

E-COMMERCE APPLICATION UTILISATION BY SOUTH AFRICAN
SMMEs

by

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CAPE TOWN

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I Kyle Andrew Fitzgerald declare that E-COMMERCE APPLICATION UTILISATION BY SOUTH AFRICAN SMMEs is my own work, that it has not been submitted before for any degree or assessment in any other University, and that all the sources I have used or quoted have been indicated and acknowledged by means of complete references. Furthermore, it represents my own opinions and not necessarily those of the Cape Peninsula University of Technology.

A handwritten signature in black ink, appearing to read 'Kyle Fitzgerald', written in a cursive style.

ABSTRACT

The Internet was functioning on Internet protocol (IP) and transmission control protocol (TCP) in the 1970s and soon afterwards electronic mail (email) was invented allowing messages to be sent from one person to another using packet switch services (PSS). However email did not form an information space for information to permanently exist. The World Wide Web (Web) arrived in the late 1980s, riding on top of the Internet providing a global and persistent information space available to everyone.

This information space has assisted in small business facing dramatic change, often referred to as the 'e-commerce evolution'. Compared to the industrial revolution with the advent of the railways and electricity the magnitude of e-commerce is no less. Advances in the information technology (or e-commerce elements) and the use of Information systems (or applications) are the main drivers behind this e-commerce evolution.

Some authors believe all businesses will be equal in the utilisation of e-commerce eroding any competitive advantage the one may have over the other. The 'digital economy' is now available with the explosive popularity of the Internet and the Web as seminal applications of e-commerce.

In South Africa the maturity level of e-commerce adoption has increased from skepticism to positivism since the world wide availability of the Internet. Although e-commerce has generated a profusion of articles in South Africa, there has been a lack of research into the effects and benefits of e-commerce utilisation by small business. Various elements of e-commerce are explored highlighting the suitability of use towards a small business. This study will explain the fundamentals that small business owners will need to understand to enable them to knowledgeably participate in the global phenomenon of e-commerce. Authors nationally and internationally have explored the applications of e-commerce for example email and electronic data interchange (EDI).

This study reveals the perceived intermediate effects of using these applications by small businesses together with the semantic relationships these effects have on final benefits for a small business, namely: cost, revenue and competitive advantage.

South Africa has played a significant role in the promotion of the use of both the Internet and the Web. Berners-Lee and Fischetti (2000:102) citing Dertouzos¹ praised the deputy president of South Africa for his mission statement of the World Wide Web and the significance to e-commerce at the world's seven wealthiest nations (G7) summit in 1995:

"Mbeki delivered a profound speech on how people should seize the new technology to empower themselves; to keep themselves informed about the truth of their own economic, political, and cultural circumstances; and to give themselves a voice that all the world could hear" (Berners-Lee & Fischetti, 2000:102) citing Dertouzos.

¹ Dertouzos, M.L. 1998. *What will be: how the new world of information will change our lives*. San Francisco: Harper.

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Chapter 1

INTRODUCTION

1.1 Background

Electronic commerce (e-commerce) makes use of the Internet and World Wide Web (Web). The characteristics of the Internet that make it so powerful are user friendliness and near universal availability. The necessary hardware (a personal computer (PC) and an Internet connection) and software are cheap to install and easy to use. Search engines make it easy to find information on the Web and software facilitating construction of web pages is cheap and user friendly (Mustaffa & Beaumont, 2004:1). South African small-, medium- and micro- enterprises (SMMEs) are taking full advantage of e-commerce, the Internet and the Web, or are they?

During 2000, as the owner of a locally based but internationally active SMME, this author established that SMMEs lacked knowledge and understanding of e-commerce elements and applications. These SMMEs failed in maximising business benefits to the level that larger corporations were likely to do. In the same year as the dot.com bubble burst, this business attracted investment by SMMEs into Web-page hosting services to assist in improving competitive advantage. These SMMEs became sceptical and argumentative about the benefits derived as they did not have the online capability to access the Web to see their Web pages.

This empirical finding prompted the direction of this study. For the author to better understand the current situation of SMMEs adopting e-commerce he interviewed two SMMEs. During the first interview of a small estate agency in the Western Cape it became apparent that this SMME business owner was reliant on the use of electronic computer devices that were cheap, effective and user friendly. The devices used were a PC, a laptop, a cellphone, and a personal digital assistant (PDA). With these devices the SMME communicated across cellular networks and the Internet for voice and messaging requirements, and accessed Web pages using Web browser software.

Electronic mail (e-mail) was a necessity for a quick, reliable and cheap messaging service for keeping in contact with customers. The SMME hinted at the intended use of Internet telephony or voice over Internet protocol (VoIP) as a cheaper method for communication with overseas clients to complement the recent installation of broadband Internet access, asymmetrical digital subscriber line (ADSL). Finally the marketing and advertising was primarily conducted through the use of Web page advertising, as this was cheap and easy to do compared with conventional advertising for example billboards and trade fairs (Stuyck, 2005).

The business owner of a small roof repair company was the second SMME to be interviewed. An accountant by profession the owner bought the business as a going concern and operates from his home. The geographic area of operation is local to the Cape Town area. Owing to the mobility of his work he relied on a cellphone and a laptop. The recently purchased laptop consisted of a 3.0 gigahertz (GHz) central processing unit (CPU) together with 512 megabytes (MB) of random access memory (RAM). After spending approximately R 15 000.00 on the laptop the business owner refused to change his Internet connectivity from the dial-up modem setup as he saw no real use for a faster connection over the additional cost it would incur. He could not accept there to be any benefit that may be gained by advertising his business through the Internet and by establishing a Web site. This example illustrates the shying away from technology acceptance by an SMME (Underwood, 2005).

With these two businesses in mind, the inventor of the Web sounds a warning for SMMEs:

“When technology evolves quickly, society can find itself left behind...” (Berners-Lee & Fischetti, 2000:123).

These are two varying examples of SMMEs with differing views from the business owners. After the use of these electronic computer devices and e-commerce applications had been digested, the work of Mustaffa and Beaumont (2004:5) was found.

This work researches the usage of e-commerce applications, the effects of the usage and the benefits derived. It was decided to base this research on this Australian study and to allow for a comparative study to be undertaken. Blending this work with the outcomes of the SMME interviews necessitated additional research tasks to be undertaken. These were the inclusion of electronic computer device usage, Internet connectivity options and messaging software utilisation. It was imperative to understand what was being used as each of them would have an impact in the results of this study.

1.2 Main research problem

SMMEs fail to utilise the applications of e-commerce impacting on the benefits offered by the medium.

1.3 Objectives of the research

The main objectives of this research were to:

- to investigate the realm of small business operating in the Western Cape;
- to examine the emergence and adoption of e-commerce in that business sector;
- to undertake a quantitative study of e-commerce application utilisation
- to understand the strategies that will lead to success in this context;

1.4 Significance of the research

Smaller businesses often have fewer employees than larger businesses resulting in a lower pool of knowledge between the employees to assist in defining IT strategies for the business. This research determined which strategic decisions SMME make in IT enabling the operation and usage of information, distribution, transaction and communication activities. The significance of utilisation of e-commerce applications, the effects that are produced and the benefits gained were explored providing evidence of effect-benefit relationships. Although South Africa has a current population of approximately three times that of Australia, this research compares e-commerce active South African SMMEs to e-commerce active Australian SMMEs and identifies which factors influence SMMEs in both countries.

1.5 Delineation of the research

Recognising the limitation in time and other resources and given the large number of candidate SMMEs in the Western Cape, it was convenient to limit the research sample to the provincial area of the Western Cape illustrated in Figure 1.1. As the Western Cape is one of the nine South African provinces, the research sample should be applicable to the rest of South Africa.

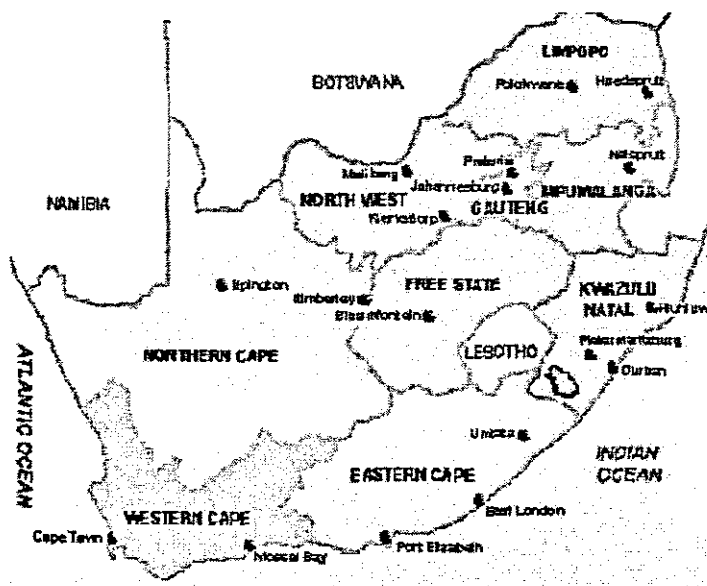


Figure 1.1: The Western Cape¹

1.6 Framework of the document

Figure 1.2 illustrates the structure and content of this dissertation. Chapter One describes the main research problem and the background to the research problem. This chapter provides an overview of the objectives and the significance of this survey together with the statement of the research problem.

Chapter Two is a comprehensive literature review of e-commerce and the strategies available to SMMEs. SMMEs are defined and their formation structures are explored. Electronic computer devices and applications of e-commerce used by small businesses in South Africa are discussed. The applications are based on Australian work by Mustafa and Beaumont (2004:5). The technologies behind the applications are explored together with empirical success factors in the utilisation of these applications.

¹ <http://www.places.co.za/html/visualfind.html>

Chapter Three describes the framework of the research based on the research model. The research questions are stated and the hypotheses formulated. The survey design is discussed together with the sampling method and data collection strategy.

Chapter Four is a survey using primary and secondary data. This chapter describes and interprets the utilisation of e-commerce applications. The significant benefits of the use of these applications are analysed and the effects are determined. Relationships between effects and benefits using stepwise regression are explained.

Chapter Five is the conclusion with recommendations and suggestions for areas of further research.

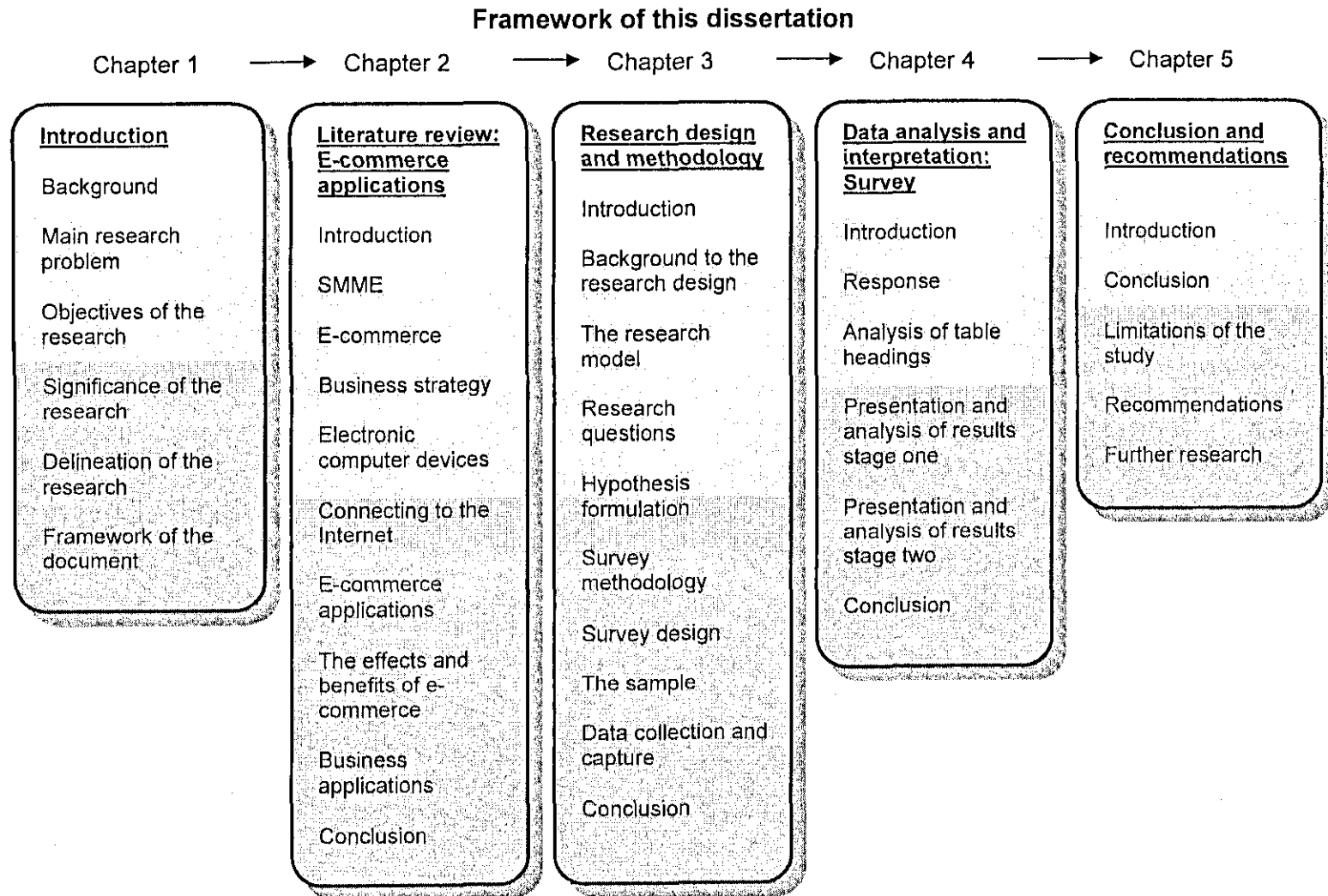


Figure 1.2: Structure and content of this dissertation

Chapter 2

LITERATURE REVIEW: E-COMMERCE UTILISATION

It may be useful to understand how the literature was found. By far the greatest number of journal articles was found using Internet search engines and university Web portals. This method was quick and highly successful. Membership of professional institutions for example: the Computer Society of South Africa (CSSA) and the South African Institute of Electrical Engineers (SAIEE), created a wider information space for searching the literature. This searching was primarily based on a keyword or a combination of keywords. The most popular keywords used were: *small business; e-commerce; strategy, effect, benefit and Web*.

The literature researched was comprehensive but limited in certain areas which prompted the review of specially selected books, two of which assisted highly in the structure of this study (Whiteley, 2000; Amor, 2002). Some literature searches took place in university libraries. These searches were lengthy and frustrating and often not fruitful. This empirically illustrated to the author how rapid and easy the uses of the Internet and the Web are for academic research purposes.

The major breakthrough in the research came when one co-author of the base paper responded to an email earlier sent to Monash University in Australia. The reply included a friendly communiqué together with their primary research data and statistical reports allowing the final objective of this study, a South African and Australian comparison, to be met (Beaumont, 2005; Mustaffa & Beaumont, 2004).

One paper by Mustaffa and Beaumont (2004:5) highlighted the issues involved in the research problem. This study based in Australia made a substantial contribution to this literature review. The references in the Australian paper were traced back to the work of Poon and Swatman (1997a; 1997b; 1998; 1999). Although these papers and journal articles, based in Australia, provided the foundation for this study the research objectives were adapted to the South African context.

2.1 Introduction

Chapter Two provides an overview of e-commerce and the strategies available to SMMEs to support increased business benefits. The terms: SMME, e-commerce and strategy are introduced to allow a basic understanding. These terms are illustrated in Figure 2.1. SMMEs are either formal or informal businesses grouped into four classes and either do or do not make use of e-commerce. As e-commerce is ubiquitous, six applications of e-commerce are researched in this study namely: email, the Internet, Internet advertising, Web pages, FAQs and EDI. For the SMME to take advantage of e-commerce and the Internet the use of electronic computer devices and Internet connectivity are necessities. The important uses of e-commerce are researched and the effect, benefits and effect benefit relationships are explored. For a SMME to participate in e-commerce a plan or strategy is required. Strategy is defined as the plan of how a SMME will utilise e-commerce, e-commerce elements and e-commerce applications, to maximise business benefits. Figure 2.1 illustrates the SMME in the business environment.

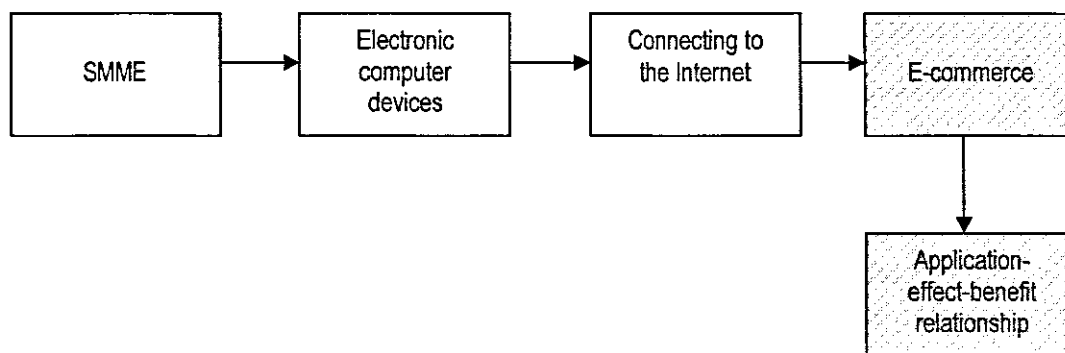


Figure 2.1: A conceptual model of the research

2.2 Small-, medium- and micro-enterprises

All businesses are typically categorised according to their size. There are various ways of measuring a size of a business. The most common method is through the number of employees in the business. With the introduction of the National Small Business Act (No. 102 of 1996) the South African Government has created a national policy supporting small business growth by recognising SMMEs are the key to South African economic development (Coombe, Gomersal & Kieffer, 2001:6).

Business definitions and measuring criteria are detailed in the Act grouped per standard industry classification (SIC) (SAOP, 1996:12-14).

The National Small Business Act defines a 'small business' as follows:

"... a separate and distinct business entity, including cooperative enterprises and non-governmental organisations, managed by one owner or more which, including its branches or subsidiaries, if any, is predominantly carried on in any sector or subsector of the economy mentioned...and which can be classified as a micro-, a very small, a small or a medium enterprise by satisfying the criteria mentioned..." (SAOP, 1996:2).

The National Small Business Amendment Bill of 2003 provides amendments to the National Small Business Act. These amendments include a uniform standard of measuring SMMEs in the four classes, namely: medium, small, very small and micro. The new standard limits the number of employees to fewer than: 200, 50, 20 and 5 respectively. Most of the figures for 'total annual turnover' and 'total gross asset value' have increased as listed in Table 2.1 (SAMC, 2003:5-6).

SAOP (1996:12-14) has ten definitions for SMMEs (one per SIC) and DTI (2004) confusingly use the term SMME to define small, medium and micro-sized exporters. According to the Electronics Communications and Transactions Bill, SMME means small-, medium- and micro-enterprises (SAMC, 2002:9).

A small business is known as 'small- and medium-sized enterprise' (SME) in countries including Australia and Canada (Mustaffa & Beaumont, 2004:2; Tiessen, Wright & Turner, 2001:1). In Greece, SME is an acronym for 'small to medium enterprise' (Tatsiopoulos, Panayiotou & Ponis, 2002:1).

Table 2.1: Small business classification schedule (SAMC, 2003:5-6)

Sector or sub-sectors in accordance with the Standard Industrial Classification	Size or class	Total full-time equivalent of paid employees Less than:	Total annual turnover Less than:	Total gross asset value (fixed property excluded) Less than:
Agriculture	Medium	100	R5.00m	R5.00m
	Small	50	R3.00m	R3.00m
	Very small	10	R0.50m	R0.50m
	Micro	5	R0.20m	R0.10m
Mining and quarrying	Medium	200	R39.00m	R23.00m
	Small	50	R10.00m	R6.00m
	Very small	20	R4.00m	R2.00m
	Micro	5	R0.20m	R0.10m
Manufacturing	Medium	200	R51.00m	R19.00m
	Small	50	R13.00m	R5.00m
	Very small	20	R5.00m	R2.00m
	Micro	5	R0.20m	R0.10m
Electricity, gas and water	Medium	200	R51.00m	R19.00m
	Small	50	R13.00m	R5.00m
	Very small	20	R5.10m	R2.00m
	Micro	5	R0.20m	R0.10m
Construction	Medium	200	R26.00m	R5.00m
	Small	50	R6.00m	R1.00m
	Very small	20	R3.00m	R0.50m
	Micro	5	R0.20m	R0.10m
Retail and motor trade and repair services	Medium	200	R39.00m	R6.00m
	Small	50	R19.00m	R3.00m
	Very small	20	R4.00m	R0.60m
	Micro	5	R0.20m	R0.10m
Wholesale trade, commercial agents and allied services	Medium	200	R64.00m	R10.00m
	Small	50	R32.00m	R5.00m
	Very small	20	R6.00m	R0.60m
	Micro	5	R0.20m	R0.10m
Catering, accommodation and other trades	Medium	200	R13.00m	R3.00m
	Small	50	R6.00m	R1.00m
	Very small	20	R5.10m	R1.90m
	Micro	5	R0.20m	R0.10m
Transport, storage and communication	Medium	200	R26.00m	R5.00m
	Small	50	R13.00m	R2.50m
	Very small	20	R3.00m	R0.50m
	Micro	5	R0.20m	R0.10m
Finance and business services	Medium	200	R26.00m	R6.00m
	Small	50	R13.00m	R3.00m
	Very small	20	R3.00m	R0.60m
	Micro	5	R0.20m	R0.10m
Community, social and personal services	Medium	200	R13.00m	R6.00m
	Small	50	R6.00m	R3.00m
	Very small	20	R1.00m	R0.60m
	Micro	5	R0.20m	R0.10m

According to Shoniregun (2004:1)¹, a UK medium sized SME must satisfy at least two of the following criteria:

- the business has a turnover of not more than £11.2 million²;
- the business has a balance sheet total of not more than £5.6 million³; and
- the business has fewer than 250 employees.

To avoid confusion, and to clarify the categorisation of South African SMMEs in this research, the definition of a small-, medium- and micro-enterprise (SMME) is defined as a privately, independently or co-operatively owned and managed business complying with at least two of the following:

- the business total annual turnover is less than R40 million ;
- the business total assets, excluding fixed property, is less than R15 million;
and
- the business has fewer than 200 full time employees.

The terms SME and SMME are interchangeable throughout this research.

2.2.1 South African SMME structures

South Africa has a full range of business structures for SMMEs. Structuring the business is the key factor as the structure can determine whether the operation of the business becomes a hindrance or an advantage (Engelbrecht, 2004). Oxford (2003:110) defines a company as:

“A corporate enterprise that has a legal identity separate from its members; it operates as one single unit, in the success of which all its members participate” (Oxford, 2003:110).

¹ Citing section 248 of the UK Companies Act of 1985

² Approximately R 129.6 million at an exchange rate of R11.57/£1 (Sharenet, 2005)

³ Approximately R 64.8 million at an exchange rate of R11.57/£1 (Sharenet, 2005)

According to Oxford (2003:403), a private enterprise is an economic system allowing natural persons to own capital and property, and to allow the running of their own businesses with minimum government interference.

In South Africa four typical business structures are: sole proprietorship, partnership, private company and close corporation.

Sole proprietorship

A sole proprietorship is a legal entity that can be used by a sole proprietor, the business owner. Oxford (2003:475) states:

“A sole proprietor is an individual who runs an unincorporated business on his or her own. Generally, a sole proprietor is known as a sole trader...” (Oxford, 2003:475).

Although a sole proprietorship is a legal entity it is not separated from the business owner's estate. The business will therefore die with the business owner (Engelbrecht, 2004). According to Mweb (2005:1), a sole proprietor or sole trader is best suited to a business that is not fixed asset-driven, and where the business owner is the sole employee. Mweb (2005:2) state:

“The disadvantage is that the business is not a separate legal entity, so the owner is liable for, and can be sued for, the business's debts. If the owner of the business dies, the business ceases to exist” (Mweb, 2005:2).

Partnership

A partnership is an association of at least two and up to a maximum of twenty business owners, formed for the purpose of carrying on a business. A partnership does not have a legal entity and therefore the business owners, known as partners, are liable for any debts of the business. A partnership will dissolve upon the death of any of the business owners (Engelbrecht, 2004; Oxford, 2003:379).

Mweb (2005:2) state:

"[A partnership is] based on the same principles as a sole proprietorship, this structure allows you to have up to 20 partners who share responsibility, skills and liability. A partnership requires a contract to formalise each person's contribution to the business, their responsibilities, profit share, means of resolving disputes, disability/death insurance, and what procedure will be followed if the partnership changes or is dissolved. Finding funds for a sole proprietorship or partnership depends on the security that the individual owner/partners are able to provide" (Mweb, 2005:2).

Private company

A private company, known as a propriety limited company in South Africa, must have at least one and up to a maximum of 50 business owners. These business owners are known as shareholders who own shares in the company. Shareholders may appoint natural persons as directors to sit on the board of directors. A private company is a legal entity with a unique company registration number (Engelbrecht, 2004; Oxford, 2003:465). Mweb (2005:2) state:

"[A company is] a separate legal entity in which directors are protected from individual liability... ..This is the best legal structure for people who ultimately want to sell their business to a large competitor, or list on the stock exchange" (Mweb, 2005:2).

Close corporation

Bankseta (2005) citing section 1 of the Close Corporations Act of 1985 defines a close corporation as:

"'Corporation' means a Close Corporation referred to in Section 2(1) which has been registered under Part III of this Act" (Bankseta, 2005).

Bankseta (2005) citing section 2(1) of the Close Corporations Act of 1985 states:

“Any one or more persons, not exceeding ten, who qualify for Membership of a Close Corporation in terms of this Act, may form a Close Corporation and secure its incorporation by complying with the requirements of this Act in respect of the registration of its Founding Statement referred to in Section 12” (Bankseta, 2005).

A close corporation (CC) is similar to a private company. The business owners of a CC own members interest in the business. This is similar to a shareholder owning shares of a private company. The term directors of a private company are known as members in a CC. One limiting factor of a CC is that companies may not become members as ownership is limited to natural persons. A CC is a legal entity with a unique company registration number (Engelbrecht, 2004; Brain, 2005; Bankseta, 2005). According to Mweb (2005:2) a CC is a popular and widely used structure that gives a business a separate legal identity without the formalities of the Companies Act that governs propriety limited companies.

The terms sole trader, partner, member and shareholder will mean business owner, throughout this research.

2.2.2 Technology enabled SMMEs

Once the structure of a business is formalised the focus shifts to technology: the acceptance and the adoption of it by SMMEs. Many SMMEs with fewer than 100 employees are adopting technology enabled information in their business operations. Case studies have revealed that IT and IS investments can produce high returns of technology enabled information, for example: investments in e-commerce usage (Shoniregun, 2004:2). Research has highlighted communication usage as the primary function of the SMME using the Internet. The application used to achieve this is email. The Internet has succeeded in providing asynchronous communications, something that traditional telephony cannot (Poon & Swatman, 1997b:9). By utilising e-commerce applications transferring information is made easier possibly reducing long term costs for SMMEs (Shoniregun, 2004:3).

Davis (1985:23; 1989:3) designed a model supporting technology adoption by business and business owners known as the technology acceptance model (TAM). It stipulates the three main areas for user motivation, namely: usefulness; ease of use; and the attitude towards using. The purpose of TAM states that when a person forms an intention to act, they will be free to act without limitation (Davis, 1985:23; 1989:3).

2.3 Electronic commerce

2.3.1 An e-commerce background

TAM can be applied to e-commerce. E-commerce is a general concept concerning business transactions and information exchange using digital technologies. E-commerce takes place between businesses as business-to-business (B2B) and business-to-consumer (B2C) (Whiteley, 2000:3). Tradanet (1999) defines e-commerce as the paperless exchange of business information using email, electronic data interchange (EDI) and Web sites. E-commerce is based on communication technologies (IP and TCP) which allow applications to operate (Internet). It is a way of transacting business through mail, purchasing, sales and banking (Sinclair, 2003:137; Collins, 2003:583). According to Bytheway (1996), e-commerce is the space between businesses.

Politicians in developed countries have expressed their views on e-commerce and the Internet. Teather (1999) quoting Blaire⁴ states:

"To British business I deliver a pretty blunt message: if you don't see the internet as an opportunity, it will be a threat. In two years time the internet could be as commonplace in the office as the telephone. If you're not exploiting the opportunities of e-commerce you could go bankrupt" (Teather, 1999).

Supporting this statement and while presenting a speech at the Harvard information infrastructure project, Hewitt (2000), the first UK minister for small business and e-commerce stated:

⁴ British Prime Minister

"The first wave of the Internet came through PCs. But the next wave will come through broadband mobile telephony and digital television" (Hewitt, 2000).

Many authors have expressed their views on e-commerce, Internet usage and Internet strategy from a business perspective. Caruthers (2003b) states:

"If you're not online, you're losing money" (Caruthers, 2003b).

Powell (2004:77) warns Internet users not be intimidated by the sheer scale of the Internet's information as search engines are available to explore interests but these need improving before they become instinctive. Porter (2001:1) states:

"Many have argued that the Internet renders strategy obsolete. In reality, the opposite is true. Because the Internet tends to weaken industry profitability without providing proprietary operational advantages, it is more important than ever for companies to distinguish themselves through strategy. The winners will be those that view the Internet as the complement to, not a cannibal of, traditional ways of competing" (Porter, 2001:1).

2.3.2 Ubiquitous commerce

Echoing the thoughts of Teather (1999) and Hewitt (2000), Schapp and Cornelius (2001:1) note that e-commerce is equivalent to a tsunami in the way it has hit business in the past few years. The wave of enthusiasm emphasises the opening up of opportunities in and around B2C, B2B, person-to-person (P2P), and mobile-commerce (m-commerce) using cellphones and hand held computers with Internet access capability.

A new phenomenon of integration has been created by the explosive force of these new commerce channels, where commerce will be able to be conducted anywhere and at anytime by buyers and sellers alike. This new integrated environment provides better controls, choice and convenience for buyers and sellers and is called universal, ubiquitous commerce (u-commerce) (Schapp & Cornelius, 2001:1).

Schapp and Cornelius (2001:1) note:

“U-commerce is a dynamic convergence of the physical and the digital, the interface of brick-and-mortar commerce with Web-based wireless and other next-generation technologies in ways that will create new levels of convenience and value for buyers and sellers. It is about the integration of more value-added information into each transaction, in ways that benefit both consumers and businesses. Ultimately, it is about minimizing friction in the commerce chain, creating new efficiencies and higher levels of productivity” (Schapp & Cornelius, 2001:1).

Supporting the views of e-commerce utilisation by Schapp and Cornelius (2001:1) and VISA (2002:2), Watson (2000:2) describes the four fundamental dimensions of u-commerce as:

- ubiquity, allowing network access to users at any time and in turn at any place;
- uniqueness, allowing each user to be uniquely identified by geographical positions, identify and associated preferences;
- universality, denoting that cellphones and mobile devices are universally usable, for example using the same network frequency in US and in Europe; and
- unison, applying to integrated data across multiple platforms providing standardised views to all users without taking account of the technology used

2.3.3 E-commerce importance

Mustaffa and Beaumont (2004:5) discuss the elements of e-commerce importance in their work. Although they did not publish their structure of the elements or their findings the data was obtained through an email request by this author (Beaumont, 2005). The five elements of e-commerce importance according to Beaumont (2005) are: subscription, sales, distribution of information, advertising and customer service.

Subscription is a payment to subscribe to something or a membership fee (Gilmour, Collins, Mackie, Cross, Holmes & Weber, 2005:748). E-banking has allowed the payments of subscription to be made through the Web page and Internet. Examples of subscription are:

- for a publication (book or magazine) (Gilmour *et al*, 2005:748);
- for Internet service provider services (Rood & Te Velde, 2003:9);
- for broadcasting services (SAMC, 2005:10);
- to a mailing list (SAMC, 2002:16); and
- for cellphone usage (Lehr & McKnight, 2003:4)

To explain the importance of sales in e-commerce (Ghosh, 1998:9) relates to Amazon.com, the global on-line retailer. He states that in 1998 only Barnes & Nohle could rival Amazon in electronic sales. His view is that customers will probably need no more than four or five of these companies. De La Harpe (2005) can evident the success of Kalahari.net, a South African online store selling thousands of products, and competitor to Amazon.com.

Mustaffa and Beaumont (2004:5) suggest that information distribution is an important element of e-commerce. They realised that one of the major perceived effects of the internet was the effective distribution of information. Grandon and Pearson (2004:4) support this view stating that e-commerce does enhance the distribution of information by improving information accessibility and improving communication using higher speed electronic processes.

According to the results of a follow up survey conducted by Abell and Black (1996) into the business use of the Internet, the number of companies using the Internet for marketing and advertising doubled compared to their original survey undertaken a year earlier. Their statistics revealed almost all companies used a home page to achieve this and 56% used advertisements on other web sites therefore highlighting the importance of advertising using e-commerce.

