

UNIVERSITY OF KWAZULU-NATAL

**A Study Of Business-to-Business Extranet Usage At Engen
Petroleum Ltd**

By

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Declaration

I, Mduduzi Khanyile, declare that:

- The content of this dissertation is my original work.
- All the information sources used or quoted have been acknowledged in text and by full references at the end of the dissertation.
- This dissertation has not been previously submitted at another university for a degree.

Signed:

Date:

Acknowledgements

To God Almighty be the glory for without Him none of this would have been possible for He is the Alpha and Omega (what he started in 1994 is being completed in 2013).

My (number one fan) wife “Nhlanhla” Khanyile, thank you for believing in me allowing this to happen and the support you provided.

My boys Khanyani and Nkazimulo Khanyile, it was not so nice not to be available in the afternoons but it is over now.

To my 2 mothers, thank you for the overwhelming support and mostly your prayers.

To my supervisor Dr. Van Niekerk, thank you for sharing your wisdom and making yourself available when needed

Abstract

E-Commerce has revolutionised the manner in which modern business is conducted, with the extranet as one of the enabling tools. Concurrently, there has been an evolution in the methods of business-to-business buying, from telesales, to fax systems, and email systems, through to online buying systems. The adoption and utilisation of the extranet system has been widespread in the developed nations, however, are these trends similar in the developing countries? The aim of this study was to evaluate the adoption and utilisation trends of the extranet system by the customers of Engen Petroleum, Ltd, after the roll-out to key customers in 2002. The approach for this research was a quantitative and descriptive study, in order to serve the purpose of measuring and understanding the underlying reasons for the adoption and utilisation of the Engen extranet. The selected sampling method was a census type in order to achieve the required sample size. The total size of the active population was 56; a sample size of 49 was recommended for a 5% margin of error and for a 95% confidence interval. Data collection was conducted using an online, structured questionnaire, which was emailed to the participants. Of the total number of 56 possible participants, 47 customers participated in the survey, which made an 84 % response rate. The technology acceptance model (TAM) and the task technology fit (TTF) were the models used to conduct the research. The key outcome of the study showed poor utilisation of the Engen extranet tool, which meant that extranet adoption process at Engen is evolutionary rather than revolutionary. The survey showed that there was a positive perceived usefulness and intention to use the Engen extranet tool; however, there was negative perceived ease of use and task technology fit. It was concluded that the utilisation may be improved with more training and support especially among the buyers above 40 years of age. In order to leverage on the positive intention to use and perceived usefulness, it was recommended that the task technology fit could be improved, by enhancing functionality of the Engen extranet, using value-added services on the extranet website.

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CHAPTER ONE

Introduction

1.1 Introduction

According to Vlosky, Fontenot, and Blalock (2000), in order to remain competitive, organisations continually seek processes, technologies and products which will add value to their existing offerings. Matthyssens and Van Den Bempt (2007) suggested that suppliers should shift from selling commodities based on price, to value-added solutions using competitive differentiation. According to Johnson, Scholes and Whittington (2008), differentiation may be achieved by offering buyers

- superior product quality;
- reliability;
- higher service levels; and
- better customer relationships compared with rivals.

According to Tassabehji (2003) the evolution of buying systems available for businesses trading with other businesses included the following:

Telesales: This refers to customers, at their own expense, making a telephone call to the supplier, in order to place the product or service order. In most cases, telesales systems are busy. This often results in customer's having to be put on hold via a queuing system, a very frustrating experience for the customer. In addition, the telesales systems operate during Monday to Friday from 8am to 5pm, and are closed over weekends. The telesales system is low on service-level and customer-relationship, however, better on reliability, because of personal contact.

Fax systems: An alternative to telesales is the fax system, in which customers can write a letter specifying their product or service requirements, and the required delivery dates, and then transfer the letter via a fax machine (Mansell 2003). . The issues associated with fax systems are that, in order for the customer to have some partial confirmation that the order has been transferred, a notification confirming that the message have been delivered must be sent from the fax machine. If the notification is not received, the customer has to re-send the fax. On the receiving side, the potential issues are that, if the machine is out of ink, the message could be unreadable; the fax output could become smudged and unreadable; the machine could run out of

printing paper; the fax printouts may be lost or mistakenly taken by wrong recipients. The fax system is low on reliability, service levels, and customer relationship.

Email systems: The advances in information technology led to an introduction of the emailing system. With the email ordering systems came an improved system, in which the sellers had a dedicated product-ordering email address. The email system required the buyer to send an email conveying all the product or service requirements (Laughlin 1999). The system allows the seller to acknowledge receipt of the order, and, in most cases, the acknowledgement is accompanied by the relevant reference and order numbers. The email system is well-functioning on the aspects of reliability, service levels, and customer relationship, but the downside is that it could be time consuming and has a potential for typing errors from the customer perspective.

Online systems: The continuous improvement in Internet technologies has brought about the introduction of online buying platforms for both businesses and individuals (Mansell 2003). The extranet is one of the platforms that have enabled online buying for businesses and individuals, improving the aspects of reliability, service level, and customer relationships. The trends for adoption and utilisation of online buying platforms such as the extranet have differed between individuals, organisations, and industries; as well as from region to region.

Organisations which were early adopters of the extranet, according to the innovation diffusion model, were seeking to gain competitive advantage over their rivals (Anandarajan, Anandarajan & Wen 1998). The modern market is characterised by commoditisation of products, elevated buyer expectations, and diminishing demand; which in turn according to Oracle White Paper of 2011 called for suppliers to offer additional value to their existing customer base (Anon 2011). It is for such reasons that Engen Petroleum Limited, as an organisation, adopted the innovation of the extranet, and has used it in conjunction with its customers.

1.2 Motivation for the Study

1.2.1 Business Need:

In a quest to align with B2B e-commerce, and the modern methods of conducting business, Engen Petroleum Limited rolled out extranet websites to its top customers. At the time of roll-

out, the extranet was seen as an added value for both the customer and Engen, Engen perceiving this as a tool which could aid customer retention. After the roll-out, some customers made full use of the extranet, some made only partial use of it, and some made no use of the tool, conducting business the old-fashioned way. In a short survey conducted in 2012 amongst 32 chemical cluster customers, the finding was that only 19% of customers used the extranet for online ordering; 56 % of the respondents preferred telesales; and 25% of the respondents preferred using emails. The survey was not conducted in an academic manner and hence the reliability and goodness of the results was unknown. The survey also raised the need for more in-depth research, of which the envisaged outcome could provide decision-makers of Engen with insight into the utilisation trends, applications, potential improvement areas, and areas where there could be mutual benefit for Engen and the customers.

1.2.2 Academic Need:

The previous studies on extranet adoption and utilisation are predominantly a reflection of the developed countries in terms of economy and information technology (Laurence & Tar 2010). This means that the findings and the conclusions of these studies cannot be generalised to the developing economies. The study will focus on the adoption and utilisation of the extranet in South Africa, as a nation still developing in terms of information technology and in its general economy. The outcome of the study could contribute a more realistic insight into the developing nations, and also give an African perspective to the hype of the extranet as a tool for e-commerce between businesses.

1.3 Background to Engen Petroleum Limited

The Engen Petroleum Limited website describes Engen Petroleum Limited as an African-based energy group focusing on the refining and marketing of petroleum-based products, and the provision of high-standard retail convenience services. Engen operates an extensive network of service stations in seventeen countries within sub-Saharan Africa. Engen also exports petroleum products to over 30 other countries in Africa and in the Indian Ocean Islands.

The following are a few facts about Engen Petroleum Limited:

- Engen Operates offices in 20 sub-Saharan African countries, and in the Indian Ocean islands;
- Refines of 135 000 barrels of crude oil per day;
- Has a cutting-edge lubricating oils' blending plant producing up to 8 million litres of finished lubricants per month;
- Is the market leader in South Africa, and in several other countries for fuel and convenience;
- Has more than 1 200 service stations in South Africa; plus 250 in sub-Saharan Africa;
- Has an estimated 600 modern convenience centres offering value added services like upmarket food retail, DVD rentals, and bakeries etc.;
- An extensive logistics infrastructure of 66 depots; 7 terminals; and aviation facilities in 22 airports in South Africa

The major shareholder of Engen Limited is Petroliam Nasional Berhad (PETRONAS), the Malaysian national oil company, which holds 80% of equity. Pembani Group (Pty) Ltd holds the balance of the equity. Engen Petroleum Limited is a wholly-owned subsidiary of Engen Limited. It conducts all downstream activities in South Africa. Pembani Group (Pty) Ltd is a South African black-controlled-and-managed company, focusing on the broader energy sector in sub-Saharan Africa.

Engen Petroleum Limited is focused on both the manufacturing and the marketing of petroleum products. The Engen Sales and Marketing Division is responsible for sales and marketing of fuels (diesel, paraffin, gasoline), lubricants, chemical specialties, bitumen, etc., through four business streams, which are: Retail; Commercial; Lubricants; Chemicals and Special Products.

1.4 Focus of the Study

The study is focused on Engen Petroleum Limited's customers connected to Engen Petroleum Limited's extranet system.

1.5 Problem Statement of the Study

The extranet has been deemed the third wave of Internet, following the Intranet, and the Internet itself (Ling & Yen 2001). According to Rahman (2007), the expectation was that the introduction of the extranet would revolutionise business-to-business e-commerce because of its wide range of

benefits. Engen Chemicals business unit of Engen Petroleum Limited rolled out the extranet to its key customers in 2008, however, the adoption and utilisation of the extranet has been poor and below expectations.

What are the reasons for the poorer than expected adoption of the extranet by Engen Petroleum customers?

1.6 Objectives:

- To investigate the actual current Engen extranet utilisation;
- To determine future intention to use the Engen extranet;
- To determine the level of perceived usefulness of the Engen extranet;
- To determine perceived ease of use of the Engen extranet;
- To measure the task-technology fit of the Engen extranet; and
- To determine the possible reasons for Engen extranet low/non-utilisation

1.7 Research Questions

- What is the actual current utilisation of Engen extranet?
- What are the Engen customers future intentions of the extranet?
- What is level of perceived usefulness of the Engen extranet?
- What is the perceived ease of use of the Engen extranet?
- What is the task-technology fit of the Engen extranet?
- What are the possible reasons for Engen extranet low/non-utilisation?

1.8 Limitations of the Study

- The study is based on Engen Petroleum business streams which have activated their customers on the Engen extranet system;
- The findings from the study are a reflection of a reality of the particular time of the research. Changes in the conditions, and the situation around the research, may have an impact on the results; and
- The study is based on the previous findings of poor adoption, based on a 2012 survey conducted by the Engen in-house survey department.

1.9 Overall Dissertation Structure

Chapter 2 will be based on previous literature on business to business extranet also relating it to the Intranet and Internet as its predecessors. A special focus of Chapter 2 will be on the models that are used to measure adoption of technologies by users. Chapter 3 will focus on the literature on how to conduct an academic research but also highlights the reasons for the research methods selected for this study. Chapter 4 will present the survey results in the form of tables and figures, Chapter 5 will discuss the key findings from the study by comparing the results to previous literature and expectations. Chapter 6 will provide the conclusions to relate the findings and the research objectives and finally make recommendations for future studies and recommendations relevant to Engen Petroleum.

1.10 Summary

After the evolution from telesales to fax systems, to email systems, modern organisations have stepped up and created online buying systems and platforms for their customers. Extranet as a platform for online buying, and other customer-centric functionalities, is relatively new technology, having huge potential to provide improved service levels, better reliability and better customer relations. The adoption and utilisation of such systems may be good in the first world countries and developed nations, while this may not be the case in developing nations such as in South African customer service.

Engen Petroleum Limited, as one of the top energy companies in South Africa, is one of the adopters of the extranet, hoping thereby to gain advantage and a leading edge in the market. Whether the extranet technology is in Engen's reality what the literature and previous studies in different parts of the world perceive it to be, is the question. The literature review section will provide what may be regarded as the foundation of the extranet technology and how it has evolved to the extent that Ling and Yen (2001) regarded it as the third wave of Internet and Vlosky *et al.*, (2000) perceived the extranet as the "next big thing" after intranet technology.

CHAPTER TWO

Literature Review

2.1 Introduction

The approach taken for the literature review is of a funnel type, as illustrated by Figure 2.1. As a starting point, the literature review focuses on the Internet in general, its origins, how it has evolved, and how it has revolutionised the way in which business is conducted, giving rise to applications such as electronic commerce (Okoli & Mbarika 2003). The study focuses on the benefits and various models of electronic commerce, which includes the Business-to-Business (B2B) model of electronic commerce.

One of the relatively new innovations of the Internet, which has been the driving force behind B2B electronic commerce, has been the introduction of the extranet tool. The literature review then focuses on the extranet, differentiating it from both Internet and intranet; the business application of the extranet, the advantages and the benefits offered by the extranet, are discussed.

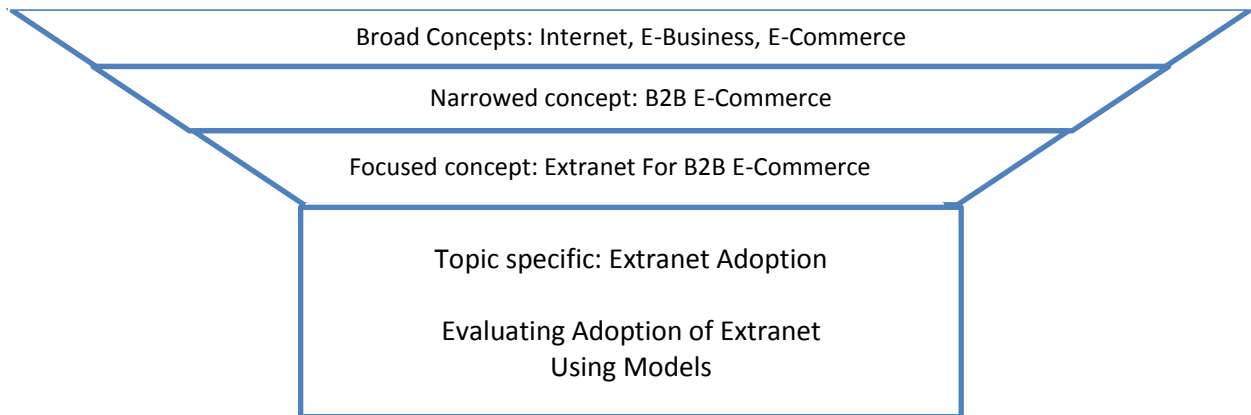


Figure 2.1: Funnel approach to the literature review.

Electronic commerce and extranet has not been received in a similar manner by organisations from the developed nations and those from developing countries (Rahman 2007). It is for this reason that the literature review is focused on global trends, and the trends in developing countries and South Africa, on matters of adoption of the extranet, using various models of technology adoption, as well as the adoption trends observed in previous literature. The literature review then concludes by focusing on the adoption of the extranet by Engen Petroleum, as an organisation, which will be the basis of the study.

2.2 The Internet

According to Laudon and Traver (2002), the Internet may be described as a network of thousands of interconnected networks, and millions of computers, which forms a link between individuals, government agencies, educational institutions, and the corporate business world.

2.2.1 Internet Brief History

The Internet has provided the world with the means and the infrastructure for communication, scientific research, and commerce. Contrary to popular knowledge, the World Wide Web or the web in short, is not the Internet; it is one of the Internet's services which provide access to over a billion web pages, in a programming language called the Hypertext Markup Language (HTML).

The Internet has been evolving over the past 50 years (Baltzan 2009) according to the stages of the evolution shown in Figure 2.2



Figure 2.2: The stages in the evolution of the Internet

Adapted from Laudon and Traver (2002)

The period from 1961 to 1974 was the innovation phase, in which the fundamental building blocks of the Internet were conceptualised. According to Laudon and Traver (2002), the original intention for the Internet when it was conceived, was to link huge mainframe computers at campuses of educational institutions, in order to replace the one-to-one communication previously conducted by telephone or postal system. After the innovation stage, the United States Department of Defence developed the Advanced Research Project Agency Network (ARPANET), which combined a network of military computers, in order to reduce the risky dependence on the centralised computer system which existed at the time (Fraser 2007).

For the institutionalisation phase to take place, government departments played a huge part in providing multimillion dollar funding for the development of the Internet. The Internet was then fully adopted by big government institutions such as the United States Defence. The commercialisation phase began when the corporations took over and expanded the Internet, offering it to ordinary citizens (Fraser 2007).

2.2.2 World Wide Web

Baltzan (2009) stated that the Internet was a good tool which enabled communication for academics and scientists during the early stages of its evolution (innovation and institutionalisation); however, it was technically difficult for ordinary people to use. Dr. Tim Bernes-Lee of the European Particle Physics Laboratory, between 1989 and 1991, developed the World Wide Web (WWW). The function of the World Wide Web and web browsers is to provide access to Internet information through documents, including text files, video files, and graphics, among others. Dr. Bernes-Lee then developed the Hypertext Markup Language (HTLM), a system which linked documents, thus allowing users to move from one document to another, using simple clicks (Laudon and Traver 2002).

Although Internet development has been evolutionary (Laudon and Traver 2002), its impact on the business world has been revolutionary (Singh 2005). Laudon and Traver (2002) suggested that the Internet may be viewed as an architecture that can be divided into four layers. Layer one or the bottom layer is the infrastructure or the technology substrate. Layer four consists of a multitude of Internet applications such as electronic mail, information browsing, financial services, and teleconferencing. Layer two includes transport services for the Internet, such as fax, video and audio. Layer three is the middleware services, which are the adhesive that affixes the applications to the communications networks comprising file systems' authentications and storage systems.

