a significant positive assocition between senior management attitudes and level of adoption of e-business*

The test of the association between managerial attitudes and level of adoption of e-business showed a statistically significant relationship between these two variables at 0.05 significance level. The test produced a p-value of 0.002 and a t-statistic of 3.35 (see Table 5.16), figures that are smaller than 0.05 and bigger than 2 respectively.This leads to rejecting the null hypothesis and accepting the alternate hypothesis stated above.

The results also produced an R-square of 0.2857 to show that 28.57% of the variability in level of e-business adoption is a result of the effect of attitudes of senior managers. Results also show a very strong positive association between these two variables (coefficient=0.857). Senior management attitudes as a construct fits very well in the e-business adoption model given the RMSEA value of 0.3499.

The interview results also confirm the role of managerial attitudes in influencing e-business adoption. When top managers have a positive attitude towards e-business, the firm will adopt it. The following statements by the interviewees portray that:

"When top managers have a negative attitude towards e-business, this will affect the whole business strategy, since they dictate the direction the firm should take and determine the level of resources committed to any project by the firm."

"At my company, there are several centre managers. You will realise that changes take place in some centres while nothing happens in other centres. It all depends on the attitudes of the centre managers towards the change. Similarly, adoption of e-business applications will depend on the attitudes of senior managers towards them."

The study has shown that managerial attitudes are positively associated with the adoption of e-business in the manufacturing sector. This is consistent with previous studies which identified that negative attitudes affect adoption of e-business, (Rasanfisah, Salbiah and Sheriffudin, 2010; Almoawi and Mahmood, 2012) while positive attitudes enhance it (Mndzeke, 2013; Huy, 2012). Furthermore, these results provide empirical evidence for the effect of managerial attitudes in the manufacturing sector in a developing country, thus strengthening the notion from previous studies.

Table 5.16 **Senior management attitudes and adoption of e-business**

Source	SS	df	MS		# of obs=30	R-squared=0.2857
Model	1.371	1	1.371		F (1, 28) =11.20	Adj R-sq=-0.2602
Residual	3.428	28	0.122		Prob>F=0.0023	Root MSE=0.3499
Total	4.8	29	0.1655			
Adoption	Coef.	Std.error	t	P>|t|	[95% confidence]	
Managerial attitudes	0.857	0.256	3.35	0.002	0.332	1.382
Constant	0.143	0.499	0.29	0.772	-0.879	1.166

Hypothesis 3b: *There is a significant positive association between CEO's perceived risk and e-business adoption level.*

The results of the test of association between the CEO's perceived risk and e-business adoption level are presented in Table 5.17. The results show that there is no statistically significant positive association between the CEO's perceived risk and e-business adoption level at 0.05 significance level. The p-value of 0.35 and t-statistic of 0.95 lead us to not rejecting the null hypothesis and rejecting the alternate hypothesis stated above.

The root mean square of error approximation (RMSEA=0.4075) is between 0 and 1 and shows that the CEO's perceived risk fits in the e-business adoption model. However, its contribution to e-business adoption level variability is only 3.13% (R-squared=0.0313).

The results of this study demonstrate that there is no significant positive association between the CEO's perceived risk and adoption of e-business in the manufacturing sector. This means that increased risk perception may lower the rate of adoption of e-business as managers are not prepared to take risk by just adopting e-business (Noy and Ellis, 2003). Increased risk perception may be a result of the newness of the technology or lack of exposure to it.

Although these results substantiate the findings by Schimdt (2004) and Scott (2004), literature on perceived risk based on the Cultural Theory explains that the level of risk perception can vary from manager to manager, industry to industry, and country to country, hence the findings of this study are unique since the industry and country variables are specific to the manufacturing sector and Zimbabwe respectively.

Table 5.17 **CEO's perceived risk and adoption of e-business**

Source	SS	df	MS		# of obs=30	R-squared=0.031
Model	0.15	1	0.15		F (1, 28)=0.90	Adj R-sq=-0.0033
Residual	4.65	28	0.166		Prob>F=0.3501	RMSE=0.4075
Total	4.8	29	0.1655			
Adoption	Coef.	Std.error	t	P>|t|	[95% confidence]	
perceived risk	0.15	0.158	0.95	0.35	-0.173	0.473
Constant	1.55	0.273	5.67	0	0.99	2.11

Hypothesis 3c: *There is a significant positive association between managerial experience and e-business adoption level*

A test of association between managerial experience and e-business adoption level was carried out using the regression analysis. The results, as presented in Table 5.18, show that there is no statistically significant relationship between managerial experience and e-business adoption at 0.05 significance level. The results show the p-value of 0.115 and this is more than 0.05, implying that the null hypothesis that states that there is no significant positive association between managerial experience and e-business adoption level should not be rejected. Therefore, the alternate hypothesis stated above should be rejected.

Although managerial experience as a construct fits in the e-business adoption model (RMSEA=0.3957), the contribution to e-business adoption variability is low (R-squared=0.0865 or 8.65%).

These results contradict the literature and, in particular, the findings by Armstrong and Sambamurthy (1999), and Chatterjee, Grewal and Sambamurthy (2002) who found out that managerial experience in information technology (IT) in a firm is a predictor of technology assimilation. Bordonaba-Juste *et al,* (2012) also found that IT expertise and experience influences adoption in firms of all sizes.

In the following examples, interview respondents showed that the managerial experience that can positively influence the adoption of e-business is one that is e-business related, otherwise any experience broods resistance.

"Yes, this factor affects adoption of e-business in the manufacturing sector because the 'we used to do it this way and it worked' stifles adoption of an innovation. Introduction of new ways might be resisted, particularly where management is not flexible. At the same time, experience exposes managers to challenges which might push them to find new solutions through adoption of an innovation."

"Experienced managers do not want to throw away traditional approaches. Any experience or qualification that is not IT-related is a problem to the adoption of e-business unless the manager has a natural bias towards e-business."

Results on managerial experience show that there is no association between this variable and adoption of e-business. This means that the more experienced a manager is, the more he/she is likely to remain attached to what he/she knows best. This, then, has the tendency of stifling learning and innovation. The respondents supported this notion during field interviews when they explained that any experience or qualification that is not IT or e-business-based does not enhance adoption of e-business unless the manager is naturally innovation-oriented. These results are consistent with the findings of Lai (2002) and Gragg and Mills (2001).

Table 5.18 **Managerial experience and adoption of e-business**

Source	SS	df	MS		# of obs=30	R-sqd=0.0865
Model	0.415	1	0.415		F (1, 28) =2.65	Adj R-sq=-0.0539
Residual	4.384	28	0.156		Prob>F=0.1146	Root MSE=0.3957
Total	4.8	29	0.1655			
Adoption	Coef.	Std.error	t	P>|t|	[95% confidence]	
Managerial	0.346	0.213	1.63	0.115	-0.089	0.782

Experience							
Constant	1.153	0.403	2.86	0.008		0.328	1.979

Hypothesis 3d: *There is a significant positive association between managerial commitment and e-business adoption level.*

The results of the test of association between managerial commitment and e-business adoption level are shown in Table 5.19. These results show that there is no statistically significant positive association between managerial commitment and e-business adoption level. This is because the test produced a p-value of 0.288, a figure greater than the significance level of 0.05. This means that the null hypothesis that states that there is no significant relationship between managerial commitment and e-business adoption level is accepted.

The results of this study also show that management commitment fits in the e-business adoption model (RMSEA=0.4056), contributing only 4.0% of e-business adoption variability (R-squared=0.0402).

The survey results show that there is no significant positive association between these two variables. The results are inconsistent with those obtained elsewhere, for example, Thatcher, Foster and Zhu (2006); Peansupan and Walker, (2006);Wanjara, Macharia and Ayogo (2012); and Mose, Njihia and Magutu (2013). However, further probing during the interviews produced results consistent with the literature as respondents suggested that, with no e-business commitment from top managers, resources are not mobilised and channelled towards that. The following is indicative of that assertion:

"*Management have no commitment towards e-business. At my company, we had to push hard just to be at the level of e-business application where we are, which, in my view, is still low*

compared to our foreign competitors. For example, it took us five years for salespeople to be given laptops and have them connected so that they have the office wherever they are. Top managers allocate resources so you can guess what happens if they are not committed to the innovation."

"An innovation is first discussed with top managers. Once they agree, resources are then availed to adopt it. Making resources available is a sign of top management commitment to the success of the project."