The presence of e-commerce can lead to better and easier interaction with customers as well as suppliers (Ghosh, 1998:1). Customer service can benefit from interactive Web based applications facilitating customer feedback and enquiries through email and online surveys to provide 24 hour-a-day availability. Online businesses can offer an online help desk for example an FAQ facility to answer customer enquiries with less direct human involvement. Two significant benefits of e-commerce realised by SMMEs are customer service and information exchange. This suggests that there is a growing awareness of the possibilities of enhanced and more efficient customer and supplier relationships, or B2B, among SMMEs (Quaddus & Achjari, 2005:9).

2.4 Business strategy

SMMEs attempting to make use of e-commerce must be guided by a business strategy. Porter and Millar (1985:5) emphasise the important use of strategy. Porter (2001:1) states that strategy plays an important role in an e-commerce environment. But how is a strategy devised and what are the factors that contribute to a successful strategy? According to Moskovitz (2005a; 2005b) the three key factors defining a forward strategy are: a mission statement; a transformation policy; and an environment.

Every organisation seeking e-commerce effects and benefits needs a strategy to look for measuring success. The approach to strategy will be different for different businesses, especially when comparing a SMME to a large multinational corporation (Bytheway, 2004:131).

“Strategies must be driven by business requirements not by technology opportunities, they must recognise priorities according to the benefits that each new information system will deliver, and they must be set to appropriate timeframes that reflect the business planning horizon - this can be five years or more in a stable business, but may be only one to two years (or even months) in a volatile one. In most businesses a two to three year plan would be most appropriate but timescales have been shortening as businesses become more adept at managing change” (Bytheway, 2004:132).

Some authors argue about the definition of strategy. For example Gavetti and Rivkin (2005:1) define a business strategy as:

“...what it chooses to do and not to do” (Gavetti & Rivkin, 2005:1)

Moskovitz (2005b) defines strategy, depicted in Figure 2.2, as:

“...the ‘how’ of where you are and where you want to be” (Moskovitz, 2005b).

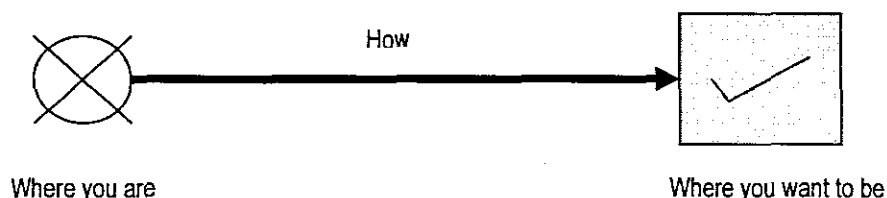


Figure 2.2: Strategy (Moskovitz, 2005b)

Bytheway (2004:122) mentions the two ways of looking at strategy: the 'why', 'what' and 'how' questions; and the 'Where are we now?' and 'Where could we be?' and 'How shall we get there?' questions.

As trends change and new network opportunities are developed, businesses need to adapt by devising and updating their strategies. An early example of strategy winning competitive advantage is Procter & Gamble in the 1800s (Dyer, Dalzell, & Olegario, 2004:15) and in the 1980s by the utilisation of innovative applications of information technologies (Bytheway, 2004:3). Designing mature Internet business strategies is vital for any business and should be based on, in the broader context, and supported by a model. For example the often cited information, communication, distribution and transaction (ICDT) model as depicted in Figure 2.3. This model prevents narrow thinking and low utilisation of strategies by small business (Angehrn, 1997:2).

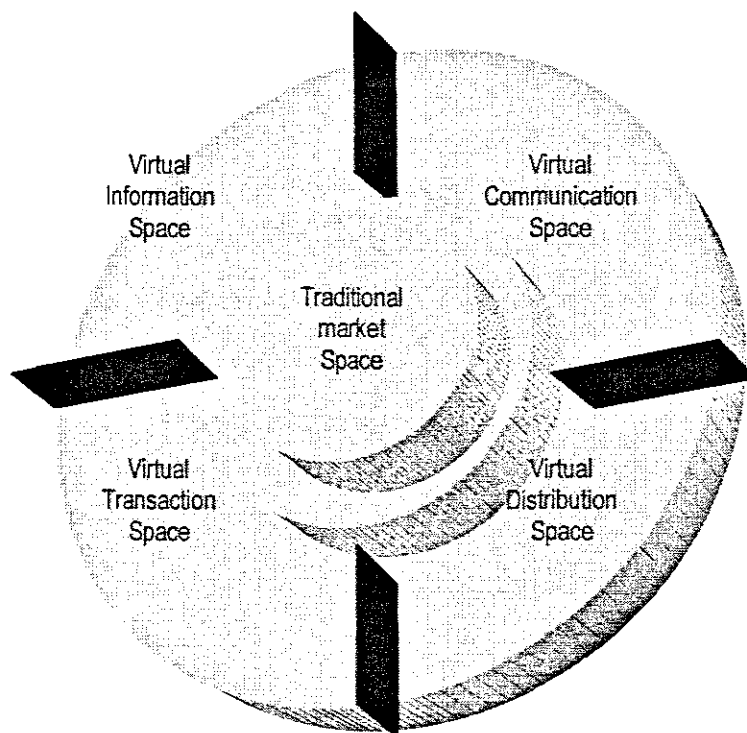


Figure 2.3: The ICDT model (Angehrn, 1997:2)

According to Angehrn (1997:8) the ICDT model defines a framework for analysing business Internet strategies. The model systematically guides the strategy process of businesses redesigning their products and services using the Internet as a medium. This model describes the Internet as an extension of the traditional market space. Angehrn (1997:2), states:

“The ICDT model takes its name from the segmentation of the space of new business opportunities created by the Internet into ‘four virtual’ spaces: a virtual information space; a virtual communication space; a virtual distribution space and a virtual transaction space” (Angehrn, 1997:2).

Referring to Figure 2.4, Angehrn (1997:3) defines communication as a virtual space whereby e-commerce communications can take place at lower cost, higher speed and skip traditional physical and geographical constraints.

The virtual distribution space provides three new distribution channels for products and services, namely: digitised products distributed through computer networks; non physical distribution services for training and consulting using text, voice or video; and auxiliary services associated with traditional services or products, distributed to customers. The exchange of business transactions constitutes the virtual transaction space whereby orders, invoices and payments are electronically processed. Initially transactions were not used extensively because of legal, security and reliability issues. The most popular virtual space within the ICDT model is information as businesses can display information about themselves together with the many products and services offered. Angehrn (1997:2) compares the virtual information space to a large advertising billboard but with flexible and global accessibility together with low cost. This space, known as the Web has opened up new marketing channels for businesses.

2.5 Electronic computer devices

Once the strategies are in place a combination of skills, tools and knowledge are required to operate a business. Many of these make use of IT and IS. Referring to the definitions stated in Chapter One, this means e-commerce electronic computer devices, for example: laptops and cellphones, and e-commerce applications for example: use of the Internet and use of the Web. Mweb (2005:16) warns business owners of newly formed SMMEs about the importance of understanding the basic framework of IT and IS for business.

After deciding the operational structure of the business, the business owner will need to examine the emerging technologies available, and determine which electronic computer devices and applications would best suit the operational environment of the business, and allow the SMME to become technology enabled. According to Shoniregun (2004:2) electronic computer devices using digital technology capability, as illustrated in Figure 2.4, assist technology enabled SMMEs to adopt and implement e-commerce (Shoniregun, 2004:2).

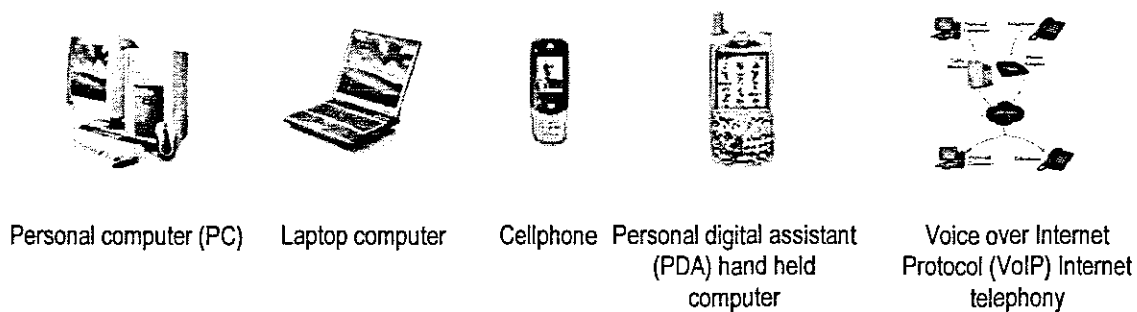


Figure 2.4: Five electronic computer devices with digital capability

The focus in this part of the research is to discuss recent technologies, especially the Internet, cellular telephony and messaging. These are e-commerce electronic computer devices that are available for use by SMMEs within South Africa: PCs⁵, laptops⁶, VoIP, cellphones and PDAs. PCs and laptops are well researched IT elements that constitute hardware and make use of digital technology (Dursch, Yen & Shih, 2004:3) and will not be discussed here.

2.5.1 Internet telephony

VoIP is an Internet telephony service recently legalised in South Africa. VoIP, known as 'Internet voice' by some authors is an application allowing a user to make a digital telephone call over the Internet instead of an analogue call over the traditional telephone line (FCC, 2005; Ince, 2003:241).

⁵ A microcomputer suitable for a single user, with a localised hard disk and a microprocessor (Oxford, 2003:387)

⁶ A small personal computer that can be operated from its own batteries, has a flat display screen that folds over the keyboard when not in use, and is generally suitable while travelling (Oxford, 2003:292).

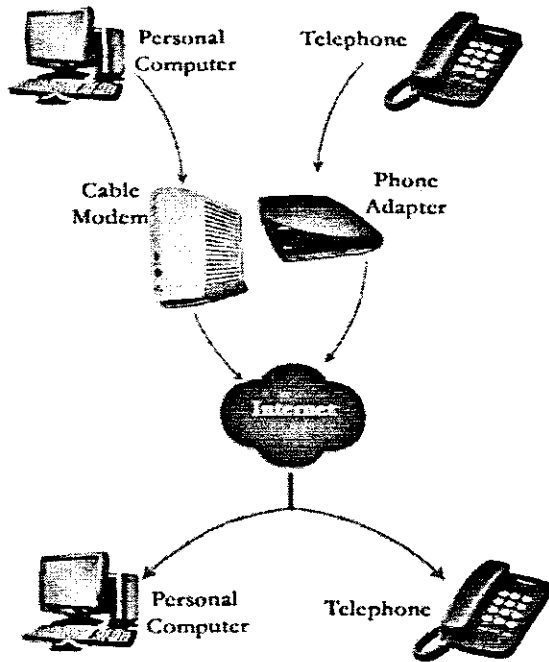


Figure 2.5: Internet telephony (FCC, 2005)

Instead of using a telephone network, VoIP uses a computer data network for example the Internet. The telephone call process involves converting the analogue voice signal from the telephone into a digital signal which is compressed and broken down into a series of packets. These packets travel across the Internet to their destination and are reassembled, decoded and converted back to analogue on the receiving side. This allows a VoIP telephone call to be made to a traditional telephone number. A traditional telephone may be replaced with a microphone and headset when using a computer to make a VoIP call. The caller may use a computer and cable modem, or a traditional telephone and phone adaptor, to connect to the Internet as depicted in Figure 2.5. The call may be routed through to a computer or telephone at its destination (FCC, 2005; Varshney, Snow, McGivern & Howard, 2002:1; Sherburne & Fitzgerald, 2004:1; Salie, 2005).

Businesswire (2005) citing Rouland⁷ states:

"Voice over Internet Protocol is increasingly being adopted by corporations that wish to save money on telecommunications costs and streamline their communication infrastructure, providing employees with advanced features while simplifying administration processes..." (Businesswire, 2005).

2.5.2 The cellphone

The second form of telephony available for use by SMMEs is the cellular phone. A cellular phone, known as a cellphone in South Africa, and a mobile phone in other countries, is a wireless device which behaves as a normal telephone (Anon, 2005b). Current cellphones in South Africa use second-generation (2G) and third-generation (3G)⁸ technology and allow connections to be made to traditional telephones and other cellphones. Most cellphones use a combination of radio wave transmission, conventional telephone circuit switching and packet switching, especially for services including Internet access and wireless application protocol (WAP) (Anon, 2005b; Lehr & McKnight, 2003:1). Cellular telephony was first introduced into South Africa in 1994 and ten years later the cellphone market reached 18.7 million subscribers (Cellular Online, 2005). According to Worx (2005a) cellphones may have been the fastest growing technology ever seen in South Africa.

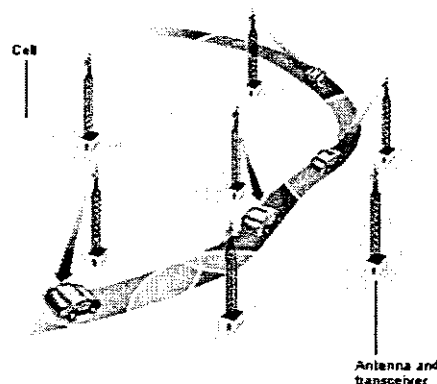


Figure 2.6: A cellular network (Anon, 2005b)

⁷ Chief technology officer of Internet Security Systems

⁸ 3G networks were introduced into South Africa in late 2004 (Stones, 2005)

Combining expanded capabilities of cell phones and PDAs has produced the smartphone with typical PC features including Web browsers, game consoles, personal music players, PDA functionality, push email⁹ and QWERTY¹⁰ keyboards (Gross & Prinz, 2000:3; Vodacom, 2005b; 2005c).

Cellphones and smartphones require wireless cellular networks to operate. Figure 2.6 depicts a cellular network provided by a typical cellular service provider. The network has many adjoining geographic areas, known as cells, making up a wireless cellular network. An antenna and receiver is located within each cell a set distance from other cells. While travelling in a motor vehicle the call is passed from the exiting cell to the next cell without interruption to the user (Anon, 2005b; Wu, Huang & Chao, 2003:6). A network of antennas, spaced approximately 10km apart, may be viewed empirically alongside the N1 national road within the Karoo region of South Africa.

The three cellular service providers in South Africa Vodacom, MTN¹¹ and Cell C¹² make use of the same global system for mobile communications (GSM) frequency while Cell C uses an additional second GSM frequency (Brown, Cajee, Davies & Stroebel, 2003:1).

2.5.3 The personal digital assistant

The third form of telephony available for use by SMMEs is the PDA. A PDA is a handheld wireless computer using various operating systems (O/S) including Windows Mobile and BlackBerry. Features of PDAs include telephone, email, text messaging, Web browsing, picture, video communication and add-on software (Vodacom, 2005a; Nokia, 2005a, Oxford, 2004:388).

⁹ A service providing real-time, secure and remote access to email, contacts and calendar direct to a range of business-focused mobile devices <http://www.vodafone.com>

¹⁰ A keyboard laid out in traditional typewriter style. The top line consists of the QWERTYUIOP keys. Designed in the 1880s to prevent fast typing on the typewriter (Sinclair, 2003:321)

¹¹ Mobile Telephone Networks South Africa

¹² 3C communications launched 17/11/2001

PDA's and wireless computers including some laptops make use of WAP. IEC (2004) state:

“[WAP is] an application environment and set of communication protocols for wireless devices designed to enable manufacturer-, vendor-, and technology-independent access to the Internet and advanced telephony services” (IEC, 2004).

According to Sinclair (2003:410), WAP is a standard method of enabling Internet access by radio communication for mobile cellphones, pagers and PDA's. Empirically, PDA's may be deployed by a business to increase customer service. Boots in the UK provided staff assistants at 130 stores with wireless PDA's to enable them to respond quicker to customer enquiries and allowing POS software access through a secure web portal (Thomas, 2005).

As noted by the literature, telephony is a valuable application for South African SMMEs. To exemplify this, the local taxi industry in Cape Town succeeded in supplying an efficient shuttle service for customers. Their success is based on the rapid re-scheduling ability of vehicles supported by the combined utilisation of PC's, cellphones and PDA's (Smith, 2005a).

2.5.4 Electronic messaging

From the invention of the Morse code in the early 1800s electronic messaging has been an important communication medium for traditional commerce. With the invention of the cellphone electronic messaging is now simplified and is now used within the e-commerce framework. The sending and receiving of electronic messages or text messages by cellphone is a popular business application and is known as a messaging service. This application is provided by cellular network service providers who can provide a short messaging service (SMS), an enhanced messaging service (EMS) and a multimedia messaging service (MMS) (Sinclair, 2003:359; Mobile Phones UK, 2005).

Messaging services have become popular with the local banking industry, together with banking applications. According to Brown *et al.* (2003:2) cellphone banking applications can be operated by a SMS-based type of banking using wireless Internet gateway (WIG) technology. A subscriber can initially download a software application menu to his or her subscriber identity module (SIM) card from the bank and thereafter access this stored menu via the subscriber's cellphone (STB, 2005). These menus offer various functions to cellphone banking including purchasing prepaid airtime, bank account balance queries, bank account transfers and the receiving of mini statements (FNB, 2005:1).

According to Needham (2005), MTN and Standard Bank have together recently launched their first banking product called 'MobileMoney'. The goal of the product is to enable customers to do their banking anywhere and at anytime using a cellphone updated with banking software.

A second form of cellphone telegraphy is mobile email. Mobile email allows the sending and receiving of email from a cellphone or mobile device. There are several ways to receive email on a mobile device depending on the underlying technology and the application used.

A typical cellphone would make use of PC based email whereas a personal digital assistant (PDA) would use Web based browser email and/or software package based email (Nokia, 2005a).

Latest cellphone technology has allowed the introduction of two more cellphone uses normally associated with the home and sailing:

- Mobile television is now available in a number of countries. Subscribers can now watch real-time television broadcasts by using their cellphones and by 2008 700 million people will have television compatible phones (Stuart, 2005).

- Mobile navigation using a cellphone was recently introduced into South Africa by a business based in Cape Town. The cellphones capable of mobile navigation are typically the high-end handsets with the latest features. An operation system together with Bluetooth and global positioning systems (GPS) are required. The street position of a person's location is calculated using special software and GPS via the cellphone. By simply entering a destination into the cellphone, searching for a street number anywhere in South Africa is made possible (Haw, 2005).

2.6 Connecting to the Internet

In order for the SMME to utilise this worldwide conglomeration of data networks called the Internet, online Internet access is a prerequisite. It must be noted that a non permanent connection was not in the original design in the use of the Internet but is now necessary owing to telecommunication company regulations (Berners-Lee & Fischetti, 2000:158). Four forms of Internet connectivity, currently available in South Africa, are discussed.

2.6.1 Dial-up modem

Dial-up is a form of internet access whereby a client uses a modem¹³ to dial an internet service provider's (ISP) node to establish a modem-to-modem link using the public switched telephone network (PSTN). This link, via the ISP, provides the Internet connection for the client. Dial-up makes use of protocols including point-to-point protocol (PPP) and transmission control protocol/Internet protocol (TCP/IP). Modem is a portmanteau word formed from modulator and demodulator. A modem is a device that encodes digital¹⁴ information by modulating an analogue carrier signal and decodes the transmitted digital information using demodulation. (Shoniregun, 2004:2; Passmore, 2004:2).

¹³ A device for connecting two computers by a telephone line (Gilmour *et al*, 2005:491)

¹⁴ The representation of data as a series of numerical values (Gilmour *et al*, 2005:210)

2.6.2 Leased line

A leased line is a symmetric telecommunications line connecting two locations together. A leased line service or diginet¹⁵ is a dedicated point-to-point connection providing the client with an 'always-on service' providing telephone, data and Internet services. A leased line service is based on carrier class symmetrical digital subscriber line technology providing agreed bandwidth between specified destinations. Advantages are: zero traffic congestion owing to the private network topology; zero bandwidth sharing with other clients; and zero reduction of data transmission speed (Telkom, 2005a).

2.6.3 Integrated services digital network

Integrated services digital network (ISDN), introduced more than 20 years ago, is a switched dial-up connection designed to allow and control digital transmission of voice and data over ordinary telephone copper wires. This results in better quality and higher speeds than analogue systems. Two advantages of using ISDN over dial-up analogue are: the absence of analogue to digital conversion requirements; and a higher transmission rate. ISDN is a set of protocols for establishing and breaking circuit switched connections.

Advanced call features, including simultaneous use of data and voice on the same communication line, are available to the end user. ISDN supports data transfer rates of 64 Kbps. ISDN is capable of integrating many services together providing digital connectivity efficient bandwidth utilisation and high quality. Its low acceptance rates and relative high cost of hardware and software have slowed down its development though (Telkom, 2005a; Gaglia & Yannelis, 1998:3; Yeng, Chou & Wang, 2001:4; Lee & Chan-Olmsted, 2004:3; Shoniregun, 2004:2). A disadvantage of ISDN is that it attracts standard telephone call charges when used for Internet connectivity (Telkom, 2005b). ISDN has been mostly superseded by digital subscriber line (DSL).

¹⁵ A term used to describe a leased line service (Telkom, 2005a)

2.6.4 Asymmetrical digital subscriber line

Digital subscriber line (DSL) has similar characteristics to ISDN whereby its technology provides a digital connection over a traditional telephone network and allows digital communication over a telephone line without blocking access to voice services. This allows a telephone line to operate a telephone or facsimile as well as provide an Internet data connection. According to Yen *et al* (2001:1) "A Digital Subscriber Line (DSL) supports multiple data communication accesses simultaneously, including Internet access, telephone communication, and cable television connection". Amor (2002:817) defines xDSL as: "[The] designation for digital subscriber line technology enabling simultaneous two-way transmission of voice and high-speed data over ordinary copper phone lines". DSL is a collective term referring to all types of DSL and is synonymous with the acronym xDSL. DSL is the technology that enables high-speed data transfer and rapid access to the Internet via telephone lines, with a secure connection straight into the high-speed network". The growth in deployment of high bandwidth demanding Internet applications has created a requirement for Internet connections faster than dial-up. Various technologies including DSL and cable modems have emerged to support high-speed Internet connectivity. Telephone companies in the US started installing commercial xDSL lines in 1998 (Cheng & Marsic, 2002:1). According to Yeng *et al* (2001:4) DSL is superior to ISDN as its acceptance by business is far quicker.

Asymmetrical digital subscriber line (ADSL), a subset of DSL, was invented in 1987 and is used to deliver high-rate digital data over telephone lines. ADSL, as depicted in Figure 2.7, provides an always available direct internet connection unlike dial-up and ISDN (Telkom, 2005a; Helmig, 2001).

Discrete multi-tone (DMT), a new modulation technology, allows the transmission of high speed data. ADSL facilitates the simultaneous use of normal telephone and high speed data transmission. Full rate ADSL permits data rates up to 6Mbps downstream and 640kbps/s upstream without disturbing the voice phone. The benefits of the DMT and asynchronous transfer mode (ATM) technologies are combined when using xDSL resulting in bandwidth and service flexibility (Cheng & Marsic, 2002:2).

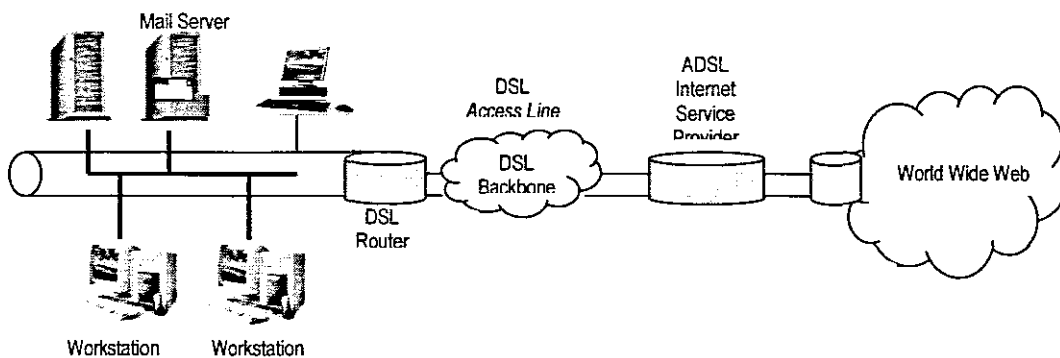


Figure 2.7: An ADSL office Internet connection based on Helmig (2001)

2.6.5 Broadband

Broadband Internet access known as 'broadband' by some authors is a high data-transmission rate internet connection. Approximately 10% of global Internet subscribers use broadband internet connectivity (Lee & Chan-Olmsted, 2004:2). Recently, and for the first time in the UK, broadband Internet access has overtaken dial-up (Brown, 2005). Some network operators advise users that the speed of an Internet connection must be at least 256 Kbps to be considered as broadband (Paltridge, 2001:6).

Two broadband services are DSL and cable modem with DSL dominating the market with 59% versus cable with 39% (Lee & Chan-Olmsted, 2004:2). According to Paltridge (2001:6) citing the FCC¹⁶, broadband is defined as having the capability of supporting, in both the downstream and the upstream directions, a speed of at least 200 Kbps in the last mile. Downstream is considered to be provider-to-consumer and upstream consumer-to-provider. Paltridge (2001:6) discusses three reasons for selecting the broadband Internet connectivity rate, namely: 200Kbps is almost four times faster than a standard telephone line internet connection at 56 Kbps; the speed is sufficient to change Web pages at a similar speed to paging in a book; and the speed is capable of supporting the transmission of full-motion video.

¹⁶ Federal Communications Commission <http://www.fcc.gov/>

During the middle of 2004, a broadband wireless Internet connectivity service was introduced into South Africa with the formation of a commercially operated state-owned enterprise known as Sentech. 3G technology together with dedicated wide area networks (WANs) forms the foundation of this service.

The major advantage of utilising 3G wireless Internet connectivity over earlier versions is speed together with a connection range of kilometres compared with meters in a typical hotspot scenario. This increased range and the elimination of fixed line constraints allows greater flexibility (Smith, 2005b; Vandepuette, 2005:4). Globally, sales of laptop computers have now surpassed desktop computers suggesting a trend towards mobile Internet activities (Smith, 2005b).

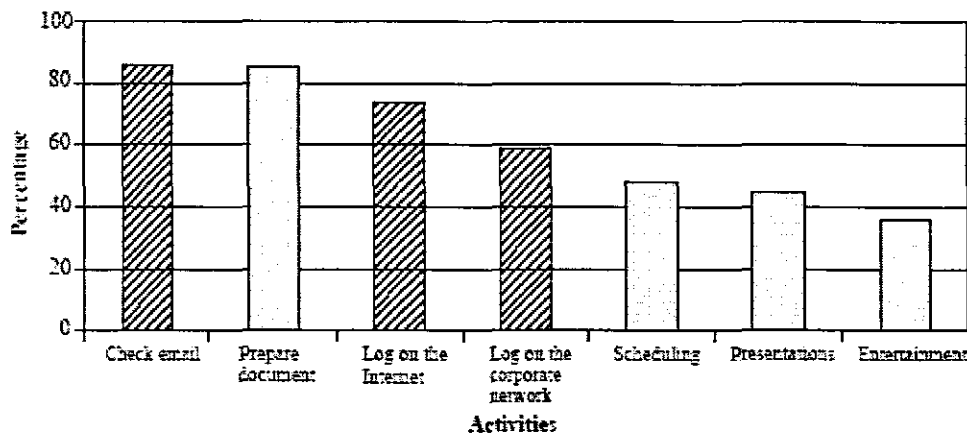


Figure 2.8: Laptop activities while travelling (Vandepuette, 2005:4)

Figure 2.8 indicates the activities of laptop users at public Internet access points or hotspots. These hotspots are often installed in high-traffic venues for example airports, hotels, and cafes. Business travellers make up this market's most lucrative audience (Vandepuette, 2005:3). With the introduction of 3G wireless technologies these limited-in-range hotspots have now become entire metropolitan areas (Smith, 2005b).

2.7 E-commerce applications

From an e-commerce application perspective the six applications chosen were based on the work of Mustaffa and Beaumont (2004:6). These applications are:

- the Internet;
- Internet advertising;
- Web pages;
- FAQ pages;
- EDI; and
- email

2.7.1 The Internet

The Internet should not be confused with an infranet¹⁷, intranet¹⁸ or extranet¹⁹ and is defined as:

“[The] worldwide conglomeration of data networks. Initially intended for military use, the Internet was increasingly used for exchanging research data among universities and institutes. Today, online service providers and network providers have made the Internet available to everyone. It is the computing network for business and leisure based on the TCP/IP protocol. All other computer networks have become irrelevant...” (Amor, 2002:794).

¹⁷ A communication structure for networking equipment in the household or in other applications such as petrol stations, restaurants, medicinal technology, or agricultural (a supplement to Internet and intranet) (Amor, 2002:793)

¹⁸ A private network that is based on the same technologies as the Internet, but is restricted to a certain user group (Amor, 2002:795)

¹⁹ Extended intranets are used to share information with business partners over the Internet in a very secure way (Amor, 2002:786)

This graphic supports the work of Amor (2002:794) when he refers to the Internet is an inter-network. An inter-network, as depicted in Figure 2.9, is a collection of individual networks connected by intermediate networking devices that functions as a single network.

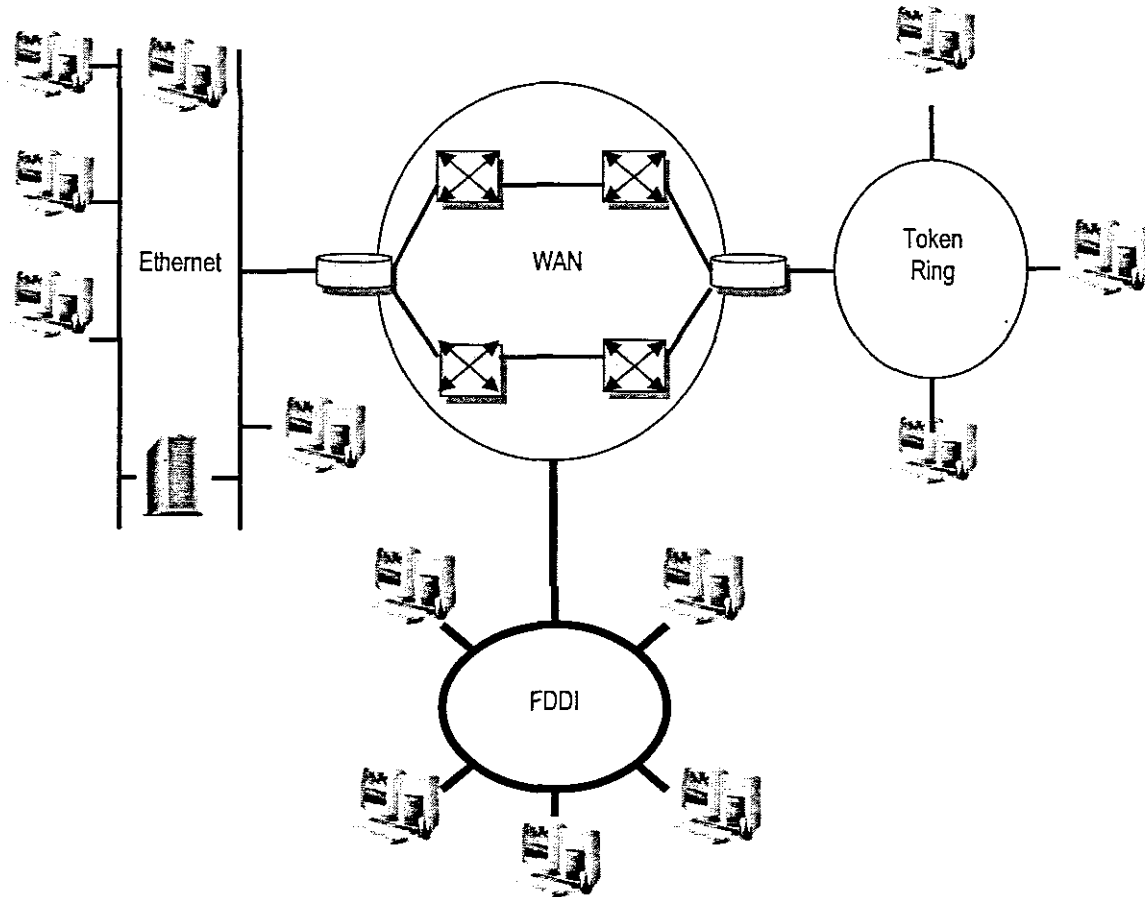


Figure 2.9: An inter-network created by different network technologies

The first inter-network, or network-of-networks, was created by the combination of the Arpanet wide area network (WAN) and research facility local area networks (LANs) and WANs, all interconnected via gateways. The packets that traversed gateways at the edge of the Arpanet needed a new packet header which is known today as Internet protocol (IP). A control protocol was required which is known as transmission control protocol (TCP). A need for a meta-network was created in the late 1980s owing to the spread of IP networks. A meta-network is a network that links separately administered internets (with a small 'i') that has become known as the public Internet (with a capital 'I') (Passmore, 2004:1-2; Leiner, Cerf, Clark, Kahn, Kleinrock, Lynch, Postel, Roberts & Wolff, 2003).

The Internet includes wired networks, wireless networks and hybrid networks as depicted in Figures 2.10 and 2.11. Examples of the networks are wireless fidelity (WiFi), wireless local loop (WLL), worldwide interoperability for microwave access (WiMAX), Bluetooth²⁰, third-generation mobile telephone technology (3G), and wireless mesh networks (WMNs). (CATIA, 2005:6; Akyildiz, Wang & Wang, 2004:4).