According to Internet World Stats, in the second quarter of 2012, Asia was the world leader in internet usage, while Africa lagged in the bottom three, as seen in Figure 2.3.

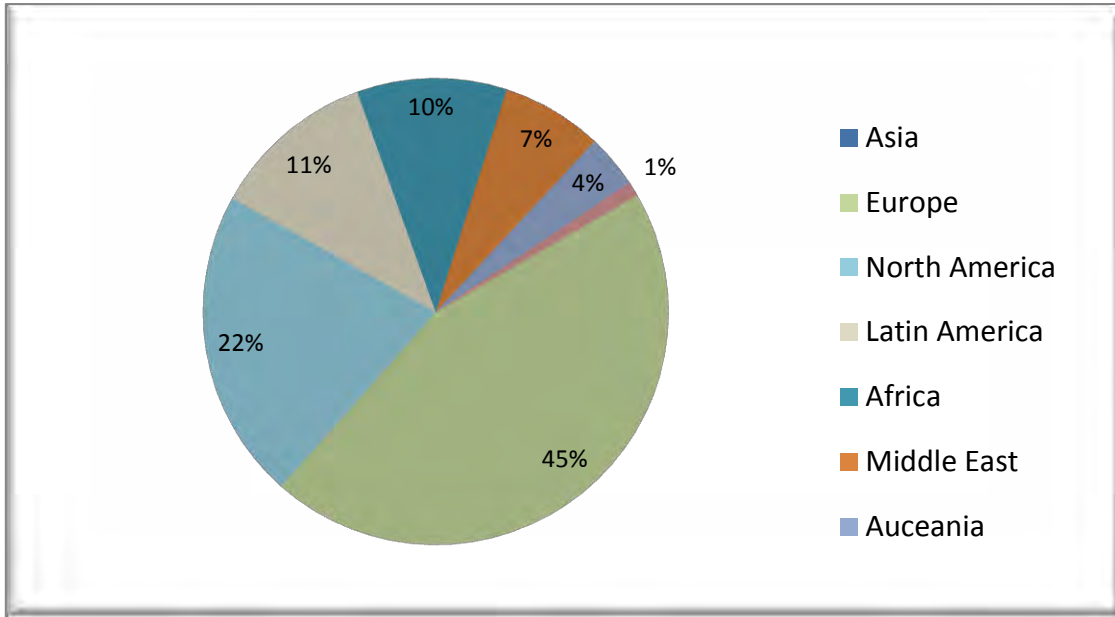


Figure 2.3: World Internet usage, second quarter 2012

Adapted from Anon (2012), Internet World Stats Usage and Population Statistics”.

According to the Internet World Stats, by June 2012, fourteen percent of the South African population was using the Internet. It was further estimated that by 2020 forty percent of the South African population will be using the Internet.

Barua, Konana, and Whinston (2004) defined Internet-enabled businesses as those which have digitalised their business processes and value chains, with the aim of achieving new levels of productivity and value creation. Examples of such Internet-enabled companies are Dell and Cisco Systems. According to Barua *et al.*, (2004), Cisco systems obtain ninety percent of their orders online; they have resolved eighty percent of their customer queries online. On the other hand in 2004 Dell earned over 80 million dollars’ worth of business online on a daily basis. The Internet is the engine which has enabled, amongst many other applications and services, the concept of electronic business (Baltzan 2000).

As displayed in Figure 2.4; electronic business may provide broad value to the users.

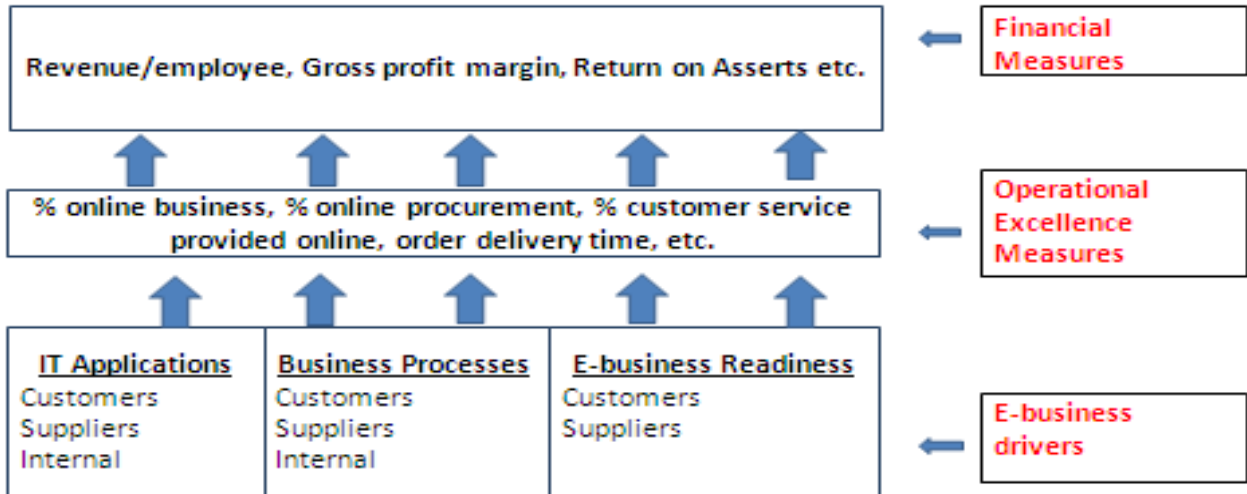


Figure 2.4: Broad value of e-business

Adapted from Barua *et al.*, (2004) page 6.

2.3 Electronic Commerce

On a global basis, businesses and organisations are adopting electronic business in order to remain competitive in a highly competitive business and organisational environment, and to link this with their core competencies (Paes 2002).

There are many definitions and descriptions of electronic commerce; generally, many authors agree that electronic commerce simply means the selling of goods and services over the Internet (Baltzan 2009). Another definition by Laudon and Traver (2002) is that electronic commerce is the utilisation of the web and the Internet in transacting business. According to Knapp (2003), electronic commerce describes a process of selling, purchasing, or exchange of products, services and information, via computer networks. King and Turban (2003) named the following further definitions, from differing application perspectives:

- Business processes' perspective: electronic commerce uses technology to automate business transactions and workflow;
- Communications perspective: electronic commerce is the delivery of products, services, and information, using computer networks;

- Service perspective: electronic commerce is the means by which companies, customers and management reduce service costs, while concurrently improving the customer-service quality; and
- Online perspective: buying and selling goods and information over the Internet, and by means of other online services.

2.3.1 Benefits of Electronic Commerce

Depending on the area of application, electronic commerce has a multitude of potential benefits which may be reaped by organisations. Table 2.1 summarises the benefits, both from a buyer and a seller perspective.

Table 2.1: Benefits of Electronic Commerce

Benefits to Sellers	Benefits to Buyers
Increased market reach and access to trading partners	Increased access to trading partners and support services
Increased marketing and sales profile	Better procurement processes
Enhanced customer service	Enhanced supplier relationships
Reduction in cost of sales, technical documentation, and customer-service costs	Reduced purchasing prices through improved price transparency
Reduced transaction processing costs	Reduced procurement costs
Reduced working capital and inventory requirement	Reduced operating costs
Competitive advantages through efficiencies and process planning	Improved efficiencies and transaction flow, visibility and control

Adapted from Moodley (2010), page 5.

2.3.2 Models of Electronic Commerce

According to Laudon and Traver (2002), a business model is a set of planned activities or business processes designed to have a profit outcome in the marketplace. Baltzan (2009) defined an electronic commerce model as planned activities of organisations towards creating, delivering, and generating revenues over the Internet. Laudon and Traver (2002) argued that a good business

model should have the following elements: value proposition, revenue model, market opportunity, competitive environment, competitive advantage, market strategy, organisational development, and a management team.

There are various types and models of electronic commerce. The illustration below summarises 4 major models.

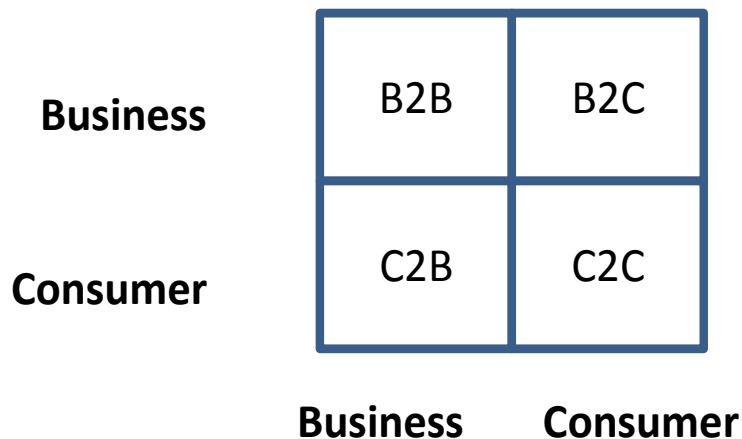


Figure 2.5: Illustration of the different models of electronic commerce

Adapted from: Singh (2005)

The B2B model applies when businesses buy and sell to each other over the Internet e.g. Engen Petroleum Limited trading fuel with service stations. The Business-to-Consumer (B2C) implies online businesses selling to consumers, e.g. Amazon selling books online. The Consumer-to-Business (C2B) applies to consumers conducting their business transactions with businesses, over the Internet. The Consumer-to-Consumer model (C2C) is the online trading of consumers with other consumers.

2.4 Business to Business Electronic Commerce

Literature offers no standard definition of B2B electronic commerce (Moodley 2010), however, the common definition for B2B electronic commerce is the enabling of businesses and organisations to buy or sell to each other online over the Internet.

2.4.1 Business to Business Electronic Commerce Trends

According to Barua *et al.*, (2004) and Baltzan (2009), in B2B electronic commerce, the Internet provides a marketplace where Internet-enabled businesses may engage in closer and more automated business relationships, commercial exchange, and consolidation of supply chains.

According to Corbitt, Seddon and Lee (1999) the value of B2B electronic commerce in the USA was worth US\$131 billion in 1999, and was projected to be worth US\$1.3 trillion in 2003. The Oracle White Paper 2012 survey results approximated the revenue online transactions at about US\$300 billion.

There are many reasons for organisations to engage in B2B electronic commerce however, Corbitt *et al.*, and (1999) named the following as the most common reasons:

- Need to reduce costs in order to survive the increased competitiveness in the marketplace;
- To take advantage of globalisation, and to allow organisations to venture into new markets;
- B2B electronic commerce provides an efficient tool for information-sharing; and
- B2B electronic commerce shortens production cycles, and allows business transactions to be conducted twenty-four hour per day, and all year round.

According to Islas (2012), the three major forces behind the fuelling of electronic commerce are economic forces, marketing and customer interaction forces, and technology. The February 2012 Oracle White Paper concluded that beyond 2012, the most successful initiatives of B2B electronic commerce will be those allowing users effectively to utilise technologies in concert, in order to engage users, and to enhance their abilities to make decisions across all touch points. The paper further stresses that cross-channel customer-experience management is approaching a new phase in B2B electronic commerce. With the increased number of digital channels and devices at customers' disposal, B2B electronic commerce is bound to create exciting opportunities for customer experience (Rahman 2007).

2.4.2 Business to Business Electronic Commerce in Developing Countries

Singh (2005) made the observation that, while electronic commerce has revolutionised the world, with the developed countries taking advantage of the benefits of B2B electronic commerce, the

same cannot be said about the developing countries (Laurence and Tar 2010). Okoli and Mbarika (2003) stated that the sub-Saharan African region has the lowest economic, information-technological, and Internet development level in the world. According to Pare' (2002), implementation of B2B electronic commerce in developing countries is expected to yield a reduction in transaction costs, and to enhance the producers in developing countries in their participation in international trade. Humphrey *et al.*, (2003), cited in Laurence and Tar (2010), predicted that electronic commerce would be one of the new drivers of economic growth for developing countries.

The following findings are from a research conducted by Pare' (2002), in which seventy-five enterprises across Kenya, Bangladesh, and South Africa trading in the garment and apparel industry, and in the horticulture and agriculture sector, were interviewed:

- Face-to-face contact is still preferred to online methods for negotiation and completion of deals;
- Companies are using electronic commerce to access online bulletins and product catalogues;
- Very little new business acquisition through B2B electronic commerce was reported; and
- There is a relatively slow adoption of B2B electronic commerce among many buyers in the two sectors examined.

Laurence and Tar (2010) concluded that the extent of B2B Internet is not yet easily accessible in developing countries; and the developing countries do not have the infrastructure and policies which can enable the use of the Internet.

The diagram in Figure 2.6 summarises the barriers to adoption of electronic commerce in developing countries based on electronic commerce policy, technology infrastructure, socio-cultural and socio-economic factors.

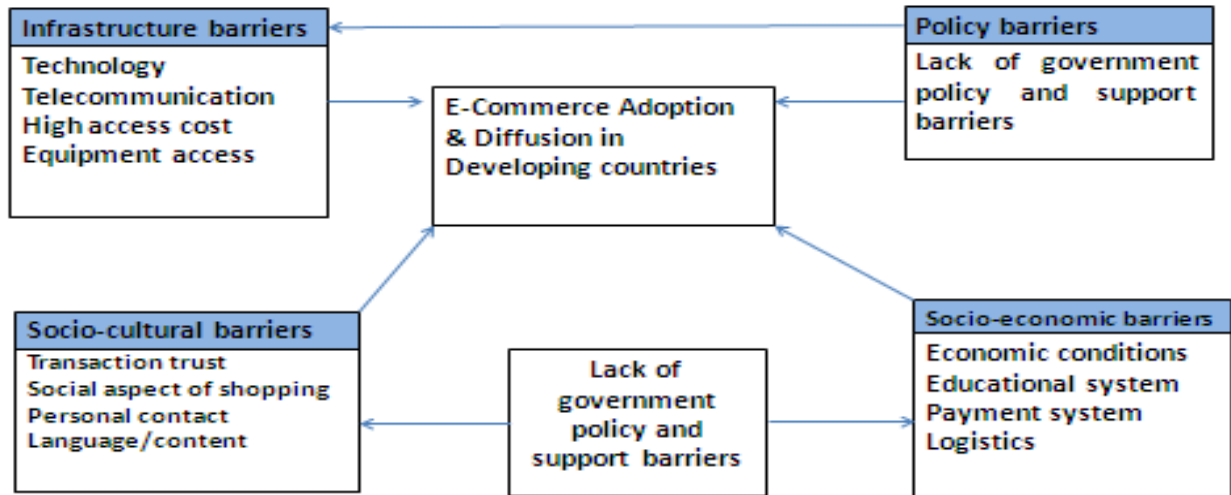


Figure 2.6: Barriers to electronic commerce adoption in developing countries.

Adapted from Laurence and Tar (2010)

Moodley (2010) emphasised that, for manufacturers in developing countries, high-speed transactions at low cost, the transfer of information at low investment and configuration cost, and interactive global market-reach, are important requirements for competing in the global market.

2.4.3 Business to Business Electronic Commerce in South Africa

South African ICT infrastructure is stable and sophisticated, when compared with other developing countries in Africa (Mungaze 2013) but studies on B2B electronic commerce have been done in South Africa. In a study conducted among 335 South African manufacturing companies, the findings were that 29.8% planning to participate in the B2B electronic commerce in the near future, 17.4% were not interested in B2B electronic commerce, 14.4% were undecided, and 38.4 % were in the process of evaluating the potential of electronic commerce for their companies (Moodley 2010).

According to Paes (2002), there is a low penetration and adoption of electronic commerce in South African-based companies. One of his findings was that the smaller the company, the less the probability of the adoption of electronic commerce. The highest adoption figures were associated with companies having between 500 and 1000 employees. These companies were

regarded as medium-sized companies. Paes (2002) conducted a research on adoption of ecommerce according to the size of a company and the results are shown in Figure 2.7.