Table 5.19 **Managerial commitment and adoption of e-business**

Source	SS	df	MS		# of obs=30	R-sqd=0.0402
Model	0.192	1	0.193		F (1, 28) =1.17	Adj R-sq=-0.0059
Residual	4.6	28	0.165		Prob>F=0.2882	RMSE=0.4056
Total	4.8	29	0.1655			
Adoption	Coef.	Std.error	t	P>|t|	[95% confidence]	
Manageri	0.321	0.297	1.08	0.288	-0.2887	0.93
Constant	1.179	0.579	2.04	0.051	-0.0089	2.364

Conclusion on the association between managerial factors and adoption of e-business

In this section, the association between managerial factor variables, namely attitudes of senior managers, the CEO's perceived risk, managerial experience as well as managerial commitment was examined. Results corroborated literature and strengthened findings from past studies when it was observed that there is a positive significant association between attitudes of senior managers and level of e-business adoption in the manufacturing sector. However, results which were inconsistent with the literature were that the CEO's perceived risk, managerial experience as well as managerial commitment have no significant positive association with the adoption of e-business in the manufacturing sector. Overall, managerial factors have limited association with the adoption of e-business in the manufacturing sector.

5.5.1.4 E-business efficiency factors

The relationship between the number of e-business applications adopted by the firm, the number of units in a firm that have adopted e-business (the spread) and the rate at which the adopted e-business applications are used were tested in this section to see if they are related to business efficiency.

Hypothesis 4a: There *is a significant positive relationship between the number of e-business applications adopted and the business efficiency of the firm.*

The study also assessed whether the number of e-business applications a firm might adopt have any relationship with the business efficiency the firm gains. Results of the regression between these two variables are presented in Table 5.20. The results show a statistically significant positive relationship between the number of e-business applications that are adopted and the business efficiency of the firm at 0.05 significance level (p value=0.000). Thus, the alternate hypothesis which states that there is a positive relationship between number of e-business applications that are adopted by the firm and business efficiency is accepted.

 The results also show that 35.25% of the firm's business efficiency variability is accounted for by the number of e-business applications that are adopted (R-squared=0.3525). The coefficient value is positive and demonstrates that for every unit increase in the number of e-business tools adopted, there will be an increase in the adoption level by 0.37 units.

Out of interest, the relationship between the number of e-business applications adopted by the firm and the firm's sustainable competitive advantage was tested. The relationship was found

to be statistically significant at 0.05 significance level. The results of the test are presented in Table 5.21

Table 5.20 **Relationship between number of e-business applications and business efficiency**

Source	SS	df	MS		# of obs=32	R-sqd=0.3525
Model	11.1744	1	11.17		F (1, 30)=16.34	AdjR-sqd=0.3
Residual	20.5218	30	0684		Prob>F=0.0003	RMSE=0.8271
Total	31.696	31	1.022			
Efficiency	Coef.	Std.error	t	P>|t|	[95% confidence]	
Number of e-business applications	0.368	0.911	4.04	0.000	0.182	0.554
Constant	1.979	0.455	4.35	0.000	1.050	2.909

Table 5.21 **Relationship between number of e-business applications and SCA**

Source	SS	df	MS		# of obs=32	R-sqd=0.4844
Model	16.201	1	16.201		F (1, 30) =28.18	AdjR-sq=0.4672
Residual	17.246	30	0.574		Prob>F=0.0000	RMSE=0.7582
Total	33.447	31	1.0789			
SCA	Coef.	Std.error	t	P>|t|	[95% confidence]	
Number of e-business application	0.443	0.835	5.31	0.000	0.273	0.613
Constant	1.580	0.417	3.79	0.001	0.728	2.432

With a p-value and t-statistic of 0.000 and 5.31 respectively, there is evidence that there is a significant positive relationship between number of e-business applications adopted by the firm and its sustainable competitive advantage. The results imply that a firm which adopts

more e-business applications is more likely to gain a sustainable competitive advantage. Given the coefficient value of 0.443, the results suggest that for every e-business application adopted by the firm, its sustainable competitive advantage increases by 0.44 units.

Hypothesis 4b: *There is a significant positive relationship between spread of e-business in the firm and e-business efficiency*

To test whether the number of business units that have adopted e-business applications has a significant positive relationship with the firm's business efficiency, a regression was done between these two variables. The results of this regression presented in Table 5.22 show that there is no statistically significant relationship between the spread of e-business applications across the firm's business units and the business efficiency of the firm at 0.05 significance level. The results show a probability value of 0.276. This is greater than 0.05 and so the null hypothesis should not be rejected. Thus, the alternate hypothesis which states that there is no significant positive relationship between the spread of e-business application across the firm's business units and the business efficiency of the firm is rejected. However, our results show that there is a fit between the spread of e-business applications and the model (RMSEA=0.759). The implication of these results is that manufacturing firms may not need to invest in e-business for all their units. They need to identify those critical units and increase the number of e-business applications in these. These results have not been produced in past studies and stand to strengthen debate in e-business adoption.

Table 5.22 **Spread of e-business applications and e-business efficiency**

Source	SS	df	MS		# of obs=30	R-squared=0.042	
Model	0.993	1	0.993		F (1, 28) =1.24	Adj R-sq=-0.081	
Residual	22.48	28	0.803		Prob>F=0.2755	R MSE=0.8961	
Total	23.47	29	0.809				
Efficienc	Coef.	Std.err	t	P>|t|	[95% confidence]		
Spread	0.254	0.228	1.11	0.276	-0.214	0.722	
Constant	3.245	0.336	6.05	0	2.14	4.34	

Hypothesis 4c: *There is a significant positive relationship between usage rate of e-business applications and the firm's business efficiency*

The study sought to test whether the rate of using e-business applications by firms has any relationship with the firm's business efficiency. After the regression of these two variables, the results presented in Table 5.23 show that there is a statistically significant relationship between usage rate of e-business applications and the firm's business efficiency at 0.05 significance level. The p-value of 0.001 leads to the rejection of the null hypothesis since it is less than 0.05.

Table 5.23 **Usage rate of e-business applications and business efficiency**

Source	SS	df	MS		P>|t|	# of obs=30	R-sqd=0.3123
Model	7.33	1	7.33			F (1, 28) =12.71	Adj R-sq=-02877
Residual	16.144	28	0.576			Prob>F=0.0013	RMSE=0.7593
Total	23.47	29	0.809				
Efficienc	Coef.	Std.erro	t	P>|t|	95% confidence		
Usage Rate	0.407	0.1141	3.57	0.001	0.173	0.64	
Constant	2.305	0.444	5.2	0	1.398	3.218	

Although the intensity of this relationship seems to be weak given the coefficient value of 0.407, the RMSEA of 0.7593 suggests a fit between these two variables, and R-squared of 0.312 demonstrates that 31.2 % of business efficiency variance is explained in terms of usage rate of e-business applications. Given the coefficient value of 0.407, for every increase in usage rate by a unit, the firm's business efficiency is likely to increase by 0.41 units. These results seem to suggest that firms with a high usage rate of e-business applications have a higher propensity to gain more business efficiencies than those with a low usage rate.

5.5.1.5 Business efficiency and sustainable competitive advantage

The relationship between the firm's business efficiency and the sustainable competitive advantage, both strategic and organisational, was tested in this section.

Hypothesis 5a: *There is a significant positive relationship between the firm's business efficiency and strategic sustainable competitive advantage*

Does the firm's business efficiency lead to a strategic sustainable competitive advantage? The study sought to find out if there is any relationship between the firm's business efficiency and sustainable competitive advantage. The results in Table 5.24 show that there is a statistically

significant relationship between the firm's business efficiency and sustainable competitive advantage. With a p-value of 0.000, and t-statistic of 6.67, the null hypothesis is rejected and the alternate hypothesis which states that there is a significant relationship between the firm and sustainable competitive advantage is accepted.

A high R-squared value of 0.6149 shows that business efficiency accounts for 61.5% of the firm's strategic sustainable competitive advantage. Furthermore, the coefficient value of 0.821 shows existence of a very strong positive relationship between these variables. For every increase in business efficiency by one unit, the firm's strategic sustainable competitive advantage has the propensity to increase by 0.82 units.

The results provide empirical evidence that there is strong positive relationship between the firm's business efficiency and its sustainable competitive advantage. The reason for this relationship seems to be that when a firm gains business efficiencies, it is likely to excel in controlling its costs. This means that it will have more financial resources available for investment in 'sustainable activities' such as product innovation and differentiation (Porter, 1980) in line with the resource-based view theory (Barney, 2003), thus increasing its competitive advantage. The results are consistent with those of Kao and Hwang (2008) who found a strong relationship between efficiency and profitability.