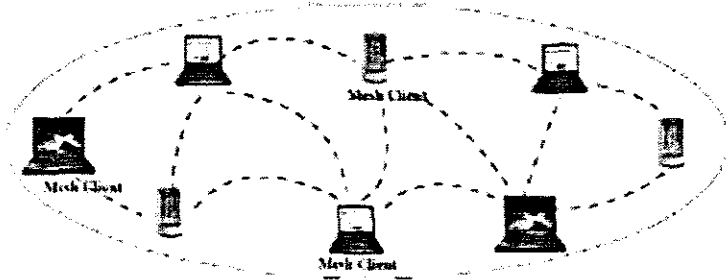


Figure 2.10: A wireless mesh network (Akyildiz et al, 2004:4)

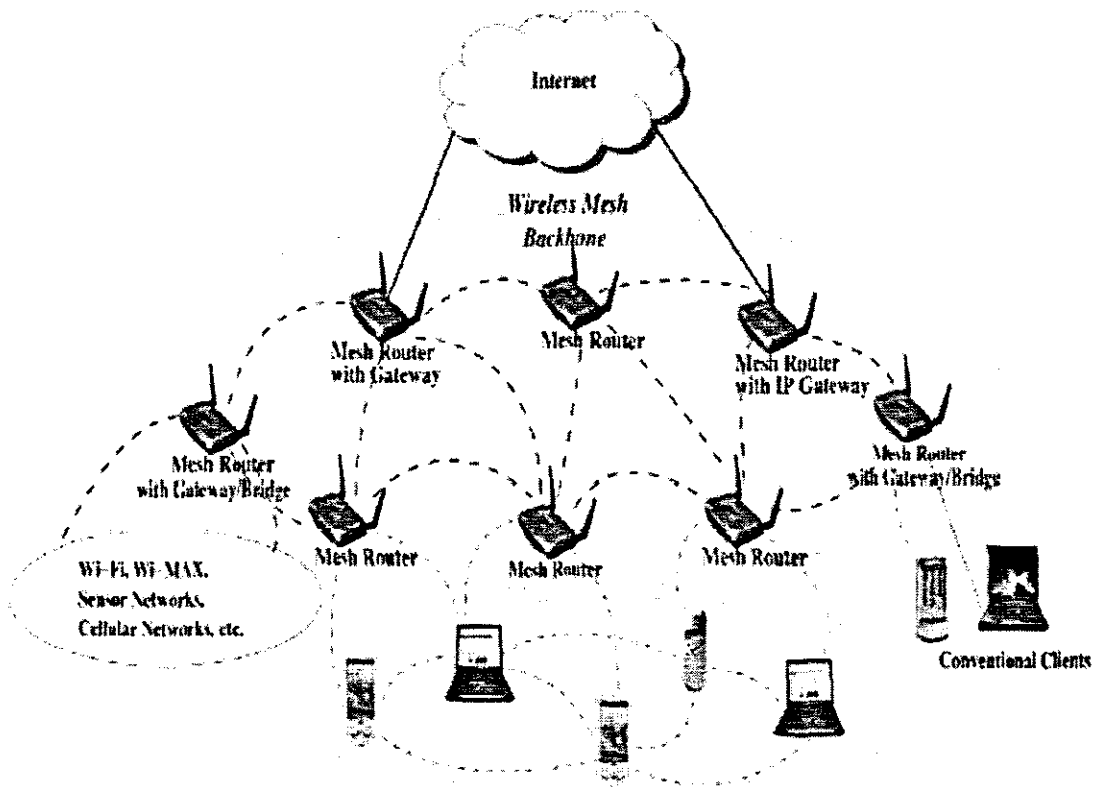


Figure 2.11: A hybrid wireless mesh network (Akyildiz et al, 2004:4)

²⁰ An advanced protocol for the transmission of data at a bit rate of approximately 1.5 Mbps between portable devices (CATIA, 2005:7)

The Internet2

By using these modern networks, technologies and protocols: is it possible for the Internet to be superseded by a faster and more efficient second generation Internet? Russo (2005) exemplified this possibility with the downloading of a 500Mb file at Columbia University in less than three minutes, a task normally taking a few hours. This new technology, termed 'Internet2', utilises a backbone network made of high-capacity fibre-optic cables compared with the current Internet. Internet2²¹, or Abilene²² network, has superior speed and faster connections but still comprises servers, switches, routers and computers. Using 'Internet2' is similar to driving on your own private motorway where the transfer rate of data is greater than 10Gbps compared with 4Mbps across the Internet using a cable modem. Abilene (2005) describes the Abilene network as:

“...an Internet2 high-performance backbone network that enables the development of advanced Internet applications and the deployment of leading-edge network services to Internet2 universities and research labs across the country [US]. The network has become the most advanced native IP backbone network available to universities participating in Internet2” (Abilene, 2005).

The Abilene network has transformed with time. It started with a communication speed of 2.5Gbps in early 1999, and by 2003 was upgraded to 10Gbps, using Internet protocol version six (IPv6²³) capabilities. The network is illustrated in Figure 2.12. Ironically this communication network and a railway network are semantically related commercially as suggested earlier by Carr (2003:6; 2004:17-20).

²¹ Internet2 is a consortium being led by 207 universities working in partnership with industry and government

²² “[Abilene is] a comparatively rare name. In the New Testament, Abilene is a region of the Holy Land (Luke 3:1), whose name is of uncertain origin, but may be derived from a Hebrew word meaning 'grass'. Several places in America have been named from this reference, notably a city in Kansas...”

<http://www.askoxford.com/firstnames/abilene?view=uk>

²³ The Internet presently uses Internet protocol version 4 (IPv4) allowing 2^{32} (4,294,967,296) address spaces based on 11 digit numbers. The next generation of IP, IPv6, allows 2^{128} address spaces based on 39 digit numbers. IPv6 will extend the range from four numbers to six numbers, thus making more IP addresses available for appliances. The Internet 2 project, based on IPv6 using a new protocol stack allows the testing of new services and applications (Amor, 2002: 87:88:796).

“Abilene is named after a railhead established in Abilene, Kansas during the 1860’s. In its time the ambitious railhead of the 1800’s staked a claim on what was then the frontier of the United States; the Abilene Project establishes a foothold from which to explore and develop pioneering network technology. The links of last century’s railway changed the way people worked and lived. The Abilene Network is transforming the work of researchers and educators today” (Abilene, 2005).

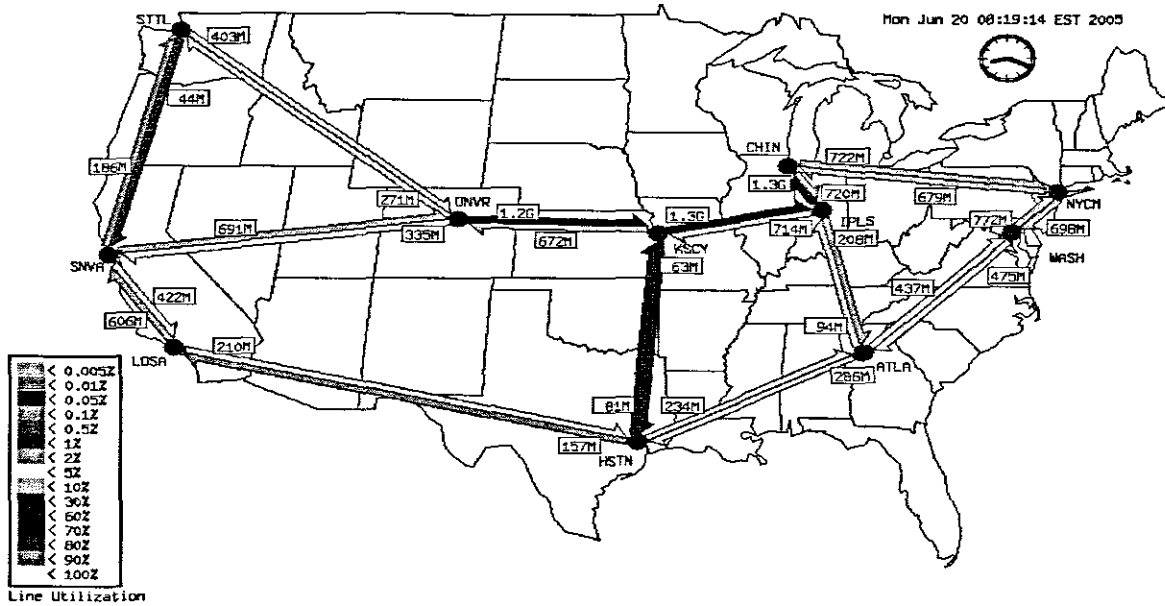


Figure 2.12: Status of the Abilene network at 10Gbps as at 20/06/2005²⁴ (Abilene, 2005).

One success story in the utilisation of the Internet2 is laparoscopic surgery (Danmore II, Johnson, Dixon, Iverson, Ellison and Melvin, 1999:1). They summarise their experience of the Internet2 as:

“While currently available for research purposes, we believe the data capacities of the Internet2 will be available soon commercially and will allow this technique of telemedicine to be applied anywhere... Internet2 remains limited outside universities but is projected to expand rapidly” (Danmore II *et al*, 1999:3).

²⁴ <http://loadrunner.uits.iu.edu/weathermaps/abilene/abilene.html>

2.7.2 Internet marketing and advertising

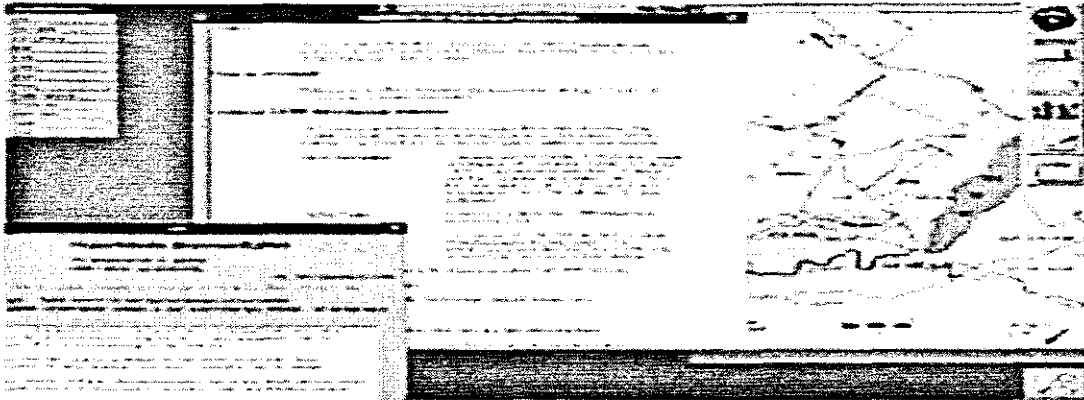
The second e-commerce application disused in this research is the use of Internet marketing and advertising for SMMEs. One objective of the study was to determine whether the Internet can effectively and beneficially assist in the marketing and advertising of a SMME's products and services.

This objective is answered by Angehrn (1997:2) referring to the ICDT model. He discusses how the Internets virtual information space has attracted the attention of businesses during the first Internet development phase, resulting in the Web becoming rapidly crowded. Interestingly the Web now has many multimedia presentations of product and service providers from nearly all business sectors. But what about these businesses marketing and advertising strategies? A second generation of mature strategies is emerging for the commercial exploitation of the virtual information space. These mature strategies are performed by businesses able to integrate the new Internet-based channels into the company's marketing strategy. This enables the exploitation of the uniquely differentiating characteristics of the Internet, for example its interactivity. Ultimately, this allows the development of new forms of effective Internet-based market information exchange (Angehrn, 1997:2-3).

2.7.3 The World Wide Web

The Web is often mistaken as the Internet but is a subset of the Internet. Some authors refer to the Web as WWW or W3. The Web is an information space in which the items of interest known as resources are identified by global identifiers. The Web is a service that operates over the Internet and is accessible through a Web browser. The very first Web browser running on a NeXT system, written by the inventor²⁵ of the Web at the European Organization for Nuclear Research (CERN), is displayed in Screen capture 2.1. It was through this Web browser that people could see the existence of a Web page running on a Web server. (Berners-Lee, 2000:51; Anon, 2005e; Amor, 2002:817).

²⁵ Berners-Lee is accredited with the invention of the Web in 1989 and heads the World Wide Web Consortium (W3C) (Berners-Lee and Fischetti, 1999)



Screenshot of the very first WWW browser running on a NeXT system

Screen capture 2.1: The very first Web browser running on a NeXT computer (Anon, 2005e)

Introducing the infrastructure of the Web, Berners-Lee and Fischetti (2000:129-130) state:

“The Web’s infrastructure can be thought of as composed of four horizontal layers; from bottom to top, they are the transmission medium, computer hardware, the software and the content. The transmission medium connects the hardware on a person’s desk, software runs Web access and Web sites, while the Web itself is only the information content that exists thanks to the other three layers. The independence of the layers is important. From the software engineering point of view, this is the basic principle of modularity. From the point of view of economics, it is the separation of horizontal competitive markets from anticompetitive vertical integration. From the information point of view, think of editorial independence, the neutrality of the medium” (Berners-Lee & Fischetti, 2000:129-130).

The Web can be defined as:

“The world wide web is a massive collection of ‘pages’ of information – more than five billion at the last count – which uses the internet as its transport mechanism” (Powell, 2004:76).

According to Anon (2005e), and Berners-Lee and Fischetti (1999; 2000:4), the original motivation behind the design of the Web was for the inventor to access library information placed on various servers. To illustrate a group of Web servers running over the Internet, a graphical representation is shown in Figure 2.13 (Anon, 2005e).

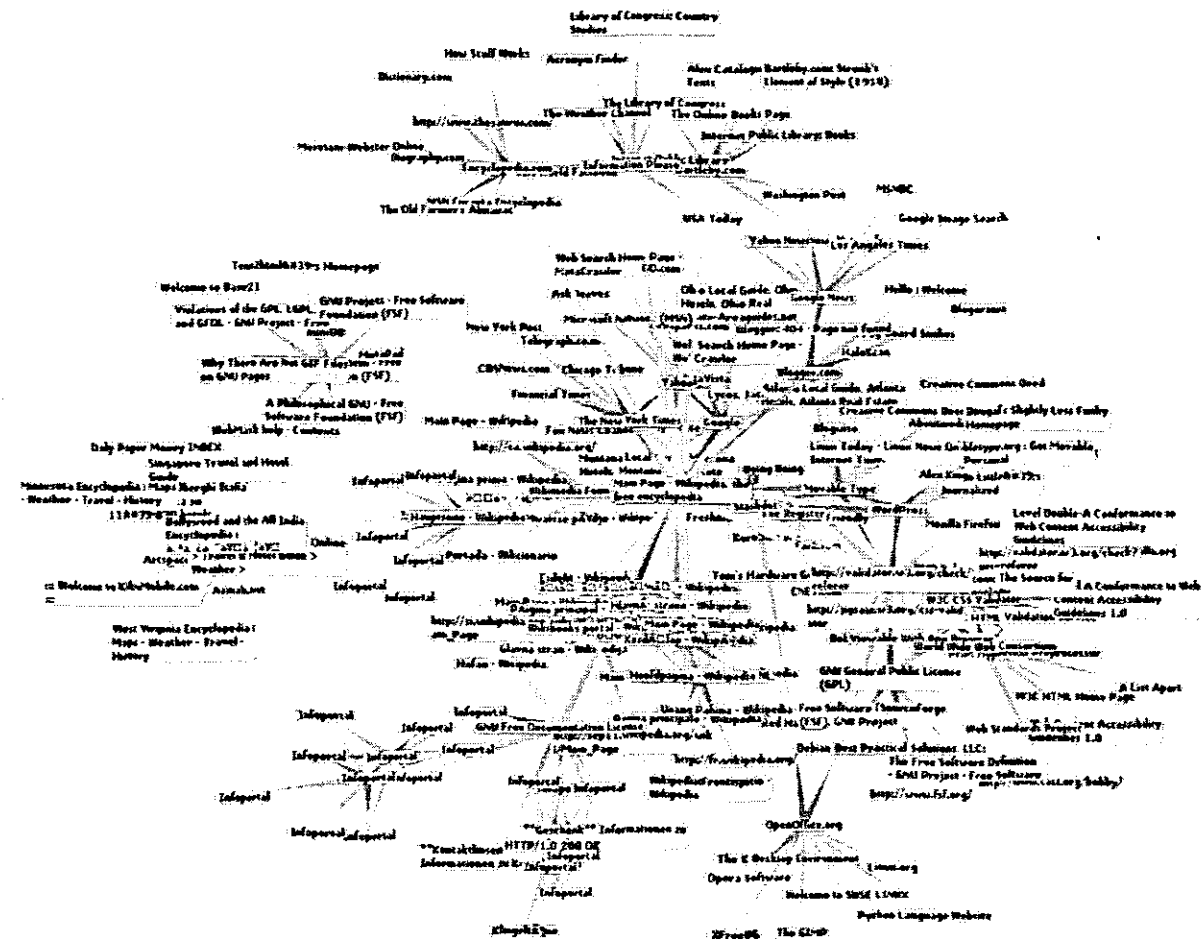


Figure 2.13: A graphical representation of the Web (Anon, 2005e)

Fielding and Taylor (2002:1) summarise the importance of the Web and state:

“The World Wide Web has succeeded in large part because its software architecture has been designed to meet the needs of an Internet-scale distributed hypermedia application. The modern Web architecture emphasizes scalability of component interactions, generality of interfaces, independent deployment of components, and intermediary components to reduce interaction latency, enforce security, and encapsulate legacy systems” (Fielding & Taylor, 2002:1).

One core technology supporting the functionality and enabling the linking of documents of the Web is hypertext.

“For people to share knowledge, the Web must be a universal space across which all hypertext links can travel.” Berners-Lee and Fischetti (2000:163)

Hypertext is viewed using a software program called a Web browser that retrieves information in the form of a document known as a Web page. A Web page is typically situated on a Web server and is displayed on a computer monitor or PDA screen. The hyperlinks on each page, allow other Web pages to be followed, an activity that is commonly known as 'surfing' or 'browsing' (Anon, 2005e; Berners-Lee and Fischetti, 1999).

Web standards

A Web address, originally known as universal document identifier (UDI), is now known as a uniform resource locator (URL) (Berners-Lee & Fischetti, 2000:61). A URL is unique address given to each Web page. The address is used by Web browsers to locate a resource on the Web. When a link associated with a URL is clicked, it is the anchor in a Web page that specifies when the Web browser will transfer to. There are three sections to a URL, namely: the protocol designator; the location of the Web server and the path name of the resource (Ince, 2003:234).

Using 'http://www.wendycap.co.za/html/wendy_options.htm' as an example of a URL and referring to Screen capture 2.2, 'http' refers to the protocol used for transferring Web pages while 'www' designates the name of the Web server. The domain name of where it can be found is therefore 'wendycap.co.za'. The final section indicates the path by which where the file 'wendy_options.htm' can be found in the directory 'html' (Ince, 2003:234).

Other protocols may be used, for example file transfer protocol (FTP). The protocol FTP forms part of TCP/IP and is used for the transfer of files stored on a FTP server. As the client is not required to identify him or herself during transfer of a file, the term anonymous FTP is sometimes referred to. Referring to the URL Web page example, 'http' would be replaced with 'ftp' if the link referred to a FTP server (Ince, 2003:92; 2003:234).

The screenshot shows a web browser window displaying the Wendy Cape website. The page features a navigation menu with links for HOME, WENDY OPTIONS, ENTERTAINMENT HUT, GALLERY, and CONTACT. A prominent table lists various options with columns for NOMINAL SIZES, WALL HEIGHT OPTIONS, WINDOWS INCLUDED, INSULATION ROOF, and VERANDAH. To the right of the table is a 'VISIT OUR SHOWROOM' section with an image of a wooden structure.

NOMINAL SIZES	WALL HEIGHT OPTIONS		WINDOWS INCLUDED	INSULATION ROOF		VERANDAH
	1.3m WALLS	2.1m WALLS				
A.X.S.						
1.8 x 1.8 m	R3490	R3590	1 SINGLE	R230	R950	
1.8 x 1.8 m	R3790	R4050	1 SINGLE	R250	R950	
1.8 x 2.3 m	R4490	R4550	1 SINGLE & 1 DOUBLE	R270	R950	
1.8 x 3.0 m	R4990	R4990	1 SINGLE & 1 DOUBLE	R280	R950	
1.8 x 3.6 m	R5390	R5890	1 SINGLE & 1 DOUBLE	R300	R950	
2.4 x 1.8 m	R4390	R4890	1 SINGLE & 1 DOUBLE	R270	R1390	
2.4 x 2.4 m	R4990	R5490	1 SINGLE & 1 DOUBLE	R290	R1390	
2.4 x 3.0 m	R5490	R5990	1 SINGLE & 1 DOUBLE	R310	R1390	
2.4 x 3.6 m	R5790	R6290	1 SINGLE & 1 DOUBLE	R320	R1390	
2.4 x 4.8 m	R6990	R7590	3 DOUBLES	R450	R1550	
3.0 x 1.8 m	R4990	R5490	1 SINGLE & 1 DOUBLE	R280	R1990	
3.0 x 2.4 m	R5490	R5990	1 SINGLE & 1 DOUBLE	R310	R1990	
3.0 x 3.0 m	R5790	R6290	1 SINGLE & 1 DOUBLE	R340	R1990	
3.0 x 3.6 m	R6290	R6790	2 DOUBLES	R360	R1990	
3.0 x 4.8 m	R7290	R7890	3 DOUBLES	R480	R1890	
3.6 x 1.8 m	R5390	R5890	1 SINGLE & 1 DOUBLE	R290	R2390	

Screen capture 2.2: A static Web page²⁶

HTTP is a seminal protocol used by the Web. This protocol is essential for the communication between a Web browser and a Web server (Ince, 2003:116). HTTP typically specifies how a Web browser and a Web server send information to each other and ensures the transfer of HTML documents (Amor, 2002:83). A definition of HTTP is:

“...the form of client-server rules for exchanging information of the World Wide Web (WWW)” (Sinclair, 2003:196)

²⁶ http://www.wendycap.co.za/html/wendy_options.htm

To exemplify this, when a hyperlink is clicked in a Web page the Web browser sends a message to the Web server containing the file, for the file to be retrieved (Ince, 2003:116).

According to Sinclair (2003:196), HTML is the standardised form of documents stored on Web sites and uses ASCII²⁷ characters for commands and formatting (tags) so that the text displays on a screen.

Whiteley (2000:175) agrees that HTML is the language of the Web and the building blocks of a Web page and may be used to create e-commerce Web sites. Ince (2003:116) argues that HTML is the language for the development of documents that are used on the Web. Sinclair (2003:196) and Ince (2003:116) discuss the use of tags. These tags indicate which facilities may be used by the writer. For example tag <P> inserts a paragraph. A further important feature is the allowing of hyperlinks to be embedded in the language.

Extensible markup language (XML) is a method for inputting structured data²⁸ into a text file. XML is a markup language and not a programming language. XML looks similar to HTML. XML makes use of tags (words bracketed by '<' and '>') and attributes (name="value"). HTML however specifies what each tag and attribute mean. XML uses the tags primarily to delimit bits of data leaving the interpretation of the data completely to the application that reads it (Sims & Tikekar, 2001:4).

The document object model (DOM) describes a model where a document or a Web page contains objects that can be manipulated. Examples of these objects are text elements, images and links. DOM allows removing, modifying or adding an element to a specific document. The content of elements may be changed together with removing, modifying or adding attributes (Amor, 2002:436). According to W3Schools (2005) an element must have an 'identity' attribute defined and a scripting language is required, for example JavaScript. The World Wide Web Consortium states:

²⁷ American standard code for information interchange (Sinclair, 2002:23)

²⁸ Spreadsheets, tables, drawings etc

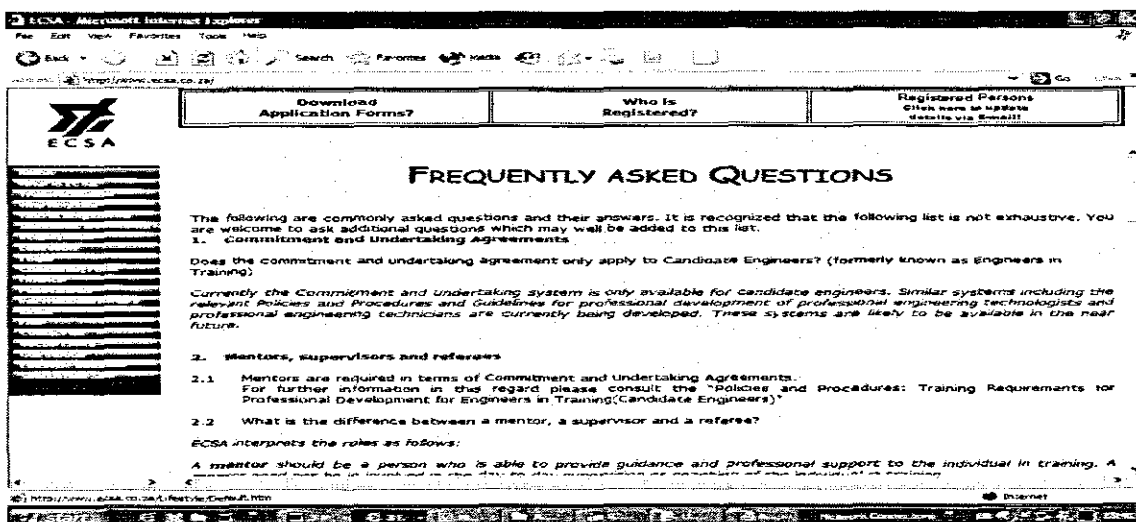
“The goal of the DOM specification is to define a programmatic interface for extensible markup language (XML) and HTML” (W3C, 1998:3).

2.7.4 Frequently asked questions

A Web page may be designed as a frequently asked question (FAQ) page to assist in the customer relationship management (CRM) process. Customer care centres are necessary in order to build up an online service. Many businesses are inundated daily with emails requesting information. Large sites, for example eBay²⁹, receive up to 60 000 emails a week asking similar or identical questions. To alleviate the workload of the response team and decrease the reply time to these emails, businesses find it helpful to build up databases with FAQs, and answers, to the queries (Amor, 2002:181; Scholtz, 2005). Mustaffa and Beaumont (2004:8) state:

“Customers can be encouraged to order by obtaining written answers to their common questions from FAQ pages” (Mustaffa & Beaumont, 2004:8)

A typical FAQ Web page consists of questions and their answers that may be interesting to many customers. An example, the FAQ page of ECSA, is shown in Screen capture 2.3.



Form
Comp
Form
Comp
Form
Comp
Form
Comp

Screen capture 2.3: A FAQ page from ECSA³⁰

²⁹ <http://www.ebay.com>

³⁰ <http://www.ecsa.co.za>

According to Mustaffa and Beaumont (2004:3), FAQ pages provide customers with answers to often asked questions. These are often about products, product features, product uses, and technical support. FAQs are available to support electronic customer relations in the virtual transaction space (Hausman, 2005:7). The information, communication, distribution and transaction (ICDT) model, establishes a virtual communication space presence requiring the training of business employees. This training is required as the Internet is effectively a communication medium supporting electronic customer relationship (Angehrn, 1997:6). FAQs may be accessed by customers from a business Web site. To exemplify the mobility of current electronic customer relationship management (CRM), a cellular phone operator in the UK is considering the installation of CRM software on hand held devices to better inform its business sales force. This strategy will enable the sales force to fully utilise the hosted CRM software, anywhere over the business's third-generation (3G) network. Business benefits include easier preparation of: customer data, customer registration processes, qualification procedures and tracking leads (Knights, 2005).

2.7.5 Electronic data interchange

The Internet, Web pages and FAQs are three seminal applications of e-commerce. The fourth application discussed in the chapter is EDI. EDI can be defined as:

“....the computer-to-computer exchange of business information using a public standard. EDI is a central part of Electronic Commerce because it enables businesses to exchange information electronically much faster, more cheaply and more accurately than is possible using a paper-based system” (Tradanet, 1999).

EDI, first used more than 20 years ago in the transportation industry, is the data format used by the majority of global e-commerce business transactions. EDI is an electronic computer-to-computer exchange of structured information from one computer software application to another (Anon, 2005a).

EDI uses agreed messaging standards and can reduce human involvement to a minimum through its automated data interchange methods. International standards allow methods of business transactional data to be exchanged between businesses and prescribe the formats, character sets and data elements used in the exchange of documents and forms including purchase orders and invoices. EDI documents should contain the same data that would normally be found in a paper document used for a specific business activity for example, ship to address, bill to address, product numbers and order quantities. EDI standards were initially designed for private network use (Anon, 2005a). One such standard is X12 EDI, or ASC X12. This standard holds more than 315 EDI transaction sets, tested over the past 25 years. X12 EDI revolutionised B2B e-commerce in the 1970s and 1980s and today continues to provide sound and secure solutions for high volume messaging (ASCX12, 2005).

Internet EDI

EDI has adapted and can now be transmitted using Internet protocols across the Internet. Traditional EDI uses private networks and bisynchronous 2.4 Kbps modems. Internet EDI replaces the traditional transmission methods of EDI with Internet protocols including FTP, email, XML and ebXML³¹ services (Anon, 2005a; Kotok & Webber, 2001). ASCX12 (2005) state:

“As conflicting XML messages proliferate, ASC X12 is using its open, consensus-based standards process to create a new generation of e-business messaging, providing a foundation for tomorrow's technology environments. ASC X12's new XML architecture, called Context Inspired Component Architecture (CICA), enables individuals to build XML business documents in a cross-industry setting and ensures organizations a significant return on investment” (ASCX12, 2005).

³¹ Electronic business using extensible markup language (ebXML) is a term used by businesses focussing on business solutions rather than the technology

2.7.6 Electronic mail

The literature has shown that email is a useful marketing, CRM and communication medium. To exemplify the use of this rapid and effective communication application, this author emailed the inventor of the Web in the US and received a reply eight hours later (Berners-Lee, 2005). For an SMME to take advantage of email as a rapid and effective telegraphy application, consideration should be given to the type of email most suitable for a business.

Mail client program

To utilise email³² as an application a mail client program is required. This can be software package based or a Web browser based (Whiteley, 2000:167). Examples of email software packages are Microsoft Outlook³³ and Pegasus Mail³⁴. Harris (2002) describes Pegasus Mail as:

“... a free, standards-based electronic mail client suitable for use by single or multiple users on single computers or on local area networks. A proven product, it has served millions of users since it was released in 1990. It is extremely feature-rich and powerful, yet remains small and fast” (Harris, 2002).

Screen capture 2.4 depicts software package based email and screen capture 2.5 depicts Web browser based email. Incoming emails are downloaded from a server to a post box or inbox. Outgoing emails are sent to a server for transmission through the Internet. Email, based on the protocols of packet switch services (PSS) and IP, requires a senders and recipients email address. (Passmore, 2004:1; Whiteley, 2000:167).

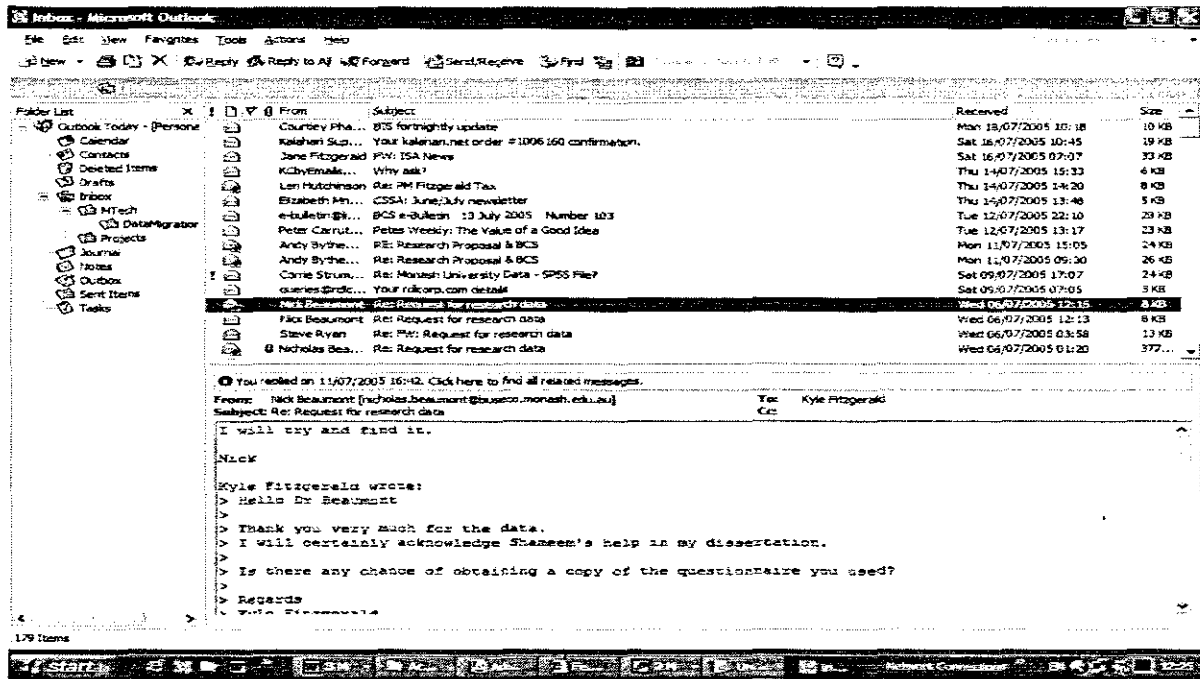
Sinclair (2003:142) defines an email address as:

“A set of characters used to identify the sender or receiver of email”
(Sinclair, 2003:142).