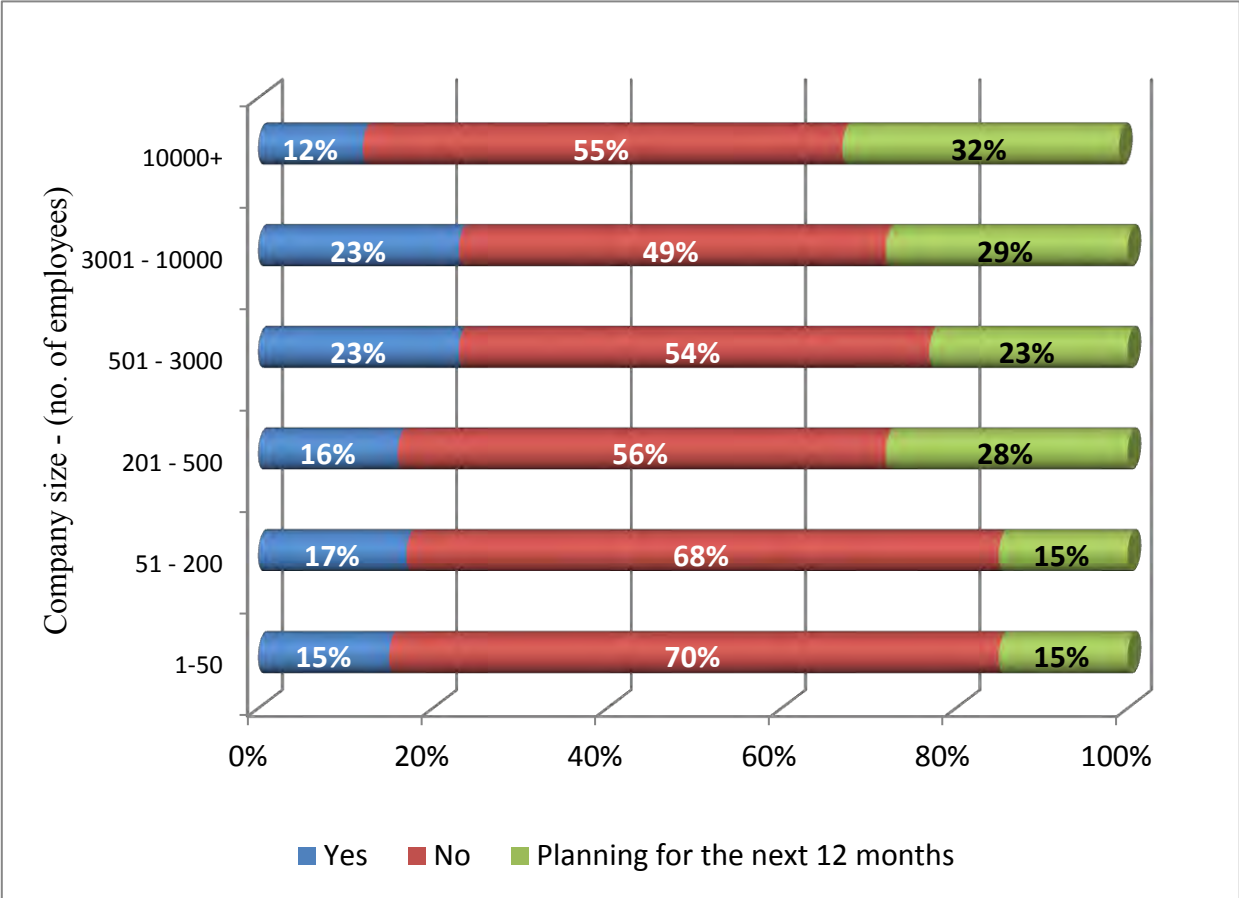


Figure 2.7: E-Commerce adoption of South African companies

Adapted from Paes (2002:32)

Figure 2.7 shows that the small size companies are not using electronic commerce and have no intentions of adopting electronic commerce in the next 12 months while the bigger size companies have intentions of adopting electronic commerce in the next 12 months.

Figure 2.8 shows the adoption utilisation trends of electronic commerce, by a wide range of South African companies, in a study conducted amongst 754 companies.

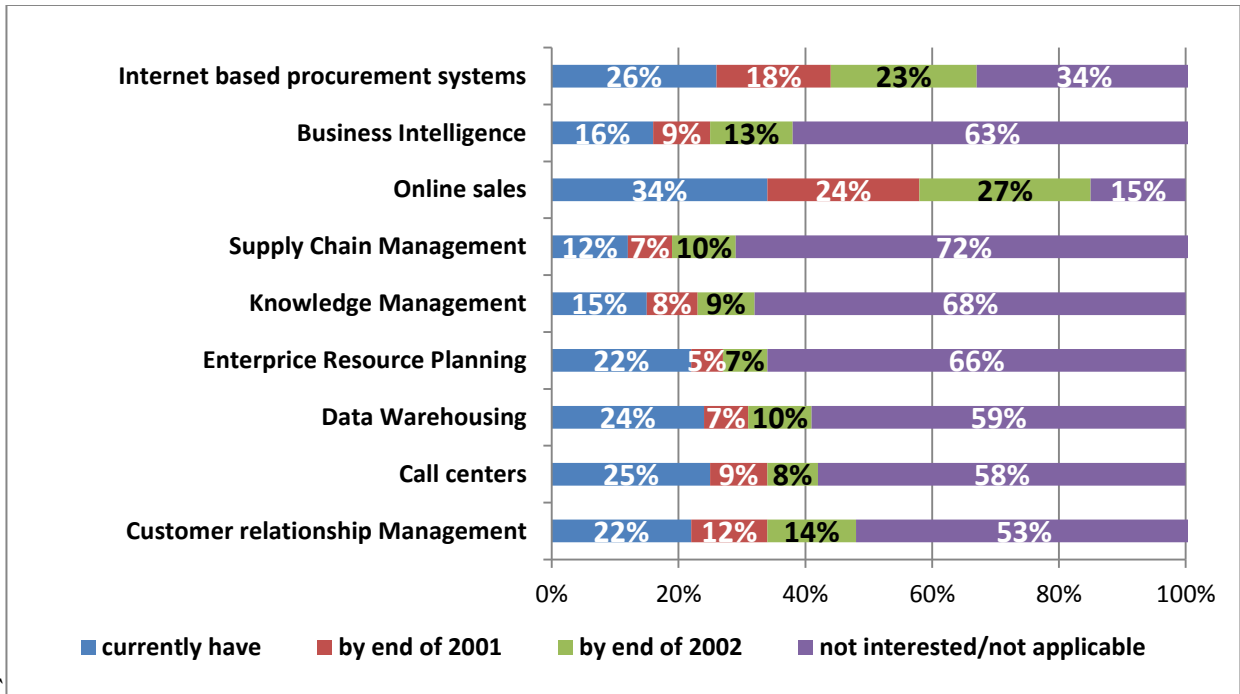


Figure 2.8: Electronic commerce utilisation applications by South African Companies

Adapted from Paes (2002:35)

Figure 2.8 shows that the companies in South Africa have room for growth in adoption of extranet in general but more so for supply chain management and knowledge management.

The findings of Moodley (2010), extracted from a sample of 132 manufacturers in South Africa, are presented in Table 2.2

Table 2.2: Corporate use of Internet

Internet Use	Current (%)	Planned (%)
Email with customers	100	-
Email with suppliers	100	-
Basic website	34.1	31.8
Intranet	37.9	28
Technical data interchange	31.8	35.6
Interactive websites	18.9	37.1
Web-based customer service	18.9	37.1
Extranet supply-chain management	3.8	5.3
Inventory management	20.5	37.8
Supply-chain logistics	20.5	25
B2B trade exchanges	16.7	24.2

Adapted from Moodley (2010:7)

Table 2.2 shows that the South African manufactures the mostly utilised application of internet are emailing customers and suppliers and that the use of extranet still lags significantly behind other applications.

Moodley (2010) concluded that the use of B2B electronic commerce in the South African manufacturing sector is limited, and has not realised its full potential, meaning that there is still scope for expanding the use of B2B electronic commerce in South Africa. He also concluded that there are not enough studies which can lead to a meaningful comparison of South African manufacturing companies' use of B2B electronic commerce with counterparts in other developing countries. This means that there is a need for future research, in order to conduct coordinated research for developing nations' B2B electronic commerce trends.

2.5 Extranet

Ling and Yen (2001) stated that the extranet was the next big trend related to the Internet. They predicted that the extranet would emerge as the favourite interconnectivity medium between business partners.

2.5.1 What is an Extranet?

According to Richard, Fontenot and Blalock (2000), electronic commerce's utilising of the extranet was a natural progression of the Internet which was growing at an explosive rate. A good starting point is the exploring of basic definitions, in order to explain exactly what the extranet is, the difference between the extranet and the Internet; and the way in which the extranet relates to both intranet and Internet. Richard *et al.*, (2000) also emphasised the importance of outlining the reasons for justifying the organisations' spending of resources, and investing in the development and implementation of the extranet.

Tassabehji (2003) described the intranet as a "private version of the Internet" used within the boundaries of an organisation, in order to share information and resources among an organisations employees. Richard *et al.*, (2000) described the extranet as a network linking company intranets, in order to enhance B2B operations. According to Kippenberger (2000), companies and organisations which have embraced e-commerce platforms such as the intranet,

have started expanding their intranet outside their organisation’s boundaries, thereby bringing outside stakeholders such as suppliers and customers, into their loop. Table 2.3 summarises the concepts of intranet, Internet and extranet.

Table 2.3: Similarities and differences between Internet, Intranet and Extranet

	Internet	Intranet	Extranet
What is it?	Information highway	The use of Internet technology within an organisation	A network using the Internet in order to link company intranets, thereby enhancing B2B relationships
Access	Open	Private	By agreement
Users	Public	Organisational members	Business partners
Information	General	Proprietary	Selective

Adapted from Vlosky *et al.*, (2000: 439)

Anandarajan *et al.*, (1998) defined the extranet as a bridge between a private corporate intranet of a firm, and its stakeholders, which can facilitate information exchange and transaction processing of large data volumes. Other definitions of an extranet stated by Ling and Yen (2001) were an “extranet is formed when a company opens its intranet to selected business partners, allowing them to connect to the business network through a secure tunnel”, and, “extranet is when a company makes available some accessibility of its Intranet to a few selected outsiders, for information exchange in a secure environment”. This exchange of information takes place in a format which is secure and structured (Korper and Ellis 2001).

Ling and Yen (2001) predicted that in the long term, with the advancement of technology, there would be a fading away of the clear distinction between intranet, extranet and Internet, which would result in a single, ubiquitous network, built on the basis of the extranet.

The security of the extranet is provided by a Virtual Private Network (VPN). Turban and King (2003) stated that, since extranet transmissions are transmitted via the Internet, this could

potentially pose a security threat; therefore it is important to ensure that there is a security feature catering for the security threat. This would be achieved by creating secure data tunnels which apply algorithms, cryptography, and authorisation protocols, so as to ensure security in the information transfer and access. This secure Internet system with the tunnelling technology is called a VPN (Turban & King 2003). Figure 2.9 illustrates how the components are put together to construct a virtual private network

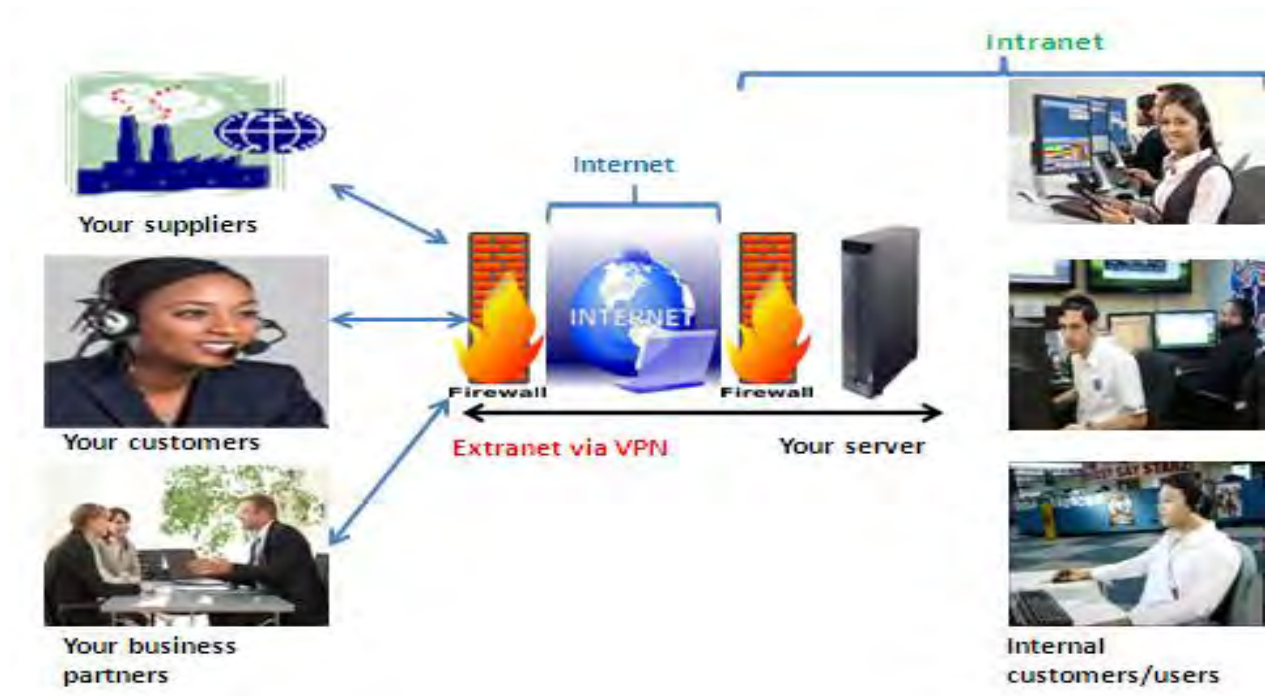


Figure 2. 9: Illustration of the Extranet and Virtual Private network

Adapted from Rahman 2007

Figure 2.9 shows that through the link between the business partners, customer, and supplies may be securely linked with the company's internal users through the virtual private network.

Krishna (2006) further defined two types of extranet on the basis of the purpose, and the functionality, which are the supranet, and the intronet. According to Krishna (2006) an intronet is formed when external stakeholders such as trading partners and customers are granted access behind the initiating company's firewall into the initiating company's intranet. This description of the intronet is quite similar to the standard description of the extranet, as described by Anandarajan *et al.*, (1998). Krishna (2006) defined a supranet as a VPN developed by one of the

members of a private group involved in a private network, thus forming a consortium sponsored and under the control of the consortium members. The purpose of the supranet is to create seamless communication and effective information transfer and between the consortium members. The intronet, intranet and the supranet are illustrated in Figure 2.6.

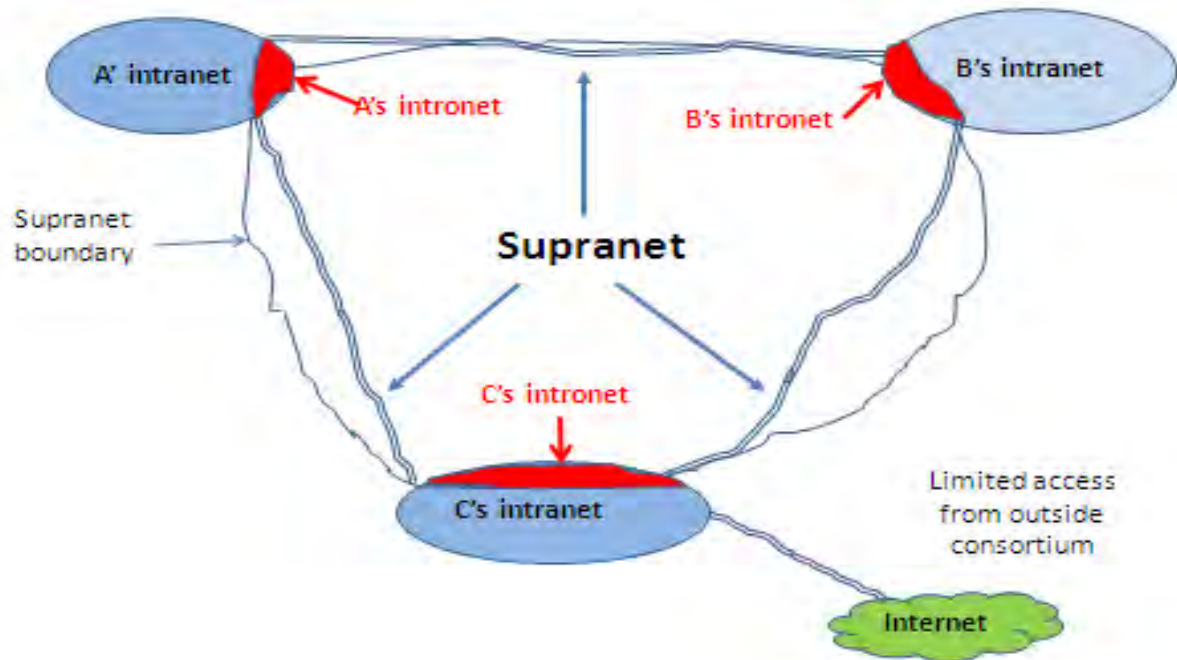


Figure 2.10: Illustration of different types of extranet, and how they connect with organisational structures.

Adapted from Krishna (2006:8)

According to Krishna (2006) an intronet is formed when external stakeholders such as trading partners and customers are granted access behind the initiating company's firewall into the initiating company's intranet. This description of the intronet is quite similar to the standard description of the extranet, as described by Anandarajan *et al.*, (1998). Krishna (2006) defined a supranet as a VPN developed by one of the members of a private group involved in a private network, thus forming a consortium sponsored and under the control of the consortium members. The purpose of the supranet is to create seamless communication and effective information transfer and between the consortium members. Table 2.4 summarises the main differences between the intronet and the supranet.

Table 2.4: Differences between intranet and supranet

Type	Intranet	Supranet
Sponsorship	Owner sponsored	Consortium sponsored
Gateway access	Propriety network	Semi-open network
Relationship	One-to-many	Many-to-many
Service offered	Information product	Communication medium
Primary justification	Provide unique resources	Efficiency and timeliness
Primary beneficiation	Initiator with information	All consortium members
Long-term objective	Lock-in partners	Consortium competitiveness
Nature of application	Pull application	Push application

Adapted from Krishna (2006:13)

Table 2.4 shows that a selection of either an intranet or a supranet is dependent on the benefits that are sort from the application. If the benefit sort is for a wider consortium of partners then supranet is the most appropriate choice but for one company that seeks to sell product to many and provide unique resources the an intranet is appropriate.

2.5.2 Business applications of the extranet

Tassabehji (2003) named a few cases which illustrated business applications of the extranet by well-known international companies; one of which was collaboration between Kimberly Clarke and OM Direct. OM direct integrated their online ordering system with that of Kimberly Clarke, who was their key supplier. This gave OM Direct's customers access to Kimberly Clarke's intranet showing catalogues, video clips on product usage, material-data sheets, etc.

According to Richard *et al.*, 2000 automotive manufacturers formed an Internet-based private network which used the extranet to link car manufacturers such as Ford Motor, Caterpillar, Chrysler, TWR, General Motors, and other auto companies, with suppliers, and other international business partners. Similarly, in the United States of America the insurance industry formed its own extranet called WINconnect, which linked the four biggest insurance companies in the world (Richard *et al.*, 2000).