Table 5.24 **Business efficiency and strategic sustainable competitive advantage**

Source	SS	df	MS		# of obs=30	R-sqd=0.6149
Model	15.808	1	15.808		F (1, 28) =44.71	Adj R-sq.=0.601
Residual	9.899	28	0.354		Prob>F=0.00	RMSE=0.5946
Total	25.706	29	0.886			
SCA	Coef.	Std.error	t	P>|t|	[95% confidence]	
Efficiency	0.821	0.122	6.67	0.000	0.569	1.07
Constant	0.637	0.48	1.33	0.195	-0.347	1.62

Hypothesis 5b: *There is a significant relationship between the firm's business efficiency and organisational sustainable competitive advantage*

The results in Table 5.25 show that there is a statistically significant positive relationship between the firm's business efficiency and the organisational sustainable competitive advantage at 0.05 significance level. The test produced a p-value of 0.003 and a t-statistic of 3.26, implying that the null hypothesis is rejected and the alternate hypothesis which states that there is a significant strong relationship between the firm's business efficiency and the organisational sustainable competitive advantage should be accepted.

The R-squared value of 0.2752 shows that 27.52% of organisational sustainable competitive advantage is accounted for by the firm's business efficiency. The RMSE value of 0.7 demonstrates a fit of business efficiency as a construct into the overall model. Furthermore, the coefficient value of 0.478 shows a positive moderate relationship between these variables. This implies that for each unit increase in the firm's business efficiency, the organisational sustainable competitive advantage is likely to increase by 0.47 units.

This means that manufacturing firms that focus on using e-business applications to attain business efficiencies such as increased speed and improved accuracy of transaction and

improved coordination with supply chain members will eventually have improved perceived organisational image, customer satisfaction and retention; and, ultimately, increased margins and profits. These results are consistent with sustainable competitive advantage literature (Cagliano, Caniato and Spina, 2005; Yin and Khoo, 2007; Wang and Sarkis, 2013; Caldwell, Harland, Bwell and Zheng, 2013) in which the role of e-business has been explained as that of increasing the firm's value and inimitability of its processes, thereby making it a source of sustainable competitive advantage.

Table 5.25 Business efficiency and organisational sustainable competitive advantage

Source	SS	df	MS		# of obs=30	R-squared=0.2752
Model	5.356	1	5.356		$F_{(1, 28)}$ =10.63	Adj R-sq=0.2493
Residual	14.110	28	0.5039		Prob>F=0.0029	Root MSE=0.7099
Total	19.4666	29	0.6713			
Sales	Coef.	Std.error	t	P>|t|	[95% confidence]	
Bus. efficiency	0.478	0.1465	3.26	0.003	0.1725	0.7778
Constant	1.6451	0.5735	2.87	0.008	0.4702	2.8199

Conclusion on e-business efficiency and sustainable competitive advantage

In this section, the relationship between business efficiency and the firm's sustainable competitive advantage was tested using regression analysis. The results showed a strong positive relationship between business efficiency and the firm's sustainable competitive advantage, both strategic and organisational. The study has also shown that e-business adoption can lead to firms gaining business efficiencies. While literature argues that strategic competitive advantage is difficult to achieve (Abu Bakar, 2004), the study shows some level of achievement of both strategic and organisational sustainable competitive advantage.

Therefore, it can safely said that e-business adoption will result in firms gaining a sustainable competitive advantage.

5.5 Summary of the hypotheses tests

Table 5.26 gives a summary of the results of all the hypotheses tests. The results show that out of the 17 hypotheses, 10 were confirmed but 7 were not. This leads to a revised model in Figure 5.4.

Table 5.26: **Summary of the hypotheses tests**

Construct	Hypothesis statement	Hypothesis number	Outcome of test
Environmental factors	There is a significant positive relationship between network pressure and e-business adoption.	1a	not significant
	There is a significant relationship between the existence of favourable technological factors and e-business adoption.	1b	not significant
	There is a significant positive relationship between institutional factors and adoption of e-business.	1c	significant
Organisational factors	There is a significant positive association between innovation orientation and adoption of e-business.	2a	significant
	There is a significant positive association between financial resources and adoption of e-business.	2b	significant
	There is a significant positive association between the firm's information technological resources and adoption of e-business.	2c	not significant
	There is a significant positive association between perceived usefulness and level of adoption of e-business.	2d	significant
	There is a significant positive association between firm size and level of adoption of e-business.	2e	significant
Managerial factors	There is a positive association between senior management attitudes and level of adoption	3a	significant

	of e-business.		
	There is a significant positive association between CEO's perceived risk and e-business adoption level.	3b	not significant
	There is a significant positive association between managerial experience and e-business adoption level.	3c	not significant
	There is a significant positive association between managerial commitment and level of adoption of e-business.	3d	not significant
E-business adoption	There is a significant positive relationship between the number of e-business applications adopted and the business efficiency of the firm.	4a	significant
	There is a significant positive relationship between the spread of e-business applications in the firm and e-business efficiency.	4b	not significant
	There is a significant positive relationship between usage rate of e-business applications and the firm's business efficiency.	4c	significant
Business efficiency	There is a significant positive relationship between the firm's business efficiency and its strategic sustainable competitive advantage.	5a	significant
	There is a significant relationship between the firm's business efficiency and its organisational sustainable competitive advantage.	5b	significant

5.6 **CHAPTER SUMMARY**

The study has extended the continuing number of academic researches carried out on the antecedents of e-business adoption and sustainable competitive advantage. Although various studies have focused on the possible relationships between environmental, organisational and managerial factors and e-business adoption, there has been limited research that link

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e-business adoption and sustainable competitive advantage. Furthermore, there has been paucity of empirical evidence to support the relationship of these constructs.

The study provided empirical evidence to support the relationship among the antecedents of e-business adoption and confirmed some of the relationships in the conceptual framework in Figure 3.1.

In conclusion, the major findings from this study are summarised as follows:

a. The level of e-business involvement by the manufacturing sector is still low.

b. Network pressure does not have a significant positive relationship with e-business adoption.

c. Technological factors do not have a significant positive relationship with e-business adoption.

d. Institutional factors have a significant positive relationship with e-business adoption.

e. Innovation orientation has a significant positive association with e-business adoption.

f. Financial resources have a significant positive association with e-business adoption.

g. The firm's IT resources do not have a significant positive association with e-business adoption.

h. Perceived usefulness has a significant positive association with e-business adoption.

i. Size of the firm has a significant positive association with e-business adoption.

j. There is a significant positive association between attitudes of senior managers and adoption of e-business.

k. The CEO's perceived risk does not have a significant positive association with e-business adoption.

l. Managerial experience and qualifications do not have a significant positive association with e-business adoption.

m. Managerial commitment has a significant positive association with e-business adoption.

n. Number of e-business applications adopted by a firm has a significant positive relationship with its business efficiency.

o. The spread of e-business in a firm does not have a significant positive relationship with the performance of that firm.

p. The usage rate of adopted e-business applications has a significant positive relationship with the business efficiency of that firm.

q. The firm's business efficiency has a significant positive relationship with the sustainable competitive advantage of that firm.

r. The firm's business efficiency has a significant positive relationship with the sustainable competitive advantage of that firm.

CHAPTER 6

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.1 INTRODUCTION

In this chapter, all the preceding chapters are summarised, highlighting the main contributions or points. The conclusions of the overall thesis then follow commentary on the findings and gaps. The research contributions and implications for practitioners and policy-makers are also discussed. Furthermore, the limitations to the study and recommendations for further research are discussed.

6.1 SUMMARY OF CHAPTERS

6.1.1 Chapter One

Chapter One highlighted the importance of e-business adoption in the manufacturing sector in light of the global competitive landscape and escalating operational costs. Despite several e-business adoption studies, researchers continue to disagree on the drivers of e-business adoption. Furthermore, few researches have gone beyond explaining e-business adoption to assess its impact on firm performance in the manufacturing sector. Attention was also drawn to the paucity of knowledge on e-business adoption research in developing countries and, in particular, to Zimbabwe. As such, five objectives were set up to address the issue of low uptake of e-business applications by the manufacturing sector in Zimbabwe. These are stated as follows:

1. To identify the e-business activities undertaken by the manufacturing sector in Zimbabwe.

2. To determine the level of e-business adoption by the manufacturing sector in Zimbabwe.

3. To identify the environmental, organisational and managerial factors affecting e-business in Zimbabwe.

4. To establish efficiency factors associated with adoption of e-business by the manufacturing sector in Zimbabwe.

5. To investigate the impact of adoption of e-business on the performance of the manufacturing sector in Zimbabwe.

6.1.2 Chapter Two

Chapter Two presented a comprehensive review and discussion of the subject under study. The definition of e-business was given as the undertaking of normal commercial, government and personal activities by means of computers and telecommunication networks and includes a wide range of activities involving exchange of information, data or value-based exchanges between two or more parties (Rao and Decou, 2003). Constructs for e-business adoption were derived from various models such as the technology-organisation and environment (TOE), technology acceptance model (TAM) and diffusion of innovation (DoI). After assessing the weaknesses of each model, this study combined the strengths of these models to produce a new model, the environmental, organisational and managerial (EON) model. Perhaps the contribution of this study in the development of e-business adoption constructs lies here as previous researches have used each model separately.