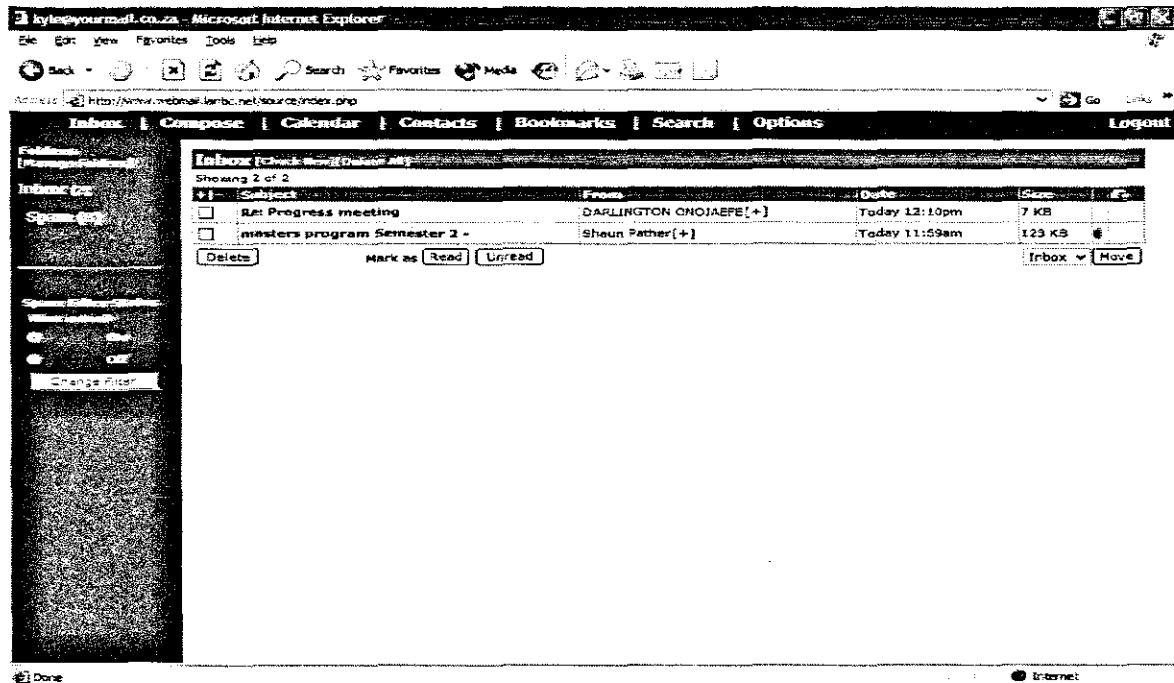
³² A system for delivering messages by downloading text from computers along telephone wires (Sinclair, 2003:142).

³³ <http://www.microsoft.com/>

³⁴ <http://www.pmail.com/>



Screen capture 2.4: Software package based email



Screen capture 2.5: Web browser based email

These addresses are contained within the email message packets as address information. The email address takes the form of a name, the '@' sign followed by the domain name, for example myname@domainname.co.za'. The domain name is used on the mail server to derive the IP address (Passmore, 2004:1; Whiteley, 2000:167).

2.8 The effects and benefits of e-commerce

From the literature it is clear that some strategies do work to produce effects on businesses allowing the creation of e-commerce benefits.

2.8.1 Business effects of e-commerce

Mustaffa and Beaumont (2004:5) based their research analysing the business effects of e-commerce on SMMEs, on a simple model. They hypothesised that e-commerce application utilisation (or the use of e-commerce technology) produced business effects and these produced business benefits, for example: revenues and costs. They state that listing business effects and business benefits is sometimes beside the point as SMMEs may have to adapt to it. In their research they classified business benefits as increased revenue, reduced costs and increased competitive advantage in both long- and short-term perspectives. Improved communication with suppliers, customers and partners exemplify their classification of business effects. The effects, with some costs, were separated into tangible and intangible as depicted in Figure 2.14 below.

Tangible	<ul style="list-style-type: none"> • Reduced cost of communication amongst staff and functions • Reduced advertising costs • Cost of establishing and maintaining e-commerce 	<ul style="list-style-type: none"> • Reduced cost of communication with customers and suppliers
	<ul style="list-style-type: none"> • Acceleration of business processes 	<ul style="list-style-type: none"> • New modes of promotion (advertising on the Web) • New ways of developing and maintaining lists of clients • Elimination of geographic restrictions • Entry of overseas competitors at marginal cost
Intangible	Internal	External

Figure 2.14: Effects and costs of e-commerce, Mustaffa and Beaumont (2004:6)

Brynjolfsson and Hitt (2000:23) support the work of Mustaffa and Beaumont (2004:5) and share an interesting view of their research into IT and e-commerce utilisation. They state:

“The use of firm-level data has cast a brighter light on the black box of production in the increasingly information technology-based economy. The outcome has been a better understanding of the key inputs, including complementary organizational assets, as well as the key outputs including the growing roles of new products, new services, quality, variety, timeliness and convenience. Measuring the intangible components of complementary systems will never be easy. But if researchers and business managers recognize the importance of the intangible costs and benefits of computers and undertake to evaluate them, a more precise assessment of these assets needn't be beyond computation” (Brynjolfsson & Hitt, 2000:23).

Mustaffa and Beaumont (2004:6) designed their research around the use of six e-commerce applications. These applications were surveyed for e-commerce effect significance as depicted in Table 2.2.

This study was based on the effects³⁵ per application listed in Table 2.2. To clarify the association lets take a look at the first application: a Web page. The two effects read as:

- Does a Web page assist in attracting new customers?
- Does a Web page help to expand local markets?

³⁵ A full list of these effects is listed in appendix F.

Table 2.2: E-commerce effect significance, based on Mustafa and Beaumont (2004:6)

Application	Effect
Web page	<ul style="list-style-type: none"> • Attract new customers • Expand local markets
Have a FAQ page	<ul style="list-style-type: none"> • Tailor products/services to customers • Stay in touch with customers • Receive timely feedback
Advertise on the Internet	<ul style="list-style-type: none"> • Reduce advertising cost
Use the Internet	<ul style="list-style-type: none"> • Expand products/services • Alternative supplies • Enter overseas markets • Overseas competitors into Australian market • Bypass traditional supplier • Sell direct to customer
Use Internet EDI	<ul style="list-style-type: none"> • Cut order and delivery time • Reduce data entry cost • Increase data transfer speed • Reduce data entry errors • Hold less inventory
Email	<ul style="list-style-type: none"> • Stay in touch with customers • Stay in touch with suppliers • Stay in touch with business partners • Stay in touch with employees

2.8.2 Business benefits of e-commerce

Further in their study Mustafa and Beaumont (2004:5) note the many cited benefits for using e-commerce in business. The major advantages (or perceived benefits) are: greater geographical coverage; decreased selling costs; and supporting competitive advantage. Some authors argue about the risks associated with perceived benefits. Onojaefe (2005:14) states:

"...important business opportunities associated with the Internet can be successfully grasped, but there are risks that can obliterate the benefits to be gained" (Onojaefe, 2005:14).

While understanding that there are risks associated in attempting to gain business benefits three prominent benefits are explored.

2.8.2.1 The cost benefit

According to the literature reduced cost is one such benefit. Research from some authors states cost is a prohibitive factor for e-commerce utilisation including the Internet (Warden & Williams, 2003:6; OECD, 1998:2). Warden and Williams (2003:6) explain how South African SMMEs not adopting e-commerce owing to cost factors, do so believing that Internet use does not achieve business growth or create customer satisfaction. Cost is a prohibiting factor but those SMMEs that perceive benefits of e-commerce adoption will plan to invest in IT.

Results from research conducted by Warden and Williams (2003:6) indicate that costs do not outweigh the derived business benefits. They state that those SMMEs that do use e-commerce find the benefits are far greater than the cost associated with utilising e-commerce. They confirm that email is the main communication application used by South African SMMEs. Warden and Williams (2003:7), indicate from their research results, that gaining competitive advantage, attracting new customers, keeping up with the competition and accessing international markets were four essential uses for e-commerce adoption by South African SMMEs. Results from a recent study on Australian companies suggest that increased internal and external benefits from the use of e-commerce significantly predict the expected and/or perceived success of e-commerce (Quaddus & Achjari, 2005:1). According to Mustaffa and Beaumont (2004:8), long-term costs are related to: staying in touch with employees; entry of overseas competition; and selecting alternative suppliers. The former is associated with email while the latter two are associated with Internet usage. But how is the scope of the business related to the benefits gained?

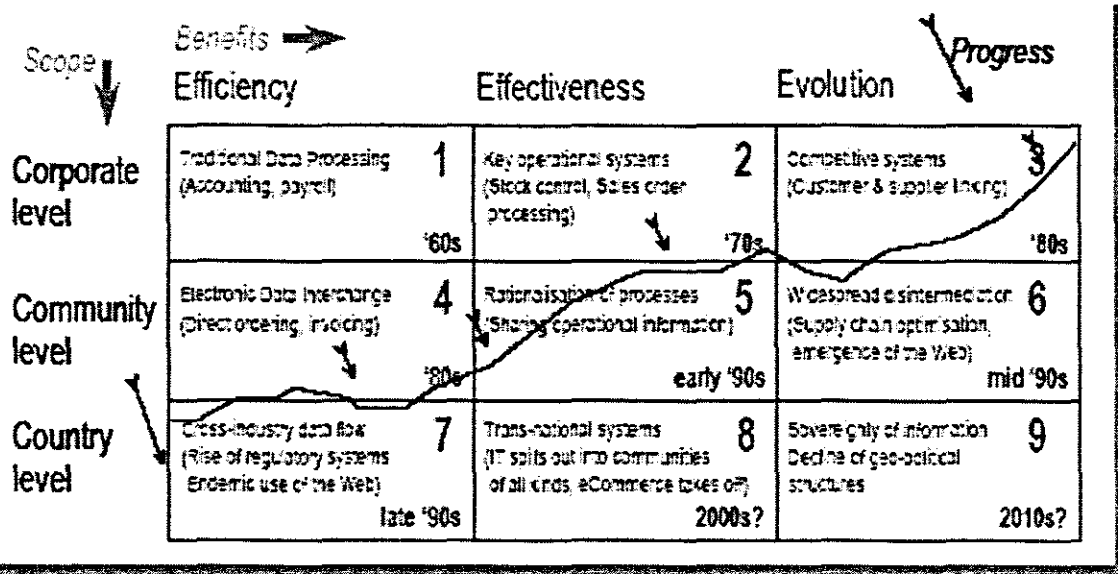


Figure 2.15: A framework of scope and benefit evolution (Bytheway, 2004:33)

Figure 2.15 depicts the simultaneous progress of scope and benefit. According to Bytheway (2004:34), to gain increased business benefits the business scope must expand accordingly. With reference to Figure 2.15 he states:

“These two things – benefits and scope – characterise the change in the nature of information systems over the decades more than anything else. The combination of the two, as each progresses from the early to the later stages, reveals much about how management thinking has developed over the years.” (Bytheway, 2004:34).

2.8.2.2 Competitive advantage

A second prominent benefit according to the literature is competitive advantage. Bytheway (2004:5) explains how competitive advantage was focussed upon in the late 1980s supported by the investment in, and the use of, information systems (IS). This is exemplified by Angeles, Corritore, Basu and Nath (2001:2) in their study of using EDI providing competitive advantage as a success factor for business. By the 1990s Bytheway (2004:5) argues that the window of advantage had narrowed owing to the commoditisation of information technology (IT). However during the 1990s, e-commerce was bolstered by the introduction of the public Internet and the development of the Web creating new opportunities for business to take advantage of Internet e-commerce (Passmore, 2004:1; Berners-Lee & Fischetti, 2000:200).

One major objective in the survey performed by Poon and Swatman (1997a:7) was to determine the ratio of SMMEs experiencing increased competitive advantage. The results showed more than 86% percent of the respondents had acquired or would acquire competitive advantage. The researchers deduced that the core reason for this high percentage was primarily based on perceived or understandable benefit as described in Figure 2.16. There was no documentary or quantitative evidence to substantiate the respondents' opinions however it was the respondents understanding that:

- their businesses were either more prominent on the Web; or
- direct competitors were not using the Internet

Benefits	<ul style="list-style-type: none"> • Reduced communication costs • Generate short-term revenue 	<ul style="list-style-type: none"> • Secure returning sales • Ongoing products or services delivery
	<ul style="list-style-type: none"> • Immediate business opportunities • Advertising and marketing 	<ul style="list-style-type: none"> • Ongoing business transformation • New business formation
Effects	Short term	Long term

Figure 2.16: Perceived benefits versus time frame adapted from Poon and Swatman (1997a:8)

The businesses that did not derive benefits from Internet usage kept their Internet connections, as this was still affordable to them. This situation can be compared to a business's fax machine, where disposing of it, would provide competitive disadvantage. Perceived benefits included tangible and intangible benefits.

According to Mustaffa and Beaumont (2004:8), short-term competitive advantage is associated with the entry of overseas competitors into local markets and the expansion of local markets. Long-term competitive advantage is associated with the range of products and/or services offered over the Internet and local markets using Web pages.

2.8.2.3 The benefit of new revenue

New revenue was found to be a significant benefit according to the research of Mustaffa and Beaumont (2004:8). E-commerce, together with its supporting technologies, offers enormous business benefits including increased revenue and reduced operating costs (Heung, 2003:2).

For example, Asian businesses have developed fast response technologies including bar coding, point-of-sale (POS) scanning, EDI and automated distribution centres designed to increase revenue (Moodley & Morris, 2004:21 citing Abernathy³⁶, Dunlop, Hammond & Weil). Mustaffa and Beaumont (2004:8) argue that short-term revenue increases are gained through attracting new customers and reducing advertising costs. Long-term revenue is gained through attracting new customers, reducing advertising costs, keeping in touch with customers, expanding product and/or services and trading in overseas markets. Pather, Erwin and Remenyi (2003:2) argue that it is not the 'if' but the 'how' of increasing revenue that is important, for example: how does a Web based presence generate increased revenue?

2.8.3 Factors supporting business benefits

Poon and Swatman (1997a:11) discovered that entrepreneurship was clearly evident among their surveyed Internet users which prompted the exploration of entrepreneurship and benefit relationships. They argue that an entrepreneur is usually a small company business owner. Entrepreneurship is defined by Poon and Swatman (1997a:11) citing Drucker³⁷ as:

³⁶ Abernathy, F.H., Dunlop, J.T., Hammond, J.H. & Weil, D. 1999. *A Stitch in time: lean retailing and the transformation of manufacturing - lessons from the apparel and textile industries*. New York: Oxford University Press.

³⁷ Drucker, P. F. 1985. *Innovation and entrepreneurship: practice and principles*. William Heinemann, UK.

“[The way an entrepreneur] always searches for change, responds to it, and exploits it as an opportunity” (Poon & Swatman, 1997a:11).

They point to the influence of the Internet on entrepreneurs by suggesting the Internet adds a totally new dimension to small business. According to (Poon & Swatman, 1998:2) the Internet supports both internal and external business functions of IT and IS utilisation, is affordable and cheap to use yet powerful and global, allowing small businesses the luxury of exploring the potential of the Internet at their own pace. In their previous research, five important factors contributing to small business IT success were raised.

These factors by Poon and Swatman (1997a:2) citing (Raymond, 1995³⁸; Martin, 1989³⁹; Yap, Soh, & Raman, 1992⁴⁰; Cragg & Zinatelli, 1995⁴¹) are:

- management enthusiasm;
- leadership;
- use of IT consultants to provide knowledge;
- competition;
- and user participation.

Poon and Swatman (1997a:1) citing (Barker, 1994⁴²; Fuller & Jenkins, 1995⁴³; Parker & Swatman, 1995⁴⁴; 1996⁴⁵) discovered two significant trends established from the most recent research on small business Internet usage.

³⁸ Raymond, L. 1985. Organizational characteristics and MIS success in the context of small business. *MIS Quarterly*, March:37-51.

³⁹ Martin, C.J. 1989. Information management in the smaller business: the role of the top manager. *International Journal of Information Management*, 9:187-197.

⁴⁰ Yap, C. S., Soh, C., P. P. and Raman, K. S. 1992. Information systems success factors in small business. *OMEGA International Journal of Management Sciences*, 20(5-6):597-609.

⁴¹ Cragg, P. B. and Zinatelli, N. 1995. The evolution of information systems in small firms. *Information and Management*, 29(1):1-8.

⁴² Barker, N. 1994. The Internet as a reach generator for small business. Unpublished Masters dissertation, Business School, University of Durham.

⁴³ Fuller, T. & Jenkins, A. 1995. Public intervention in entrepreneurial innovation and opportunism: short cuts or detours to the information superhighway? *Babson Entrepreneurship Conference*, London Business School, 9-13 April 1995.

⁴⁴ Parker C.M. & Swatman P.M.C. 1995. Educating tomorrow's managers for telecommunications and EDI: a cross-cultural experience, *Journal of Information Technology and People*, 8(2):58-79.

⁴⁵ Parker C.M. & Swatman P.M.C. 1996. TREAT: Promoting SME adoption of EDI through education, *Proc Conf "HICSS-29"—Proceedings of the 29th Hawaii International Conference on Systems and Software*, Hawaii, January:387-396.

These trends are:

- tangible benefits; and
- training

These trends are supported by two positive observations in the same research (Poon & Swatman, 1997a:5). These observations are:

- Curiosity: 62% of respondents were company⁴⁶ directors⁴⁷ and less than 50% of these directors had formal IT qualifications. Some of these directors motivated for their companies Internet adoption through empirical knowledge gained from informal experiences and not because of formal qualifications. Poon and Swatman (1997a:5) state:

“[It was] their curiosity and belief that such an information infrastructure offered opportunities for them to be more competitive which drove them to adopt the Internet” (Poon & Swatman, 1997a:5).

- Creating additional opportunities: The majority of businesses observed, 52%, had fewer than six staff prompting a further investigation for why this phenomenon had occurred. According to Poon and Swatman (1997a:5), the inconclusive trend found for these SMMEs was that they were:

“More sensitive to opportunities which could extend their visibility” (Poon & Swatman, 1997a:5).

One important reason for struggling businesses adopting the Internet was to create additional opportunities including international ones. Internet adoption decision making was rapid as these small businesses had basic organisational structures and often the director was the business owner.

⁴⁶ A company is an audited business and should not be confused with a close corporation, partnership or sole trader.

⁴⁷ A company director is not always a shareholder who holds shares in the business, whereas a member of a close corporation does, in the form of member's interest.

2.9 Business applications

Berners-Lee and Fischetti (2000:133) sum up the value of the Web in collaboration with the Internet when they state:

“All the human effort people and organizations have put in all over the world to create Web sites and home pages is outstandingly large, and most of the effort has to do with what’s in the Web, not the software used to browse it. The Web’s content, and thus value, will continue despite any one company’s actions” (Berners-Lee & Fischetti, 2000:133)

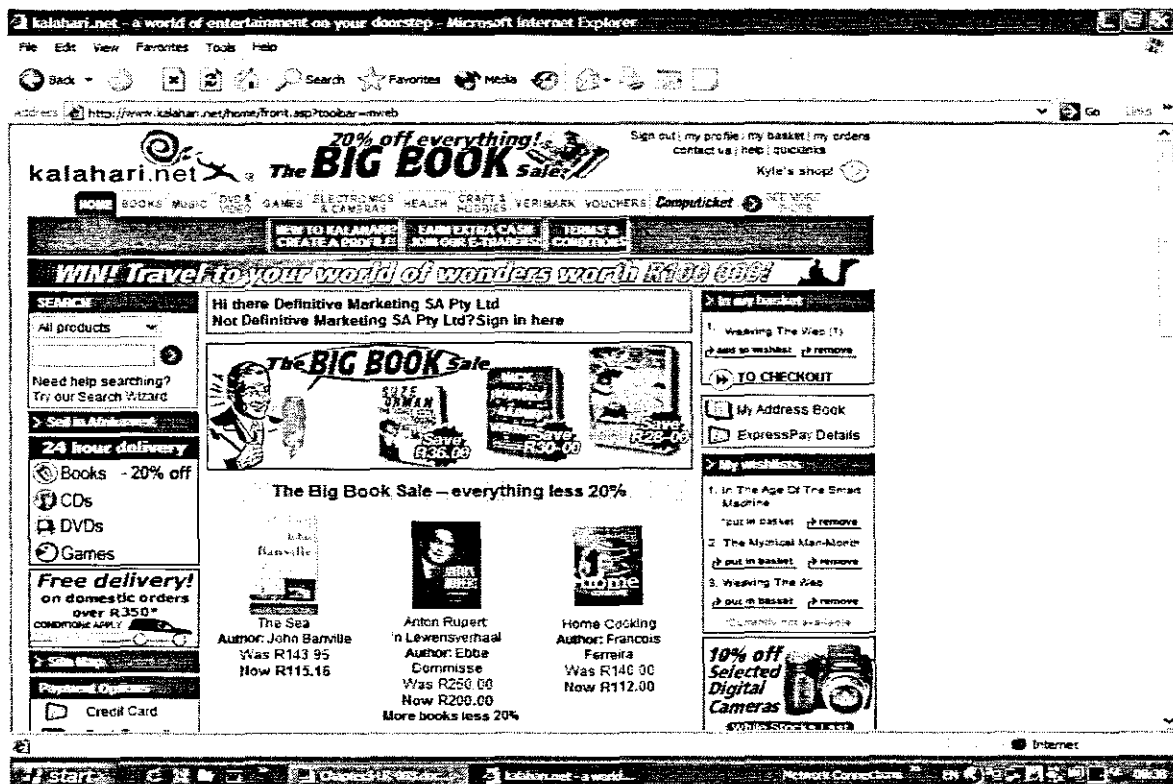
2.9.1 Web site adoption

Reflecting on the thoughts of Berners-Lee and Fischetti (2000:133) the content of the Web may be expanded by business through the adoption of Web sites. Businesses initially develop Web sites using static Web pages. Static Web pages have a major advantage as no programming knowledge is required (Amor, 2002:435). According to Ince (2003:216) a static Web page stays constant during the process of being retrieved and sent to a Web browser. All a business owner will require to set up a business Web page online is a Web page editor. The Web editor allows the information of the business to be displayed on the Web page.

Once online, Web server software is required for the Web page to operate across the Web. A static Web page requires low resources, unlike a dynamic Web page, on a Web server. The Web server’s only activity is to locate the Web page from the server’s hard disk drive and pass it on to the Web browser (Amor, 2002:434). Screen capture 3.2 shows a typical static Web page displaying products and prices. To update one item on this page, the whole page needs to be rebuilt. Static Web pages are primarily used by small businesses that require only a few Web pages that require infrequent updating (Amor, 2002:435).

As business owners become more experienced with Web page design, they will want to explore further options, for example linking Web pages to their business databases. The database model makes use of dynamic Web pages allowing visitors to the Web page to add, insert and delete data. Dynamic Web pages do consume more resources than static Web pages but are more flexible (Amor, 2002:435). Ince (2003:216) compares dynamic Web pages to static Web pages. He states that dynamic Web pages are altered before being sent to the Web browser and typically include dynamic data from a database.

To evident this, let's look at an online store as depicted in Screen capture 2.6. Kalahari.net⁴⁸ is a South African online store selling thousands of products. The details of each of the approximate 6000 products are stored on a database server. Credit card payments account for 99% of the products sold in South Africa (De La Harpe, 2005).



Screen capture 2.6: A dynamic Web page

⁴⁸ <http://www.kalahari.net>

The advantage of using a dynamic Web page is that it is simple to add new products to the range. This is performed by adding the product details to the database. Thereafter the details are extracted by the Web server and displayed on the Web page without rebuilding the Web page (Amor, 2002:435). He states:

“Through the use of dynamic Web pages, companies are able to create standard layouts, saved in a separate location from the data. When a customer accesses your Web site, the layout and the content are combined on the fly to form a highly individual Web page, which answers the customers query” (Amor, 2002:435).

Most businesses use dynamic Web pages as changes to the layout are made easy using templates. Three important benefits are derived namely: reduced cost for the business, reduced time in Web page design and development, and allows design agencies to create Web designs without touching the content (Amor, 2002:435).

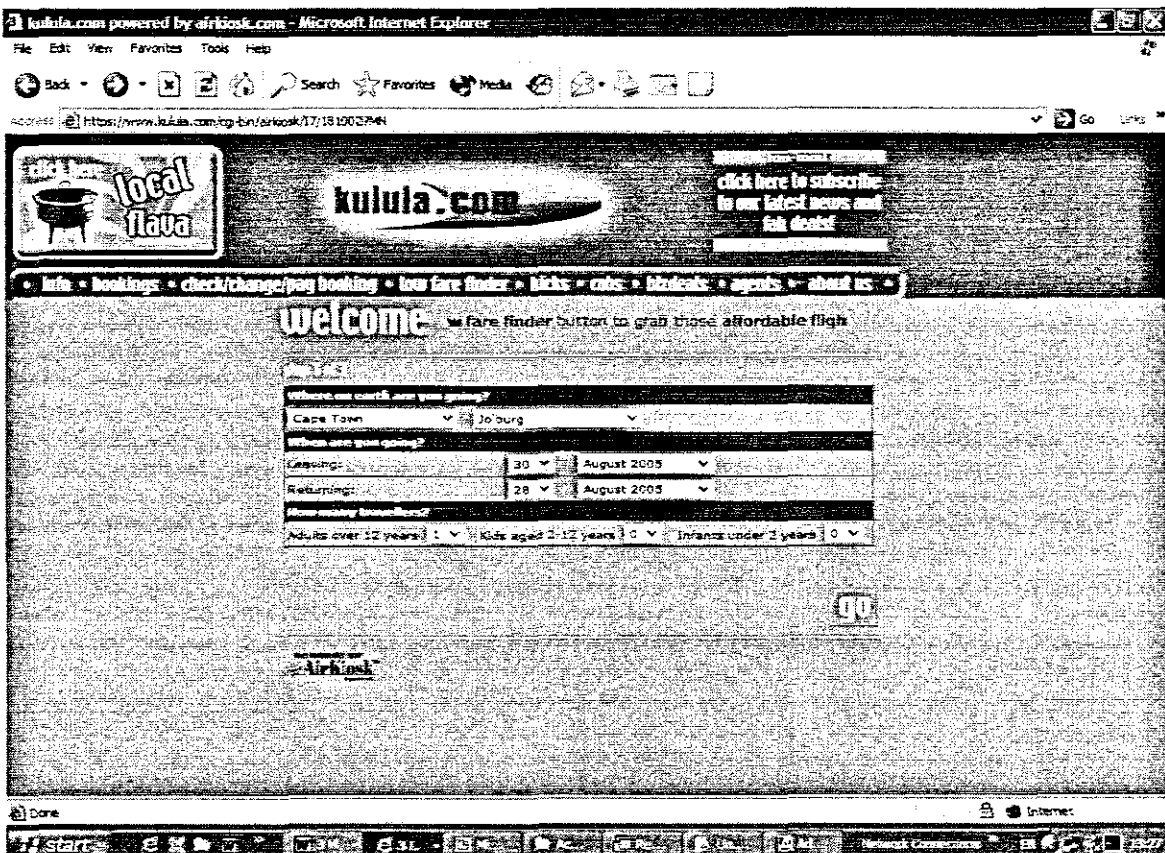
2.9.2 South African retail success factors

This simplification of Web page design has enabled business to contribute to the information space of the Web. Goldstuck (2004) reports:

“Despite the slow-down in growth of online retail in South Africa, the number of retail web sites has exploded: from 215 at the end of 2001 to more than 700 at the end of 2003” Goldstuck (2004).

He discusses how the South African market is dominated by the eight online retailers namely: Pick 'n' Pay Home Shopping, Kalahari.net, Woolworths Inthebag, Netflorist, Cybercellar, Streetcar.com, MWEB ShopZone and Digital Mall. These eight online retailers account for 80% of the online retail market in South Africa. According to Goldstuck (2004), the growth for these online retailers is steady but less strong than in past years. Most of them are in better condition now and are generally profitable.

A second example of a dynamic Web page is Kulula.com⁴⁹. Kulula, known as 'easy' in Xhosa⁵⁰, is a low cost airline company operating within South Africa. Kulula's parent company, (known as) Comair, holds the franchise rights to operate planes with British Airways insignia within South Africa. For the two airlines to compete different strategies were needed. Kulula's main strategy was to sell low cost plane tickets utilising a Web site with dynamic Web pages (Scholtz, 2005). Clients utilise the Kulula.com Web site to browse for flights and prices as shown in Screen capture 2.7.



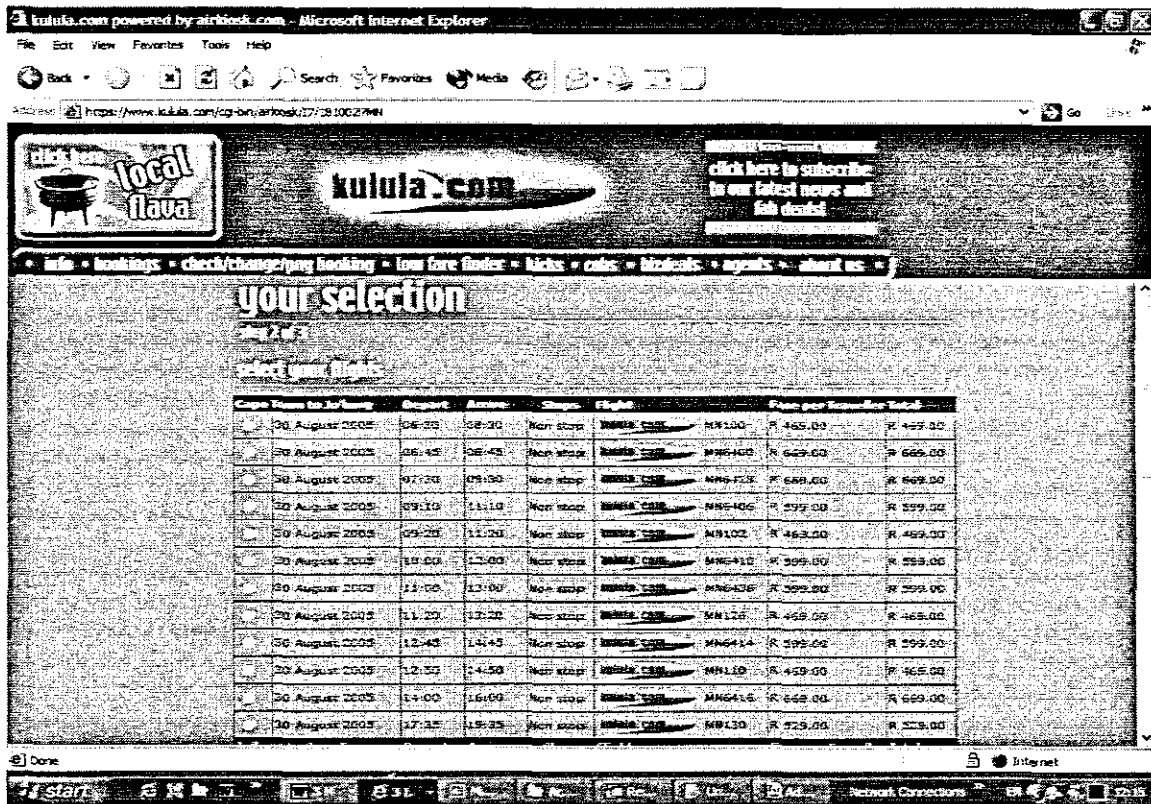
Screen capture 2.7: Flight departure and return options from Kulula.com

By entering a departure place and time, with an optional return date and time, flights details and prices are displayed using a Web browser as depicted in Screen capture 2.8. Owing to their successful strategy kulula.com has become the largest online retailer (by the number of transactions) in South Africa (Faber, 2004:3).

⁴⁹ <http://www.Kulula.com>

⁵⁰ Xhosa is one of eleven official languages in South Africa

This success is attributed to ten e-business key factors, namely: simplicity, efficiency, innovation, flexibility, responsiveness, scalability, security, manageability, fault tolerance and usability (Scholtz, 2005).



Screen capture 2.8: Flight and price details from Kulula.com

Faber (2004:3) relates the Kulula.com Web success by stating: "...in doing so the company drastically reduced the administration costs. Travel is an industry that works well on the internet because there is no need to deliver anything to consumers". Faber (2004:3) citing Novick states: "We banked on the popularity of the internet and the consumer convenience of simply being able to book tickets online". The success of Kulula.com, according to Scholtz (2005), is the utilisation of the Internet and the Web. Kulula.com is an Internet business and without the Web Kulula.com would not exist. The successful twelve point plan used by Kulula.com to implement and manage its robust web server technology is: redundancy, bandwidth availability, payment gateway interface, system performance management, application optimisation, web server scalability, firewalls, load balancing, database replication, mail servers, new websites and type 'B' messaging.