Previous studies have showed that the most common application of the extranet is based on the sharing of large amounts of data between the business and its partners (electronic-data interchange) e.g. product brochures, manuals, product specification sheets, corporate policies and procedures, etc. (Tassabehji, 2003).

The same was confirmed by Richard *et al.*, (2000), when, in his research of 56 extranet users, he requested them to rank their top 5 general applications of the extranet. The summarised results from his findings are seen in Figure 2.11.

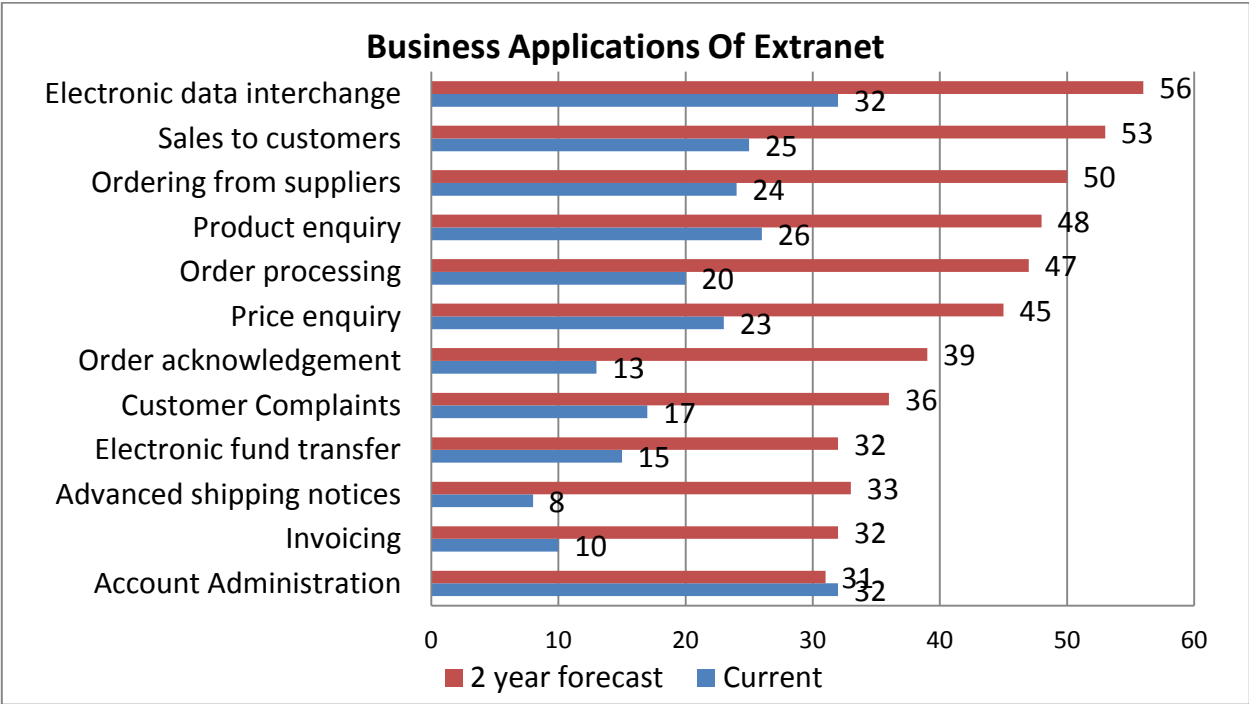


Figure 2.11: Statistics of extranet utilisation

Adapted from Richard *et al.*, (2000:444)

Figure 2.11 shows that extranet is mostly used for data interchange and sales to customers. It is worth noting that invoicing and electronic fund transfers, both which are components of making payments are one of the least used applications.

Watson and McKeown (1999) named a case of Heineken USA, the North American distributor of Heineken products, who formed an extranet system called HOPS (Heineken Operations Planning System), which enables their 450 local distributors to find information in the American Software Supply Chain Management Software. This was used by Heineken for production and inventory

control. The HOPS system formatted information as spreadsheet tables and graphical displays showing previous sales and future sales forecasts. This allowed the local distributors to amend the spreadsheet where required. After the amendments made by distributors, the system could place future orders for the following periods.

2.5.3 Benefits of using extranet

According to Rahman (2007), companies use the extranet as a tool with which to stay in touch with their important stakeholders, such as customers, trading partners, and suppliers. The extranet assists the firms in the exchange of high volumes of business information. It also improves their business efficiency. Richard *et al.*, (2000) generalises the benefits of the extranet to the sharing of information, the lowering of operational costs, the saving of time and resources, the improvement of customer service, and the improving of customer relationships in the B2B electronic commerce.

Kippenberger (2000), Rahman (2007), Kippenberger (2000), and other authors have conducted research on the benefits of the extranet; their findings have many commonalities. The findings of Vlosky, cited in Rahman (2007), were that the main benefits of the extranet are improved value to customers, timely information exchange, improvement in competitive standing, increased information access, reduced cost of conducting business, and lower price to customers. In a study conducted by Angeles (2001), cited in Rahman (2007), the benefits put forward were: speedier B2B transactions, fewer transaction errors, increased quantity of business from partners, more efficient collaboration with business partners, and easy information access.

Anandarajan *et al.*, (1998) stated that the benefits of using the extranet may be classified into operational, tactical, and strategic categories. These benefits would differ across various organisations, depending on the purpose for implementation of an extranet.

From a strategic perspective, Rahman (2007) stated that implementation of the extranet has the potential to contribute to organisational differentiation and cost leadership strategies. According to Hough, Thompson, Strickland and Gamble (2011), cost leadership is about providing customers with value for their money, by incorporating excellent product attributes at a lower

cost than rivals. Differentiation strategy is about seeking to offer services or products that offer benefits different from those of competitors, and that are widely valued by customers (Johnson, Scholes & Whittington 2008).

From a tactical perspective, Anandarajan *et al.*, (1998), the extranet offers important, yet intangible marketing benefits such as stakeholder collaborations and business partnerships. According to Rahman (2007), extranets can be good marketing tools which can create value-added services like inventory visibility, reporting tools, up-to-date forecasts, online graphs, customised user interfaces, tracking tools for deliveries, and the cost-effective transfer of and information exchange.

Rahman (2007) argued that, by offering a tool for better customisation and value-added services, implementing of an extranet can contribute to the differentiation strategy of a company and that the extranet can also contribute to a company’s cost leadership strategy, by offering standardised and cost-effective customer service. Table 2.5 summarises the extranet benefits with respect to different strategy types.

Table 2.5: Strategic Benefits of Extranet adoption

Strategy Type	Extranet Benefits
Cost leader	<ul style="list-style-type: none"> • Efficient operations • Reduced transaction costs • Standardised and efficient customer service
Differentiation	<ul style="list-style-type: none"> • Value-added service • Differentiated exchange experience • Mass customisation
Focused	<ul style="list-style-type: none"> • Improved relationships • Offered to selected customers
Broad scope	<ul style="list-style-type: none"> • Cost-effective to offer to a broad scope of partners

Adapted from Rahman (2007:15)

Table 2.5 highlights that leaders may include consider the benefits that extranet could offer during the strategy build up for their organisations.

According to Kippenberger (2000), the benefits of implementing the extranet include facilitation of learning and knowledge, reduction in marketing time, enabling of electronic business, shortening of sales cycles, and enhancing of customer service and support. Inzuza and Guan (2008) concluded that the extranet brings about positive cost savings in the organisations' supply-chain activities.

Rahman (2007) summarised the operational benefits of implementing the extranet in Table 2.6.

Table 2.6: Operational and value-chain benefits of the extranet

Value-chain activity	Operational benefit
Operations and production	<ul style="list-style-type: none"> • Reduction of inventory • Improved demand forecast • Sharing of supply and demand information • Integration of accurate and timely data into planning
Distribution and outbound logistics	<ul style="list-style-type: none"> • Elimination of middleman • Electronic delivery • Improved availability of tracking data
Service and after-service	<ul style="list-style-type: none"> • Quicker responsiveness • Around-the-clock information access • Customised service at low cost
Sales and marketing	<ul style="list-style-type: none"> • Reduced communication costs • Improved relationship • Improved customer and market information • Quicker documentation process

Adapted from Rahman (2007:16)

Each value chain activity as highlighted in Table 2.6 clarifies an opportunity and a benefit that may emanate from applying extranet in organisations.

2.6 Models of extranet adoption

Robinson (2009) argued that the qualities which make an innovation spread, and which determine why other innovations fail, are: the level to which the new innovation is perceived by the users

as better than the existing systems (e.g. financial benefits, convenience, social prestige); compatibility with the existing practices and values; the ease of use; triability; and the observable results.

Laurence and Tar (2010) concluded that the barriers to adoption of the extranet and B2B electronic commerce in developing countries, may be classified as infrastructure, technology, network access costs, access to computers, socio-cultural, transactional trust, limitation on personal contact, and computer literacy. It is critical that the success of information systems is measured (Lee, Su, Lu & Yu 2007). This makes user-acceptance of information systems' technology such as the extranet an important field of study (Chuttur 2009).

Various models have been used to predict and also to explain the adoption and use of information systems. According to Lee *et al.*, (2007), researchers have proposed eight adoption models which are: Theory of Reasoned Action (TRA); Technology Acceptance model (TAM); Motivational Model (MM); Theory of Planned Behaviour (TPB); Combined TAM and TPB Model of PC Utilisation (MPCU); Innovation Diffusion Theory (IDT); and Social Cognitive Theory (SCT). The most popular examples are the Task Acceptance Model (TAM), Task-Technology Fit model (TTM), Unified Theory of Acceptance, and Use of Technology (UTAUT). Kloppping and McKinney (2004) suggested that, although each of the mentioned models has different sets of adoption determinants, the most popular and widely used are the TTF and the TAM models.

Lee *et al.*, (2007) described the TTF model as focused on the level to which systems fit the user task needs. The core of the TTF model is the match between the capability of the technology and the demands of the tasks (Dishaw, Strong & Bandy 2002). The four important constructs of the TTF model are: task characteristics, technology characteristics, the task-technology fit, and the utilisation. The TTF model posits that a new system, such as the extranet will be used if, and only if, what it offers the user supports the requirements of the user (Kloppping & McKinney 2004).

The TAM is an adaptation of the TRA model for the information technology field, based on the theory that behaviour is determined by an intention to perform, and that the behaviour is

voluntary (Dishaw *et al.*, 2002). According to Chuttur (2009), the TAM proposes that user's motivation to adopt and use technology may be explained by the perceived ease of use, perceived usefulness, and attitude towards using the new technology tool such as the extranet. Adapting the analysis by Shroff, Deneen and Ng (2011) to the extranet, it may be said that:

- When users perceive the extranet as easy to use, they may have a positive attitude towards the usefulness of the extranet system; and
- When the users have a positive attitude towards the extranet system, they may use the system frequently, and may have a favourable intention of using the system.

Klopping and McKinney (2004) went further, merging the TAM and TTF models into a hybrid model which may be applied to explain the adoption patterns of a technology innovation. Their merged model is depicted in Figure 2.12.

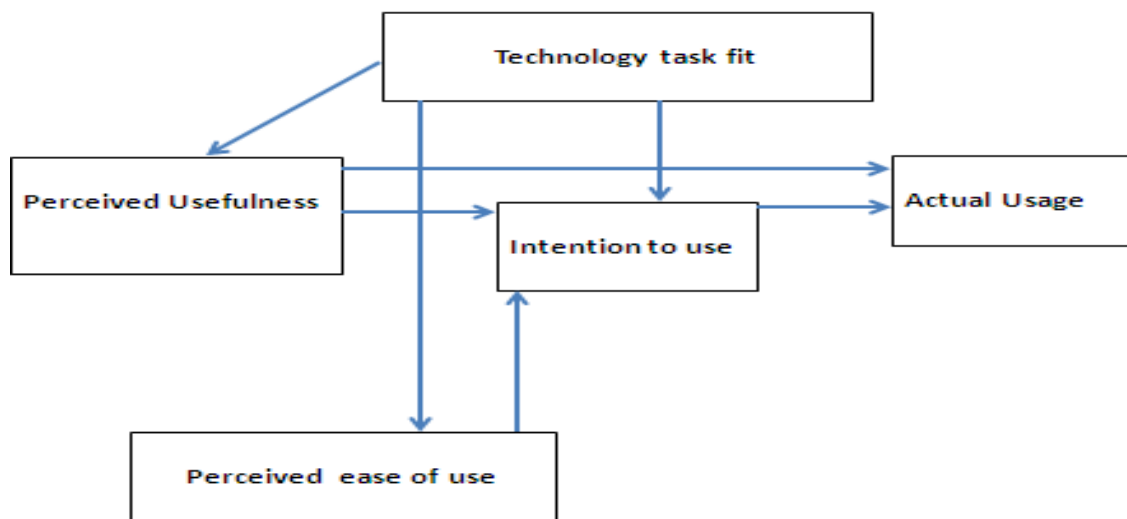


Figure 2.12: Hybrid model of TAM and TTF

Adapted from Klopping & McKinney (2004:48)

The hybrid model in Figure 2.12 means that if the technology fits the tasks and the desired applications of the potential user, then they will perceive the technology as useful and they will have intentions to use the technology. The combination of the technology task fit and perceived usefulness on its own may lead either intention to use or into actual usage of the technology.

Other than the popular TTF and TAM models, another important model relevant to developing countries, is the Computer Self-Efficacy model (CSE) (Dishaw *et al.*, 2002), who defined the CSE model as the judging of an individual's ability to use a computer, or the ability of an individual to complete a certain task using a computer.

In the South African context Ako-nai (2005) conducted his technology acceptance, usage and adoption at Unilever where amongst other things he concluded a positive correlation between the PEU, PU and IU. The key findings of Chang (2004) in his study on TAM were strong correlation between PU and IU, and a strong correlation between PEU and PU. The findings of Bonizzato (2011) also were in agreement with the proposition that PU and PEU are strongly correlated to one another. According to Godoe and Johansen (2012) if the target population of new technology displays a low PU and PEU, the new technology will be rejected regardless of other factors.

2.7 Previous Studies on Reasons for Rejection of the Extranet

The TAM and TTF models have developed instruments which assess the adoption of a technology innovation, on the basis of perceived usefulness (PU), perceived ease of usefulness (PEU), actual usage (AU), and also, on the way in which the technology functionality fits the users' expectations (Klopping & McKinney 2004). The TAM and TTF models may also be integrated into the TTF/TAM, because the instruments for the TAM/TTF models are capable of accommodating the reasons derived from the Möbius (2002) matrix, as illustrated on Figure :

The reasons for extranet rejection by Möbius like no perceived benefits, missing functions, extranet not addressing the customer needs all are related to the perceived usefulness of extranet, while the lack of customer training and support, challenges I handling, and process errors may be related to the perceived ease of use. The technical aspects of extranet like system errors and processing speed are related to the task technology fit.

Figure 2.13 shows that if the technology does not address the customer needs or there is no supports in terms of training and preparation, people tend to reject extranet.

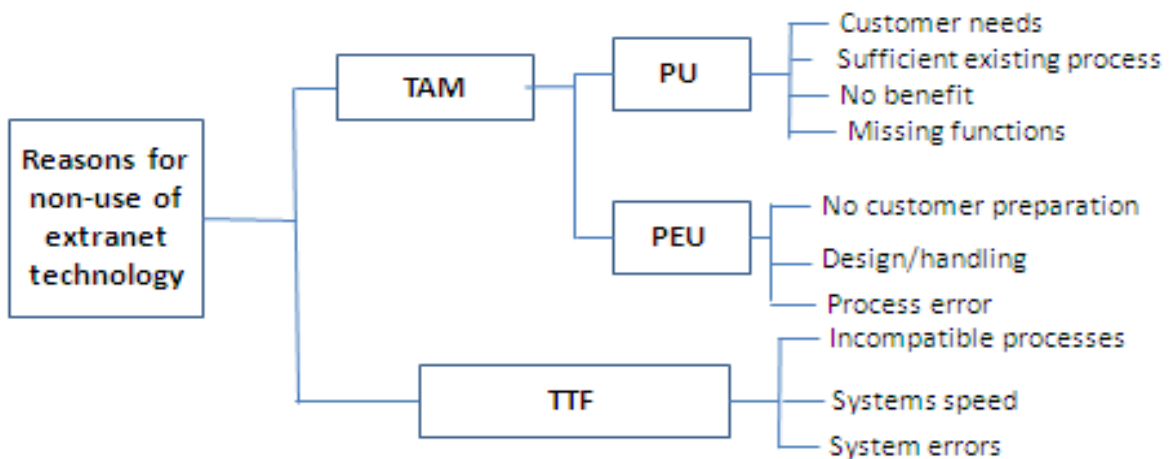


Figure 2.13: Möbius matrix of extranet non-adoption reasons

When the existing processes are sufficient to fulfil customer needs, or the new system offers no perceived benefits, or causes processing errors, there will be higher rate of rejection of the extranet. If the extranet has technical problems like slow processing speed and system errors, extranet will be rejected.