Through the literature search, it was also found that the e-business applications that firms use fall in seven categories which are email, website, supply chain management (SCM), customer relationship management (CRM), enterprise resource planning (ERP), intra and inter-firm

communication and coordination, and online marketing. It was reviewed that firms adopt these e-business technologies gradually to avoid existing technology being rendered redundant. In some cases, the cautious adoption of an innovation was to facilitate progress commensurate with their 'learning level'.

Another contribution in this chapter was to link e-business adoption with business efficiency and sustainable competitive advantage via the resource-based view (RBV) theory. Very few studies have, in the past, linked innovation adoption with firm performance due to failure to quantify profits or costs as a result of the innovation. It was noted that although e-business may have lagged-off effects as the result may take long to reflect on financial statements, its communication and administrative efficiency gains are immediate (Abbu Bakar, 2004).

6.1.3 Chapter Three

Chapter Three focused on establishing relationships between the stated constructs. The study proposed 17 hypotheses. Environmental (network pressure, technological factors and institutional factors), organisational (innovation-orientation, financial slack, firm's IT resources, perceived usefulness and size) and managerial factors (the CEO's risk perception, experience, commitment and attitudes) were hypothesised to have a positive significant relationship with e-business adoption. On the other hand, e-business involvement factors (number of e-business tools adopted, usage rate and the spread of e-business tools) were hypothesised to be positively related with firm's efficiency gains. Finally, firm efficiencies were hypothesised to be significantly associated with the firm's sustainable competitive advantage. The chapter ended by presenting a model which shows these relationships.

6.1.4 Chapter Four

Chapter 4 dealt with issues related to research methodology used in the study. The study adopted a pragmatic philosophical approach to fully understand the situation under study. As

such, a mixed method approach involving a sequential exploratory-descriptive design was used. The qualitative approach was used in reviewing the literature and identifying the problem and then in giving explanations to the quantitative results after the survey. On the other hand, the quantitative approach was used to test the hypotheses.

The data for the descriptive phase was obtained using surveys while a semi-structured interview and literature review were used for the exploratory phase.

The population of the study consisted of 170 Zimbabwean manufacturing firms drawn from the 2012 Confederation of Zimbabwe Industries (CZI) membership list. Proportionate stratified sampling was used in selecting the units. Within each manufacturing category, systematic random sampling was used and 118 questionnaires were distributed by email or drop-off mail to information systems (IS) managers or other senior managers with e-business experience.

The final usable sample consisted of 30 responses, making an effective response rate of 25%. This response rate was sufficient to consider results valid as similar researches with a response rate less than 10% were considered valid and acceptable (Abbu Bakar, 2004; Hsu, Kraemer and Dunkle, 2006). Measures of all the constructs were subjected to scale development and validation as suggested in literature (Nunally, and Beinstern, 1994; Creswell, 2007; and Kumar, 2011).

6.1.5 Chapter Five

In this chapter, the results of the relationship between variables were tested and presented. Regression analysis on STATA 11 was used to conduct the analyses while content analysis of the interview results was used to identify the salient and overarching features to give explanation to the descriptive results. A summary of these results are as follows:

Table 6.1: Summary of research findings

Research objective	Hypotheses	Findings
Identify e-business activities undertaken by manufacturing firms in Zimbabwe.	none	Firms have adopted the use of email, websites, Supply Chain Management (SCM), Customer Relationship Management (CRM), Enterprise Resource Planning (ERP), intra-firm communication and coordination, and online marketing.
Determine the level of e-business adoption by manufacturing firms in Zimbabwe.	none	Level of adoption is still low with 40% of firms having adopted, at most, two applications only.
Identify environmental, organisational and managerial factors affecting the adoption of e-business in Zimbabwe	Network pressure is positively associated with e-business adoption.	Not significant
	Technological factors are positively associated with e-business adoption.	Not significant
	Institutional factors are positively related with e-business adoption.	Significant
	Innovation orientation is positively associated to e-business adoption.	Significant
	Financial resources are positively associated with e-business adoption.	Significant
	Firms' IT resources are positively associated with e-business adoption.	Not significant
	Perceived usefulness is positively related with e-business adoption.	Significant

		~~Significant~~
	Size of the firm is positively related with level of e-business adoption.	
	Managerial attitudes are positively associated with e-business adoption.	~~Significant~~
	CEO's perceived risk is associated with e-business adoption.	Not significant
	Managerial experience and education are positively associated with e-business adoption.	
	Managerial commitment is positively associated with e-business adoption.	Not significant
Establish efficiency factors associated with adoption of e-business	The number of e-business applications adopted is positively associated with the firm's business efficiency	Significant
	The spread of e-business applications is positively associated with business efficiency.	Not significant
	The usage rate of e-business applications is positively associated with business efficiency.	Significant
Investigate the impact of adoption of e-business on organisation's	There is a significant positive relationship between business efficiency and the firm's organisational sustainable competitive advantage.	Significant
	There is a significant positive relationship between the firm's business efficiency and its strategic	

| performance | sustainable competitive advantage | Significant |

6.2   THE E-BUSINESS ADOPTION AND COMPETITIVE ADVANTAGE MODEL

The original e-business adoption model used in this study (Figure 3.1) combined the Technology Acceptance Model (TAM), Technological, Organisational and Environmental (TOE) context model and the Diffusion of Innovation (DoI) model with the objective of capitalising on the strengths of each individual model. Furthermore, the combination of these models was to allow for the understanding of the holistic impact of the environmental, organisational and managerial (EOM) factors on the adoption of e-business since previous studies have focused on each model separately. E-business adoption was conceptualised as the extent to which a firm uses ICTs to support its business activities.

The study then operationalised e-business adoption by using three empirical variables: number of e-business applications adopted, usage rate of e-business applications and spread of the e-business applications. No e-business adoption studies reviewed were able to offer a comprehensive way of measuring e-business adoption.

In the study, the number of e-business applications adopted refers to the number of different e-business uses adopted by the firm. These could be categorised as email, website, enterprise resource planning, customer relationship management, supply chain management, intra-firm coordination and communication or online marketing-related activities. These are shown in Table 2.4. On the basis of the number of e-business tools that were adopted, a criterion was formulated to categorise the level of e-business adoption as low, moderate or high.This involved classifying firms according to the number of e-business applications that were adopted as having low e-business adoption level if they had 1-2 e-business applications only,

moderate e-business adoption level for those with 3-4 e-business applications and high e-business adoption level if they had 5-7 e-business applications.

Usage rate, in this study, refers to the frequency of use of the e-business applications and this ranged from 'seldom' to 'very often'. This variable has become a very important dimension of e-business adoption measure as firms differ in their usage rate of e-business applications.

The spread of e-business applications refers to the extent to which the firm's units have adopted the e-business applications. Respondents indicated as a percentage the number of units in their firms that have adopted e-business. The relationship between number of units that have adopted e-business and the overall firm performance was determined using regression analysis.

To operationalise e-business efficiency and sustainable competitive advantage, two types of economic value creation variables were distinguished: organisational and strategic sustainable competitive advantage. First, e-business adoption can improve efficiency and effectiveness. Second, e-business adoption can offer the opportunity to increase market share by entering new markets, satisfying customers and retaining them.

The testing of the model in Figure 3.1 produced interesting results which led to the modification of that model. The new model in Figure 6.1 is now effective in explaining e-business adoption and creation of a sustainable competitive advantage in the manufacturing sector.