2.9.3 Benefits of online sales using the Web

Scholtz (2005) emphasises the benefits of online sales by explaining how Kulula.com sold 55,000 seats in two days over the Internet. He emphasises that in order for their call centre to handle this huge sales volume the staff quantity would need to have been increased from 60 to 1200. The design of the Web site took top priority. The number of Web pages used on Kulula's Web site, for purchasing an airline ticket by a client, was reduced from five to three. This strategy reduced the time a client spent on the server improving sustainability.

Scholtz (2005) emphasis these strategic decisions can only be made if IT can deliver the systems. He sums up the future of e-business as: industry is changing and technology is the theme, the Internet has a key role to play, we are just seeing the beginning and e-commerce and e-business are in their infancy.

2.9.4 Internet marketing success factors

Earlier marketing research by Kummerow and Lun (2005:4) show that many businesses in the 1990s adopted Internet marketing as a key factor of their business strategies. Some businesses were not successful resulting in other business shying away. Results from research carried out by Poon and Swatman (1998:7) indicate that business owners do not necessarily experience the Internet as an effective virtual marketplace. The results showed that the effectiveness of Internet marketing was industry-sector dependent. Results from research conducted by Mustaffa and Beaumont (2004:9) reveal that both Internet advertising and email are seminal marketing and CRM mediums.

According to Codrington (2005:1-2), one such CRM technique is the blog⁵¹. A blog is a Web page accessed via the Internet allowing comments from customers and others to state good and bad experiences about marketing brands and businesses. Three typical uses are: customer relations, public relations and marketing. He summarises a blog by stating:

“Blogs are a public broadcast medium which can effortlessly publish personal thoughts to innumerable viewers” (Codrington, 2005:1-2).

⁵¹ <http://www.blogger.com>

2.9.5 FAQ adoption and success factors

On larger sites, Amor (2002:182) suggests that FAQs are designed for every service and product line. He further suggests that on the feedback page a link should be provided to the FAQ page as the presentation should be prominent. *Pre-testing FAQs is vital with customers. This can be achieved by simply emailing prominent clients requesting their opinion.* Newsgroups are a further possible addition to FAQs where all the questions and answers are shown together with the customers (Amor, 2002:182). In order to accommodate the more difficult or seldom asked questions from customers, a service known as online chat may be used. Online chat offers written communication in real time (Amor, 2002:372).

Mustaffa and Beaumont (2004:3) citing Symonds⁵², discuss how Cisco Systems⁵³ grew very quickly creating bottlenecks at their after-sales support. Using the Internet and specifically FAQs, to automate and answer popular questions, the bottleneck was removed reducing costs in after-sales support. Quaddus and Achjari (2005:9) support this example by suggesting online businesses offer online help desks in the form of a FAQ facility. This creates the provision of a simple 24 hour a day support facility.

2.9.6 EDI and the trade cycle

According to Whiteley (2000:124) a major use of EDI is for the execution, exchange and settlement exchange within the trade cycle. The trade relationship is typically agreed in the context of a formal contract between trading partners⁵⁴. The documentation flow pattern, illustrated in Figure 2.17, for basic trade exchange is:

- the customer sends an order to the supplier;
- the supplier sends the goods and delivery note to the customer;
- after delivery the supplier sends an invoice to the customer; and
- the customer makes payment to the supplier against the invoice and sends a payment advice

⁵² Symonds, M. 1999. Business and the internet. *The Economist*: 64, June 26.

⁵³ <http://www.cisco.com>

⁵⁴ A trading partner is a business that has agreed to exchange business information electronically (Tradonet, 1999)

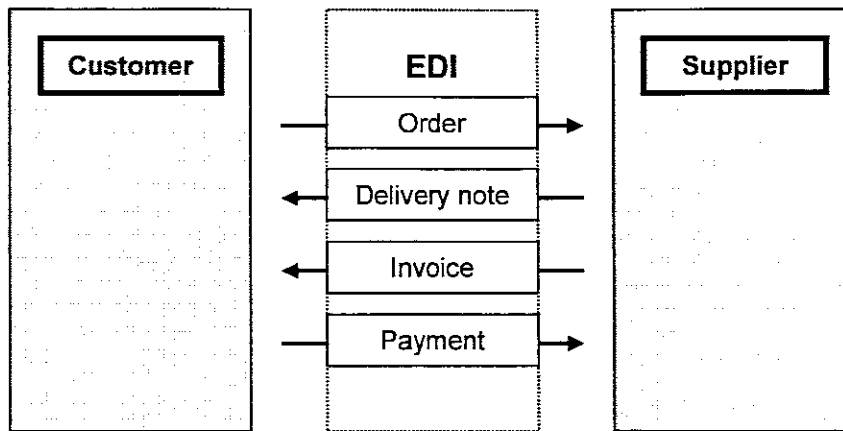


Figure 2.17: EDI trade document exchanges (Whiteley, 2000:124).

Potential benefits from EDI utilisation

Jiménez-Martínez and Polo-Redondo (2004:2) concur that EDI utilisation produces direct benefits to a business. These benefits are: increased paper savings, reduced filing costs and maintenance, reduced repetitive administrative procedures, and reduced administrative personnel. Indirect benefits listed are: increased payment speed, improved cash flow, reduced production stoppages, reduced purchasing and sales cycle (ordering, delivery and invoice), reduced stock levels and reduced inventory breaks.

Strategic benefits of EDI use, according to Jiménez-Martínez and Polo-Redondo (2004:2), are: increasing business relationships with companies using EDI, improving customer loyalty, improving the quality and quantity of information, faster response and access to information, gaining new business contacts using EDI and reducing the number of business contacts by concentrating on those that use EDI. They warn that the degree of EDI integration in the company needs to be addressed as this depends on the cost benefit ratio obtained. Heavy financial investment is required in implementing EDI as software and training of staff is required. These investments do later reduce communication and participation costs. They highlight that benefits are not evident initially but increase as the number of staff users and the businesses IT involvement grows.

Using EDI to reinvent a business

According to Zimmerman (2003:153), EDI can be used to increase a businesses ability to respond to changing demands from customers. Implementing EDI in a business can contribute to increasing staff productivity, reducing stock and supporting cash flow. To exemplify this, bar codes could be used on products in a warehouse. Tracking of these products entering or leaving the warehouse can be simply done by scanning the product. The details of the products could also be available on hand held computers or PDAs to include stock levels and re-order quantities, facilitating shorter ordering times (Zimmerman, 2003:157).

Zimmerman (2003:155) summarises the use of EDI by stating:

“Data analysis, shipping schedules production management, accounting, warehouse / inventory status, and shipping are just a few of the many different applications you can link to EDI” (Zimmerman, 2003:155).

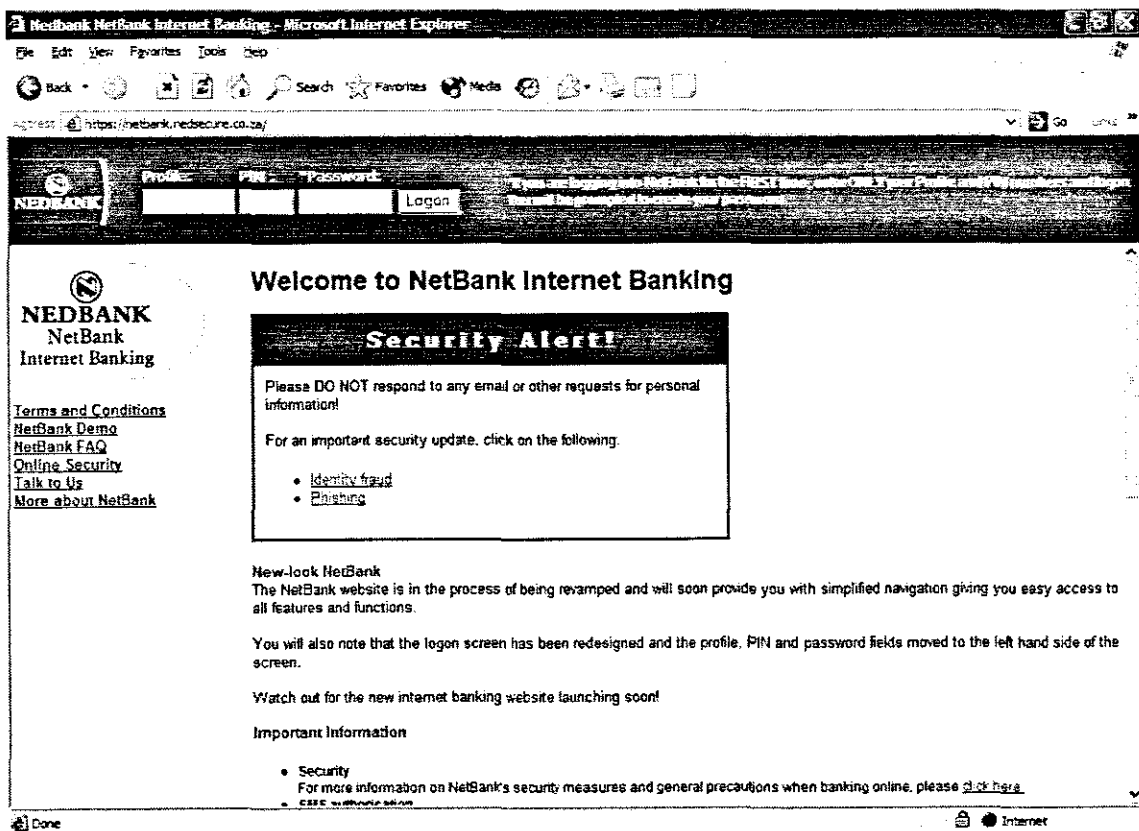
2.9.7 Advantages and disadvantages of using email

Caruthers (2003b) discussed six benefits for SMMEs utilising email as a business application, namely: email keeps a business in contact with existing customers; email is simple to use; email works; email makes customers feel special; emailing customers develops a bond; and advertising using email draws customers back. Shoniregun (2004:3) confirms the thoughts of Caruthers (2003b) in simplicity of email and further states that email is the most widely used online service used by e-commerce business for sending and receiving messages. The establishment of business partnerships using email is an advantage to small business (Poon & Swatman, 1997b:2).

While SMMEs gain advantage using email, postal and telecommunication companies are losing competitive advantage through the use of electronic communications, especially email that combines the benefits of both telephone calls and letters (Amor, 2002:35).

According to SAMC (2002:13) a benefit of email is that electronic messages (including email) and written documents are now legally equivalent.

A disadvantage of the use of email is cryptographic⁵⁵ fraud. One example is 'phishing'⁵⁶, known in the US and UK and now recently in South Africa. 'Phishing' takes place where customers of well known banks are targeted by rapidly spreading emails requesting personal Internet banking details and passwords (Marud, 2005b). Screen capture 2.9 depicts one on Nedbank's Web pages with security warnings highlighting potential identity fraud, and 'phishing', to customers.



Screen capture 2.9: A security alert on a banks web page (<https://netbank.nedsecure.co.za/>)

⁵⁵ The art of writing or solving codes http://www.askoxford.com/concise_oed/cryptography?view=uk

⁵⁶ Obtaining people's details especially credit card details, through fake websites or emails <http://www.askoxford.com/worldofwords/wordfrom/modernslang/?view=uk>

2.9.8 A case for VoIP

South Africa, Australia and Turkey have monopolistic fixed-line telecommunications companies known as Telkom, Telstra and Turk Telecom respectively (Brown *et al*, 2003:1; Hiles, 2005; Webb, 2004; Paltridge, 2001:42). Telephone calls made from South Africa are traditionally more expensive than in other countries (Salie, 2005).

According to Bennett (2005:1) the cost of international fixed-line calls in South Africa has dropped marginally but local call costs are expected to increase, putting further pressure on SMME telephone budgets. Some authors argue that South African corporations are currently attracted to VoIP but SMMEs are shying away from it (Bennett, 2005:1; Hiles, 2005; Worx, 2005b). According to Businesswire (2005) and Microwire (2005), VoIP is an easy-to-use application but the technology behind it is complex, prompting security concerns for SMMEs including secured remote access and authentication.

The major benefit for an SMME in the utilising of VoIP is the cost savings over traditional telephone calls (Bennett, 2005:1). According to Coetzer (2005) these cost savings range between 35% and 60% depending on the VoIP application used by the SMME, for example a call centre. VoIP now has the advantage of open market competition between VoIP service providers with its legalised release from Telkom (Salie, 2005).

To exemplify the international trend towards VoIP, the European aircraft manufacturer Airbus has recently awarded a five-year contract for the installation of 30,000 IP telephony extensions in France and 10,000 in the UK (Computing, 2005a)

2.9.9 Broadband costs in South Africa

Some authors argue that cellphone costs in South Africa are high compared to other countries. The Communications Users Association of South Africa (CUASA) and the Independent Communications Authority of South Africa (ICASA) argue that *current cellphone charges require investigation. The abolition of the previous duopoly of Vodacom and MTN, by the licensing and introduction of a third cellular service provider Cell C, has failed to reduce prices noticeably* (Stones, 2005; Marud, 2005a; 2005c). Bonorchis (2005) citing Davis argues that South Africa's telecommunication costs are much higher than the international average. ICASA have recently investigated a number of consumer complaints about the high cost of Internet access including ADSL. They concluded in their investigation that the cost of ADSL access should be levied only once, similar to an installation fee, thereafter charges should be based on line rentals, allowing homes and businesses lower Internet access costs (Bonorchis, 2005)

ADSL attracts a fixed monthly charge for unlimited usage unlike the call charge in ISDN (Telkom, 2005b). In countries where there is a telecommunication industry monopoly there is a small chance that competition will assist in the reduction of DSL service charges (Paltridge, 2001:42). According to Caruthers (2003a), the current ADSL service supplied by Telkom is: substantially cheaper; superior to any other Internet connectivity service Telkom offers; and is adequate for a SMME.

Bugan (2005) confirms the costs of using ADSL. He states that a 512k ADSL from Telkom earlier this year cost R699.00 per month for business lines and R599.00 per month for home lines. These prices have recently dropped to R477.00 per month for both business and home users. But there are cheaper packages by Telkom for home use, the 192k and 312k home DSL costing R270.00 and R359.00 per month respectively.

2.9.10 A cellphone success story

As noted by the literature, telephony is a valuable application for South African SMMEs. To exemplify this, the local taxi industry in Cape Town succeeded in supplying an efficient shuttle service for customers. Their success is based on the rapid re-scheduling ability of vehicles supported by the combined utilisation of PC's, cellphones and PDA's (Smith, 2005a). More recently designers of new motor vehicles are allowing for mobile PDA usage by including connection points in the instrument binnacle of motor vehicles for PDA and USB devices (Winfield, 2005).

2.9.11 Internet utilisation in Africa

Are South African SMMEs moving towards broadband Internet connectivity? The literature indicates there is a trend. By comparing Figures 2.17 and Figure 2.18 this trend is illustrated showing Internet users in Africa moving towards high-speed Internet connectivity including broadband (Jensen, 2002).

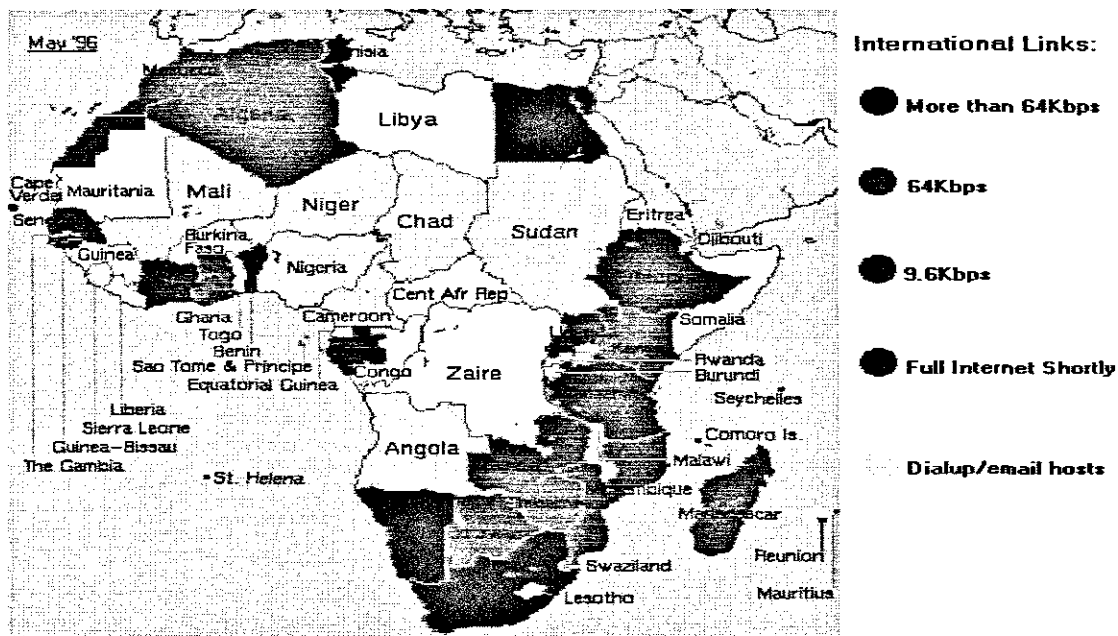


Figure 2.18 Internet usage in Africa as at 1996 (Jensen, 2002).

According to estimates provided by Computing⁵⁷ (2005b), South Africa will have 870,000 broadband subscribers by 2009 while revenue forecasts for Internet access are expected to jump from R 2.5 billion in 2004 to R 5.8 billion in 2009.

⁵⁷ Citing ICT World

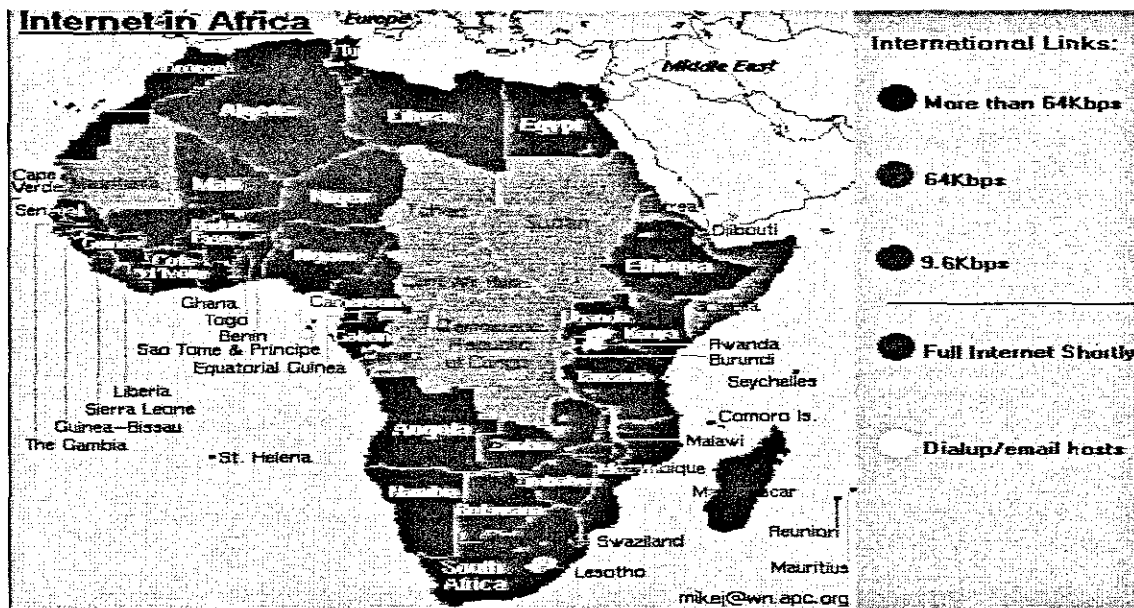


Figure 2.19: Internet usage in Africa as at 2001 (Jensen, 2002).

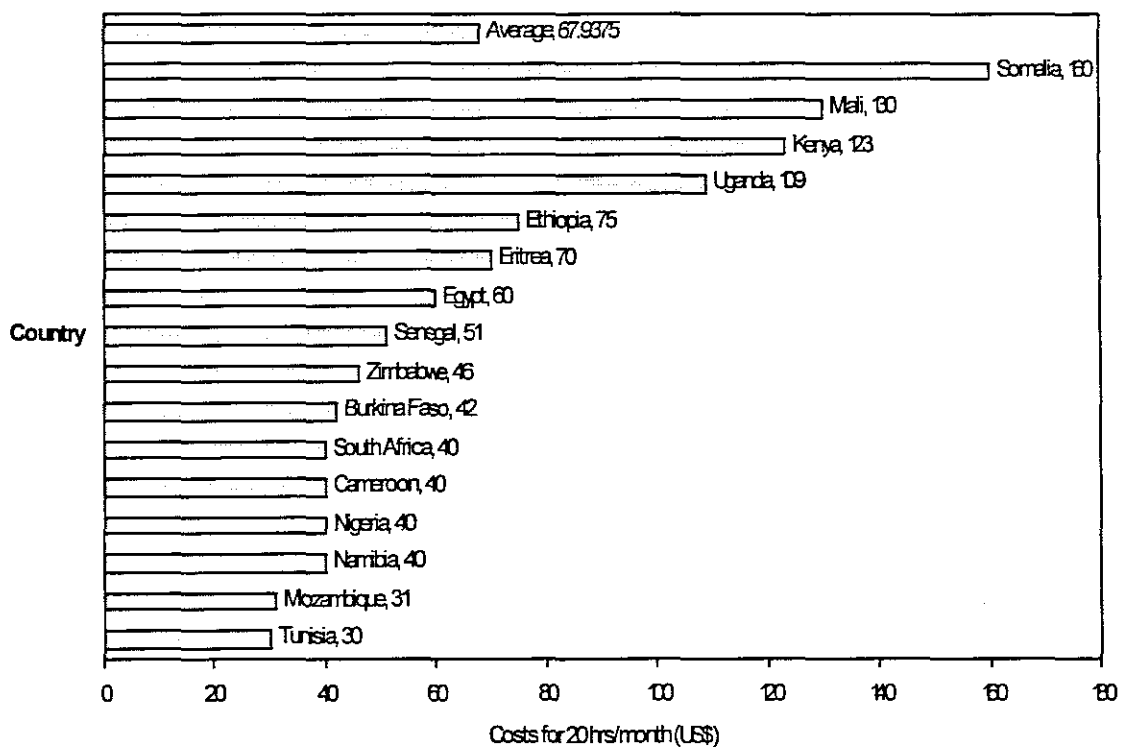


Figure 2.20: Internet access costs in Africa as at 2001 (Jensen, 2002).

Internet connectivity costs in South Africa are the third lowest in Africa according to 2001 statistics as depicted Figure 2.18 (Jensen, 2002). Sweden, with 75 percent of its population making use of broadband Internet connectivity, leads the global statistics with Hong Kong and US close behind as shown in Table 2.3.

African countries including South Africa do not feature in Table 3.2 supporting some authors' arguments that Internet usage is still relatively low and Internet connectivity is still very expensive in South Africa (IWS, 2005; Lazenby, 2002:151; Caruthers, 2003a). According to Brown (2005), UK broadband costs are dropping. A typical monthly 512Kbps connection in 2002 cost £27.00⁵⁸ while a 1Mbps connection in 2005 costs £20.00⁵⁹.

Table 2.3: Top 20 countries - highest Internet broadband subscribers, adapted (IWS, 2005)

No	Country	DSL Broadband Subscribers	Internet Users	Population 2004 Est	Users / Population (%)
1	Sweden	751000	6722564	9010700	75
2	Hong Kong	774000	4878713	6727900	73
3	United States	12594316	199861345	293271500	68
4	Australia	910000	13410833	20275700	66
5	Netherlands	1552000	10806328	16254900	66
6	Canada	2568351	20450000	31846900	64
7	Denmark	594000	3375850	5397600	63
8	Switzerland	717000	4585364	7433000	62
9	South Korea	6717251	30670000	49131700	62
10	United Kingdom	3335000	34874469	59595900	59
11	Germany	5950000	46455814	82633200	56
12	Japan	12739564	66586234	127853600	52
13	Taiwan	2900000	11602523	22689300	51
14	Italy	3680000	28610000	57987100	49
15	France	5253000	24803250	60011200	41
16	Belgium	983000	3769123	10402200	36
17	Spain	2227805	14095951	41895600	34
18	Israel	600000	2000000	6867200	29
19	Brazil	1633700	18660650	179383500	10
20	China	13700000	94000000	1288307100	7

Goldstuck (2004), referring the report on online retail in South Africa 2004, states:

“The single biggest obstacle to growth identified by all the executives we interviewed was access to higher and cheaper bandwidth...Unless the telecommunications authorities deregulate the market more effectively, online retail in South Africa will stagnate” Goldstuck (2004).

⁵⁸ Approximately R 312.39 at an exchange rate of R11.57/£1 (Sharenet, 2005)

⁵⁹ Approximately R 231.40 at an exchange rate of R11.57/£1 (Sharenet, 2005)

Formby (2005) mentions the possible creation of South Africa's second national operator (SNO) by the end of 2005. This new business will be owned by various companies, including a 15% stake by the state owned power utility Eskom. Could Eskom be planning to utilise its current national electricity grid for Internet broadband?

Broadband over power lines (known as BoP) makes use of power-line carrier (PLC) technology providing broadband Internet access through ordinary power lines (Anon, 2005c; Boake, 2003:72). Wills (2005) uses the term 'grid and distributed computing' at the University of Southampton. Reuters⁶⁰ (2005) have disclosed that three companies in the US, namely Google, Goldman Sachs and Hearst Corporation are considering investing US\$100 million in a start-up communications group that offers high-speed Internet connections over electricity lines. According to Formby (2005) the SNOs business strategy will be to introduce lower prices for products including data, voice and video products together with new infrastructures that will hopefully create strategic advantage. Figure 2.19 depicts a typical BoPL modem configuration, with a bit rate of up to 14 Mbps, connected to computers with simple plug-in facilities to the mains supply (Archnet, 2005; SAPA, 2005).

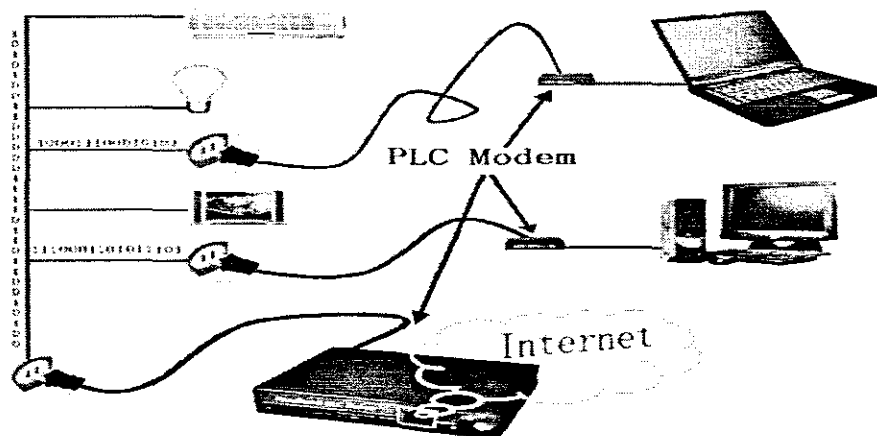


Figure 2.21: A broadband power line modem configuration (Archnet, 2005).

⁶⁰ Citing the Wall Street Journal

2.10 Conclusion

Chapter Two described the framework of e-commerce applications encompassing the SMME. By appropriate use of scientific, engineering and technological devices the SMME business owner can create positive effects and produce direct benefits for his or her business. This chapter provided a background to electronic computer devices and the literature revealed positivism of e-commerce capabilities by utilising online Internet access and six e-commerce applications. Authors posit that the Internet and the Web are advantageous in lowering costs, increasing competitive advantage, supporting customer relations, and generating new revenue.

In Chapter Four the framework of the research design and methodology based on the research model is discussed. This chapter will define; the elements of e-commerce usage researched; the perceived effects of e-commerce; the perceived benefits of e-commerce; and the effect benefit relationship model. The research questions will be stated and the hypotheses formulated. The survey design is discussed together with the reasoning behind the compilation of the questionnaire. The sampling method is explained and the data collection strategy is provided.

Chapter 3

RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

Chapter Two was a literature review described the framework of e-commerce applications encompassing the SMME. By appropriate use of scientific, engineering and technological devices the SMME can create positive effects and produce direct benefits for his or her business. This chapter provided a background to electronic computer devices, e-commerce importance and e-commerce messaging. The literature revealed positivism of e-commerce capabilities by utilising online Internet access. Authors posit that the Internet and the Web are advantageous in lowering costs, increasing competitive advantage, supporting customer relations, and generating new revenue.

Chapter Three describes the framework of the research design and methodology based on the research model shown. This chapter defines; business demographics; the electronic computer devices; types of connections to the Internet, e-commerce importance; the perceived effects of e-commerce applications; the perceived benefits of e-commerce; and the application-effect-benefit relationship model. The research questions are explored together with the hypothesis formulations. Three sets of hypotheses were specified: the first set for e-commerce importance; the second for effects; and the third for benefits. The survey design is discussed and the sampling method is explained together with the data collection strategy.

3.2 Background to the research design

'E-commerce application utilisation by South African SMMEs' is the work concerned with how e-commerce is supplied within SMMEs. It is important to understand what is typically meant by the word 'application'. In the history of information systems (IS) as it has been taught, an application is referred to as the payroll, stock control and sales order processing. Today the real world of Internet technology is being applied in the new sector of small businesses and so traditional ideas must be put to one side.

The choosing of two small businesses that were accessible but sufficiently different divulged some kind of commonality between them (Stuyck, 2005: Underwood, 2005). As their stories were made known through conversation it became evident that they first decide on which electronic computer device to purchase. Did they buy a PC, a laptop or PDA? One chose a PC, a laptop, a cellphone and PDA and hinted at possible VoIP use while the other chose a laptop and cellphone.

The second layer of concern after purchasing electronic computer devices was that they of course had to then connect to the Internet. It was clear from these two early conversations that both SMMEs were heavily pre-occupied in deciding to select one of: dial-up modem, ISDN, leased line or ADSL. One business owner had some experience with dial-up ISDN which become frustrating to use and costly, especially when a connection was once inadvertently left active overnight and the call charges shot passed his budgeted expenditure. He selected ADSL because firstly it attracted a fixed monthly charge irrespective of use, secondly it has always-on capability and thirdly it uses broadband technology supporting high speed transmission rates. The second business owner was not so experienced and lacked IT intuitivism. His recently purchased laptop came standard with a 56Kbps dial-up modem and because of this he would not justify further spending on Internet connectivity as he had this capability already. He settled for dial-up modem, disallowed other members of the business from using the Internet in order to control costs, and was not perturbed by the slow transmission rate.

In terms of using the computers and having achieved a connection to the Internet clearly the most useful and most common e-commerce application is email. Email, known for its ingenious packet switched services (PSS), allowed these business owners to communicate effectively and benefit from substantially reduced communication costs.

This begins to reflect big business in the 1970s and 1980s which did the obvious thing: to computerise the accounting department. Once the successful system was in, the trust element was in place so the next move was to computerise the stock control, as businesses down the road were doing so. So, now there is a social process known as "me too strategies" (Bytheway, 2005a).

Very few people are brave enough to make the first move. Now that the first business owner had become comfortable with his new computer connection to the Internet it came to this authors notice that without even thinking about it, he happened to browse on the Web and stated: "I want to be on the Web too" (Stuyck, 2005). Owing to his frequent visits to the European Union (EU), he opted for the availability of Web browser based email (to complement his existing software based email) to conveniently allow him to send and receive email, irrespective of which computer he utilised while out of the country, therefore inadvertently supporting global Web functionality.

So the next layer of application consideration for a business is to have its own Web site followed by advertising on the Internet as illustrated in Figure 3.1. These layers are a maturity cycle rediscovering the ideas that these business owners had (Stuyck, 2005; Underwood, 2005). These layers supported the ideas of technology acceptance, usability and usefulness for business owners.

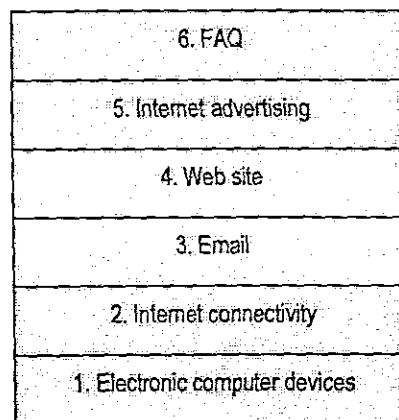


Figure 3.1: SMME application layers

As a result of discussion of the research design the technology acceptance model (TAM) was brought to this author's notice when it was decided that he would make an early investigation into two accessible but different companies. Out of this came the confirmation that TAM is a very real thing. These business owners wanted to have access so they bought the computers and connections to the Internet. They discovered email was very usable and it was the first successful application to do that. Then it was useful to communicate and they realised that there was more to it and browsing the Web made them realise that they had to proceed and develop their own Web page presence.