According to Morris & Venkatesh (2006), the older workers in organisations displayed weak adoption of new technologies compared with younger workers. Möbius (2002) conducted a study where he sorts to find reasons for extranet rejection in channel relationships within retailers in Germany, a developed country. Möbius (2002) developed a framework for rejection on the basis of infrastructure, systems, process, and people as shown in Figure 2.14

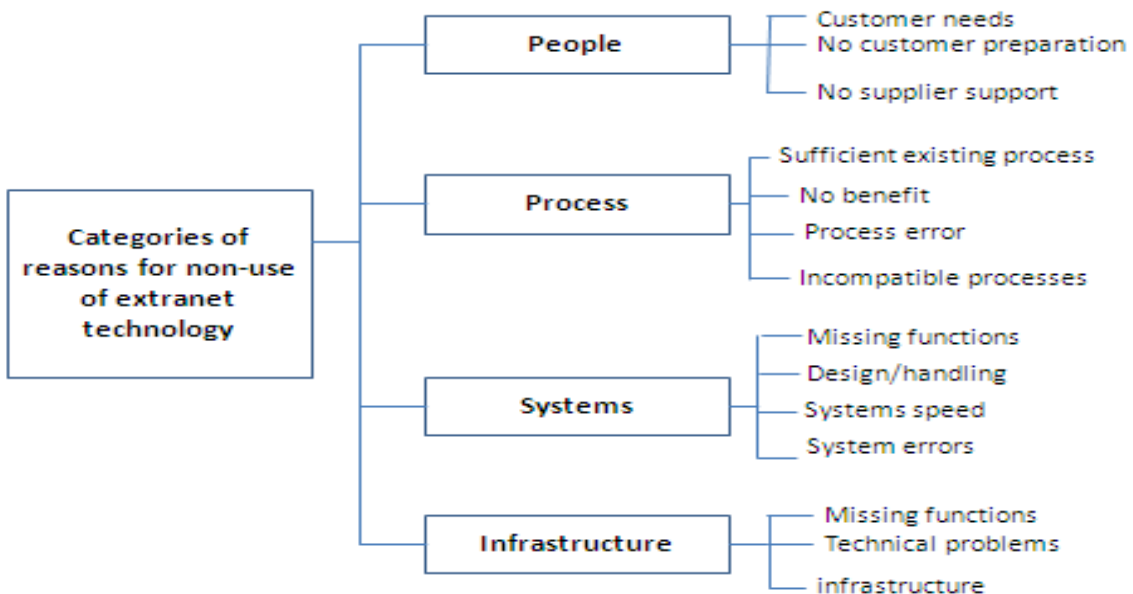


Figure 2.14: Matrix of reasons for poor utilisation of extranet.

Adapted from Möbius (2002:50)

2.8 Extranet at Engen Petroleum Limited

According to Vlosky *et al.*, (2000), in order to remain competitive, organisations continually seek processes, technologies, and products that will add value to their existing offerings. Organisations that were early adopters of the extranet, according to the innovation diffusion model, were seeking to gain competitive advantage over their rivals (Anandarajan *et al.*, 1998). The modern market is characterised by commoditisation of products, elevated buyer expectations, and diminishing demand, which in turn calls for suppliers to offer their existing customer base some additional value (Kelley, 2012).

Over the years, customer relationship management (CRM) has become an important focus for many other organisations Dhar and Winer 2011. This has been fuelled by forces of globalisation and increased competitive forces (Corbitt *et al.*, 1999). Yen *et al.*, (2003) defined CRM as all the tools and technologies used to facilitate, manage, and improve sales support and related interactions with customers. As with most other companies, Engen Petroleum Limited’s CRM strategy underwent remodelling, in order to take advantage of the extranet (Paes 2002).

According to Kippenberger (2000), the extranet may be used to forge stronger relationships with customers. Other key SCM deliverables suggested by Yen *et al.*, (2003) were sales-force automation (including automation of sales promotions, auto-tracking of customers, repeated orders for future sales, coordinating marketing, and sales call-centre) and the use of technology in delivering value (e.g. up-to-date customer data and accessibility, online ordering, twenty-four-hours availability).

Initially, an approach taken by Engen Petroleum Limited was to roll-out the extranet free of charge to Internet-enabled key customers as an “added value” or value proposition. This was in line with the CRM aspect of the extranet, in which the innovation was to provide dual benefits to both Engen Petroleum Limited as a supplier, as well as its key customers (Laukkanen, Sarpola, & Kemppainen 2007).

2.9 Summary

The adoption of B2B electronic commerce in developing countries has been slow-paced, owing to barriers such as computer literacy, Internet connectivity, initial costs, etc. This is in contrast to the developed countries where electronic commerce has been embraced as the modern way of conducting business. Extranet as the third wave after the Internet and intranet is estimated to be the new driving force behind further adoption of B2B electronic commerce. There are various models available which can evaluate the adoption and success of the extranet; however, the most popular ones are the TAM and the TTF models. The previous studies on adoption of extranet have mostly been based on the developed countries and thus may not be generalised of a developing country like South Africa. The previous studies have also focused more on evaluating the suitability of the technology acceptance models as opposed to applying them in situations to evaluate how a new technology like extranet have been accepted in a specific scenario. The application of these models will be the core of the research questionnaire in the research methodology Chapter 3.

CHAPTER THREE

Research Methodology

3.1 Introduction

The layout of the research methodology chapter will follow the approach illustrated in Figure 3.1.



Figure 3.1: Layout of the steps that were followed in the research methodology

3.2 Research Purpose

The purpose of the study is to assess the adoption and the utilisation behaviour of the Engen extranet tool by Engen customers. A short study of the utilisation of the extranet was conducted in 2012, as a first assessment after the Engen extranet was rolled out to a select few customers. The results of the survey conducted in 2012 showed poor adoption and utilisation of the Engen extranet, especially as a tool for ordering products online (which was the key original purpose of the extranet tool). The current study aimed deeper, in order to extract more details and to gain insight into the utilisation and adoption of the extranet tool.

The following are the objectives of the study:

- To measure the actual current Engen extranet utilisation;
- To determine future intention to use the Engen extranet;
- To determine the level of perceived usefulness of the Engen extranet;
- To determine perceived ease of use of the Engen extranet;
- To measure the task-technology fit of the Engen extranet; and
- To determine the possible reasons for Engen extranet low/non-utilisation

3.3 Research Approach

According to Kruger, Mitchell and Welman (2009), the purpose of conducting research is to define, explain, predict, and even modify, or control human behaviour, its organisations, products, or events. Research approaches may be either descriptive in nature, or exploratory, or

they may be conducted for the purpose of testing hypotheses (Bougie & Sekaran 2009). The choice of an approach to a research study is made on the basis of the level of knowledge of the research topic, or subject matter in general (Bougie & Sekaran 2009).

Exploratory studies are conducted when there is not much knowledge on the subject or the situation, or when there is no information from previous studies on a similar problem (Rahman 2007). According to Bougie and Sekaran, (2009) descriptive studies are conducted in order to understand the current state of affairs. Descriptive studies enable the researcher to describe the characteristics of variables of interest in that particular study (Kruger *et al.*, 2009). Hypothesis testing is conducted in order to explain the differences in the dependent variables, also to predict organisational outcomes (Bougie & Sekaran 2009). Hypothesis testing is conducted in order to identify cause and effects, and to show causal relationships amongst variables (Rahman 2007).

Electronic commerce, B2B electronic commerce and the extranet have been relatively well researched in the past. Many studies have been of the hypothesis type and of an exploratory nature. This means that the basic concepts of the extranet, B2B electronic commerce are well known (Wing, 2004). Many of the previous studies, of the hypothesis type, seek to explain the models of the extranet and B2B electronic commerce adoption (Ahmad, Madarsha, Zainuddin, Ismail & Nordin 2010). This study will take a descriptive approach and not an exploratory study or hypothesis testing, because it is an extension of an existing descriptive survey which must be investigated further, in order to describe and explain it in a more detailed manner.

There has been much research conducted, especially in developed countries, which has taken the form of exploratory studies (Möbius 2002). These have enhanced the body of knowledge on the subject. The choice of the descriptive study is informed by the quest to find the reasons for the behaviour displayed, so that future interventions may be undertaken which could alter this behaviour.

According to Bougie and Sekaran (2009), the strategy for conducting research may be based on one of two forms of reasoning: inductive or deductive reasoning. The deductive method opens with a general theory, which is then applied in focusing the approach of the qualitative research

on a specific case. The researcher establishes the problem, the hypothesis, and the research strategy for hypothesis testing. On the other hand, according to Kruger *et al.*, (2009) the inductive approach is a research type in which the theory is established from real observations. The inductive approach uses collected data, various cases, or observations from reality (Rahman 2007).

The motivation for this research was the observation of underutilizing of the extranet by Engen customers. This observation was confirmed by a preliminary survey conducted in 2012, showing underutilisation of the extranet tool amongst Engen customers. The approach for this study is therefore inductive in nature, being based on real observation and a preliminary survey on the matter of adoption and utilisation of the extranet by Engen customers.

The TAM and the TTF models for evaluating the level of technology adoption were selected as the basis for this study because they are the most popular models and have been widely used in the past (Klopping & McKinney 2004). This means that it would be possible to compare the results from this study to the results and findings from previous studies where these models were used.

3.4 Sampling Process

According to Bougie and Sekaran (2009) a sampling process is the selection of the right objects, individuals, or events, to be representatives of the whole population. The sampling techniques provide a range of methods enabling the researcher to reduce the amount of data needed, by considering only the data from the sub-group, instead of considering all the elements (Krishna 2006). A sample is a subset of the population, which comprises some members selected from the population (Kruger, *et al.*, 2009). The idea behind sampling is that, by selecting some elements of the population, the researcher may draw a conclusion about the entire population (Rahman, 2007).

Lind, Marchal and Wathen (2010) stressed that sample selection is one of the important stages of the research. Generalizability is important, in the sense that, when a sample is not selected appropriately, the results from that sample cannot be generalised to the entire population (Kruger

et al., 2009). The two major sampling designs are probability and non-probability (Bougie & Sekaran 2009). In probability sampling, the elements of the population have a known non-zero chance of being selected as subjects of the study (Fraser 2007).

According to Rahman (2007), in probability sampling, the elements are selected randomly. They have an equal chance of being selected, which improves the chances of sample representativeness. In contrast with probability sampling, in non-probability sampling, the probability that an element will be selected cannot be specified (Kruger *et.al.*, 2009), which means that some elements of the population have no chance of being selected, and some have a high chance of being selected as the elements. Table 3.1 shows the examples of probability and non-probability sampling.

Table 3.1: Examples of the types of sampling

Probability Sampling	Non-Probability Sampling
<ul style="list-style-type: none"> • Simple random sampling • Stratified random sampling • Systematic sampling • Cluster sampling 	<ul style="list-style-type: none"> • Accidental sampling • Quota sampling • Purposive sampling • Snowball sampling • Self-selection sampling • Convenience sampling

Adapted from Bougie & Sekaran (2009:278)

The most appropriate method for this study is probability sampling, which follows the simple random method, because generalizability of the results to the population is of importance to the study.

Fraser (2007) described the following as the major steps of a sampling process:

- Defining the population;
- Determining the sample frame;
- Determining the sample design;
- Determining the appropriate sample size; and

- Executing the sampling process.

3.4.1 Population and Sample Frame

The population of the study was comprised of Engen Petroleum Limited's customers, predominantly Engen Chemicals' business unit, and a business unit of Engen Petroleum Limited. Engen Petroleum Limited trades with these customers on a B2B basis. Engen Chemicals was the champion of the initial roll-out of the extranet tool, as a step towards e-commerce. The customers which make up the population are geographically spread across all provinces of South Africa. Engen grouped the customers into four regions: Eastern Cape, Western Cape, Gauteng, and KwaZulu-Natal.

The subjects of the study are the buyers and procurement persons who execute the buying of the Engen products for their respective companies. The Engen Information Systems' department keeps a database of all customers who have registered with the Engen extranet system; and therefore have made the information available as a sampling frame. There is a total of ninety-seven registered customer accounts on the Engen extranet system.

- From the sample frame of ninety-seven accounts, twenty-six accounts were eliminated as potential elements of the study, because, although registered for the Engen extranet, the accounts had not been activated by the customers (i.e. by the supplying of the customer with basic training and a password);
- Another twelve were eliminated because they were no longer trading with Engen for a number of reasons (including having closed down, purchasing from Engen opposition, and product discontinuation). These were considered stale accounts because they had not purchased any product within the past three years; and
- Another four accounts were eliminated, because they had one central buying centre, where one buyer was responsible for multiple extranet accounts residing in different regions.

This reduced the total number of the accounts which could be regarded as the active population, at 56. Figure 3.2 shows the percentage of accounts in the various regions of South Africa.

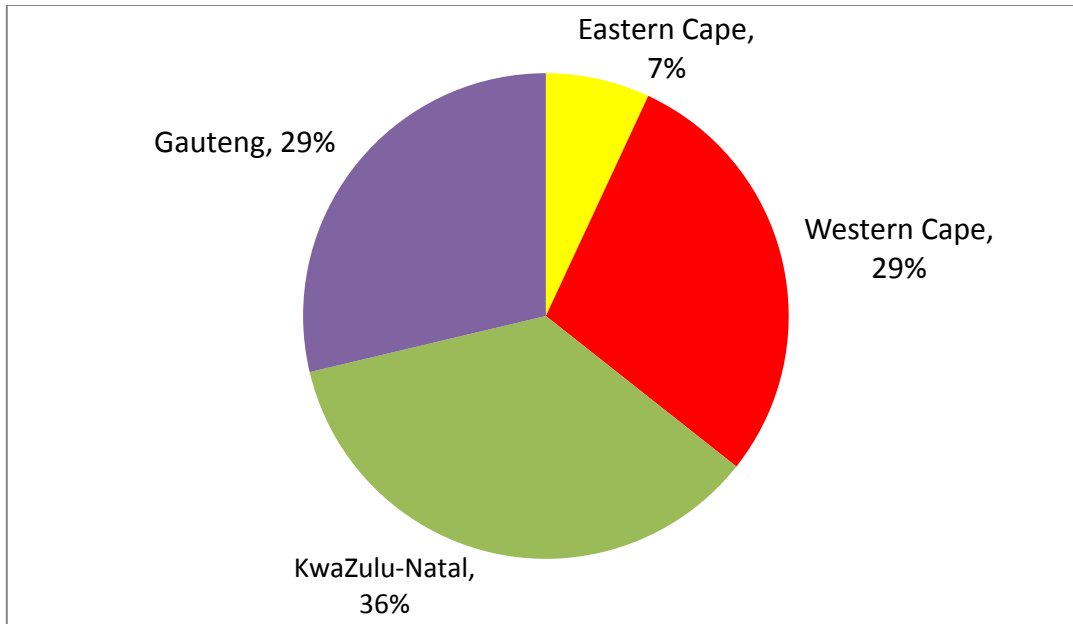


Figure 3.2: Geographic distribution of Engen extranet active population

3.4.2 Sample size

According to Lohr (2010) the two important factors, when considering sample size, are the required level of confidence, and the tolerable margin of error. The online version of a sample size calculator by Raosoft also confirms the confidence level and margin of error importance (anon 2004). The typical margin of error is 5 %, and typical confidence levels are 90%, 95% and 99% (Lohr 2010). Using the Raosoft online tool for a population of 56, the recommended sample size for 5% margin of error, and 95 % level of confidence, is 49. This is also confirmed by the tabular type sample size calculator by Bougie and Sekaran (2009). For a margin of error of 10%, and 95% level of confidence, the sample size calculator recommends a sample size of 36.

In order to improve the chances of obtaining a representative sample for this study, all 56 members of the population were requested to participate in the survey, and also to mitigate against the possible poor response rate, increasing the chance of the sample's being representative. Lohr (2010) defined census as an instance where the entire population is involved in the survey. All 56 members of the active population were chosen as possible elements.

3.5 Data Collection

3.5.1 Data Collection Method

According to Kruger *et al.*, (2009) there are various options in which research data may be collected; the main methods being the qualitative and the quantitative methods. Qualitative data refers to information collected in a form of a narrative, using interviews and observations (Bougie & Sekaran 2009). The qualitative method is non-numerical, and usually subjective. It often leaves the process of measurement to the discretion of the researcher (Krishna 2006). Möbius (2002) supported the qualitative approach and conceptual development, and warned against resorting to testing theories in which sound context has not been properly developed.

The quantitative approach attempts to measure variables or to count occurrences of specific phenomena (Kruger *et al.*, 2009). According to Krishna (2006), the quantitative method expresses the extent of an outcome in the form of numbers. The present research was based on the quantitative method, where respondents were requested to answer a structured questionnaire in an attempt to answer the research problem.

The questionnaire was delivered to the elements by email. The reasons for selecting the online questionnaire tool delivered via email were:

- It was a cost-effective method, emailing being relatively cheap;
- There was a speedy transfer time to the survey participants;
- It offers flexibility and convenience to the participants, who may answer in their own time; and
- It is effective in terms of reaching the participants located across all the provinces of the country (Fraser 2007).

The developed questionnaire was loaded into the “Questionpro” tool. Questionpro was used to create online surveys, collect responses, and to conduct preliminary analysis of the data.

3.5.2 Data-Collection Steps

- In the beginning, the Regional Area Sales Managers for the respective customers were requested to inform and alert the customers of the intention to conduct this study. This was a measure taken to ensure that the study elements did not unexpectedly receive a

request for a survey, which they could consider as “spam-mail”, associated with unsolicited emails (Fraser 2007);

- The following step was the emailing of the actual survey package, which consisted of the informed consent letter on the front page, followed by the questionnaire. The informed consent served as an introduction, in which the participants were made aware of confidentiality, the voluntary nature of the exercise, and the due date for returning the answered questionnaire;
- There were two scheduled reminders; the first was seven days after the sending of the package; and the second reminder was forwarded fourteen days after the initial package had been sent.

3.5.3 Questionnaire Design

The survey questionnaire consisted of 30 questions, divided into seven sections. The first section was used to capture demographic details of each subject. The other sections were used to capture information related to the various research questions as per Table 3.2.