 The model now shows that e-business adoption in the manufacturing sector in Zimbabwe can be explained in terms of institutional factors, innovation orientation, financial resources, size of the firm, perceived usefulness of e-business and attitudes of senior managers. Similarly, sustainable competitive advantage is explained in terms of number of e-business tools

adopted by the firm, usage rate of the e-business tools and the e-business efficiency gains. The number in brackets against each variable or arrow represents the R-squared values and shows the percentage variability of the dependent variable accounted for by the independent or mediating variable. The model demonstrates that e- business adoption is embedded in the firm's organisational context (*total R-squared values=58.78*) then followed by managerial context *(total R-squared value=28.57)* and, lastly, environmental context (*R-squared=13.74*). Similarly, a total R-squared of 66.4% shows that efficiency gains variability is largely accounted for by e-business adoption. This provides empirical evidence that e-business adoption is a driver of organisational and strategic competitiveness.

As expected, this new model has implications for the organisations and policy-makers and these are discussed in section 7. This model has the advantage of relating e-business adoption variables, business efficiency and sustainable competitive advantage at once, an approach which previous studies have not done.

Figure 6.1: The revised e-business adoption and competitive advantage model
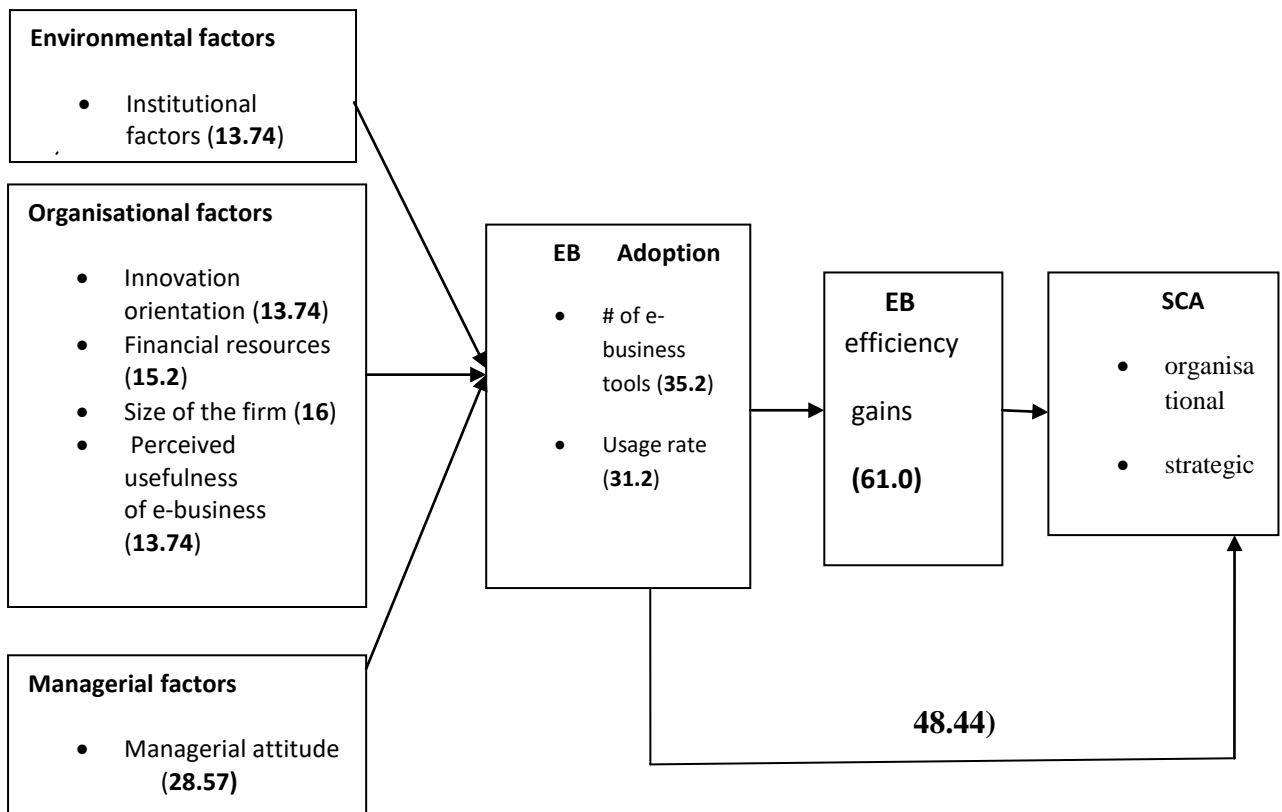
6.3 CONCLUSIONS

The first objective sought to identify the e-business applications used by manufacturing firms in Zimbabwe. As shown in Tables 5.4 and 6.1, it can be concluded that at least two of the seven major e-business related applications (email, website, Supply Chain Management, Customer Relationship Management, Enterprise Resource Planning, intra-firm communication and collaboration, and online marketing) have been adopted by the manufacturing sector. Results show that all the firms have adopted the use of emails and informational websites. However, the same cannot be said about supply chain management, customer relationship management, enterprise resource planning, intra and inter-firm communication and coordination, and online marketing as these need more resources, commitment from managers and a culture of innovation.

Objective number two focused on determining the level of e-business adoption by firms in the manufacturing sector. It can be concluded that the level of adoption of e-business is still low. Figure 5.2 shows that 40% of the firms are still in the low category since they have adopted between one and two applications only, 33% are in the moderate category with three to four applications adopted and, 27% are in the high category with five to seven applications. The implication of these results is that business efficiencies will remain low as long as e-business usage rate or involvement is low since these factors have a positive relationship.

The third objective sought to identify factors that affect the adoption of e-business in the manufacturing sector. The conclusion that can be derived from our results is that network pressure *(p-value-0.559)*, technological factors *(p=0.559)*, the firm's IT resources *(p=0.4330)*, the CEO's perceived risk *(p=0.35)*, managerial experience *(p=0.115)*, and managerial commitment *(p=0.288)* have no significant relationship with the adoption of e-business, whereas institutional factors *(p=0.05)*, financial resources *(p=0.0344)* innovation orientation *(p=0.043)*, size of the firm *(p=0.025)*, managerial attitudes *(p=0.02)* and perceived usefulness *(p=0.043)* enhance the adoption of e-business.

The establishment of efficiency factors associated with e-business adoption was the fourth objective. It is concluded that the number of e-business applications adopted *(p=0.0)* and their usage *(p=0.01)* is positively associated with business efficiency while the spread of these *(p=0.276)* does not have an effect on efficiency. Previous studies did not identify the e-business constructs that can be linked to e-business efficiency. This study contributes to new knowledge on e-business adoption by identifying the number of e-business applications adopted and the usage rate of the e-business applications as key constructs of e-business involvement which have a positive effect on e-business efficiency.

Finally, the last objective focused on investigating the relationship between e-business efficiency and the firm's sustainable competitive advantage. We conclude that e-business efficiencies increase both the firm's organisational *(p=0.03)* and strategic *(p=0.0)* sustainable competitive advantage, hence its performance.

6.4 CONTRIBUTIONS OF THE STUDY

This study has practical contribution to theory and practice. Therefore, in this section, the meaning of the outcome of the research to the academia, manufacturing sector, policy-makers and other stakeholders such as those involved in consultancy is discussed.

6.4.1 Contribution to theory

First, whereas previous studies have explored organisational, managerial and environmental determinants of innovation adoption separately, for example, Tornatsky and Fleischer,1990; Rodgers, 2003, this study contributes to the existing literature on innovation adoption through a holistic study of these three contexts (sets of variables) that influence firm propensity to adopt e-business. Therefore, the study answers the calls in previous researches, for example, Smith and Spiers, 2009; Ramdani, Chevers and Williams (2013) for the integration of the determinants of innovation adoption instead of dealing with each of them in an isolated manner.

Second, the measurement of e-business adoption as a construct was operationalised using number of e-business applications that were adopted, usage rate and spread of e-business applications and quantitative scales were devised and successfully tested. This contributes to the body of knowledge on e-business adoption since the researcher's to the best of our knowledge, current literature does not have such scales.

Third, the study has established new insights into the factors influencing e-business adoption and strengthened the debate on the relationship between e-business adoption and firm performance by providing empirical evidence to support relationships between these variables. Whereas there is paucity of studies on e-business adoption in developing countries, these have not confirmed a positive relationship between e-business adoption and firm performance. The study, therefore, fills a gap in e-business adoption in developing countries. Furthermore, the quantitative and qualitative nature of the study provides better understanding of e-business adoption and firm performance in the manufacturing sector in developing countries and, in particular, Zimbabwe.

Fourth, the study is grounded on existing theories of innovation adoption and competitive advantage. By building on earlier research, the study shows how these theories can be used to explain adoption of e-business and creation of a sustainable competitive advantage in the manufacturing sector.