A frequently asked question (FAQ) page is one example of how one can support a Web presence even further. It is just not 'hey this is my phone number', the FAQs move it on providing information value (Angehrn, 1997:2). The obvious business applications are the business processes that can economically and efficiently support the business. This is about selling, dealing with customer complaints, finding new customers, and promoting goods and services. Further discussions led to "why are we doing all this" questions by the business owners.

By using these applications the two business owners argued that some advantages would be gained for the business and in some period of time benefits must be derived to provide advantage over their competitors (Stuyck, 2005; Underwood, 2005). This prompted the search for previous research in small business application utilisation, the usage of application layers, and the need to determine quantitatively business the effect-benefit relationships as illustrated in the proposed e-commerce application-effect-benefit relationship model in Figure 3.2.

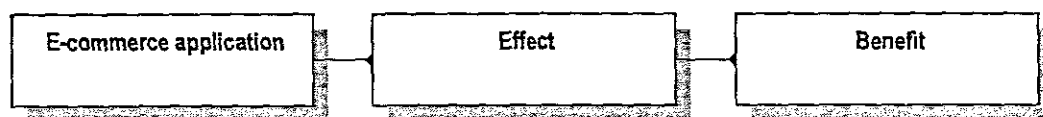


Figure 3.2: The e-commerce application-effect-benefit relationship model

Previous research

The work of Mustaffa and Beaumont (2004) was found searching the Internet. Their research entitled 'The effect of electronic commerce on small Australian enterprises' supported the research problem and the views of the two business owners. An attempt to contact one of the authors from an Australian university was not initially successful. Colleagues urged this author to make contact as they believed a comparison of surveys conducted in the two countries would be most informative. After a six week period contact was finally made and the request for the primary data of the Australian survey was asked for and was promptly supplied via email (Beaumont, 2005; Mustaffa & Beaumont, 2004). Their work consisted of e-commerce intermediate effects, final benefits and effect-benefit relationships complementing the objectives of this research.

The main reason for choosing their work as a base for this research is due to their similar application layer philosophy, as illustrated in Figure 3.3. The introduction of EDI was included in their survey as they believed this formed an advanced stage of e-commerce maturity amongst business owners.

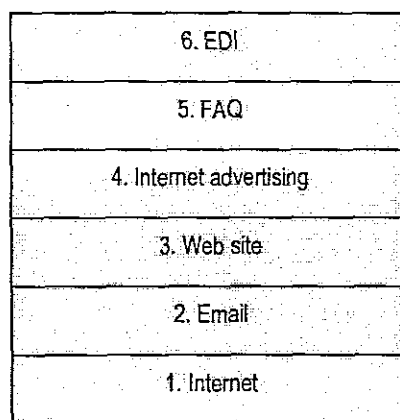


Figure 3.3: Australian six SMME application layers

In their survey, the use of six application layers was researched together with the intermediate effects produced and the final benefits derived for small business in Australia. Based on this it was decided as part of the research design to combine

the initially derived applications for the South African businesses with these application layers (Stuyck, 2005; Underwood, 2005; Mustaffa & Beaumont, 2004). This combined application layer is illustrated in Figure 3.4.

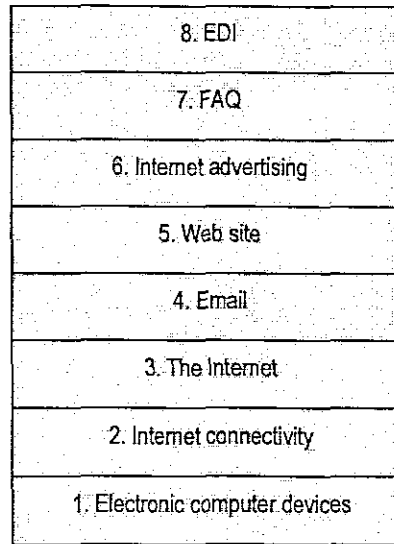


Figure 3.4: The application layer research model

E-commerce

Moving on to the importance of e-commerce the internationally active business owner wanted to increase sales, increase advertising and to distribute information about his business globally. Customer service was imperative as he was dealing with customers face to face in the property market. Subscription was unimportant as he did not see the need for electronic transactions across the Internet and had no 'product' for a client to subscribe to.

The second business owner, with his combined melancholic and sanguine tendencies, enjoyed the e-banking concept by bringing in income electronically, quickly (client dependant) and efficiently, avoiding postal delays and eliminating cheque clearance times. Surprisingly, although sales and distribution of information in his roof repair business were important, he preferred traditional advertising formats through the popular press and information distribution by word-of-mouth (of clients). Email and cellphones supported his customer service initiatives in e-commerce enabling a direct link between client and business owner.

3.3 The research model

It is important to note that as 'electronic computer devices' and 'Internet connectivity' did not form part of the Australian survey, but were considered vital for this research, they were included to determine their usage, but were not included in the causal effect, benefit and effect-benefit relationship¹ analysis. Further exploration of the Australian analysis of email highlighted the omission of messaging types (Web browser based email and software based email). This analysis was therefore included in the research on email utilisation. A common requirement in both research designs was business demographics allowing the responding businesses to be categorised into SMME or non SMME. All these factors contributed to the research model as shown in Figure 3.5.

Referring to Figure 3.5 the research model allows the classification of businesses as stated in the literature. The determinants are asset value, turnover and the number of employees (in the business). Depending on the outcome of the decision tree the business will be defined as a SMME or not. The five electronic computer devices are explored to establish which of these are actually utilised by SMMEs. Internet connectivity follows with dial-up modem through to 'other' form of Internet connectivity. The final block is e-commerce which is segmented into four, namely:

- importance (identifying the importance of e-commerce to the sales process, information distribution, customer service, subscription, advertising and 'other');
- time (establishing a time frame in e-commerce usage by the SMME); and
- application-effect-benefit relationships

¹ An association between (Borowski & Borwein, 2005:479)

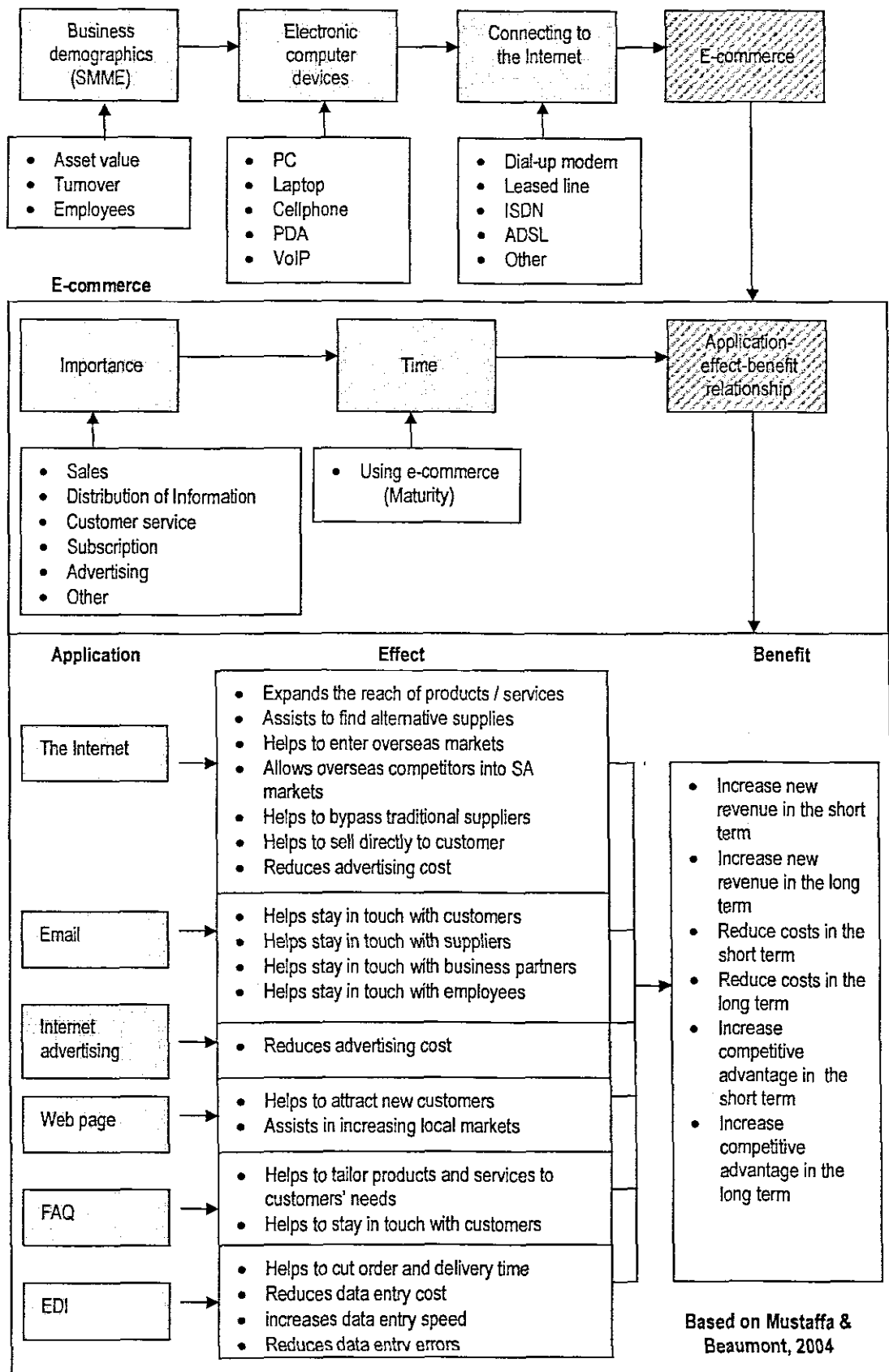


Figure 3.5: The research model

E-commerce application utilisation by South African SMMEs

This last segment, the application-effect-benefit relationship, is based on the Australian work (Mustaffa & Beaumont, 2004:6). One may argue that the six applications listed are not all true applications. One may further argue that one application could be a subset of another. As this research was based on their work the applications (or techniques) were kept the same for comparative studies to be made. This allows the perceived effects of application utilisation to be tested for significance, for example: the Internet expands the reach of products / services. Each perceived application-effect relationship is hypothesised and these hypotheses will be tested for significance. Similarly each perceived e-commerce-benefit relationship is hypothesised and these hypotheses will be tested for significance. After hypothesis testing only the alternative hypotheses of the rejected null hypothesis will be used to test the final part of this research, the application-effect-benefit relationship as illustrated in Figure 3.2. Stepwise regression will be used to test for causal relationships.

3.4 Research questions

Four research questions have evolved from the research model:

- Which electronic computer devices do SMMEs most use?
- Which Internet connections do SMMEs most use?
- What elements of e-commerce do SMMEs deem important?
- How do South Africa and Australia compare in e-commerce utilisation?

The three sub-questions are:

- What are the positive effects of SMME e-commerce application utilisation?
- What are the positive benefits of SMME e-commerce application utilisation?
- What significant relationships exist between effects and benefits?

3.5 Hypothesis formulation

In order to support the third research question, hypotheses were formulated for each element of e-commerce importance. Each of these elements' null hypothesis will be tested using statistical analysis. For example, to test whether SMMEs deem sales are an important use of e-commerce, the following hypotheses will be tested for acceptance or rejection.

The null hypothesis is:

H101₀: Sales are not an important use of e-commerce

The alternative hypothesis is:

H101₁: Sales are an important use of e-commerce

Hypotheses were formulated to assist in answering the fourth research question. For each effect the null hypothesis will be tested. To exemplify the testing of the relationship between e-commerce application 'email' and the effect 'helps stay in touch with customers' the following hypotheses are formulated.

The null hypothesis is:

H201₀: Email has no effect in helping to stay in touch with customers

The alternative hypothesis is:

H201₁: Email has a positive effect in staying in touch with customers

Similarly, to answer the fifth research question a null and an alternative hypothesis will be tested for each benefit. To test whether 'e-commerce' has no benefit with 'increasing short-term new revenue' the following hypotheses is formulated.

The null hypothesis is:

H301₀: E-commerce has no benefit in increasing short-term new revenue

The alternative hypothesis is:

H301₁: E-commerce has a positive benefit in increasing short-term new revenue

E-commerce application utilisation by South African SMMEs

3.6 Survey methodology

The research design was a statistical study testing: six e-commerce importance hypotheses (H101₀ - H106₀); twenty one 'effect' hypotheses (H201₀ – H221₀); and six 'benefit' hypotheses (H301₀ – H306₀) quantitatively². The statistics supported four of the qualitative research questions. This research was conducted using survey methodology that used a structured questionnaire administered to SMMEs in the Western Cape (Cooper and Schindler, 2003:339). Secondary data analysis (SDA) was used to reanalyse existing quantitative data supplied to test hypotheses of earlier research (Mouton, 2004:164; Beaumont, 2005). Logistical and financial considerations made the geographical domain of the Western Cape an appropriate choice for conducting this research. As other questionnaires could not be located, the questionnaire was partially self-designed, and partially re-engineered from data supplied from earlier Australian research, allowing comparative studies to be made (Beaumont, 2005). The survey sought: responding business's data related to the research model illustrated in Figure 3.4.

3.7 Survey design

The questionnaire was structured using twelve sections (A to L) as illustrated in Figure 3.6. Each section maps to a block within the research model in Figure 3.5. Section C allows for any of sections D through to K to be omitted if the application is not utilised. Some sections comprise statements (prefixed with 'S'), questions (prefixed with 'Q') or both.

² Refer to Appendix F for a list of the null and alternate hypotheses.

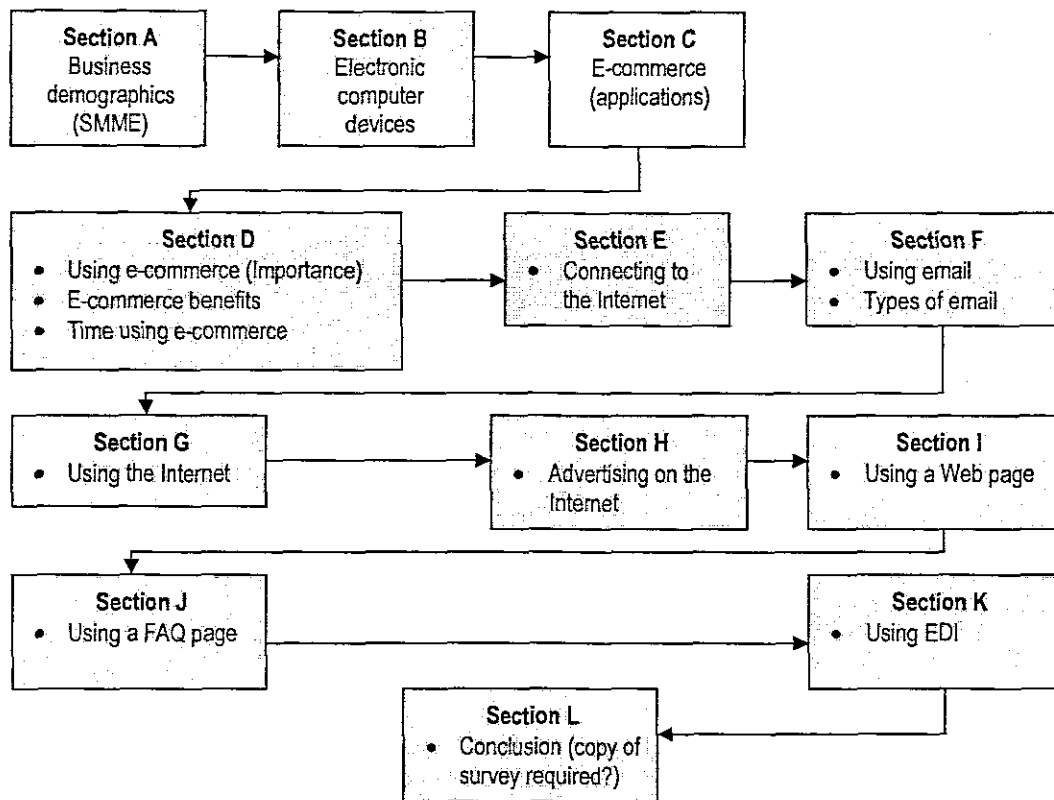


Figure 3.6: A layout of the questionnaire design

3.7.1 Section A: business demographics

A simple category scale³ (Yes/No) for two questions and one quantitative question were used in section A to acquire business demographic data. At least two of the three questions were required to be answered either 'Yes', or '< 200' for the responding business's to be categorised as a SMME. The SMME definition as stated in Chapter Two was used to create the decision tree for business categorisation as shown in Figure 3.7. Data from non SMMEs was rejected. Geographical area of the responding business's was captured to ascertain depth of business operation within South Africa and globally. The four-point multi-choice single response scale chosen ranged from local, provincial, national to international (Strümpfer, 2005a; Cooper & Schindler, 2003:253).

³ Also known as a dichotomous scale

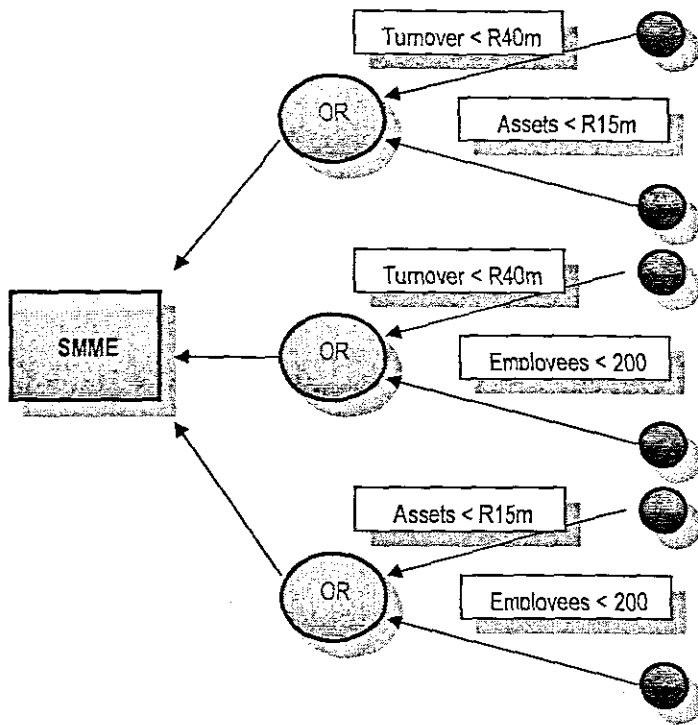


Figure 3.7: The decision tree for business categorisation

3.7.2 Section B: electronic computer devices

Five electronic computer devices were chosen for this section, including VoIP recently legalised in South Africa. These elements were: personal computers (or desktops); laptop computers; cellphones; PDAs and VoIP, and are illustrated in Figure 3.8.

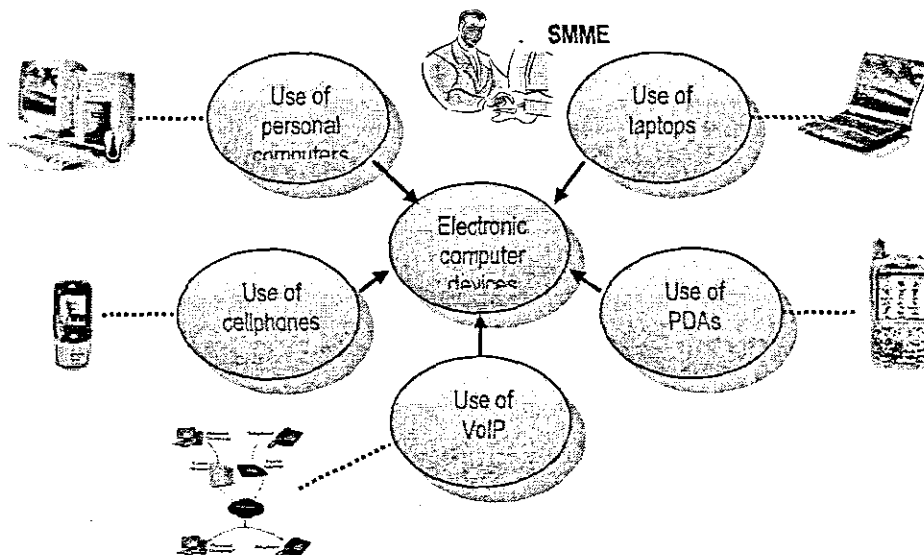


Figure 3.8: Use of electronic computer devices

The five-point Likert scale chosen was anchored by 1 (not at all) and 5 (to a very large extent) (Mustaffa & Beaumont, 2004:7; Watkins, 2005b). One question was asked for each of the five devices, for example: does your business use VoIP?

3.7.3 Section C: e-commerce applications

Upfront questions relating to the use of e-commerce applications were asked to enable faster completion time of the questionnaire by respondents. The subjects of these questions are illustrated in Figure 3.9. Question formats were based on Yes/No answers. An additional 'No longer use' option was included to enable the monitoring of businesses that had stopped using any of the e-commerce applications. If the respondent answered 'No longer use' an open ended qualitative question requesting the reason was asked. By answering 'No' to any of the seven questions, the sections relating to these questions and statements could be skipped by the respondent.

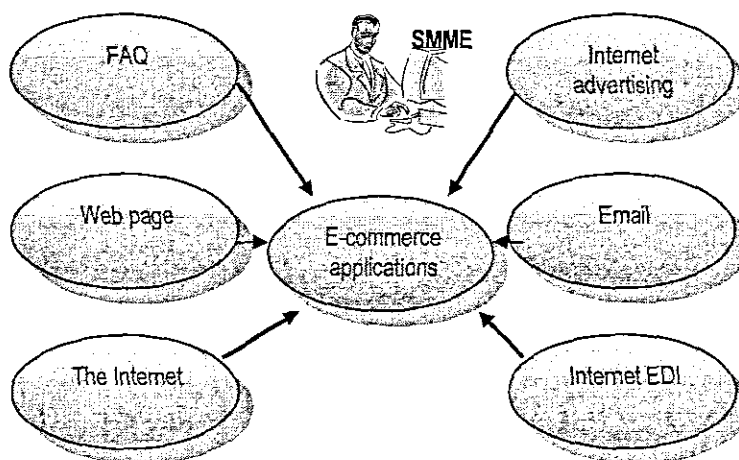


Figure 3.9: The six e-commerce applications surveyed

3.7.4 Section D: e-commerce importance

Six statements relating to the elements of e-commerce importance as illustrated in Figure 3.10 were chosen using a five-point Likert scale. This scale was anchored by 1 (not at all) and 5 (most important).

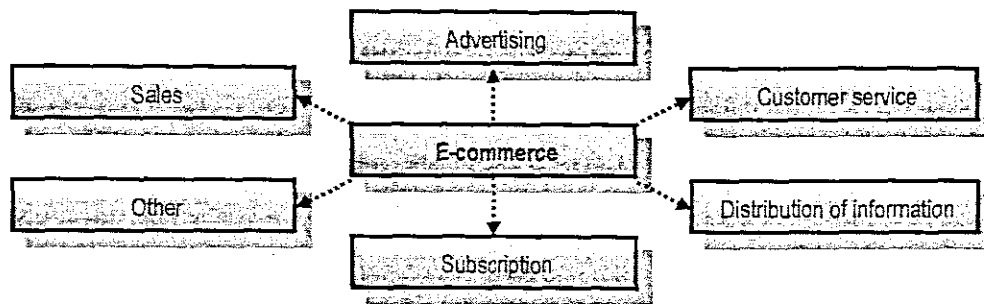


Figure 3.10: Elements of e-commerce importance

To measure the benefits associated with e-commerce a further six statements were used as illustrated in Figure 3.11. A six-point Likert scale was chosen anchored by 1 (0-10%) and 5 (more than 40%) with 0 (don't know). One quantitative question was asked to determine the length of time the responding business had used e-commerce.

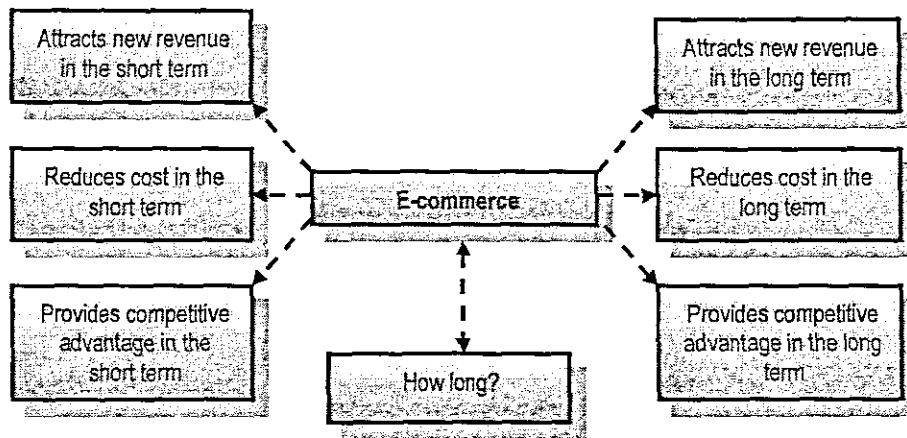


Figure 3.11: Benefits of e-commerce utilisation

3.7.5 Section E: connecting to the Internet

The method of gaining online access to the Internet was deemed important for this research as it influences cost and transmission rates for online SMMEs.

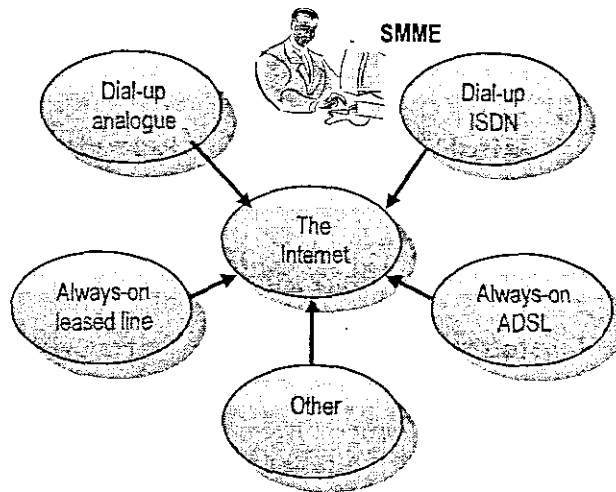


Figure 3.12: Elements of online Internet connectivity

Associating Internet connectivity bit-rate speed with commercially available connectivity services shows that the higher the bit-rate the higher the cost for the service. Figure 3.12 illustrates four typical internet connectivity options available in South Africa. A fifth option, 'other', was included to determine any additional types of connectivity used by SMMEs. The five-point Likert scale chosen was anchored by 1 (not at all) and 5 (to a very large extent).

3.7.6 Section F: using email

The measurement of email effectiveness was required to determine if any relationship of using email existed among SMMEs. Figure 3.13 illustrates the four relationships of using email, to stay in touch with: customers, suppliers, business partners and employees. Four statements were chosen together with a five-point Likert scale anchored by 1 (not at all) and 5 (to a very large extent).

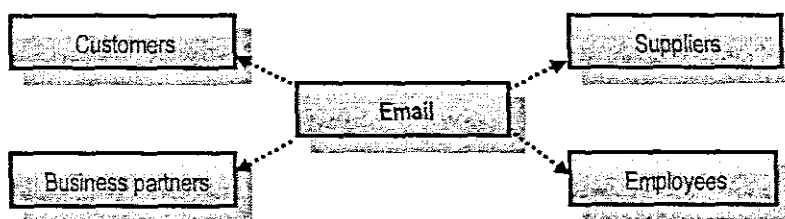


Figure 3.13: Effects of email utilisation

With the rapid rise in the rate of the introduction of new technologies current e-commerce elements can expand from traditional electronic devices to more recent inventions. Figure 3.14 identifies four current methods of sending and receiving of email by SMMEs, namely: software based; Web browser based; cellphone software based; and PDA software and Web browser based. The four questions chosen used a five-point Likert scale anchored by 1 (not at all) and 5 (to a very large extent).

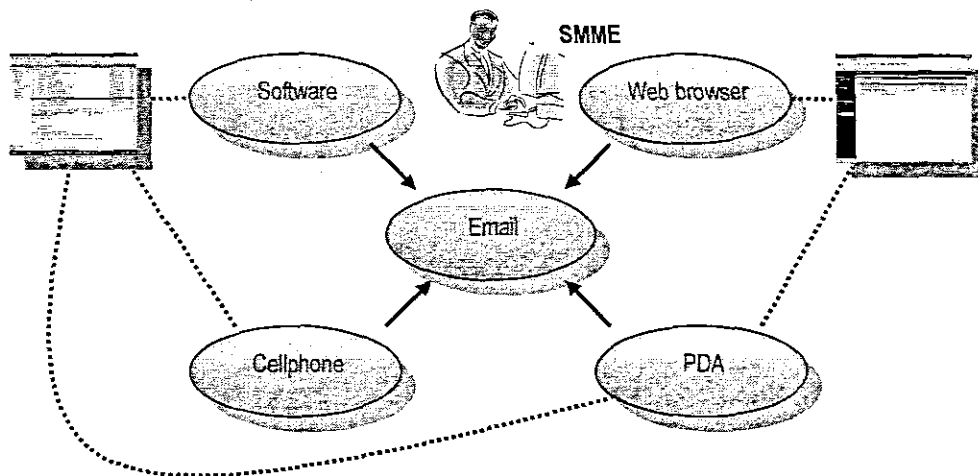


Figure 3.14: Four methods of email utilisation

3.7.7 Section G: using the Internet

Six statements relating to the effects of Internet utilisation, as illustrated in Figure 3.15, were chosen using a five-point Likert scale anchored by 1 (not at all) and 5 (to a very large extent).

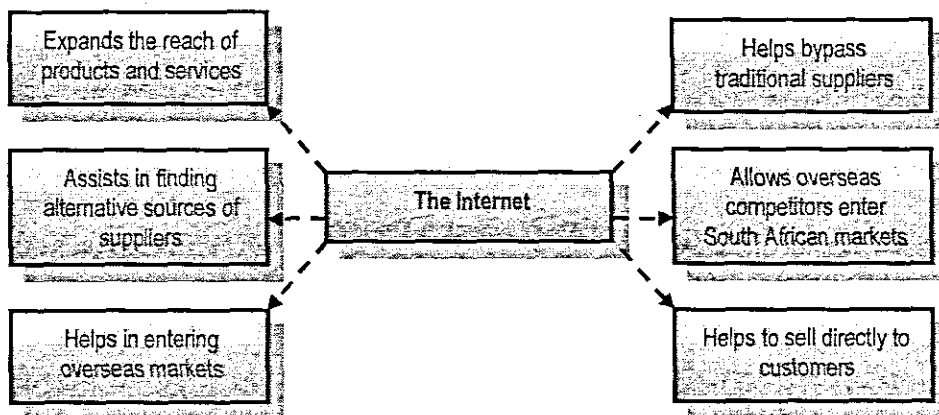


Figure 3.15: Effects of Internet utilisation

3.7.8 Section H: advertising on the Internet

To measure any advertising effect gained with Internet usage one further statement was used as illustrated in Figure 3.16 using the same five-point Likert scale as in section G.

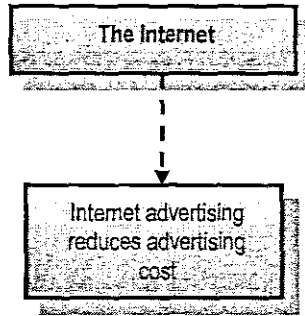


Figure 3.16: Effect of Internet advertising

3.7.9 Section I: Web page utilisation

Two statements were used to explore the effects, if any, on Web page utilisation. These refer to 'attracting new customers' and 'increasing local market share', as illustrated in Figure 3.17. A five-point Likert scale was chosen anchored by 1 (not at all) and 5 (to a very large extent).

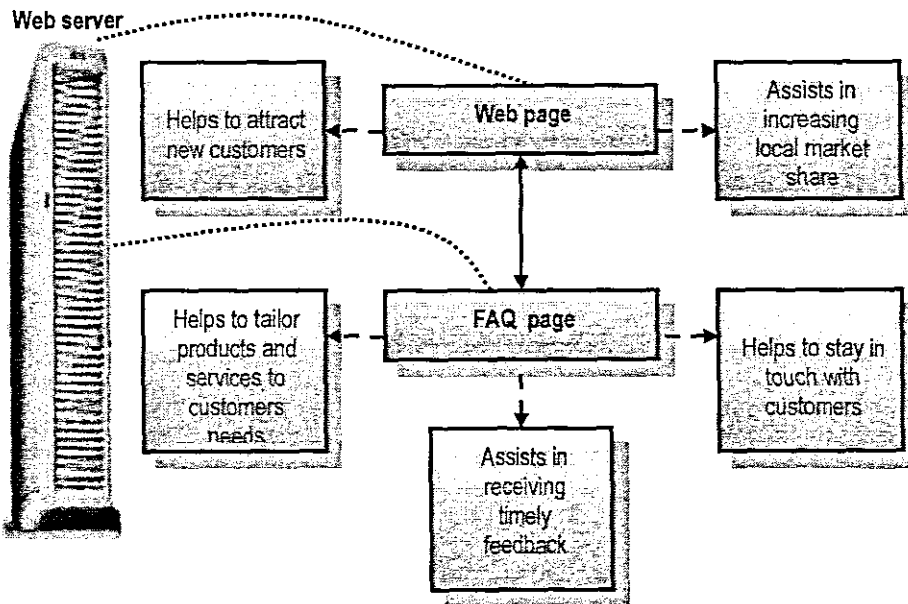


Figure 3.17: Effects of Web page and FAQ page utilisation

3.7.10 Section J: FAQ page utilisation

Three additional questions based on the same Likert scale were asked to determine FAQ effects on: tailoring products and services to customers need; staying in touch with customers; and receiving timely feedback.