Table 3.2: Structure of the research instrument used

Question numbers	Research Question
1 to 5	Demographic information
6 to 8	Actual Utilisation of Engen Extranet tool (AU)
9 to 11	Perceived Usefulness of Engen Extranet tool (PU)
12 to 16	Perceived ease of Use of Engen Extranet tool (PEU)
17 to 19	Intention to Use Engen Extranet tool (IU)
20 to 23	Fit between Engen Extranet Technology and Customer Tasks (TTF)
24 to 30	Possible Reasons for Low/Non-usage of Engen Extranet Tool

The technology acceptance model survey took the form of psychometric scales prompting perceived usefulness (PU), perceived ease of use (PEU), and actual usefulness (AU) as was originally developed by Davis (1989) cited in Chuttur (2009). The task-fit technology instruments were adapted from (Klopping & McKinney 2004). The outcomes of Möbius (2002) yielded a list of possible reasons for non-use of extranet technology. For this study, those possible reasons were adapted, forming the basis of the 5 point Likert scale questionnaire.

3.6 Data Analysis Procedure

Services of a professional statistician were employed in order to for the results and the data analysis to be of an acceptable standard. SPSS version 21 (SPSS Inc., Chicago, Illinois, USA) was used to analyse the data where a p value < 0.05 was considered as statistically significant.

The focus of the data analysis was:

- To describe (painting a visual picture of the data);
- To count (e.g. number of survey participants that “Strongly disagree” on a Likert scale)
- To make comparisons (e.g. compare utilisation trends between male and female survey participants)
- To make inferences (explore and test propositions about certain variables of concern); and
- To estimate (to use the data collected to make informed guesses about the population).

One important part of the analysis was to examine the way in which one may ensure that the measures developed were reasonably good or “the goodness of the measures” (Bougie & Sekaran 2009). According to Kruger *et al.*, (2009), reliability is a test concerned with how consistently the measuring instrument measures whatever concept it is measuring. Cronbach’s Alpha is a measure of internal consistency, showing the degree to which all the items in a test measure the same attribute (Lohr 2010). According to Dennick and Tavakol (2011), the Cronbach’s alpha coefficient values above 0.7 are generally accepted as they represent reasonably reliable data. The analysis of data section also measured data validity, which is a statistical test of how well an instrument that is developed measures the concept it is intended to measure (Bougie & Sekaran 2009).

A section of the data analysis focused on descriptive statistics. Lind *et al.*, (2010) defined descriptive statistics as a method of organizing, presenting and summarizing data in an informative way. The analysis will include depiction of the demographics of the population through relevant distribution frequencies and percentages.

In statistics measured data may be classified as nominal, ordinal, and ratio scales (Kruger *et al.*, 2009). Nominal scale is obtained if survey responses are classified into distinctive categories with no order or value, ordinal scale is where it is possible to rank order all the categories according to

some criteria, and ratio scale is an ordered scale where the proportions and differences between the numerical values is meaningful (Curwin & Slater 2008).

Mcgrane and Smailes, (2000) defined correlation as a mathematical method used to gauge the strength of an association between two variables. The commonly used correlation technique for interval and ratio scaled variables was originated by Karl Pearson, hence it is called the Pearson coefficient, on the other hand when the variables are measured on an ordinal scale the Spearman rank-order correlation (also known as Spearman's Rho) is used (Kruger *et al.*, 2009). The Pearson coefficient was used to assess the strength of the association between various variables of interest contained in the data.

For ordinal scales, the test of difference between distributions if the samples are independent, the Mann-Whitney u test is used and for three or more independent samples the Kruskal-Wallis test is used (Kruger *et al.*, 2009).

3.7 Summary

The approach for this research was a quantitative and descriptive study, in order to serve the purpose of measuring and understanding the underlying reasons for the adoption and utilisation of the Engen extranet. The selected sampling method was a simple random probability study, which would enhance the generalizability of the results. The total size of the active population was 56. Data-collection was conducted using an online, structured questionnaire that was emailed to the participants. The data analysis section will focus on data description, testing the reliability and validity of the data and it will include correlations between variables of interest. Chapter 4 will present the survey results, using graphical displays tables and summaries.

Chapter Four

Presentation of Results

4.1 Introduction

This chapter began by presenting the value of data using the reliability and validity concepts as they were introduced in Chapter 3. The results obtained from the professional statistician were compared with acceptable standards. The feedback statistics of the survey participants was organised and presented in tabular and graphical form. The descriptive statistics of the data were then presented with sections relating to the research objectives, as highlighted in Table 3.2.

4.2 Reliability and Validity

According to Curwin and Slater (2008), researchers should be in a position to justify the research approach in terms of reliability.

4.2.1 Reliability

Reliability is a test of worth/value of the survey data, which assesses how consistently a measuring instrument is measuring whatever it is measuring (Bougie & Sekaran, 2009). According to Dennick and Tavakol (2011), the Cronbach Alpha coefficient values above 0.7 are generally accepted. Lower values could mean that there is low inter-relatedness between items of the construct. This is generally remedied by eliminating the individual items that have very low Cronbach's alpha values (Dennick & Tavakol 2011).

Cronbach's alpha was computed on all Likert-scale questions, yielding an overall alpha value of 0.960. Table 4.1 shows the reliability of the individual research objectives.

Table 4.1: Reliability measured by Cronbach's Alpha Coefficient

Research Question Objective	Cronbach's Alpha
Perceived Usefulness of Engen Extranet tool (PU)	0.901
Perceived ease of Use of Engen Extranet tool (PEU)	0.950
Intention to Use Engen Extranet tool (IU)	0.728
Fit between Engen Extranet Technology and Customer Tasks (TTF)	0.934
Possible Reasons for Low/Non-usage of Engen Extranet Tool (PR)	0.901

The Cronbach's alpha coefficient scores for all objectives together, as well as individually, were above 0.7, which indicated a high degree of internal consistency amongst the items in each section.

4.2.2 Validity

According to Bougie and Sekaran (2009), validity is a test of how well an instrument that was developed and used in a study measures the particular concept it is intended to measure. Factor analysis is a statistical procedure which is performed for various statistical applications, one of which is to assess the construct validity (Curwin & Slater 2008).

Factor analysis was computed on all Likert-scale questions, excluding Q25. Four factors were produced, as follows;

$$\text{Factor 1} = (Q30+Q9+Q8+Q19+Q24+Q20+Q15+Q16+Q13)$$

$$\text{Factor 2} = (Q22+Q14+Q12+Q21+Q28+Q23)$$

$$\text{Factor 3} = (Q33+Q17+Q29+Q18)$$

$$\text{Factor 4} = (Q26+Q2)$$

The validity was established by testing the four factors for normal distribution using the Kolmogorov-Smirnov test, where the results from Table 4.2 showed normality for the factors.

Table 4.2: One-Sample Kolmogorov-Smirnov Test

	N	Z - value	p - value
Factor 1	34	0.579	0.891
Factor 2	33	0.981	0.291
Factor 3	35	1.1	0.177
Factor 4	35	0.774	0.587

4.3 Descriptive Statistics

According to Bougie and Sekaran, (2009) descriptive studies are conducted in order to understand the current state of affairs and they enable the researcher to describe the characteristics of variables of interest in that particular study (Kruger *et al.*, 2009).

4.3.1 Demographics

In the case of demographic data, the descriptive statistics in the form of frequencies and percentages were used to describe the characteristics of the sample, as well as the responses to the items relating to the study variables. Thereafter, the mean and standard deviation were used in order to evaluate the overall response to the study variables.

Of a total number of 56 possible participants, 47 participated in the survey, which yields an 84 % response rate. The details of the survey participation are summarised in Figure 4.1

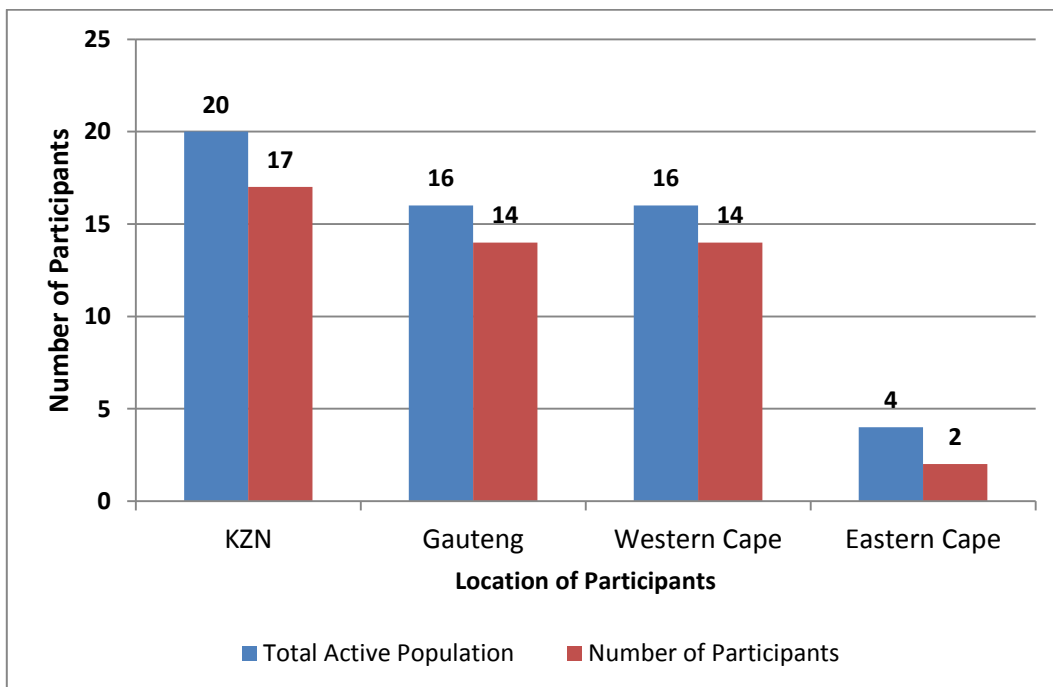


Figure 4.1: Participation statistics for the extranet survey, per region.

It was noted that 2 participants were re-classified under Gauteng, because they were controlled by the Gauteng regional office, although they were physically located in Pretoria.

Table 4.3 is a summary of the demographic data of the participants collected according to questions 1 to 5 of the research questionnaire.

Table 4.3: Summary of demographic data of the survey participants

		Count	Percentage
Gender	Male	27	59%
	Female	19	41%
	Total	46	100%
Regional Location	KwaZulu-Natal	17	36%
	Gauteng	12	26%
	Eastern Cape	2	4%
	Western Cape	14	30%
	Other	2	4%
	Total	47	100%
With regard to the use of Internet technologies in general, how would you describe yourself?	Expert	5	11%
	Comfortable	38	84%
	Not comfortable	2	4%
	Total	45	100%
Age group	Below 25 years	0	0%
	25 to 30 years	5	10.86%
	31 to 40 years	15	32.61%
	Above 40 years	26	56.53%
	Total	46	100%

From the Table 4.3 it was observed that some participants did not endeavour to answer all questions as it was seen that 2 out of 47 participants did not rate answer the question “with regards to Internet technologies, how would you rate yourself?” Even on the question of age one participant did not divulge their age group.

Table 4.4 shows a summary of the descriptive statistics relating to the research objectives in the form of mean and standard deviation.

Table 4.4: Summarised Descriptive Statistics of the survey variables

	N	Minimum	Maximum	Mean	Std. Deviation
PU	42	1	5	3.36	1.06
PEU	47	0	5	2.97	1.53
IU	47	0	5	3.38	1.27
TTF	47	0	5	2.97	1.52
PR	47	0	4.71	2.37	1.09

For PU and IU, the mean values above 3.00 indicates positive perceived usefulness and intention to use whilst for PEU and TTF the mean values of 2.97 indicated that neutrality of the participants regarding the ease of use and the technology task fit.

Because the data is of ordinal scales, independence of variables of interest and the Mann – Whitney and Kruskal – Wallis tests were used to examine the relationship between the demographic variables and the study dimension. The results are shown in Table 4.5.

Table 4.5: Comparison of mean rank scores of male and female participants

		Male	Female	Total
PU	Mean	2.99	2.42	2.75
	N	27	19	46
	Std. Deviation	1.595	1.444	1.544
PEU	Mean	2.93	2.68	2.83
	N	27	19	46
	Std. Deviation	1.503	1.595	1.529
IU	Mean	3.28	2.65	3.02
	N	27	19	46
	Std. Deviation	1.26	1.317	1.308
TTF	Mean	3.04	2.61	2.86
	N	27	19	46
	Std. Deviation	1.462	1.56	1.502
PR	Mean	2.07	2.18	2.12
	N	27	19	46
	Std. Deviation	0.925	1.38	1.122

Table 4.5 shows that female participants scored lower mean scores than male participants in all objectives, except on possible reasons for non-usage (which was a negatively structured question).

The results indicated that male participants showed better acceptance of the extranet technology than female participants. The Mann-Whitney test in Table 4.6 compares such differences.

Table 4.6: Mann-Whitney test for male and female participants

	Mann-Whitney U	Z	P
PU	197.5	-1.333	0.182
PEU	240	-0.372	0.71
IU	169.5	-1.956	0.050*
TTF	204.5	-1.171	0.242
PR	234.5	-0.492	0.623

The results of the Mann-Whitney test reflected that only ‘Intention to use the Engen Extranet tool’ was significantly differently answered by male and female participants.

The statistics from this survey, as observed in Figure 4.2, showed that a high percentage of older workers had never used the Engen extranet for conducting business.

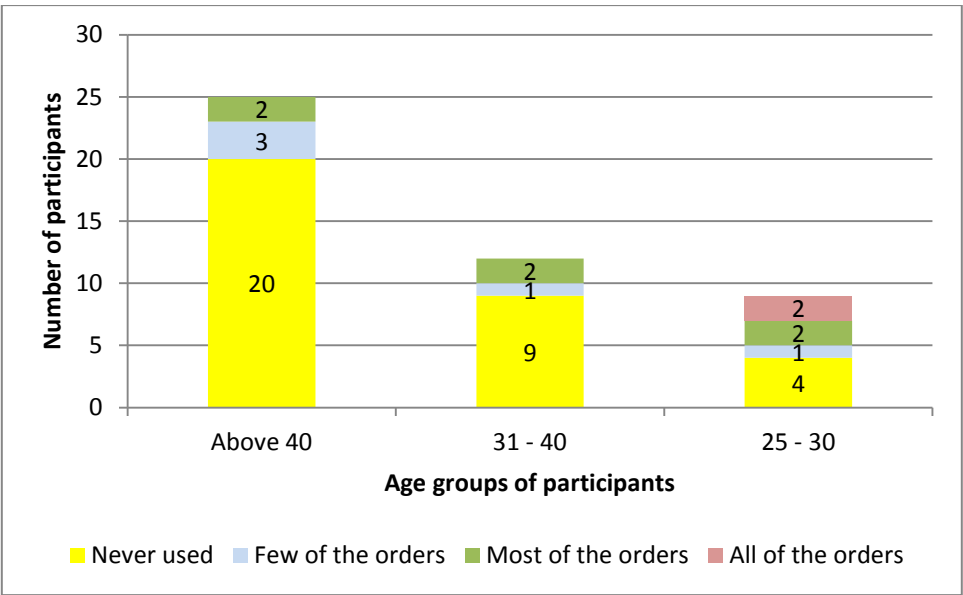


Figure 4.2: Engen extranet utilisation trends according to age groups

The participants' age groups were aggregated to older participants aged above 40, and younger participants aged below 40 years. The results are presented in Table 4.7.

Table 4.7: Comparison of the mean rank scores for the age group of the participants

		40 & below	Above 40	Total
PU	Mean	2.8	2.72	2.75
	N	20	26	46
	Std. Deviation	1.457	1.635	1.544
PEU	Mean	3.17	2.57	2.83
	N	20	26	46
	Std. Deviation	1.372	1.617	1.529
IU	Mean	3.08	2.97	3.02
	N	20	26	46
	Std. Deviation	1.149	1.439	1.308
TTF	Mean	3.18	2.62	2.86
	N	20	26	46
	Std. Deviation	1.35	1.591	1.502
PR	Mean	2.31	1.97	2.12
	N	20	26	46
	Std. Deviation	1.004	1.202	1.122

Table 4.7 shows that the older participants (aged above 40 years) yielded lower mean scores than did the younger participants in all objectives, except possible reasons for non-usage (which was a negatively structured question).

The results indicated that younger participants showed better acceptance of the extranet technology than did older participants. The Mann-Whitney test results are shown in Table 4.8.

Table 4.8: Mann-Whitney test for the age group of the participants

	Mann-Whitney U	Z	P
PU	257.5	-0.056	0.955
PEU	206.5	-1.198	0.231
IU	260	0	1
TTF	211	-1.096	0.273
PR	227	-0.733	0.464

The results of the Mann-Whitney test with age groups showed no significant differences between age groups at the 95% level ($p>0.05$), which indicated that younger participants showed higher mean scores, however, the difference was not significant.

Table 4.9 shows the mean rank scores per geographic location of participants.

Table 4.9: Mean rank scores per geographic region of participants

		KwaZulu-Natal	Gauteng	Western Cape	Total
PU	Mean	3.29	2.22	2.62	2.78
	N	17	12	14	43
	Std. Deviation	1.476	1.572	1.535	1.553
PEU	Mean	3.25	2.55	2.54	2.82
	N	17	12	14	43
	Std. Deviation	1.211	1.593	1.822	1.54
IU	Mean	3.29	2.75	2.83	2.99
	N	17	12	14	43
	Std. Deviation	0.79	1.776	1.376	1.308
TTF	Mean	3.37	2.31	2.55	2.81
	N	17	12	14	43
	Std. Deviation	1.18	1.478	1.819	1.531
PR	Mean	2.5	2.1	1.74	2.14
	N	17	12	14	43
	Std. Deviation	0.887	1.281	1.273	1.156

Table 4.9 revealed that the participants from KwaZulu-Natal scored higher means than those from Gauteng and the Western Cape regions.