6.4.2 Contribution to the practice

First, results show that e-business adoption and firm performance are largely dependent on the initiatives the manufacturing firms make themselves. Results show that organisational factors have the highest total variability index or R-squared value: innovation orientation R-squared=13.74; financial slack R-squared=15.2; size R-squared=16; perceived usefulness R-squared=13.74. Therefore, the manufacturing firms have the opportunity to decide and influence their own future as far as use and adoption of e-business applications is concerned. There is little evidence that uncontrollable outside factors determine chances of firms to adopt and benefit from e-business. Therefore, manufacturing firms have the chance to determine and influence their future regarding e-business adoption and performance.

Second, empirical findings from this study demonstrate a strong relationship between the number of e-business applications that were adopted and e-business adoption as well as usage rate of these e-business applications and e-business adoption. Results also show that nearly all firms are connected but have limited number of e-business applications (see section 5.3.4). The implication is that policy measures should shift from connectivity to uptake of ICT applications. The current limited uptake of e-business applications could be a result of limited knowledge of the e-business tools available. Therefore, government and industry policy measures could focus at stimulating increased usage of ICTs, thereby stressing the integrated e-business concept. Policy measures to encourage learning and training are recommended. These may include facilitating access to information, promoting intra and inter-sector networking, supporting research and development (R&D) in information communication technology and workshops to expose firms to various advanced information communication technologies such as internet-related technologies, mobile data communication, broadband applications and office automations.

Third, the cost of investing in e-business could be reduced on the part of individual firms should government continue to support the development of the national ICT infrastructures as outlined in the ICT Policy of 2005. Policy measures could include offering tax reduction incentives on e-business-related applications that manufacturing firms adopt. Coupled to this could be the clustering of firms in the same industry category or geographic area which then would put resources together to facilitate the development of ICT infrastructure for their own use. This will have the advantage of minimising the negative effects that are associated with 'smallness' of firms or lack of financial resources since the size of the firm and financial resources are predictors of e-business adoption. Furthermore, since the study has shown that the usage rate of e-business applications is a predictor of sustainable competitive advantage,

government and industry could work collectively to assess the other means of ensuring increase in bandwidth to improve ICTs products usage.

Fourth, the study's empirical evidence on e-business adoption's impact on sustainable competitive advantage should assure top managers that investment in e-business technologies is a worthwhile venture.

6.5   LIMITATIONS OF THE STUDY

As with any study, this research is not without limitations. First, the sample size is small compared to the number of constructs and proposed relationships. Furthermore, the response rate in some manufacturing categories is low. As such, the results of the study may need to be used with caution due to limited generalisability.

The study used a single respondent from each target firm, that is, there was no cross-validation of responses from other informants in the same firm. This has a chance of increasing random measurement error (Ranganathan, Dhaliwal and Teo, 2004). However, targeting senior executives with vast e-business experience was an attempt to minimise this error.

The cross-sectional nature of the study restricts the determination of the causality between variables, particularly e-business adoption and sustainable competitive advantage to statistical considerations. A firm's competitive advantage would need a long period of time to be evaluated, considering that e-business technologies have to be learned and adapted to (Abu Bakar, 2004).

6.6   FURTHER STUDY

This study needs to be seen as an ongoing search for new knowledge on e-business adoption and sustainable competitive advantage in developing countries. Checkland(1986:xii) states

that, "obviously, the work is not finished, and can never be finished. There are no absolute positions to be reached in an attempt by man to understand the world in which they find themselves: new experiences may in the future refute present conjecture." In the quest for new knowledge, further research could be done to test the model in different business sectors. Furthermore, there is need for confirmation of the reliability of the scales used to operationalise the constructs.

It is further recommended that longitudinal testing on a larger sample, targeting more than one respondent per firm could be done to confirm causality of the variables, particularly e-business adoption and sustainable competitive advantage.

Although the study was investigated from the motivational perspective, it would be interesting to explore the customer factors that might have led to technology adoption such as prior experience using computer and the internet. Future studies in this area could take this dimension.

It is also recommended that future studies could use Exploratory Factor Analysis (EFA) or Principal Component Analysis (PCA) to augment the reliability analysis with Cronbach's alpha.

6.7 CONCLUDING REMARKS

Finally, the study has accomplished the goal set at the beginning which is "to investigate the factors affecting the e-business adoption and its impact on the firm's sustainable competitive advantage" in the manufacturing sector in Zimbabwe. The study has made significant contribution in the fields of strategic management, strategic marketing, Information

Technology and innovation adoption by providing empirical evidence to support 'anecdotal accounts' on the proposed relationships.

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Appendix A: E-business questionnaire

Section A

1. Job title of respondent..
2. Level of education of respondent.....Masters in Business Administration...
3. Industry sector category e.g. Food and beverage/ pharmaceutical...
4. Number of years the company has been operating

   0-5 ☐ 6-10 ☐ 1-15 ☐ 5-20 ☐ ove 20 years ☐

5. Years of e-business experience by the company
   0-3 years ☐ 3-5years ☐ 5-10 years ☐ ove 10 years. ☐

Section B

6. Mark with a tick the column which best describes the level of e-business involvement situation in your company.

My company has	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Not yet adopted any e-business activity.					
Its own website but provides only basic information of the firm's activities.					
Its own website with information on executing internal business tasks only.					
Established business to business and business to customer systems through which employees, supplier and customers interact and do online transactions.					
Integrated Enterprise Resource Planning (ERP) and Supply Chain Management (SCM) systems					

Uses e-business systems to establish and maintain partnerships and exploit business opportunities.					

If your company has not yet adopted any e-business activity, may you list down on the space below thee   reasons
....
....
....

7. Indicate with an X the e-business applications your company has adopted.

E-business applications used	Mark
e-mail	
Website (for product information display)	
Supply chain management (SCM)/ collaboration with supply chain members	
Customer relationship management (CRM)	
Enterprise resource planning (ERP)	
Communication and collaboration among business units in the company	
Online marketing	

Any other...

8. Mark with an X the column that describes the effect of the following listed factors on the adoption of e-business by your company. SD=strongly disagree/ D=disagree/ N=neutral/ A=agree/ SA= strongly agree.

a). **Network pressure**

Network pressure statement	SD	D	N	A	SA
Most of our trading partners have active websites and do business online.					

Our trading partners put pressure on us to adopt e-business					
We adopted e-business in response to what our competitors were doing					
Network partners easily understood the e-business applications we were using.					
E-business knowledge transfer from our partners was easy.					

b) **Technological factors**

We adopted e-business because	SD	D	N	A	SA
The applications were easy to acquire.					
The technology was easy to use.					
We had the technical ability					
The technology was easily affordable					
We perceived advantages from its use.					
Our network partners easily understood it					

Any other factor:..

c) **Institutional factors**

We adopted e-business in order to	SD	D	N	A	SA
Achieve our mission.					
Meet stakeholder expectations.					
Respond to pressure from the industry and government.					
Have a unique identity.					
Complement our business strategy.					

Any other factor..

d) **Innovation orientation**

We adopted e-business.	SD	D	N	A	SA
To provide solution to company problems.					
As the new way of doing business.					
As management was very result-oriented.					

	SD	D	N	A	SA
To adapt to changes in our environment.					
As traditional approaches were no longer producing desired results.					

Any other factor...

e) Financial slack

	SD	D	N	A	SA
We have enough financial resources to meet our ICT needs					
We prioritised e-business strategy in spite of inadequate financial resources.					
We used the little resources that were available					

Any other...

f) Firm's IT resources

When we adopted e-business in our company, we had	SD	D	N	A	SA
Adequate IT infrastructure to apply e-business.					
Adequate IT infrastructure to apply e-business.					
The necessary requisite technical skills to implement e-business strategy.					
The necessary requisite technical skills to implement e-business strategy.					
A high knowledge level of e-business.					

Any other...

g) Perceived usefulness

Managers perceived e-business to	SD	D	N	A	SA
Improve company performance.					
Increase productivity.					
Increase perceived image.					
Improve product and service quality					

	SD	D	N	A	SA
Improve coordination with suppliers and customers					

h) Managerial experience and qualifications

	SD	D	N	A	SA
Key managers have previous experience of IT or e-business.					
Key managers have relevant IT qualifications.					
Key managers received basic training in IT.					
Key managers have outstanding IT skills					

Any other...

i).Managerial attitude

	SD	D	N	A	SA
Managers think that e-business produces better results than the traditional approaches to business.					
Managers think that it is easier and better to use e-business as opposed to traditional approaches					
Managers think it is desirable to use e-business than traditional approaches.					