3.7.11 Section K: using EDI

The penultimate section surveyed was designed to determine the effects of Internet EDI: data, inventory and delivery time, as illustrated in Figure 3.18. A five-point Likert scale was chosen a used in section I.

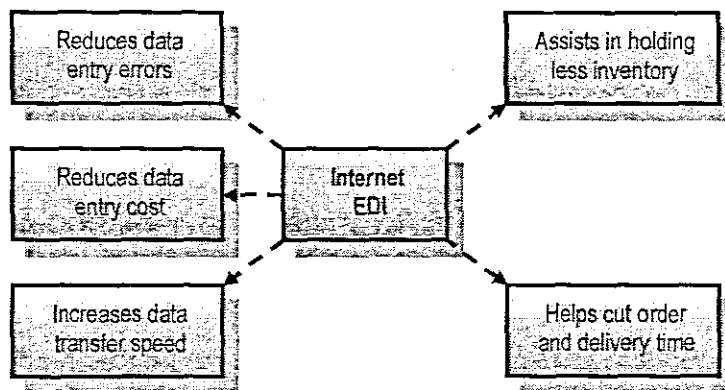


Figure 3.18: Effects of Internet EDI utilisation

3.7.12 Section L: conclusion

To measure the interest shown in the results of this survey, the responding businesses were requested to indicate their interest in acquiring a copy of the results from this survey, by ticking the appropriate block at the end of the questionnaire.

3.8 The sample

Now with the questionnaire fully designed and compiled a random sample of three hundred businesses was selected from the Cape Peninsula Yellow Pages. Pre-stamped reply envelopes together with a covering letter explaining the objectives of the research, accompanied the questionnaire. The administered envelopes were prepared for posting to the target sample, as shown in Figure 3.19. The postal method for distribution was chosen over email as these businesses all had postal addresses eliminating any assumption of email or e-commerce use.

The questionnaire was designed to provide quantitative results allowing the testing of the hypotheses by statistical analysis. The questionnaire structure included three leading questions to assist in determining whether the business approached fell within the SMME definition. According to Watkins (2005a) an expected response of 12% is acceptable for this type of research and it was hoped that the response from this research would be at least 15%. The questionnaire was pre-tested on five businesses, and the statistics received were pre-analysed to allow for any required changes to be made to the questions before final distribution.



Figure 3.19: Preparation of the survey

3.9 Data collection and capture

To consolidate the mailing of business data and the capturing of surveyed data, an access 2002 database was designed and developed by the author. Four data tables were designed and created.

One table, named 'MailingList', was designed for the initial capture of the surveyed business attributes. These attributes included 'Company Id', 'Title', 'Company Name', 'Address 1', 'Address 2', 'City' and 'Post Code' as depicted in Screen capture 3.1.

ID	Name	Company Name	Address 1	Address 2	City	Postcode	Tel
1	The Managing Director	ACT Paper Co. (Pty) Ltd	8700 Gales	Spring Hill	7400	254	
2	The Managing Director	Access City Managers	1 Van Riebeeck R	Kaprivier	7400	103	
3	The Managing Director	Adaptive Labs, Swakop	163 Pioniersvlei	Saltz-NB	7400	160	
4	The Managing Director	ACG Architects & Design	501 De Waa	172 Koenigs Road	Unswagadam	7329	6
5	The Managing Director	Active Property Markets	13 Pioniersvlei	Swakop	7400	221	
6	The Managing Director	Advent Bus & Coach SA	14 Pioniersvlei	Swakop	7400	16	
7	The Managing Director	Advan Pharmacy	Advan Card Main Road	Sea Point	8001	243	
8	The Managing Director	Advan Tech-Web Packer	7 Vraag Street	Green Point	8001	39 F	
9	The Managing Director	African Child & Goods	111 Eudora Street	Clare Town	8041	176	
10	The Managing Director	Auto-Car Hire	PO Box 708	Green Point	8041	13	
11	The Managing Director	Aubrey for Pianos & A	51 Waterloo Road	Wynberg	7929	88	
12	The Managing Director	Anderson K Sales	PO Box 22493	Food Ave	7912	120	
13	The Managing Director	Anderson's	193 Victoria Road	Woodstock	7925	84	
14	The Managing Director	ASCO Consulting Engine	PO Box 9122	Waterfront	8002	60	
15	The Managing Director	Atlas Gates & Engine	9 Malanda Av	Pinelands	7608	287	
16	The Managing Director	Audi World	724 Pioniersvlei	Langerak	7400	285	
17	The Managing Director	Avenue Motor	211 Pioniersvlei	Sea Point	8001	288	
18	The Managing Director	Avon Cosmetics	1 Barmoor Close	Pinelands	7600	40	
19	The Managing Director	Axi Soft Int.	54a Barmoor Road	Claremont	7125	14	
20	The Managing Director	Axon Medical & Research	PO Box 960	Vandenberg	7454	309	
21	The Managing Director	BAF Automobile	PO Box 3379	Clare Town	8000	236	
22	The Managing Director	Bank South Africa	371 Pioniersvlei	Swakop	7400	102	
23	The Managing Director	Banquet	74 Pioniersvlei	Swakop	7400	10	
24	The Managing Director	Banquet Pharmacy	PO Box 27	Unswagadam	7400	242	
25	The Managing Director	Baro Properties (Pty) Ltd	PO Box 474	Swakop	8012	112	
26	The Managing Director	Baro Office Laboratories and GP (Pty) Ltd	Terse Veyler Dr	Seelbale	7123	222	
27	The Managing Director	Bay & Canvas Goods	21 Pioniersvlei	Tygerburg	7400	81	
28	The Managing Director	Beams & Photography	33 Ardena Road	Tyden Kloof	7440	247	
29	The Managing Director	Beck of Records	16 Vrijheid Road	East Hill	7175	142	
30	The Managing Director	Beck's Book	PO Box 20	Claremont	7140	12	
31	The Managing Director	Beck's Consulting	16 Trossel Street	Swakop	7400	26	
32	The Managing Director	Beck's & Photography	16 Vrijheid Street	East Hill	7175	224	
33	The Managing Director	Beta Systems Technology	PO Box 2387	Claremont	7121	34	
34	The Managing Director	Bhaskar Art & Design	PO Box 5283	Tyger Valley	7500	173	
35	The Managing Director	Bio-Gem Electronics	72 Camp Road	Walden	7426	174	
36	The Managing Director	Robinson's Cosmetics	11a Maritz	Claremont	7123	223	
37	The Managing Director	Carlson Trading SA	14 Oostenvlei E	Marine Valley	7208	29	
38	The Managing Director	Carroll's Kitchen	357 Pioniersvlei	Sea Point	7400	15	
39	The Managing Director	Cashier's Realty	591 Albert Road	Unswagadam	7400	229	
40	The Managing Director	Cashier's Realty	20 Albert Road	Unswagadam	7400	229	
41	The Managing Director	Cashier's Realty	20 Albert Road	Unswagadam	7400	229	
42	The Managing Director	Cashier's Realty	20 Albert Road	Unswagadam	7400	229	
43	The Managing Director	Cashier's Realty	20 Albert Road	Unswagadam	7400	229	

Screen capture 3.1: Mailing list data table

Address details for the businesses selected from the Cape Peninsula Yellow Pages were insufficient for mailing purposes (TDS, 2005). The major shortcoming was the omission of area postal codes. Postal codes for omitted areas were extrapolated from the South African postal code book (SAPO, 1996). Some postal codes required did not feature in the postal code book resulting in further clarification of these postal codes from the search facility on the South African Post Office⁴ Web site.

Additional fields containing the names of the statements and questions in the questionnaire, for example: Q22 and S14, were appended to the 'MailingList' table. This enabled efficient capturing of the respondents data. Each questionnaire had the 'Company Id' handwritten on the first page to enable the identification of the business returning the questionnaire. The data received was subsequently entered alongside the 'Company Id' in the table as shown in Screen capture 3.2.

⁴ http://www.sapo.co.za/cms/templates/template_postal_codes.asp

The screenshot shows a Microsoft Access database window titled 'MailingListStats'. The main area displays a data table with the following columns: Respondent ID, Name, Address, City, and a series of columns for demographic and response data. The data rows are numbered from 1 to 304. The demographic columns include fields like 'Age', 'Gender', 'Marital Status', 'Income', and 'Education'. The response columns include 'Response', 'Response Date', and 'Response Time'. The table is sorted by Respondent ID in ascending order.

Screen capture 3.2: Mailing list data table showing respondents' data on the right

The additional fields appended were data-typed for easy data capture, for example check boxes were used for business demographics and Text (1) for Yes/No answers. These results required conversion to numeric data in preparation for the quantitative analysis. A Visual Basic Access (VBA) program was written by the author to perform this conversion and is listed as Appendix E. A second table named 'MailingListStats' was designed to receive the quantitative data.

3.10 Conclusion

Chapter Three described the framework of the research design and methodology based on the research model shown. The chapter defined; business demographics; the electronic computer devices; types of connections to the Internet, e-commerce importance; the perceived effects of e-commerce applications; the perceived benefits of e-commerce; and the application-effect-benefit relationship model. The research questions were explored together with the hypothesis formulations. Three sets of hypotheses were specified: the first set for e-commerce importance; the second for effects; and the third for benefits. The survey design was discussed and the sampling method was explained together with the data collection strategy.

Chapter Four describes the process of data analysis and the interpretation of the survey. The analysis categorisation is based on the sections stated in the questionnaire. Various statistical analyses will be performed using t-tests and stepwise regression to identify elements, effects, benefits and associated relationships from the data.

Chapter 4

DATA ANALYSIS AND INTERPRETATION: SURVEY

4.1 Introduction

Chapter Three described the framework of the research design and methodology based on the research model shown. The chapter defined; business demographics; the electronic computer devices; types of connections to the Internet, e-commerce importance; the perceived effects of e-commerce applications; the perceived benefits of e-commerce; and the application-effect-benefit relationship model. The research questions were explored together with the hypotheses formulations. Three sets of hypotheses were specified: the first set for e-commerce importance; the second for effects; and the third for benefits. The survey design was discussed and the sampling method was explained together with the data collection strategy.

Chapter four describes the process of data analysis and the interpretation of the survey. It relates back to the technology acceptance model (TAM) emphasising acceptance, usability and usefulness (Davis, 1985:23; 1989:3). In terms of the design of the survey one objective was to enquire about business demographics and thereafter to establish the basic computer devices available to help the respondent orientate their thoughts in the right direction. Now by having them thinking about their computers and their investment in Internet connectivity the need to establish the use of e-commerce was pursued. This started with their perception of the importance of e-commerce. Only now were the applications of e-commerce introduced and therefore explored with the respondent. To summarise, the analysis categorisation is based on the sections stated in both the research model and questionnaire, and these are:

- business demographics (categorisation of a business as a SMME);
- electronic computer devices (usage of PCs, laptops, cellphones, PDAs and VoIP by SMMEs);
- connecting to the Internet (usage of dial-up modem, leased line, ISDN and ADSL by SMMEs);

- e-commerce importance (determining the importance of sales, information distribution, customer service, subscription and advertising by SMMEs);
- benefits of e-commerce utilisation (revenue, cost and competitive advantage in the short- and long-term);
- time using e-commerce (determining e-commerce maturity in SMMEs);
- the effects of e-commerce application utilisation (establishing the perceived business effects determined by SMMEs);
- relationships between benefits and effects (to identify significant relationships between applications, effects and benefits); and
- South Africa versus Australia (a comparison between this survey and the Australian survey)

Various statistical analyses was performed using *t*-tests and stepwise regression to identify elements, effects, benefits and relationships from the primary data. Secondary data analysis (SDA) was performed on the data received from Australia as not all the required comparative statistics were revealed in their work (Mustaffa & Beaumont, 2004; Beaumont, 2005).

4.2 Response

The response rate of the survey was 13.3% (or 40 out of 300) compared with an anticipated response rate of between 12% and 15%. Was this result typical of this kind of survey? Some colleagues argued a possible maximum of only 3% while another stated the norm was 14%. So this figure fell just short of the traditional norm for this type of survey. At one stage it was suggested that telephone calls be made to the businesses that had not responded to step up the return rate, but this could have caused unwanted delays as time was of the essence. Various researchers were consulted, one of which agreed that this response rate of 13.3% was acceptable (Watkins, 2005a). Interestingly, exactly half of the respondents indicated their interest in the results of this survey suggesting that this survey sparked enthusiasm in the business owners responding.

Two unexpected events happened. One of these was the return of a blank questionnaire with a note attached. The Managing Director of this responding business was of the opinion that her company was not a small business and therefore not an SMME and her company used all the applications listed, and therefore the questionnaire was inapplicable. After a telephone call was made to her explaining the usefulness of the data for this research, irrespective of whether the company was defined as a SMME or not, the call was forwarded to her IT manager. After discussing the situation with him the IT manager diligently returned the completed questionnaire by email.

The second unexpected event was when one completed questionnaire was returned by a business employing one person. These two introductory questions relating to turnover and asset value for less than a specific amount were marked 'No' indicating this business was not a SMME by definition. A telephone call was made to the owner highlighting a possible misunderstanding of these two questions and the answers provided. The business owner confirmed these questions were incorrectly answered and commented that it would be fantastic to own a one person business with a turnover of more than R 40 million. This conversation therefore allowed her business to be defined as a SMME and the results of this particular questionnaire to be included in the data analysis.

4.3 Analysis of table headings

As this survey uses quantitative methodology and various statistical tests are used, an understanding of the terms, abbreviations, definitions and table column headings are now presented.

Coefficient of determination (R-squared)

The coefficient of determination known as R-squared (or R^2) is the proportion of a sample variance of a response variable that is explained by the predictor¹ variables when a linear² regression is performed.

¹ X-variables $\{x_1, x_2, \dots, x_n\}$

² Linear regression is the simplest and most used of all regression models. This model states the random variable Y is related to the x -variable by $Y = \alpha + \beta x + \epsilon$

The sample correlation coefficient (r) is an estimate of the population correlation coefficient known as rho (ρ). In a hypothesis test, testing for significant evidence of a linear relationship between the x-variable and Y, the null hypothesis is compared, for example $\rho = 0$, and the alternative hypothesis, $\rho \neq 0$, rejecting the null hypothesis if r is too large. An F -test is a statistical test in which the test statistic has an F -distribution if the null hypothesis is true (Upton & Cook, 2004:85)

Degrees of freedom (df)

The number of degrees of freedom is denoted by 'df'. It is a parameter that appears in probability distributions used in statistical inference particularly the t -distribution. Degrees of freedom (df) in the case of the t -distribution usually reflects the shape of the t -distribution and the number of cases on which the test is based (Upton & Cook, 2004:100; Strümpfer, 2005b). Population variance (σ^2) is the mean of the squared differences between the values of the members of the population and the population mean (μ). This is the expectation of $(X - \mu)^2$ (Upton & Cook, 2004:289). Statistical inference is the process of drawing conclusions about the nature of some system on the basis of data subject to random variation. A variable is subject to random variation if its value is not predictable (Upton & Cook, 2004:348). In this study, 'df' is simply:

$$df = N - 1$$

F -test (F-statistic)

An F -test³ is used to test whether two variances are equal. This test is most frequently encountered in the context of an analysis of variance table, for example ANOVA⁴, where it is often referred to as a variance-ratio test. The test compares the ratio with critical values of an F -distribution (Upton & Cook, 2004:140).

³ Refer to appendix H for the statistical table of critical values

⁴ Analysis of variance

Mean

The mean, of a set of n items of data represented as $X = \{x_1, x_2, \dots, x_n\}$, is known as the arithmetic mean, sample mean, population mean or average (Upton & Cook, 2004:226). The formula is represented as $X(\text{bar}) = (x_1 + \dots + x_n)/n$ or

$$\bar{x} = \frac{1}{n} \sum_{i=1}^n x_i.$$

A sample mean (X bar) is used to estimate a population mean represented as μ (μ). In this study 'Mean' will represent 'mean response' as the average value within the Likert scale used (ranked from 1 to 5) of the respondents data (Mustaffa & Beaumont, 2004:6)

Mode

Mode is the most common occurring value. It is possible during analysis to obtain more than one mode: in this case the highest response would be represented in the tables for simplicity. According to Upton and Cook (2004:233) a mode "...is a data value whose frequency is not less than the frequency of neighbouring values"

Number of observations (N or frequency)

N is the number of observations. An observation is a result of an experiment or trial in which a variable, numerical or categorical, is measured (Upton & Cook, 2004:265). In this study N represents the number of respondents answering the relevant question (Q^5) or statement (S^6).

Number using

This represents the number of respondents making at least some use of an application. For example where a five point Likert scale is used ranging from 'not at all' (rank of 1) to 'a very large extent' (rank of 5) the 'number using' will be the sum of the observations excluding the rank of 1.

⁵ Questions in the questionnaire where labelled Q1, Q2....Q29

⁶ Statements in the questionnaire where labelled S1, S2....S30

One- and two-tailed hypothesis tests

A typical null hypothesis may state the population mean is equal to twenty ($\mu = 20$). The alternative hypothesis is $\mu < 20$ and is known as one sided and the test procedure is described as one-tailed. Using the alternative hypothesis $\mu \neq 20$ is two sided and the test is two-tailed. This two-tailed test therefore effectively tests for $\mu < 20$ and $\mu > 20$ (Upton & Cook, 2004:165).

In most of the hypotheses stated in this research, only positive significance levels were to be tested creating the need for the one-tailed test as opposed to the two-tailed test. In the work of Mustaffa and Beaumont (2004:9) two-tailed tests were performed. Their data was re-worked using the one-tailed test and reported on so as to allow comparative statistical tests to be made between the South African and Australian data.

Percentage using

This is the 'number using' divided by the 'number of respondents', represented as a percentage.

Regression

Regression is a word derived from the phrase 'regression towards the mean' and is often used as shorthand for linear regression or multiple regression models. 'Regression towards the mean' is a principle stating that of related measurements, the second is expected to be closer to the mean than the first. It is a statistical phenomenon which causes outcomes to be more likely to fall toward the centre of a statistical distribution. In these models the mean of one variable Y is presumed to be independent of one or more other variables (x_1, x_2, \dots). In regression the dependant variable Y is also known as the response variable or outcome variable. The independent x -variables (x_1, x_2, \dots) are also known as predictor variables, explanatory variables or controlled variables (Upton & Cook, 2004:313-315).

Standard deviation (σ or s)

The sample standard deviation is the square root of the variance and is denoted by the symbol⁷ σ (Upton & Cook, 2004:346). A sample standard deviation (σ) estimates a population standard deviation represented as sigma (s).

Standard error of the mean

The standard error of the mean of a sample of N observations taken from a population with a variance σ^2 is

$$\frac{\sigma}{\sqrt{N}} \quad \text{and estimates} \quad \frac{S}{\sqrt{N}}$$

The standard error mean provides a simple measure of uncertainty in a value.

Statistical significance (p)

In statistics a result is significant if it is unlikely to have occurred by chance. In traditional statistical hypothesis testing the significance level of a test, for example a t -test, is the maximum probability of accidentally rejecting a true null hypothesis. This decision is known as a Type I error. The significance of a result is called its p -value. The smaller the p -value, the more significant the result is.

One may choose a significance level of 1%, 5% or 10% and calculate a critical value of a statistic, for example the mean, so that the probability of it exceeding that chosen value given the truth of the null hypothesis would be 1%, 5% or 10% respectively. Now if the actual calculated statistical value exceeds the critical value then it is said to be significant at that level (1%, 5% or 10%). The significance level is denoted by alpha (α). This means a result that is significant at the 1% level is more significant than a result at the 5% level, and a result that is significant at the 5% level is more significant than a result at the 10% level.

⁷ The symbol σ was introduced by Karl Pearson in 1893

A balance-of-power game is now played between significance and error. A test at the 1% level is more likely to have a Type II error than a test at the 5% level resulting in less statistical power. In devising a hypothesis test a typical aim is to maximize power for a given significance. Generally, the best that may be achieved is to be a balance between significance and power. This means between the Type I and Type II errors. Indecently a Type I error is not necessarily any better or worse than a Type II error and vice versa. The severity depends on each case. To allow both an increase in significance and an increase in power the sample size will need to increase exponentially (Strümpfer, 2005b).

If the alternative hypothesis is true a sufficiently large sample size is likely to give a highly significant result. This applies even if the difference between the null hypothesis and the alternative hypothesis is very small. Statistical significance is not an indication of how substantial or important the difference is (Anon, 2005d; Upton & Cook, 2004:336).

In the statistical analysis in this research initial tests were performed at the 1% significance level, and thereafter at the 5% and 10% levels. In each table these levels are noted and are applied to the column 'Sig (1-tailed) (p)' meaning significance, one-tailed test. If a 1% significance level is used then the null hypothesis would be accepted if the p-value was greater than or equal to 0.010, alternatively the null hypothesis would be rejected if the p-value was less than 0.010.

Stepwise regression

Stepwise regression constitutes procedures for identifying an appropriate model of association between variables. The expectation of the response variable Y is modelled as a linear combination of many (p) explanatory x -variables (x_1, x_2, \dots). Forward selection begins by determining which of the x -variables provides the most information about Y . The procedure now considers the remaining ($p - 1$) variables, and in conjunction with the first, determines which variable provides the most additional information (an increase in R^2) about Y . Backward elimination reflects forward selection. It starts with the model containing all the p (say) x -variables and removing ineffective variables one at a time.

A variable is ineffective if its contribution results in a value for the F -test that fails to exceed the F -to-remove value (or F -value). In this research the F -value is set equal to one. Owing to the removal of one variable at a time, this procedure is known as stepwise regression (Upton & Cook, 2004:315-316).

t -test

A t -test is any statistical hypothesis test in which the test statistic has a student's t -distribution if the null hypothesis is true.

4.4 Presentation and analysis of results – stage one

The presentation and analysis of results comprises of respondent data displayed in tables and where required, illustrated graphically. Explanations of the data represented in these tables and the trends suggested by the graphs are explained. This applies to stage one (the first three blocks) of the research model (business demographics through to connecting to the Internet) as illustrated in Figure 4.1.

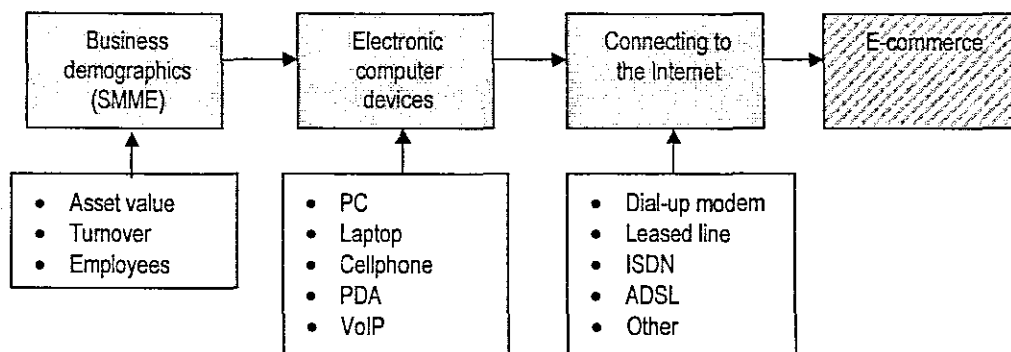


Figure 4.1: Stage one of the research model

4.4.1 Business demographics

The purpose of capturing company demographic data had five objectives:

- To identify which responding businesses were SMMEs;
- To determine the four classifications of SMMEs;
- to identify the frequency of responding SMMEs per classification;
- to calculate the percentage of SMMEs per classification; and
- to compare corresponding data with similar SMME classification from the Australian survey

To enable classification of SMMEs the three questions relating to this are restated. The definition of a SMME is defined as a privately, independently or co-operatively owned and managed business complying with at least two of the following:

- the business total annual turnover is less than R40 million ;
- the business total assets, excluding fixed property, is less than R15 million;
- and
- the business has fewer than 200 full time employees

From the results of these questions, and by applying the logic in the decision tree formulated in the survey, of the 40 respondents, 38 were categorised as SMMEs resulting in: 11 micro-enterprises, 15 very small-enterprises, 6 small-enterprises and 6 medium-enterprises. These results are shown in Table 4.1. Micro- and very small-enterprises comprised 68.4% of the informants, the rest were small- and medium-enterprises with equal share. These proportions are representative of South African SMMEs, but how does this compare with Australia?

Table 4.1: Business classification of SMMEs excluding turnover and asset value

SMME classification (excluding turnover and asset value)	Number of employees	Frequency (South Africa)	% (South Africa)	Frequency (Australia)	% (Australia)
Micro	1-5	11	28.9	40	53.3
Very small	6-20	15	39.5	21	28.0
Small	21-50	6	15.8	7	9.3
Medium	51-200	6	15.8	6	8.0
(Missing)				1	1.4
Total		38	100.0	75	100.0

The secondary data from the Australian survey was incorporated into Table 4.1 (columns five and six) based on employee numbers with a graphical representation of these figures displayed in Figure 4.2. Interestingly the greatest number of responding Australian SMMEs was micro-enterprises as opposed to South Africa's very small-enterprises. For the second highest number of respondents, these positions were reversed, indicating both micro- and very small-enterprises make up the majority of SMMEs in these two countries with South Africa contributing 68.4% and Australia 81.3%.

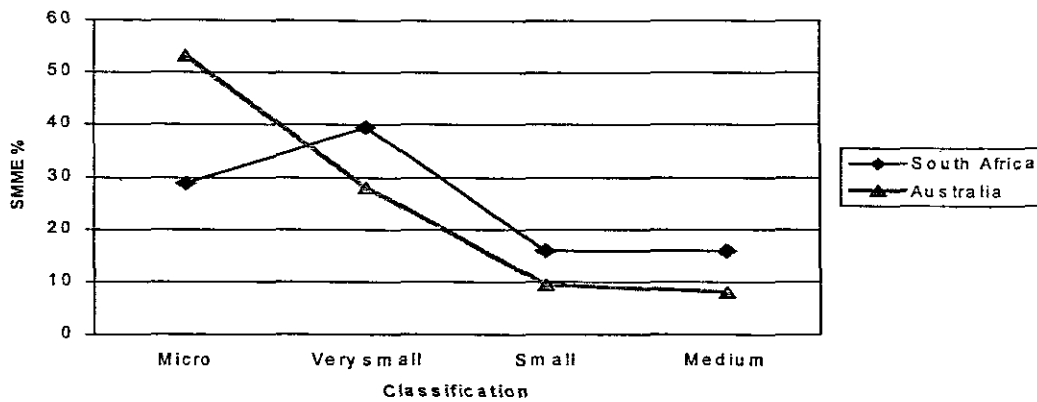


Figure 4.2: Business classification of SMMES (South Africa versus Australia)

By taking a look at the shape of this graph in Figure 4.1 it suggests a similar trend in business formation in both countries. From the responding data in both surveys, South Africa has slightly more very small-, small- and medium-enterprises. The exception is micro-enterprises where Australia has nearly double compared with South Africa. Could this mean that forming a business in Australia is easier and simpler, or perhaps South Africa has heavier statutory and labour regulations suppressing business start-ups? Ntuli (2005) supports this by stating that South Africa's labour laws have increased the cost in conducting business and the employment termination process is both awkward and difficult.

Geographical area

Geographical area of the responding business's was captured to ascertain depth of business operation within South Africa and globally. The four-point multi-choice single response scale chosen listed local, provincial, national and international as responses to the question: what is the geographic area of your business operation?

The results of this question are displayed in Table 4.2. This table reveals that some businesses do operate outside their local area of operation. Micro- and very small-enterprises have the highest and second highest local presence respectively, together with provincial, national and international representation.

Very small-, small- and medium-enterprises all have equal international representation suggesting the use of e-commerce to extend their operational depth geographically.

Table 4.2: Business size and geographical area (South Africa)

SMME classification (excluding turnover and asset value)	Number of employees	Local (SA)	Provincial (SA)	National (SA)	International (SA)	Total (SA)
Micro	1-5	8	1	1	1	11
Very small	6-20	10	2	1	2	15
Small	21-50	3	1		2	6
Medium	51-200	3		1	2	6
Total		24	4	3	7	38
% of Total		63	11	8	18	

The secondary data from Australia was incorporated into Table 4.3. This table reveals that many more businesses operate outside their locality compared with South Africa. Micro- and very small-SMMEs have the highest and second highest local presence respectively. These results are similar to the findings in South Africa. Small- and medium-enterprises in Australia showed less national and international depth in operation than South Africa suggesting that smaller businesses are adopting e-commerce as a cost effective way of expanding their global reach.

Table 4.3: Business size and geographical area (Australia)

SMME classification (excluding turnover and asset value)	Number of employees	Local (Aus)	Regional (Aus)	National (Aus)	International (Aus)	Total (Aus)
Micro	1-5	12	6	10	11	39
Very small	6-20	4	4	9	4	21
Small	21-50	2		5		7
Medium	51-200	2		3	1	6
Total		20	10	27	16	73
% of Total		27	14	37	22	

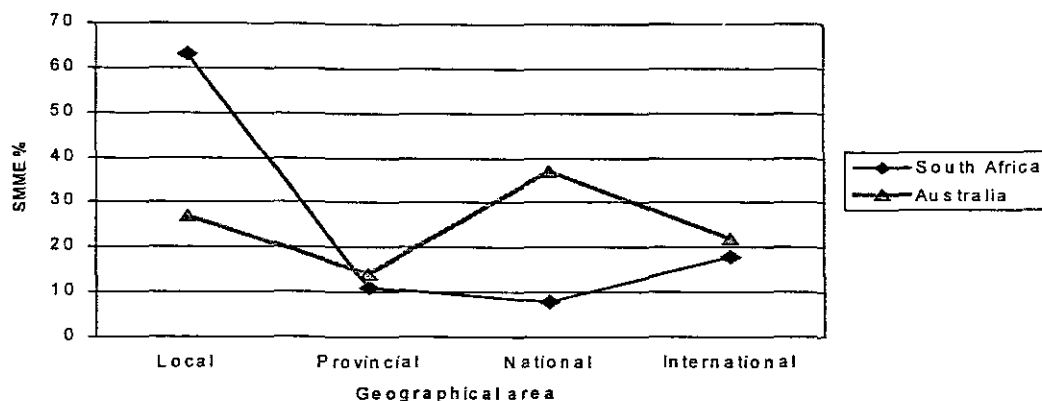


Figure 4.3: Geographic area of operation by SMMEs (South Africa versus Australia)

The graph illustrated in Figure 4.1 combines all four classifications of SMMEs and is compared with the four geographical areas of operation. South Africa has a high local and low national operational area while Australia is the opposite with a high national and lower local operational area. Why does South Africa have such a high local presence amongst SMMEs? Could this suggest that South African urban areas have higher populations and a local operation is sufficient to sustain a SMME, or could the transport infrastructure limit expansion within South Africa? International operations are closely matched suggesting similar trends in both countries to expand the reach of products and services globally.

Further exploration for these reasons was not possible in this survey suggesting a possible limitation. A minimum of demographic data was solicited from the respondents specifically: geographic area of operation. This was limited to the four answers in this survey, namely: local, provincial, national and international. In depth operational enquiries could have stretched into the 'where, what and why' businesses were operating in these four areas. As this research was based on the Australian survey and comparative results together with simplicity were aimed for, this approach was not undertaken.

4.4.2 Electronic computer devices

Moving on to the second block in the research model, one research question was to determine which electronic computer devices were mostly used by SMMEs. For each of the five electronic computer devices listed in Table 4.4 a question was asked, for example: does your business use personal computers (PCs)? Each question in the questionnaire allowed an area provided to be ticked within the corresponding Likert scale ranging from 'not at all' (rank of 1) to 'a very large extent' (rank of 5). 'Number using' included the ranking of 2 through to 5 to identify at least some use of the specific electronic computer devices in question.

Table 4.4: Electronic computer device usage

Electronic computer device	Frequency	Number using	Mean	Mode	Percentage Using (%)
PC	37	36	4.08	5	97
Cellphone	38	20	3.76	5	53
Laptop	37	17	2.00	1	46
PDA	37	4	1.16	1	11
VoIP	37	4	1.16	1	11

Of the 37 responding SMMEs 36 (or 97%) responded positively to using PCs indicating that the PC is the most widely utilised electronic device surveyed. The mean of just over 4 indicated a high usage value equivalent in saying 'SMMEs use PCs to a large extent'. The mode of 5 indicates that this is the most occurring value and with the highest ranking in the Likert scale used. Cellphones were the second most utilised electronic computer device (Stuyck, 2005; Underwood, 2005) with 20 (or 53%) of the 38 respondents indicating so. With a mean of just less than 4 and a mode of 5, the statistics substantiate this. A cellphone has the advantage of mobile communication, mobile messaging and recently mobile computing (Nokia, 2005b). Laptops were the third most popular electronic computer device used by SMMEs with 17 (or 46%) of the 37 respondents indicating so (Stuyck, 2005; Underwood, 2005). The two least utilised electronic computer devices were PDA and VoIP with an equal 11% utilisation. These could suggest some possible resistance to PDA acceptability while VoIP is relatively new and was only legalised in South Africa this year. The usage of these five electronic computer devices surveyed is graphically illustrated in Figure 4.4.