Although higher mean scores were observed for the KwaZulu-Natal region as seen in Table 4.9, the results of the Kruskal-Wallis test in Table 4.10 showed that there were no significant differences between regional location; this stands at the 95% level ($p>0.05$).

Table 4.10: Kruskal-Wallis test with Regional Location

	Chi-Square	df	P
PU	3.897	2	0.142
PEU	1.316	2	0.518
IU	1.134	2	0.567
TTF	4.037	2	0.133
PR	2.695	2	0.260

The results of the 5-point Likert scale on perceived usefulness, perceived ease of use, intention to use, task technology fit, and the possible reasons for Engen extranet rejection were presented using graphs where:

SD = strongly disagree; D = disagree; N = neutral; A = agree; SA = strongly agree; NA = not answered.

4.3.2 Perceived Ease Of Use

The perceived ease of use section comprised 5 items, as seen in Figure 4.3

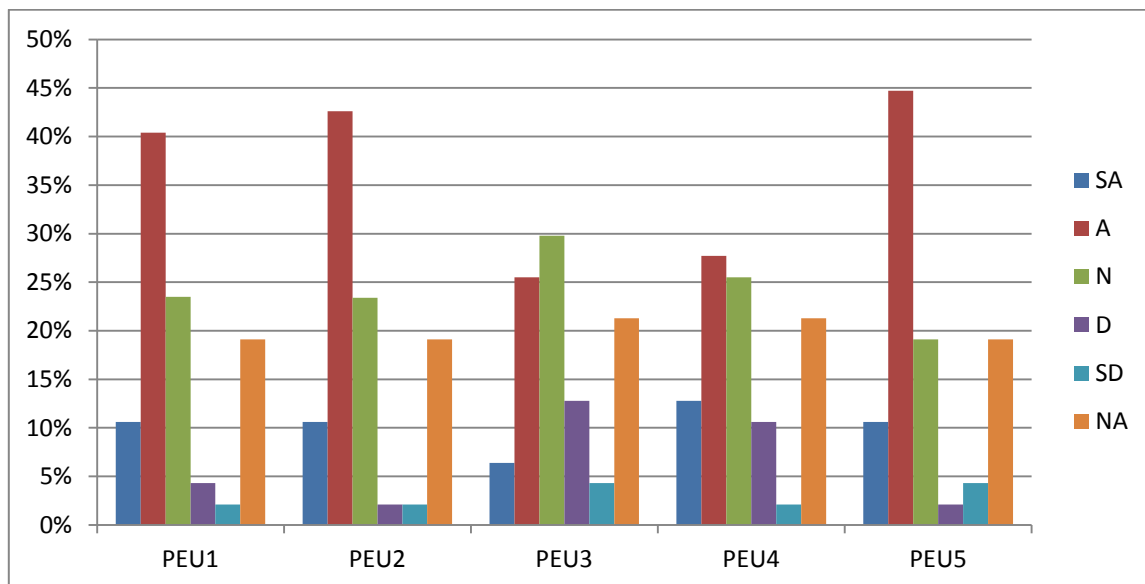


Figure 4.3: Evaluation of items making up the perceived ease of use (PEU).

Where:

PEU 1 – “It was easy to learn how to use Engen extranet for my tasks.”

PEU 2 – “I took a short time learning to use Engen extranet for my tasks “

PEU 3 – “I seldom get confused when I use Engen extranet for my activities”

PEU 4 – “The product information on the Engen extranet is easy to find”

PEU 5 – “I am able to obtain access to Engen extranet whenever I need to use it.”

At 51 % (strongly agree, plus agree), the majority of the participants agree that it was easy to learn how to use the Engen extranet. At 53%, most of the participants also agreed that it took a short time to learn to use the Engen extranet for conducting their tasks, compared with the total 4% who disagreed. The 30% of the participants were neutral on the question, “I seldom get confused when I use Engen extranet”, and however, 36 % is a combination of participants who agree and strongly agree, compared with a 17 % disagreement. The combination of participants who strongly agree and those who agree that product information on the Engen extranet is easy to find yielded 41 %, compared with 13 % who disagreed. 56 % of the participants reported that they were able to access the Engen extranet whenever they needed to use it, compared with 6 % of participants who disagreed on that point. For all the constructs of the PEU, between 18% and 21 % of the participants did not answer the question.

4.3.3 Perceived Usefulness of Engen Extranet tool

As displayed in Figure 4.4, perceived usefulness was measured by 3 items. Item one (PU 1) stated: “Using Engen extranet in my job enables me to accomplish tasks more quickly”. A total of 39 % of the participants were in agreement, however, 38 % were neutral, compared with 13 % who disagreed. Only 11% of the participants disagreed that Engen extranet made it easy for them to conduct business (PU 2), however, 38 % agreed. The data also showed that 30% of participants were neutral, or unsure whether Engen extranet was useful for their work activities (PU 3), whereas 39 % of the participants were in agreement, compared with the 9% of participants who were not in agreement. Also, 10%, 21% and 23% of participants did not answer PU 1, PU 2, and PU 3, respectively. The overall survey results showed positive perceived usefulness of the Engen extranet, as confirmed by the mean of 3.36 as shown in Table 4.4.

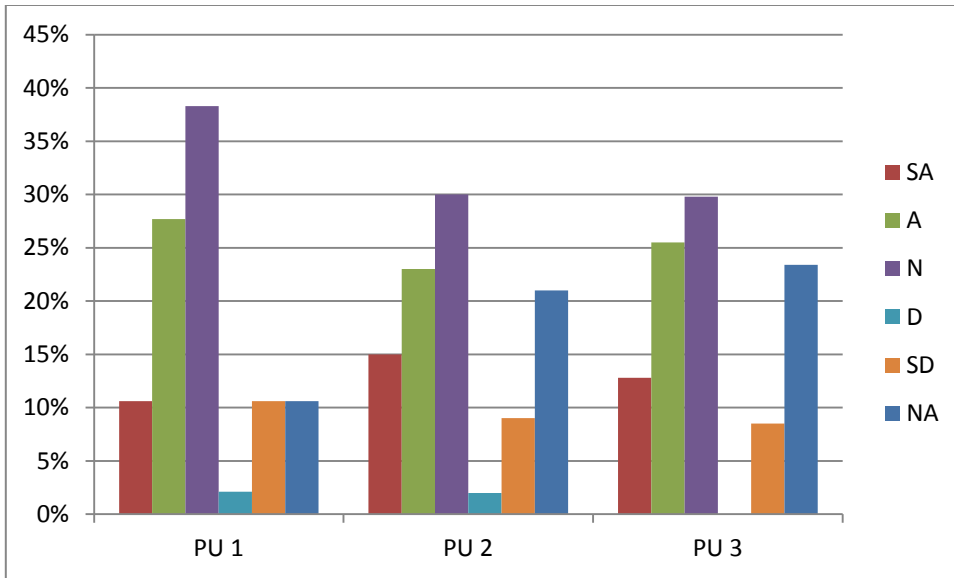


Figure 4.4: Evaluation of items of perceived usefulness of Engen extranet

4.3.4 Task Technology Fit

As seen in Figure 4.5, the task technology fit section comprised 4 items. It may be observed in Figure 4.4, that in each item, more participants remained neutral (at least 32 %) with regard to the task technology fit. An average of 19 % of the participants did not answer the TTF questions. On the other hand, it was observed across all items of the task technology fit, that the combined participants had a positive perception of task technology fit compared with the participants who were in disagreement regarding the task technology fit.

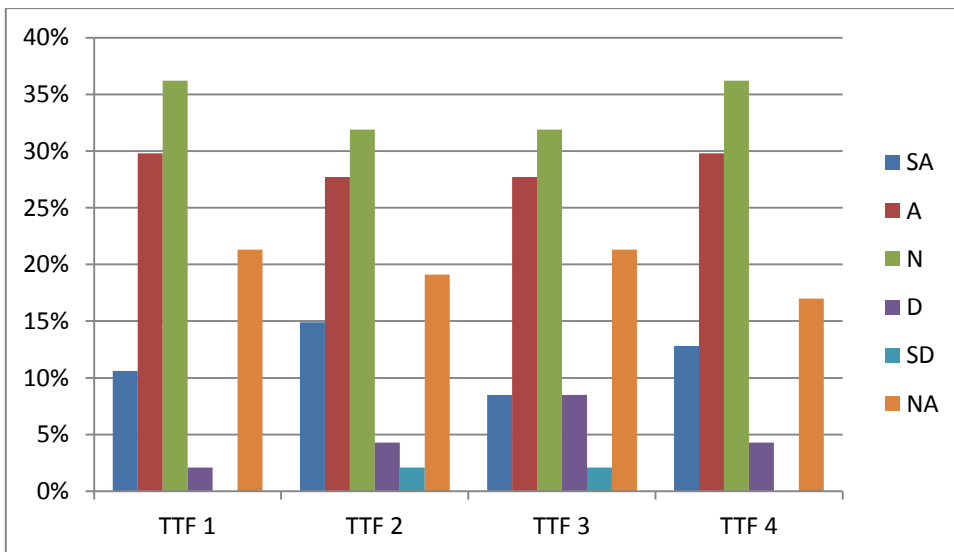


Figure 4.5 : Evaluation of the items of task technology fit

On TTF 1 (‘Engen extranet sufficiently provides and maintains detailed product information’) 41% of the participants were in agreement, compared with 2% who disagreed. On TTF 2 (‘Engen extranet is constructed and displayed in a readable and understandable manner ’), 43% of the participants were in agreement, compared with 6% who disagreed. On TTF 3 (‘the functionality provided by the Engen extranet is what I need to carry out my tasks’) 37% of the participants were in agreement, versus 11% who disagreed. On TTF 4 (‘the features on the Engen extranet website are suitable for my business needs’), 43% of the participants were in agreement, versus 4% who disagreed.

4.3.5 Reasons For Rejection of Engen Extranet

Figure 4.6 provides a summary of the questions selected in presenting possible reasons for poor use or non-use of Engen extranet.

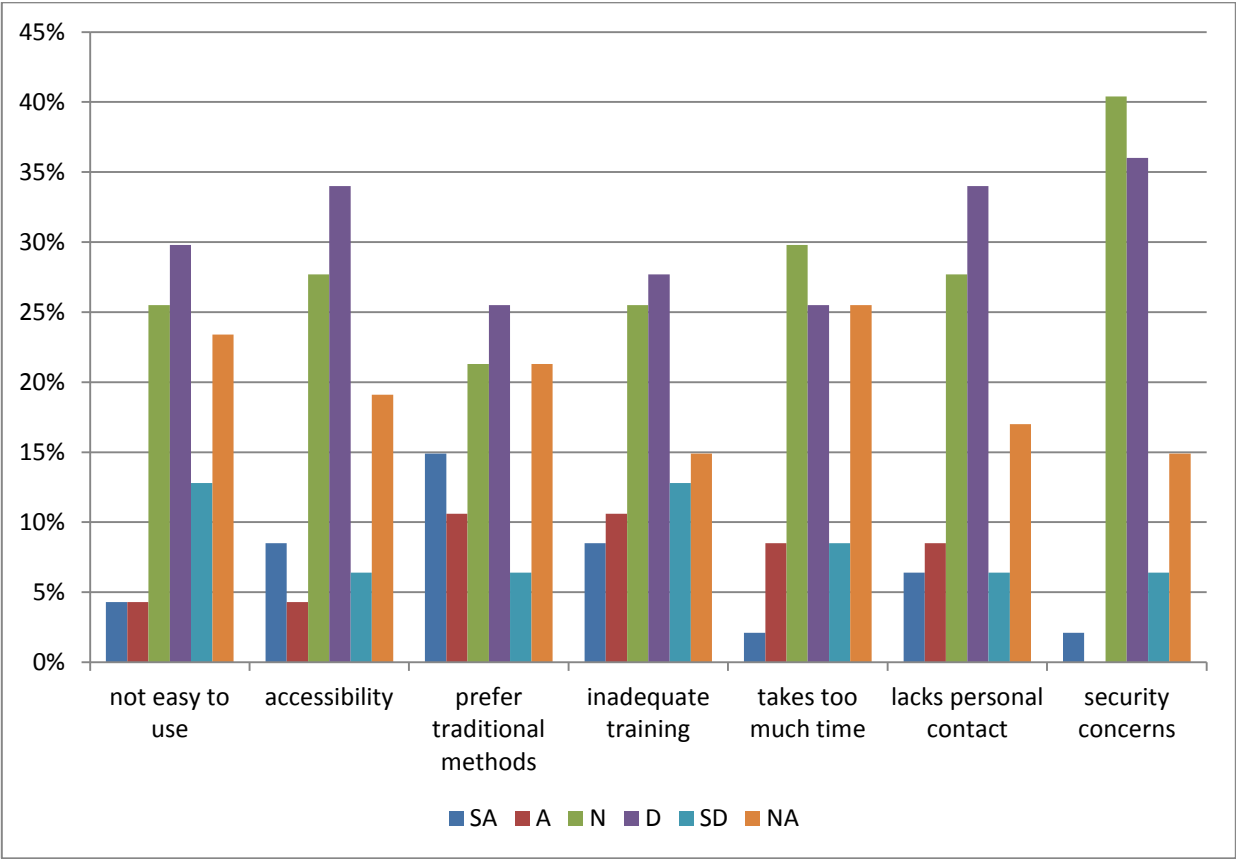


Figure 4.6: Participants’ results on the possible reasons for extranet rejection

On the question whether the participants prefer traditional methods of product ordering, 20% of the respondents favoured the traditional methods over the extranet method, while 21 % and 20% remained neutral, or did not answer the question, respectively. This is also in line with the low utilisation statistics that were obtained. On the other hand, the results showed a minor preference for personal contact with regard to product ordering.

The survey data showed that some participants reported that they do not use Engen extranet because they are inadequately trained to use the extranet tool. This represents an area which could create improvement of utilisation as the participants perceive usefulness of the extranet tool, and would probably be willing to use it, after receiving training.

4.4 Inferential Statistics

Spearman's Rank Order Correlation was used in assessing the inter-correlations among the study dimensions, as shown in Table 4.11

Table 4.11: Spearman's Correlation Coefficient for the study

		PU	PEU	IU	TTF	PR
PU	Correlation Coefficient	1.000	0.706**	0.386*	0.680**	-0.599**
	P	.	0.00	0.011	0.00	0.00
	N	42	42	42	42	42
PEU	Correlation Coefficient	0.706**	1.000	0.418**	0.885**	-0.126
	P	0.00	.	0.03	0.00	0.399
	N	42	47	47	47	47
IU	Correlation Coefficient	0.386*	0.418**	1.000	0.415**	-0.181
	P	0.011	0.03	.	0.04	0.224
	N	42	47	47	47	447
TTF	Correlation Coefficient	0.680**	0.885**	0.415**	1.000	-0.188
	P	0.00	0.00	0.04	.	0.206
	N	42	47	47	42	47
PR	Correlation Coefficient	-0.599**	-0.126	-0.181	-0.188	1.000
	P	0.00	0.399	0.224	0.206	.
	N	42	47	47	47	47

** - correlation is significant at the 0.01 level (2-tailed); * - correlation is significant at the 0.05 level (2-tailed)

The results of this study showed positive and significant correlation at the 1% level of significance between the Perceived Usefulness of the Engen Extranet Tool, and the Perceived Ease of Use of the Engen Extranet Tool ($r = .706$; $p < 0.01$).

Table 4.11 also showed a positive and significant correlation at a 5% level of significance, between the Perceived Usefulness of the Engen Extranet Tool, and the Intention to Use the Engen Extranet Tool ($r = 0.386$; $p < 0.05$). The results from this study showed positive correlation at a 1% level of significance, between the Perceived Usefulness of the Engen Extranet tool and the Task Technology Fit of the Engen Extranet Tool ($r = .415$; $p < 0.01$). Table 4.4 showed a mean of 2.97, which meant that the survey participants were in slight disagreement regarding the Engen extranet fitting the requirements of their tasks. Although the results showed a positive correlation, the weak TTF explains the observation of low utilisation of the Engen extranet.

As expected, Table 4.11 showed an overall negative correlation between the possible reasons for extranet rejection, and TAM and the TTF constructs, mainly because all the questions on the PR were negatively constructed. This showed that the possible reasons apropos the study by Möbius (2002) are not applicable to this study.

4.5 Summary

Through the reliability and validity tests the results of the survey showed good internal consistency. The overall survey response rate to the survey was excellent at 84%, and the demographic data of the survey was presented using tables and graphs. The results showed positive perceived usefulness and intention to use; and negative results on task technology fit and perceived ease of use. The responses to the possible reasons for extranet rejection were also negative. Chapter 5 will provide a deeper analysis and discussion on the findings from this chapter.

CHAPTER FIVE

Discussion of Results

5.1 Introduction

In this chapter the key findings of the study are detailed and compared with what was expected; they also related to the previous studies in the literature review. The following were the objectives for the research:

- To investigate the actual current Engen extranet utilisation;
- To determine future intention to use the Engen extranet;
- To determine the level of perceived usefulness of the Engen extranet;
- To determine perceived ease of use of the Engen extranet;
- To measure the task-technology fit of the Engen extranet; and
- To determine the possible reasons for Engen extranet low/non-utilisation

5.2 Discussion of results

Using the Raosoft online tool for a population of 56, the recommended sample size for 5% margin of error, and 95 % level of confidence, is 49. For a margin of error of 10%, and 95% level of confidence, the sample size calculator recommends a sample size of 36. A total sample size of 47 participants was obtained which was very close to the target of 49. At a 95 % level of confidence, the sample size margin of error is between 5% and 10%. What also gave the result credibility was the fact that the reliability and validity of results were good.