Any other...

j) CEO's perceived risk

My CEO perceives the following e-business risk (s)

Type of risk	SD	D	N	A	SA
Financial loss.					
Time loss.					
Opportunity loss.					

	SD	D	N	A	SA
Functional loss.					
Social loss.					

Any other...

k).**Managerial commitment**

	SD	D	N	A	SA
Management commits resources to the e-business activities.					
Management identifies with the e-business activities.					
Management commits itself to the e-business project until it is completed.					
Management supports e-business training					
Management promotes e-business use					

m). **Efficiency factors**

The following efficiency gains were obtained by our company as a result of e-business adoption?

Efficiency gains	SD	D	N	A	SA
Transaction processing time decreased.					
Transaction accuracy increased.					
Volumes of transactions processed increased.					
Transaction cost per customer decreased.					
Order fulfilment time decreased.					
Improved coordination with supply chain members.					
Number of satisfied customers increased.					

Any other...

n) **Sustainable competitive advantage factors**

The following competitive advantages were gained by our company as a result of e-business adoption:

	SD	D	N	A	SA
Increased sales volume					
Increased customer retention					
Increased market share					

Increased margins and profits					
Improved perceived image					
Improved communication with customers					
Increased product and service quality					

9. **Usage rate**

The usage rate of e-business tools in our company on a five point scale ranging from seldom to very often where seldom=1 and very often =5 is:

Seldom..very often

1 ☐   2 ☐   3 ☐   4 ☐   5 ☐

10. **Spread of e-business applications**

Put a tick in the correct box to describe the spread of e-business tools in your company.

E-business tools in our company are used by	YES	NO
All our business units		
More than 50% of business units		
Up to 50% of business units		
Less than 50 % of the business units		

11. How big is your company in terms of sales and market share?

- Annual sales (in 1000 USD): 0-99 ☐ 00-999 ☐ 00-2000 ☐ 2001 and above ☐
- Market share: upper end   middle range ☐ ower end ☐

Thank you for your time

Appendix B: Interview guide

A survey was recently conducted to establish the organisational, managerial and environmental factors affecting the adoption of e-business by manufacturing firms in Zimbabwe. What do you think are the reasons for the following results which were obtained?

Network pressure among value chain players does not positively influence e-business adoption.

1. Technological factors do not positively influence e-business adoption.
2. Institutional factors positively influence e-business adoption.
3. Innovation orientation positively influences e-business adoption.
4. Financial resource availability positively influences e-business adoption.
5. Firm's IT resources do not positively influence e-business adoption.
6. Perceived usefulness of e-business positively influences e-business adoption.
7. Managerial experience does not positively influence e-business adoption.
8. Managerial attitudes positively influence e-business adoption.
9. Perceived risk of e-business by CEOs does not positively influence e-business adoption.
10. Commitment towards e-business by top managers does not positively influence e-business adoption.

Thank you for your time and responses.

Appendix:C   Krejcie   and   Morgan   Sample   Estimation   Table

N	S	N	S	N	S
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	1000000	384

Note.—N is population size. S is sample size.

Source: Krejcie & Morgan, 1970

Appendix D: Percentage of firms that participated

Manufacturing category %
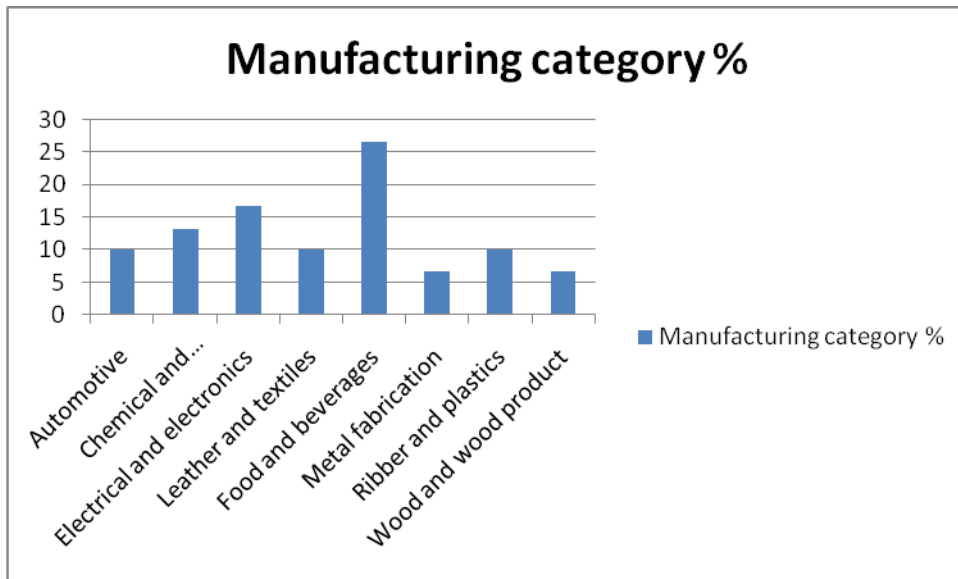
Appendix E: Cronbanch alpha calculations

Appendix E.1: Network pressure

	Q1	Q2	Q3	Q4	Q5	Total
R1	1	2	1	3	2	9
2	4	3	2	3	2	14
3	4	5	2	3	2	16
4	4	1	1	2	2	10
5	4	1	3	3	4	15
6	4	1	3	3	4	15
7	1	2	3	2	2	10
8	2	2	3	2	4	13
9	4	3	2	4	4	17
10	2	1	2	3	3	11
11	2	3	2	4	4	15
12	4	3	4	4	4	19
13	5	5	4	4	4	22
14	1	3	2	2	1	9
15	4	4	4	4	4	20
16	1	1	1	1	1	5
17	2	2	2	2	2	10
18	3	2	3	2	2	12
19	3	2	3	3	2	13
20	3	3	3	3	3	15
21	4	3	4	3	3	17
22	4	4	4	4	3	19
23	2	2	3	3	2	12
24	2	3	4	3	3	15
25	3	5	4	4	3	19
26	1	2	1	3	3	10
27	4	3	1	3	3	14
28	4	3	2	4	3	16
29	4	4	2	4	3	17
30	5	5	5	5	5	25
Total	91	83	80	93	87	434
Sum of VAR	1.61954	1.564368	1.264368	0.782759	0.989655	**6.22069**
VAR	**18.74023**					
α=0.691093						

Appendix E.2: Technological factors

	Q1	Q2	Q3	Q4	Q5	Q6	Total
R1	1	2	4	1	5	3	16
R2	3	4	4	2	5	4	22
R3	3	4	5	3	5	4	24
R4	4	5	5	3	5	5	27
R5	5	5	5	5	5	5	30
R6	1	1	2	2	4	2	12
R7	3	2	4	3	4	3	19
R8	4	3	4	4	5	3	23
R9	1	1	1	1	1	1	6
R10	1	2	2	2	3	2	12
R11	2	2	2	2	4	3	15
R12	2	2	2	2	4	3	15
R13	2	3	4	2	5	3	19
R14	3	4	4	2	5	4	22
R15	4	4	4	3	5	4	24
R16	4	3	4	2	4	2	19
R17	4	4	4	4	4	3	23
R18	2	2	3	4	4	3	18
R19	3	4	3	4	4	3	21
R20	4	4	4	4	4	4	24
R21	4	4	4	5	4	4	25
R22	2	2	4	2	3	3	16
R23	4	4	5	4	3	4	24
R24	4	5	5	5	3	5	27
R25	2	4	4	2	4	3	19
R26	2	5	4	2	5	3	21
R27	4	5	4	4	5	4	26
R28	1	3	3	3	3	2	15
R29	4	4	3	4	4	2	21
R30	4	4	4	5	5	3	25
Total	87	101	110	91	124	97	610
Sum(VAR)	1.472414	1.481609	1.057471	1.481609	0.878161	0.943678	7.314943
VAR(tot)=	28.02299						
α=088676							

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Appendix E.3: Managerial commitment