5.2.1 Actual Utilisation

According to the survey data, the majority of the respondents, at 64 %, indicated that they do not use Engen extranet for placing their orders, thus depicting a very low utilisation level. The results of the survey showing low utilisation of Engen Extranet were in line with the findings from the survey conducted in 2012, and also in agreement with findings of Laurence and Tar (2010), which were the fact that B2B electronic commerce has not revolutionised the developing countries as much as it has done in developed countries.

The results of the survey showed that female participants scored lower mean scores than male participants on all objectives. The results indicated that male participants showed better

acceptance of the extranet technology than did female participants. This was also confirmed by the Mann-Whitney test, which showed that the differences were significant. This means that there are better chances of extranet adoption by males than by females. This result may be attributed to historical gender imbalances which exist in the South African workplace, where the female population has been deprived of skill acquisition and development opportunities (Chinyamurindi & Louw 2010).

In agreement with Morris & Venkatesh (2006), the statistics from the survey showed that a high percentage of older workers have never used the Engen extranet with which to conduct business. Nevertheless, given time, as more of the younger generation who are more technologically savvy, and as the older generation becomes more used to the online methods, the Engen extranet utilisation will improve.

5.2.2 Perceived Ease of Use

According to the TAM model, adoption and utilisation of technology is linked to the positively perceived ease of use (Chuttur 2009). When users perceive the extranet as easy to use, they may have a positive attitude towards the usefulness of the extranet system; and when the users have a positive attitude towards the extranet system, they may use the system frequently, and may have a favourable intention of using the system (Shroff *et al.*, 2011). The overall survey results showed negative perceived ease of use of Engen extranet. The negative results came predominantly from the participants aged over 40 years, thus representing a generation which has found comfort in the traditional methods.

5.2.3 Perceived Usefulness

The results from the participants showed positive perceived usefulness of the Engen extranet, which was an indication of an acknowledgement that Engen extranet has the potential to add value to their business processes. The TAM proposes that when users perceive new technology as useful, there is a good chance that the technology will be accepted (Shroff *et al.*, 2011). In this case, the PU was positive, however, the PEU was negative, which then did not work in favour of the extranet technology acceptance at Engen.

5.2.4 Intention to Use

The survey results reflected a positive intention to use the Engen extranet. This outcome confirmed that there is a potential for improvement in the future, because the participants perceive the technology as useful, and they also have positive intentions to use it.

5.2.5 Task Technology Fit

The overall survey results showed negatively perceived task technology fit of the Engen extranet and the tasks of the participants. As mentioned in Section 2.4, the core of the TTF model is the match between the capability of the technology and the demands of the tasks (Dishaw *et al.*, 2002). Poor TTF is an area of the extranet technology which may be improved by modifying the technology functionality, based on the needs and feedback of the users.

5.2.6 Possible reasons for extranet non-/low utilisation

The survey data showed some participants reporting that they do not use Engen extranet because they are inadequately trained to use the extranet tool. This represents an area which can create improvement of utilisation, because participants perceive the extranet tool as useful, and they would probably be willing to use it after receiving training. The results showed weak but positive preference for personal contact with regard to product ordering, which is in agreement with Pare' (2002), who cited that the developing countries (including South Africa) still prefer personal touch and face-to-face methods. From the list of the possible reasons for Engen extranet rejection, the strongest reason was the preference for the traditional methods of conducting product ordering; the weakest reason was the concern about security.

Laurence and Tar (2010) concluded that the extent of B2B Internet is not yet easily accessible in developing countries; and the developing countries do not have the infrastructure and policies which can enable the usage of the Internet. In contrast with this, the results showed that accessibility to the Engen extranet was not a problem. This finding is supported by the fact that South African ICT infrastructure is stable and sophisticated, when compared with other developing countries in Africa (Mungaze 2013).

The majority of the survey participants also indicated that they were less concerned with security matters; this may therefore not be regarded as a reason for the limited utilisation. Such a finding is also not in agreement with Laurence and Tar (2010), who stated that one of the socio-cultural barriers to adoption of business-to-business e-commerce is the lack of transactional trust. The B2B electronic commerce users still have a great deal to learn when it comes to matters of security.

5.3 Summary

The results of the study confirmed low utilisation of the Engen extranet, as was the case with the survey conducted in 2012. The key findings from the study were that age and gender of the participants had an impact on the adoption of the Engen extranet. Although the results showed positive perceived usefulness and intention to use the Engen extranet, the low adoption and utilisation results were associated with low perceived ease of use, and low task-technology fit. Preference for traditional methods of product ordering was the strongest reason for extranet adoption; and concerns for security over the extranet system were the weakest reason.

Chapter 6 will provide the conclusions and recommendations, on the basis of the observations and findings presented in this chapter.

CHAPTER 6

Conclusions and Recommendations

6.1 Introduction

This chapter contains conclusions arrived at by the researcher, based on prior literature and the data analysis from Chapter 5. The chapter further made and discussed recommendations for the research; finally, it made recommendations for future research on the subject of extranet for business-to-business e-commerce.

The purpose of the research was to study the B2B extranet adoption at Engen Petroleum Limited. The survey was conducted by administering a 5-point Likert-scale questionnaire based on the TAM model and the TTF model, eliciting the possible reasons for Engen extranet rejection. A total of 47 responses were received from a population of 56, which was better than the 10% margin of error at 95% level of confidence.

6.2 Conclusion

Klopping and McKinney (2004) suggested that new technology is adopted and utilised if the users perceive that the new technology will have a positive impact on their business, it is for that reason that high technology adoption and high utilisation of Engen extranet would be a clear indication that the extranet has had a significantly positive impact on business. The results obtained from this study displayed low utilisation of Engen extranet, which is in agreement with the preliminary survey conducted by the Engen information systems department survey team in 2012. The negatively perceived ease of use and negative task technology fit results served to explain the poor utilisation of Engen extranet, which is in agreement with . With the positive intention to use and positively perceived usefulness, it was concluded that the users of the Engen extranet have a positive attitude towards the technology.

The results obtained from this study yielded a conclusion that extranet for business-to-business electronic commerce at Engen Petroleum Ltd has not been “revolutional”, in that the migration from traditional methods to online methods as provided by the extranet has been slow. This conclusion also indicates to a limited extent that South Africa is lagging behind the developed

nations in terms of technology adoption. Adoption of extranet technology will therefore be evolutionary rather than revolutionary.

As Moodley (2010) concluded, the use of B2B electronic commerce tools such as extranet has not yet realised its full potential, similarly, in this study, it was concluded that the low utilisation levels of Engen extranet were not a reflection of full potential. Higher utilisation could have been achieved had there been sufficient marketing efforts, and regular tracking of the utilisation trends since the initial roll-out. The utilisation could have been even better had there been a better technology support system, that provided training to buyers who needed training.

Looking towards the future, the adoption of online buying systems such as extranet for conducting business-to-business transactions will show improvements as more technology savvy buyers replace the current generation aged over forty, who generally are technology laggards, according to the technology diffusion model (Moseley 2008).

As mentioned in Section 2.5, Möbius (2002) conducted a study of extranet acceptance in Germany, categorising the reasons for lack of adoption of extranet into infrastructure, systems, process, and people. From this survey it may be concluded that the most predominant category for poor adoption is people, however, the poor TTF and PEU imply that there could also be improvements in the Engen extranet systems and processing categories.

This study has contributed to providing a better understanding of the Engen extranet population demographics. This type of information, when combined with the literature, forms a better platform for making future decisions on new technology roll-out in the Engen organisational context. The results from this study contributed to understanding the current behaviour of the population. It is the right point of reference when considering how to approach the implementing of improvement initiatives so as to achieve better utilisation in the future.

6.3 Recommendations

As the survey showed positive perceived usefulness of the Engen extranet, coupled with the fact that participants also use the Engen extranet for various purposes (other than product ordering)

but at lower utilisation, it was concluded that the utilisation could be improved with more marketing of the extranet to the buyers. This may be done by implementing enhancements and added value functionalities on the extranet website, which would be relevant to the buyers.

Examples of such enhancements are technical converters (e.g. from kilograms to litres), financial calculators (rand /dollar calculators), relevant up-to-date trends (e.g. crude oil price trends, and rand/dollar exchange), promotions, and newsletters. First National Bank “banking app” is a typical champion on this regard. It offers its customers added value such as in the display of FNB forex, allows users to purchase airtime or data bundles; it displays branch locators, etc. All these “value adds” of which has increased the overall utilisation of the “banking app”. This resulted in FNB winning an award in 2012 (<http://www.appoftheyear.co.za/2012-app-of-the-year/fnb-banking>).

Although many of the participants regard themselves as comfortable with handling information technology, it is recommended that Engen Regional Sales Managers play a role in administering technical and training support to their customers on how to use the Engen extranet. With more support and training, combined with continuing change in the age profile of the buyers, and the acceptance of the Engen extranet, the utilisation of the tool will improve.

In order to ensure tighter security measures of the Engen extranet tool, the user password expires every second month. This has resulted in users forgetting the passwords and having no time to enquire of Engen Information Services department for password reset. The survey has shown that the users are not too concerned with security issues, therefore it is recommended that the password change schedule be altered to a biannual schedule.

In order to keep track of the utilisation trends of the Engen extranet, it is recommended that a tracking system be put in place that would be able to report annual usage of the Engen extranet. These results may also contribute either to confirming or dismissing the notion of evolutionary technology adoption.

Moodley (2010) suggested that B2B electronic commerce brings various benefits to both buyer and sellers. In the case of B2B extranet, Anandarajan *et al.*, (1998) suggested that the benefits of implementing B2B extranet may be categorised as operational, strategic, and tactical. It is recommended that further studies having a focus on the perceived benefits versus actual benefits realised by buyers and sellers who have adopted extranet should be conducted. If there is a low perception of benefits, and also low realised benefits from sellers and buyers, this could explain poor adoption of B2B extranet.

In order to obtain better results, it is recommended that future studies focus only on the non-user of the extranet. In this study, the population was composed of a mixture of the customers, including both those who had never used the Engen extranet and those who had done so. That made some sections of the survey irrelevant to a large proportion of the population, and resulted in the participants' choosing neutral as their response.

An option of complete removal of other means of product ordering to steer the customers to using only extranet may be considered, however this recommendation may pose a threat of loss of sales to the customers that are not keen to using technology based solutions.

Future studies should exclude self-efficacy as part of the demographic data. In this study most of the participants viewed themselves as comfortable with handling of new technologies, however, the overall result suggested a low trial rate of the new technology.

6.4 Limitations of the Study

The study is based on Engen Petroleum business streams which have activated their customers on the Engen extranet system. This means that the outcome of the study cannot be generalised over the entire population of Engen customers.

The findings from the study are the reflection of a reality of the particular time of the research. Changes in the conditions, and the situation around the research, may have an impact on the results.

Although the study was based on the Engen customers in South Africa, the findings are not a representation of the technology acceptance behaviour of the South African business-to-business population.

6.5 Summary

Engen Petroleum Limited, as with other major companies in South Africa, have embraced the extranet as the third wave following the intranet, however, they were met by the reality that the extranet technology acceptance was not revolutionary; it was seen as an evolutionary process. The survey participants displayed a positive attitude towards the extranet technology, however, the adoption was hindered by the negatively perceived ease of use, and negative task technology fit. In order to leverage on the positive intention to use and perceived usefulness, it was recommended that the task technology fit could be improved, by enhancing functionality of the Engen extranet, using value-added services on the extranet website. It was also recommended that more effort be put into training and support, in order to improve the perceived ease of use.

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M, Appendix A : Informed Consent Letter
UNIVERSITY OF KWAZULU-NATAL
GRADUATE SCHOOL OF BUSINESS AND LEADERSHIP

Dear Respondent,

MBA Research Project
Researcher: Mduduzi Khanyile (0732324746)
Supervisor: Brett Van Niekerk (031 2601626)
Research Office: Ms P Ximba 031-2603587

I Mduduzi Khanyile am an MBA student, at the Graduate School of Business of the University Of KwaZulu Natal. You are invited to participate in a research project entitled: **A Study Of Business-to-Business Extranet Usage At Engen Petroleum Ltd**. The main aim of this research is to investigate the adoption and utilisation of the Engen extranet by Engen customers.

Your participation will help us to understand the adoption trends, the reasons for adoption or lack of adoption of Engen extranet. Your participation in this project is voluntary and your anonymity of records identifying you as a participant will be maintained. You may refuse to participate or withdraw from the project at any time with no negative consequence. The survey should take you 5 - 10 minutes to complete.

Researcher Name: Mduduzi Khanyile (073 2324746)

Research Supervisor: Brett Van Niekerk

Thank you very much for your time and support.

Please start with the survey now by clicking on the Continue button below.

Appendix B: Research Instrument sent to participants

Demographic Information

1. Please state your Gender

Male	
Female	

2. Please indicate your regional location

Kwa-Zulu Natal	
Gauteng	
Eastern Cape	
Western Cape	

3. With regards to the use of internet technologies in general, how would you describe yourself

Expert	
Comfortable	
Not comfortable	

4. Please indicate your age group

Below 25 years	
25 to 30 years	
31 to 40 years	
Above 40 years	

Actual utilisation

5. How frequently do you order product from Engen Petroleum Limited.

Weekly	
Monthly	
Few times a year	
Never	

6. How frequently do you use Engen extranet to order product

For all my orders	
For most of my orders	
For a few of my orders	
Never	

7. Please indicate business activities you conduct on Engen extranet (may select more than 1)

None	
Ordering product	
Checking invoices	
Checking Product information e.g. MSDS	
Other (please specify)	

8. I use other companies extranets (besides Engen Petroleum Limited) to conduct business.

Strongly Agree	
Agree	
Neutral	
Disagree	
Strongly disagree	

Perceived Usefulness

	Strongly Agree	Agree	Neutral	Disagree	Strongly disagree
9. Using Engen extranet in my job enables me to accomplish tasks more quickly.					
10. Using Engen extranet makes it easier for me to conduct business.					
11. I find extranet useful in for my work activities					

Perceived Ease of Use

	Strongly Agree	Agree	Neutral	Disagree	Strongly disagree
12. It is easy to learn how to use extranet to do my tasks Using extranet in my job enables me to accomplish tasks more quickly.					
13. I took a short time to learn to use extranet to do my tasks					
14. I seldom get confused when I use extranet for my activities					
15. The product information on the Engen website is easy to find					
16. I am able to obtain access Engen extranet when I need to use it.					

Intention to use

	Strongly Agree	Agree	Neutral	Disagree	Strongly disagree
17. It would be a good idea to use Engen extranet for conducting business in addition to traditional methods					
18. In my opinion it would be a good idea to use Engen extranet to replace the traditional methods					
19. I like using Engen extranet to conduct business activities					

How well the Engen extranet performs its function (Task-Technology Fit)

	Strongly Agree	Agree	Neutral	Disagree	Strongly disagree
20. The Engen extranet sufficiently provides and maintain detailed product information					
21. The Engen extranet is constructed and displayed in a readable and understandable form manner.					
22. The functionality provided by the Engen extranet is what I need to carry out my tasks					
23. The features on the Engen extranet are suitable for my business needs.					

Possible reasons for low/non usage

	Strongly Agree	Agree	Neutral	Disagree	Strongly disagree
24. I use Engen extranet less frequently because it is not easy to use					
25. I frequently experience accessibility problems with Engen Extranet					
26. I prefer using traditional methods (e.g. telephone, fax, e-mail)of product ordering					
27. I am not adequately trained to use Engen Extranet					
28. Traditional methods are faster than Engen Extranet methods					
29. I don't use Engen extranet because it lacks the personal contact					
30. I am concerned about security issues with extranet in general					

Appendix C: Letter from the Statistician

27 June 2013

To Whom It May Concern

I confirm that I assisted Mr. M Khanyile with the statistical analysis for his MBA Dissertation.

Should any further information be required, I can be contacted as follows:

Email – naidoojm@telkomsa.net

Home – (031) 2082634

Cell - 0827213926

Mr. J M Naidoo

Appendix D: Letter from the Language Editor



Lydia Weight
NTSD English Specialist
SACE No: 11135129
Cell: 082 594 3904
E-mail: lydiaweight@gmail.com

Pinpoint Proofreading Services
40 Ridge Road
Kloof
Durban
3610
13 November 2013

To whom it may concern

This is to certify that I, Lydia Weight, have proofread the document titled: A Study Of Business-to-Business Extranet Usage At Engen Petroleum Ltd, an MBA thesis. I have made all the necessary corrections. The document is therefore ready for presentation to the destined authority.

Yours faithfully

A handwritten signature in black ink that reads "L. Weight". The signature is written in a cursive, flowing style.

L. Weight

Appendix E: Ethical Clearance Approval



6 May 2013

Mr Mduduzi Khanyile 941354144
Graduate School of Business and Leadership
Westville Campus

Dear Mr Khanyile

Protocol reference number: HSS/0268/013M
Project title: A Study of Business-to-Business Extranet Usage at Engen Petroleum Ltd

EXPEDITED APPROVAL

I wish to inform you that your application has been granted Full Approval through an expedited review process.

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment/modification prior to its implementation. In case you have further queries, please quote the above reference number. Please note: Research data should be securely stored in the school/department for a period of 5 years.

I take this opportunity of wishing you everything of the best with your study.

Yours faithfully


.....
Professor Steven Collings (Chair)

/pm

cc Supervisor: Dr Brett van Niekerk
cc Academic Leader: Dr E Munapo
cc School Admin.: Ms Wendy Clarke

Humanities & Social Sc Research Ethics Committee
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