	Q1	Q2	Q3	Q4	Q5	Total
R1	**2**	**2**	**4**	**2**	**2**	**12**
R2	4	4	4	3	4	**19**
R3	4	4	4	4	4	**20**
R4	1	3	3	4	3	**14**
R5	4	4	3	4	4	**19**
R6	4	4	4	4	4	**20**
R7	5	4	4	5	5	**23**
R8	5	5	5	5	5	**25**
R9	2	3	4	3	2	**14**
R10	3	4	4	3	3	**17**
R11	4	4	4	4	4	**20**
R12	1	1	1	1	1	**5**
R13	2	2	3	4	4	**15**
R14	4	3	4	4	4	**19**
R15	4	4	4	4	4	**20**
R16	4	4	4	4	4	**20**
R17	4	4	4	4	4	**20**
R18	4	4	5	5	5	**23**
R19	1	2	1	2	1	**7**
R20	4	4	2	2	4	**16**
[R21](#)	4	3	4	4	4	**19**
R22	5	5	5	5	5	**25**
R23	5	5	5	5	5	**25**
R24	4	4	4	3	4	**19**
R25	4	4	4	4	4	**20**
R26	4	4	4	4	4	**20**
R27	5	5	5	4	5	**24**
R28	4	4	2	4	4	**18**
R29	4	4	4	4	4	**20**
R30	4	5	4	5	5	**23**
Total	**109**	**112**	**112**	**113**	**115**	**561**
Sum(VAR)	1.412644	0.96092	1.098851	1.012644	1.178161	**5.663218**
VAR(Tot)=22.63103 α**=0.937298**						

Appendix E.4: Financial Slack

	Q1	Q2	Q3	Total
R1	**4**	**1**	**1**	**6**
R2	4	4	4	**12**
R3	5	4	4	**13**
R4	2	2	2	**6**
R5	4	2	3	**9**
R6	4	4	4	**12**
R7	5	4	4	**13**
R8	3	4	2	**9**
R9	5	4	4	**13**
R10	5	5	4	**14**
R11	1	3	4	**8**
R12	2	4	4	**10**
R13	1	1	1	**3**
R14	3	2	3	**8**
R15	4	2	3	**9**
R16	4	3	3	**10**
R17	4	4	4	**12**
R18	5	4	4	**13**
R19	5	4	4	**13**
R20	2	3	3	**8**
[R21](#)	3	4	4	**11**
R22	3	4	4	**11**
R23	1	1	1	**3**
R24	4	2	1	**7**
R25	4	3	1	**8**
R26	5	3	1	**9**
R27	5	4	1	**10**
R28	2	2	2	**6**
R29	2	2	4	**8**
R30	4	4	4	**12**
Total	**105**	**93**	**88**	**286**
Sum(VAR)	1.775862	1.265517	1.581609	4.622989
VAR(Tot)=8.671264				
α=0.700292				
α=0.700292				

Appendix E.5: Managerial Experience

	Q1	Q2	Q3	Q4	Total
R1	**1**	**1**	**3**	**1**	**6**
R2	2	2	4	2	**10**
R3	3	4	4	3	**14**
R4	2	2	3	3	**10**
R5	3	4	4	4	**15**
R6	4	4	4	4	**16**
R7	4	4	4	5	**17**
R8	4	5	5	5	**19**
R9	3	3	4	3	**13**
R10	4	4	4	3	**15**
R11	5	5	5	4	**19**
R12	1	1	1	1	**4**
R13	2	2	4	2	**10**
R14	3	3	4	2	**12**
R15	3	3	4	2	**12**
R16	4	3	4	3	**14**
R17	4	4	4	3	**15**
R18	4	4	5	3	**16**
R19	2	2	2	1	**7**
R20	3	2	4	3	**12**
R21	4	2	4	2	**12**
R22	4	4	4	2	**14**
R23	5	5	5	4	**19**
R24	3	4	3	3	**13**
R25	4	4	4	4	**16**
R26	4	4	4	4	**16**
R27	4	4	4	4	**16**
R28	4	5	4	4	**17**
R29	4	5	4	4	**17**
R30	5	5	5	4	**19**
Total	**102**	**104**	**117**	**92**	**415**
Sum(VAR)	1.144828	1.498851	0.713793	1.236782	4.594253
VAR(Tot)=14.76437 **α=0.918438**					

Appendix E.6: Managerial attitudes

	Q1	Q2	Q3	Total
R1	**3**	**3**	**3**	**9**
R2	3	4	4	**11**
R3	3	4	4	**11**
R4	4	4	4	**12**
R5	4	4	4	**12**
R6	4	4	4	**12**
R7	3	3	3	**9**
R8	2	4	4	**10**
R9	3	4	4	**11**
R10	1	1	1	**3**
R11	3	3	4	**10**
R12	3	4	4	**11**
R13	3	4	4	**11**
R14	4	4	4	**12**
R15	4	4	4	**12**
R16	5	5	5	**15**
R17	3	4	4	**11**
R18	4	5	5	**14**
R19	5	5	5	**15**
R20	3	1	1	**5**
[R21](#)	3	3	3	**9**
R22	3	4	4	**11**
R23	4	4	4	**12**
R24	5	5	5	**15**
R25	4	4	4	**12**
R26	4	4	4	**12**
R27	5	5	5	**15**
R28	4	4	4	**12**
R29	4	4	4	**12**
R30	5	5	5	**15**
Total	**108**	**116**	**117**	**341**
Sum(VAR)	0.868966	0.947126	0.92069	2.736782
VAR(Tot)=7.205747 α**=0.930292**				

Appendix E.7: Efficiency gains

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Total
R1	**5**	**5**	**5**	**5**	**5**	**4**	**5**	**34**
R2	5	5	5	5	5	5	5	**35**
R3	5	5	5	5	5	5	5	**35**
R4	3	3	3	3	3	3	3	**21**
R5	4	4	4	3	4	4	3	**26**
R6	5	5	5	3	5	5	4	**32**
R7	4	3	2	3	3	3	3	**21**
R8	4	4	3	4	4	4	3	**26**
R9	4	4	4	4	4	4	4	**28**
R10	4	4	4	4	4	4	4	**28**
R11	5	5	5	5	5	5	5	**35**
R12	3	2	2	3	3	3	3	**19**
R13	4	4	4	4	4	3	4	**27**
R14	4	4	4	4	4	3	4	**27**
R15	1	1	1	1	1	1	1	**6**
R16	4	2	2	2	3	3	3	**16**
R17	4	4	3	3	4	4	4	**22**
R18	4	4	5	4	4	4	4	**25**
R19	5	4	5	4	4	4	4	**26**
R20	5	5	5	4	4	4	4	**27**
[R21]()	5	5	5	4	5	5	5	**29**
R22	2	2	2	2	2	1	2	**13**
R23	4	4	4	4	2	3	3	**24**
R24	4	4	4	4	3	3	3	**25**
R25	5	5	5	5	4	4	4	**32**
R26	5	5	5	5	5	5	5	**35**
R27	4	4	2	2	4	2	3	**21**
R28	4	4	4	4	4	4	3	**27**
R29	4	4	4	4	4	4	4	**28**
R30	5	4	4	4	4	5	5	**31**
Total	**124**	**118**	**115**	**111**	**115**	**111**	**112**	**694**
Sum(VAR)	0.878161	1.098851	1.454023	1.044828	0.971264	1.182759	0.96092	**6.629885**
VAR(Tot)=45.68851 α=0.997371								

Appendix E.8: Sustainable competitive advantage

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Total
R1	2	3	4	2	3	4	4	22
R2	4	4	4	4	4	4	4	28
R3	4	4	4	4	4	5	4	29
R4	4	5	4	4	5	5	4	31
R5	4	3	3	3	4	4	5	26
R6	5	5	3	4	5	5	5	32
R7	5	5	5	5	5	5	5	35
R8	1	1	3	2	3	4	2	16
R9	3	4	3	3	4	4	4	25
R10	1	1	1	1	1	1	4	10
R11	2	2	2	2	2	2	4	16
R12	3	3	3	3	2	4	4	22
R13	3	4	3	3	4	4	4	25
R14	4	4	4	3	4	4	4	27
R15	4	4	4	4	4	4	4	28
R16	4	4	4	4	4	4	4	28
R17	3	4	3	4	4	4	3	25
R18	5	5	5	4	5	5	5	34
R19	5	5	5	5	5	5	5	35
R20	2	3	3	3	3	4	4	22
R21	3	3	3	3	4	4	4	24
R22	4	4	3	4	4	4	4	27
R23	4	4	4	4	5	5	4	30
R24	4	4	4	4	5	5	5	31
R25	2	3	3	3	3	3	3	20
R26	2	3	3	3	4	4	3	22
R27	3	3	3	4	4	4	4	25
R28	4	4	2	4	2	4	4	24
R29	4	4	4	4	4	4	4	28
R30	4	5	4	5	4	5	5	32
Total	102	110	103	105	114	123	122	657
Sum(VAR)	1.282759	1.126437	0.805747	0.87931	1.062069	0.782759	0.478161	**5.93908**
VAR(Tot)=33.06782 α**=0.95713**								