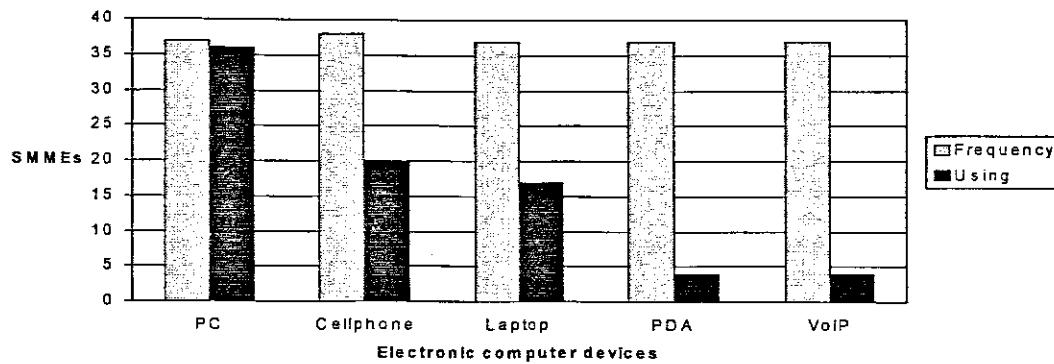


Figure 4.4: Electronic computer device usage

4.4.3 Connecting to the Internet

The second research question was to determine which connections to the Internet were mostly used by SMMEs. The results of these are listed in Table 4.5. Of the five Internet connections each had a question in the questionnaire relating to the 'use of' for example: does your business use a dial-up modem? Each of these questions allowed an area provided to be ticked within the corresponding Likert scale ranging from 'not at all' (rank of 1) to 'a very large extent' (rank of 5). 'Number using' included the ranking of 2 through to 5 to identify at least some use of the Internet connectivity in question. These results are now discussed.

Table 4.5: Internet connectivity usage

Internet connection	Frequency	Number using	Mean	Mode	Percentage Using (%)
Dial-up modem	34	26	3.38	5	76
Always-on ADSL	34	13	2.47	1	38
Always-on Leased line	31	9	1.97	1	29
Dial-up ISDN	33	7	1.52	1	21
Other	35	2	1.14	1	6

Referring to Table 4.5 and the graphical representation of the data in Figure 4.5, 26 of the 34 responding SMMEs (or 76%) surveyed used dial-up modem (Underwood, 2005). Dial-up with its known slow transmission rates, billable call charges and narrowband technology is the most frequently used form of online internet connectivity in South African SMMEs, with a mean of 3.38 and a mode of 5. Always-on broadband ADSL was the second most utilised Internet connectivity option with 13 (or 38%) of the 34 respondents (Stuyck, 2005). According to the literature current Internet connectivity costs in South Africa are high and ADSL is

one of the most expensive but has the advantage of always-on access and a fast broadband transmission rate. With a recent trend to lower ADSL tariffs, ADSL is becoming increasingly more popular. But will ADSL ever surpass dial-up modem as the preferred Internet connection known for its high acceptance, average usability but still highly useful? These results possibly indicate that the more knowledgeable SMMEs are about the availability of various options of online Internet connectivity available, the greater their advantages will be enabling more effective utilisation of e-commerce.

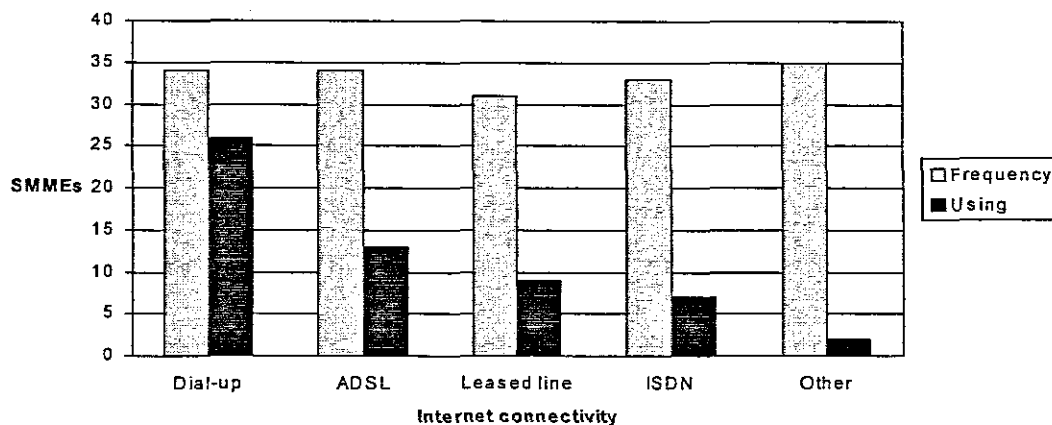


Figure 4.5: internet connectivity usage

Leased line known for its high cost was rated third and ISDN with call charges but without broadband capability was rated fourth. The statistics show two SMMEs responded to the 'Other form of Internet connectivity' question, one of which wrote on the returned questionnaire the use of 'Internet cafes'. How interesting it was, despite the quantitative nature of this research that some respondents were driven to make an adaptation of the questionnaire which suggests for example a more relaxed approach to completing questionnaires.

4.4.4 Summary of stage one

To summarise the work so far, the business demographics were explored classifying SMMEs into micro-, very small-, small- and medium-enterprises. The statistics reveal that most SMMEs use electronic computer devices (a PC, a laptop or cellphone) and most have Internet connectivity (dial-up modem or ADSL). It is interesting to note the usability of the Internet with these electronic computer devices.

Some SMMEs use more than one type of Internet connection as illustrated in Table 4.6. This table shows the relationship of each Internet connectivity type with each of the electronic computer devices discussed.

Table 4.6: Electronic computer device and Internet connectivity usage

Electronic computer device	Number using	Dial-up modem	Leased line	ISDN	ADSL	Other
PC	36	26	10	7	13	2
Cellphone	34	23	9	5	12	1
Laptop	17	10	5	3	10	0
PDA	4	3	1	2	2	0
VoIP	4	3	0	0	1	0

Most PC, laptop and cellphone using SMMEs use dial-up modem and ADSL. Dial-up modem outweighs the use of ADSL in some cases except for laptops where the usage is equivalent (10 each). An unexpected statistic was revealed with the use of VoIP. Of the four SMMEs using VoIP three of them use dial-up modem while one uses ADSL. None of the other Internet connections feature here.

This represents the analysis performed on the data so far according to the research model. SMMEs were classified, the use of electronic computer devices was revealed and the types of Internet connectivity were discussed. The next stage is to explore e-commerce represented as the fourth block as in Figure 4.1. This block is defined as e-commerce and includes e-commerce importance, time in e-commerce, together with a breakdown of application-effect-benefit relationships.

4.5 Presentation and analysis of results – stage two

The presentation and analysis of results of stage two comprises of respondent data displayed in tables representing significance of use (using *t*-tests) and relationships (using stepwise regression) and, where required, these are illustrated graphically. Explanations of the significance of use in these tables and the relationships are explained. This applies to stage two of the research model as illustrated in Figure 4.6.

Firstly, e-commerce is explored comprised of the e-commerce importance, time using e-commerce and finally benefits of e-commerce utilisation. Thereafter the effects of e-commerce application utilisation are explored and finally the possible relationships between applications, effect and benefits are tested.

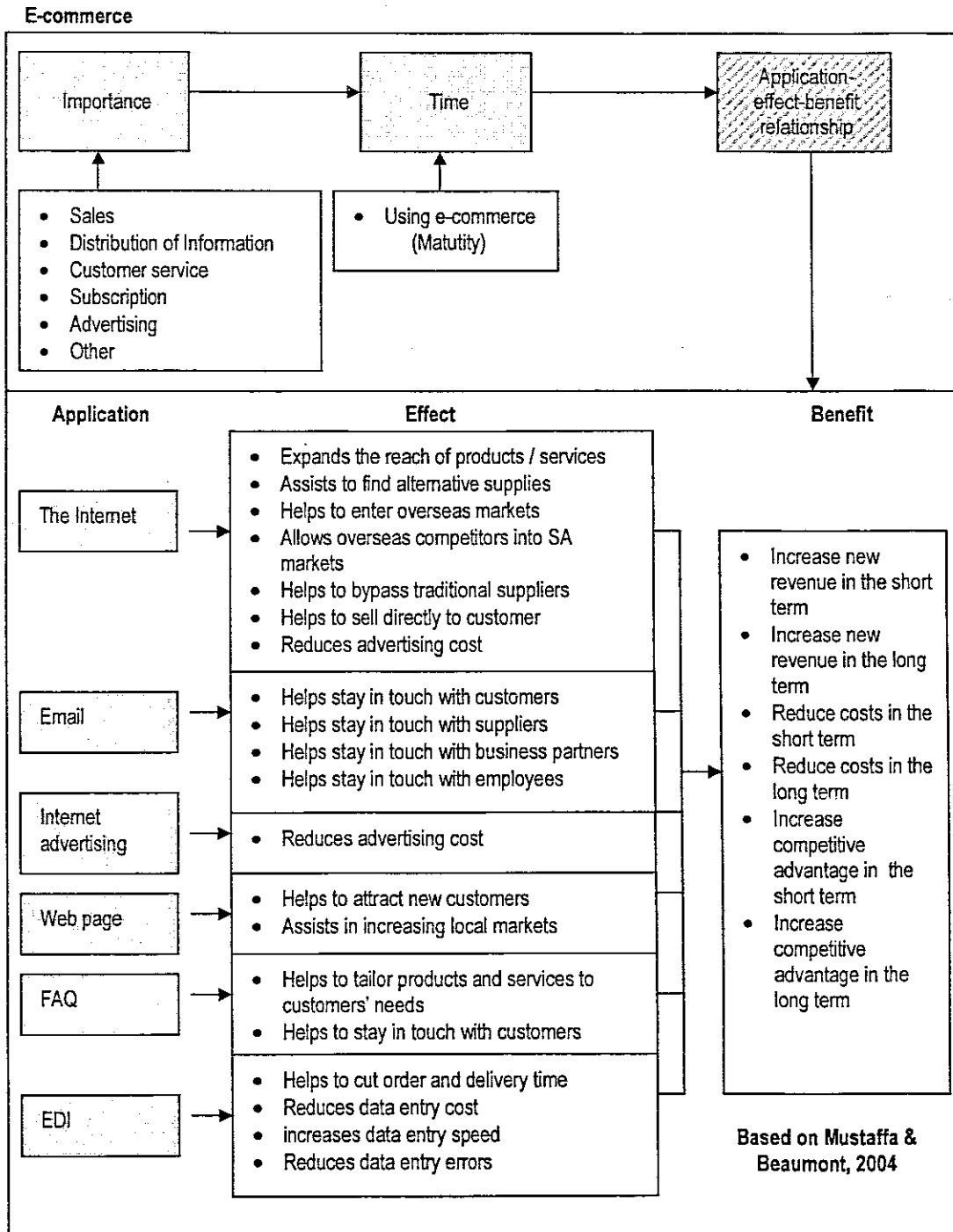


Figure 4.6: Stage two of the research model

4.5.1 E-commerce

The research on e-commerce was divided up into three sections namely:

- e-commerce importance;
- benefits of e-commerce utilisation; and
- time using e-commerce;

4.5.1.1 E-commerce importance

Six elements of e-commerce (sales, information distribution, customer service, subscription, advertising and other forms of e-commerce importance) were examined for levels of importance by SMMEs. Each had a statement in the questionnaire for example: sales are an important use of e-commerce. Each of these statements provided an area to be ticked within the corresponding Likert scale ranging from 'not at all' (rank of 1) to 'most important' (rank of 5).

Table 4.7: Elements of e-commerce importance significantly used by SA SMMEs

Element of e-commerce importance	N	Mean	Std. Deviation (σ)	Std. Error Mean	t	df	Sig (1-tailed) (p)
Information distribution	16	2.44	1.315	0.329	4.373	15	0.000
Customer service	16	2.31	1.138	0.285	4.612	15	0.000
Sales	16	2.25	1.183	0.296	4.226	15	0.000
Advertising	16	2.19	1.047	0.262	4.538	15	0.000
Subscription	16	1.94	1.289	0.322	2.908	15	0.005
Other	8	1.63	0.744	0.263	2.376	7	0.025

These elements of importance within e-commerce were analysed using one-sample *t*-tests with a test-value of one. Five of the six elements as listed in Table 4.7 (sales, information distribution, customer service, subscription and advertising) had very strong significance at less than the one percent significance level while one element (other) had strong significance. These null hypotheses for these elements were very strongly rejected allowing the acceptance of the alternative hypotheses, and these are:

H101₁: Sales are an important use of e-commerce

H102₁: Information distribution is an important use of e-commerce

H103₁: Customer service is an important use of e-commerce

H104₁: Advertising is an important use of e-commerce

H105₁: Subscription is an important use of e-commerce

H106₁: There are other important uses of e-commerce

South African SMMEs find information distribution, customer service, sales and advertising have some importance while subscription, a payment to subscribe to something, and 'other' had low importance.

Table 4.8: Elements of e-commerce importance significantly used by Australian SMMEs

Element of e-commerce importance	N	Mean	Std. Deviation (σ)	Std. Error Mean	t	df	Sig (1-tailed) (p)
Advertising	21	4.33	1.197	0.261	12.759	20	0.000
Other	8	2.88	1.808	0.639	2.934	7	0.011
Subscription	44	2.66	1.311	0.198	8.396	43	0.000
Sales	38	2.53	0.951	0.154	9.892	37	0.000
Information distribution	39	2.18	1.073	0.172	6.865	38	0.000
Customer service	55	1.82	0.983	0.133	6.173	54	0.000

The data from the Australian survey was analysed using identical *t*-tests and the results are listed in Table 4.8. Australian SMMEs find advertising, 'other', subscription, sales and information distribution have some importance while customer service had low importance. Comparing the results from this South African survey and the Australian survey, the three e-commerce elements with the highest importance for South Africa were information distribution, customer service and sales. Strangely these three are the least important elements in Australian e-commerce. This suggests that South African SMMEs are more customer focused, information dependant and sales driven than their Australian counterparts while the Australians are more advertising and subscription focussed.

4.5.1.2 Benefits of e-commerce utilisation

A research question was to identify the benefits of e-commerce. The six potential e-commerce benefits in the short- and long-term, each had a statement in the questionnaire for example: e-commerce will help to attract new revenue in the short-term. Each of these statements provided an area to be ticked within the corresponding Likert scale ranging from '0-10%' (rank of 1) to 'more than 40%' (rank of 5) while 'don't know' was excluded (rank of 6).

Table 4.9: Positive benefits with $p < 0.01$ for one-tailed significance test (*t*-test)

Benefit	N	Mean	Std. Deviation (σ)	Std. Error Mean	t	df	Sig (1-tailed) (p)
long term competitive advantage	10	3.30	1.636	0.517	4.445	9	0.001
long term costs reduced	11	3.00	1.549	0.467	4.282	10	0.001
long term new revenue	13	2.62	1.609	0.446	3.619	12	0.002

Table 4.10: Positive benefits with $p \geq 0.01$ and $p < 0.05$ for one-tailed significance test (t-test)

Benefit	N	Mean	Std. Deviation (σ)	Std. Error Mean	t	df	Sig (1-tailed) (p)
short term costs reduced	8	2.38	1.685	0.596	2.308	7	0.027
short term competitive advantage	9	2.33	1.658	0.553	2.412	8	0.021
short term new revenue	10	1.90	1.449	0.458	1.964	9	0.041

The potential benefits were analysed using one-sample *t*-tests with a test-value of one. Three of the six benefits listed in Table 4.9 (increased competitive advantage, reduced cost and new revenue, all in the long-term) had very strong significance at less than the one percent significance level. These null hypotheses were very strongly rejected. Interestingly the remaining three benefits listed in Table 4.10, all short-term (new revenue, reduced cost and increased competitive advantage) showed some evidence of significance at less than the five percent level resulting in these null hypotheses being rejected. This allowed all six alternative hypotheses to be accepted and these are:

H301₁: E-commerce has a positive benefit in increasing short-term new revenue

H302₁: E-commerce has a positive benefit in increasing long-term new revenue

H303₁: E-commerce has a positive benefit in reducing costs in the short-term

H304₁: E-commerce has a positive benefit in reducing costs in the long-term

H305₁: E-commerce has a positive benefit in increasing short-term competitive advantage

H306₁: E-commerce has a positive benefit in increasing long-term competitive advantage

These results indicate South African SMMEs do gain business benefits by utilising e-commerce. The positive benefits for the SMME are:

- increased competitive advantage in the long term;
- reduced costs in the long term;
- increased new revenue in the long term;
- reduced costs in the short term;
- increased competitive advantage in the short term; and
- increased new revenue in the short term

4.5.1.3 Time using e-commerce

One of the questions in the questionnaire was asked to establish how long the SMME had used e-commerce for. Twelve of the 38 SMMEs responded to this question. The statistics are displayed in Figure 4.7 together with the results from the Australian survey. Interestingly the graph increases and peaks at 33% of SMMES using e-commerce for four years and then decreases to 8% at two years, the same as eight years ago. One question that came to mind was: could this graph illustrate the dot com crash of 2000 at the five year interval? Further exploration of this graph reveals that both countries SMME utilisation percentages peak at 33% but with Australia peaking two years later than South Africa. Could this indicate that South African SMMES have a higher confidence factor than Australian SMMES because they invested in e-commerce earlier? This question warrants further exploratory research.

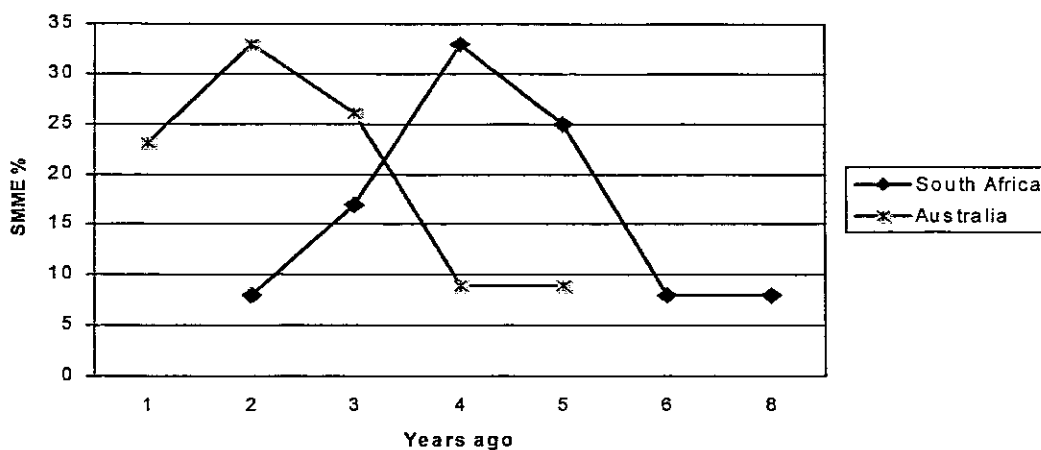


Figure 4.7: Percentage of SMMEs using e-commerce, years ago

4.5.2 The effects of e-commerce application utilisation

Moving on to the final part of the research model, the effects of e-commerce are explored together with relationships between effect and benefits. A research objective was to identify the effects of e-commerce applications. Table 4.11 lists the effects (in hypothesis order) explored answering the research question:

What are the positive effects of e-commerce application utilisation?

The effects were analysed by comparing means, using one-sample *t*-tests with a test-value of one.

Table 4.11: Positive effects with $p < 0.01$ for one-tailed significance test (t-test)

Application	Effect	N	Mean	Std. Deviation (σ)	Std. Error Mean	t	df	Sig (1-tailed) (p)
Email	Stay in touch with customers	35	3.34	1.413	0.239	9.809	34	0.000
Email	Stay in touch with suppliers	35	3.11	1.491	0.252	8.392	34	0.000
Email	Stay in touch with business partners	35	3.17	1.689	0.285	7.607	34	0.000
Email	Stay in touch with employees	35	2.37	1.457	0.246	5.569	34	0.000
Internet	Expand products / services	34	2.79	1.473	0.253	7.104	33	0.000
Internet	Alternative supplies	34	3.12	1.472	0.252	8.387	33	0.000
Internet	Enter overseas markets	34	2.03	1.359	0.233	4.416	33	0.000
Internet	Overseas competitors into SA markets	31	2.55	1.457	0.262	5.917	30	0.000
Internet	Bypass traditional supplier	33	2.39	1.368	0.238	5.854	32	0.000
Internet	Sell directly to customer	33	2.27	1.506	0.262	4.856	32	0.000
Internet advertising	Reduce advertising cost	26	1.92	1.197	0.235	3.931	25	0.000
Web page	Attract new customers	21	2.24	1.446	0.316	3.924	20	0.000
Web page	Increase local markets	21	2.00	1.265	0.276	3.623	20	0.001

Thirteen of the twenty one effects had very strong significance at less than the one percent significance level therefore supporting the rejection of these null hypotheses allowing the alternative hypotheses to be accepted and these are:

H201₁: Email has a positive effect in staying in touch with customers

H202₁: Email has a positive effect in staying in touch with suppliers

H203₁: Email has a positive effect in staying in touch with business partners

H204₁: Email has a positive effect in staying in touch with employees

H205₁: The Internet has a positive effect in expanding products and or services

H206₁: The Internet has a positive effect in finding alternate source of supplies

H207₁: The Internet has a positive effect in helping to enter overseas markets

H208₁: The Internet has a positive effect in allowing overseas competitors to enter South African markets

H209₁: The Internet has a positive effect in bypassing traditional suppliers

H210₁: The Internet has a positive effect in helping to sell directly to customers

H211₁: The Internet has a positive effect in reducing advertising cost

H212₁: A Web page has a positive effect in attracting new customers

H213₁: A Web page has a positive effect in increasing local market share

The effects of e-commerce applications FAQ and Internet EDI were excluded from the list in Table 4.10 as there was too low a response for reliable statistical analysis with $p > 0.01$ and $p > 0.05$ for both one-tailed and two-tailed significance tests. The statistics show the positive effects on SMMEs utilising email as an e-commerce application. Email helps the SMME to stay in touch with:

- customers;
- suppliers;
- business partners; and
- employees

With a mode of five and 71% usage, software email is the most frequently used form of email by SMMEs with Web browser based email second on 47.4%. Software email is traditionally installed on PCs or laptops using software packages according to the literature. Web browser email has the advantage of enabling flexible global use. Although the usage is quite low, cellphone email is useful for mobile CRM support staff answering customers email queries while on the move. Table 4.12 shows the results of messaging use by SMMEs.

Table 4.12: Email messaging usage

Email messaging	Frequency	Using	Mean	Mode	Percentage Using (%)e
Software email	35	25	3.29	5	71
Web browser email	34	18	2.21	1	53
Cellphone email	35	5	1.20	1	14
PDA email	35	2	1.06	1	6

The effects found in using the Internet were:

- expands the market reach of products and or services;
- assists in finding alternative suppliers;
- helps the SMME enter overseas markets;
- allows overseas competitors to enter South African markets
- helps the SMME to bypass traditional suppliers; and
- helps the SMME sell directly to customers

Internet advertising is accredited with reducing advertising costs. The literature has shown this is owing to the low set-up costs in advertising over the Internet. These statistics indicate a Web page helps in attracting new customers and increases local market share. Although EDI showed unreliable statistics one interesting comment, was made by a respondent not currently using EDI was:

“In future one of my companies will”.

4.5.3 Relationships between benefits and effects

One of the research objectives was to identify the effects of e-commerce applications having a positive impact on business benefits for short- and long-term revenue, cost and competitive advantage. Stepwise regression was used to examine the statistical relationships between e-commerce application effects and benefits (Upton & Cook, 2004:313).

Assumptions relating to stepwise regression were tested prior to analysis with no serious violations identified (Coakes & Steed, 2003:163). In their study Mustaffa and Beaumont (2004:8), state:

“In principle it would be desirable to regress each final variable against all intermediate variables. However, it was clear that the many missing values would mask any statically significant results.”
(Mustaffa & Beaumont, 2004:8)

This was evident for this study resulting in each benefit being regressed against each group of effects (e-commerce application) associated with a feature of e-commerce. Therefore the six benefits were regressed against each of the remaining four e-commerce applications (FAQ and EDI were omitted). Seven of the 24 cases produced statically significant relationships. Forward and backward procedures together with the stepping method criteria used resulted in an *F*-value entry at less than or equal to 0.05 and removal at greater or equal to 0.10. One-tailed significance tests were used with a significance level of less than 0.05 ($p < 0.05$).

Table 4.13: Relationships between effects and benefits with $p < 0.05$ (stepwise regression)

Dependant variable (Benefit)	N	R-squared	F-statistic	E-commerce application	Independent variable (Effect)	Std coefficient (β)	Sig (p)
Short-term new revenue	9	0.454	5.81	Web page	A Web page increases local market share	0.673	0.047
Long-term new revenue	12	0.408	6.894	Internet	The Internet assists in selling directly to customers	0.639	0.025
Short-term costs reduced	7	0.695	11.386	Internet advertising	Internet advertising reduces advertising cost	0.834	0.020
Long-term costs reduced	10	0.470	7.105	Email	Email helps to stay in touch with customers	0.686	0.029
Short-term competitive advantage	8	0.741	17.194	Web page	A Web page increases local market share	0.861	0.006
Short-term competitive advantage	8	0.723	15.677	Internet advertising	Internet advertising reduces advertising cost	0.850	0.007
Long-term competitive advantage	9	0.469	6.186	Email	Email helps to stay in touch with customers	0.685	0.042

Table 4.13 lists the e-commerce application-effect-benefit relationships and these relationships were explored to answer the research question:

What significant relationships exist between effects and benefits?

The dependant variable short-term new revenue is associated with increased local market share. This independent variable is associated with having a Web page. Creating a Web page through an ISP can be a quick and effective method of promoting a SMME. The ISP supplies the knowledge and methods that many SMMEs do not have to allow rapidly increasing local market share thus generating increased revenue in the short-term.

Long-term new revenue is associated with selling directly to customers. This independent variable is associated with Internet utilisation. Selling directly to customers creates business-to-customer (B2C) activities. These activities allow freedom of choice by the customers assisting in the increased markets boosting revenue in the long-term.

Short-term cost reduction is associated with reduced advertising cost. This independent variable is associated with Internet advertising. SMMEs can gain cost advantages by using the Internet to reduce their advertising cost which is a fraction of the set-up costs for traditional adverting, for example: billboards, traditional media or mobile media (A-frame advertising trailers).

Long-term cost reduction is associated with staying in touch with customers using the e-commerce application, email. Email has very small marginal costs if software and IT based. Cellphone and PDA based email can be more costly but are seldom used by SMMEs.

The dependant variable short-term competitive advantage is associated with both increased local market share and reduced advertising cost. These independent variables are associated with having a Web page and Internet advertising respectively. A Web page gives global visibility using a known or branded URL or by using an efficient Internet search engine to find the page. This aids market share expansion at low cost. SMMEs can gain competitive advantage by using low cost Internet advertising.

Long-term competitive advantage is associated with staying in touch with customers. This independent variable is associated with email utilisation. CRM is essential for any business as described in the literature. Using email as a rapid communication channel has created advantages for SMMEs in the long-term.

4.5.4 South Africa versus Australia

The results of this South African study reveal thirteen positive effects in e-commerce utilisation matching the thirteen effects found in the Australian study. These effects are summarised in Table 4.14, in stated hypothesis⁸ order.

Table 4.14: Effects of e-commerce application utilisation – South Africa and Australia

Application	Effect	South Africa		Australia	
		N	Sig (1-tailed) (p)	N	Sig (1-tailed) (p)
Email	Stay in touch with customers	35	0.000	62	0.000
Email	Stay in touch with suppliers	35	0.000	57	0.000
Email	Stay in touch with business partners	35	0.000	57	0.000
Email	Stay in touch with employees	35	0.000	55	0.000
Internet	Expand products / services	34	0.000	56	0.000
Internet	Alternative supplies	34	0.000	55	0.000
Internet	Enter overseas markets	34	0.000	56	0.000
Internet	Overseas competitors into SA (Aus) markets	31	0.000	53	0.000
Internet	Bypass traditional supplier	33	0.000	56	0.000
Internet	Sell directly to customer	33	0.000	54	0.000
Internet advertising	Reduce advertising cost	20	0.000	39	0.000
Web page	Attract new customers	21	0.000	66	0.000
Web page	Increase local markets	21	0.001	65	0.000

⁸ Refer to appendix F

The results from both surveys conclude:

- Email helps us stay in touch with customers
- Email helps us stay in touch with suppliers
- Email helps us stay in touch with business partners
- Email helps us stay in touch with employees
- The Internet has helped us expand products and service
- The Internet has helped us to identify alternate suppliers
- The Internet has helped us enter overseas markets
- The Internet has helped overseas competitors enter South African (Australian) markets
- The Internet has helped us to bypass the traditional supplier
- Internet advertising reduces advertising cost
- A Web page helps to attract new customers
- A Web page increases local market share

Similarly the six benefits explored in this research matched the six benefits in the Australian study. These benefits are summarised in Table 4.15, in stated hypotheses order.

Table 4.15: Benefits of e-commerce application utilisation – South Africa and Australia

Effect	South Africa		Australia	
	N	Sig (1-tailed) (p)	N	Sig (1-tailed) (p)
short term new revenue	10	0.041	43	0.000
long term new revenue	13	0.002	60	0.000
short term costs reduced	8	0.027	14	0.006
long term costs reduced	11	0.001	25	0.000
short term competitive advantage	9	0.021	40	0.000
long term competitive advantage	10	0.001	44	0.000

The results from both surveys conclude the business benefits for SMMEs are:

- Increased short-term new revenue
- Increased long-term new revenue
- Reduced short-term costs
- Reduced long-term costs
- Increased short-term competitive advantage
- Increased long-term competitive advantage

The final comparison takes a look at the application-effect-benefit relationships between the two countries as listed in Table 4.16. The statistics in this study revealed that short-term new revenue is associated with a 'Web page increases local market share'. Interestingly the Australian survey revealed the second of the two effects, namely a 'Web page attracts new customers'. These two associations are themselves related as increasing market share implies the customer base will increase and vice versa. The 'Internet helps to reduce advertising cost' was the second association found in the Australian survey supporting increased short-term revenue.

Table 4.16: Relationships between effects and benefits (South Africa and Australia)

Benefit	E-commerce application	Effect (South Africa)	Effect (Australia)
Short-term new revenue	Web page	A Web page increases local market share	
	Web page		A Web page helps to attract new customers
	Internet	The Internet helps to reduce advertising cost	
Long-term new revenue	Web page		A Web page helps to attract new customers
	Email		Email helps to stay in touch with customers
	Internet	The Internet assists in selling directly to customers	
	Internet		The Internet has helped us expand products and services
	Internet		The Internet has helped us enter overseas markets
Short-term costs reduced	Internet advertising	Internet advertising reduces advertising cost	
Long-term costs reduced	Email	Email helps to stay in touch with customers	
	Email		The Internet has helped overseas competitors enter the Australian market
		Email	
Short-term competitive advantage	Web page	A Web page increases local market share	A Web page increases local market share
Short-term competitive advantage	Internet		The Internet has helped overseas competitors enter the Australian market
Short-term competitive advantage	Internet advertising	Internet advertising reduces advertising cost	
Long-term competitive advantage	Web page		A Web page increases local market share
	Email	Email helps to stay in touch with customers	
	Internet		The Internet has helped us expand products and services

South African SMMEs say that long-term new revenue is associated with B2C using the Internet to assist in the selling of products directly to customers. Long-term new revenue in the Australian survey revealed four significant relationships, namely:

- a Web page helps to attract new customers;
- emails help to stay in touch with customers;
- the Internet has helped to expand products and or services; and
- the Internet has assisted in entering overseas markets

Short-term cost reduction in South Africa was found to be associated with Internet advertising reducing advertising costs, while in Australia associations were not pursued as short-term cost reduction was omitted from the study, showing no significance at the one percent significance level.

The Australian survey revealed associations with both email and the Internet. Email was associated with staying in touch with customers while the Internet was associated with both: helping overseas competitors enter Australian markets and the Internet helps to identify alternative suppliers. South African SMMEs confirmed the association that email does help to stay in touch with customers.

Short-term competitive advantage is associated with Web page and Internet advertising. Web pages helped increase market share while Internet advertising has helped to reduce advertising cost. The Australian survey revealed the former association and but showed that the Internet had helped overseas competitors enter Australian markets.

In Australia long-term competitive advantage was associated with the Internet and Web page utilisation. The Web pages helped in expanding local markets and the Internet had helped in expanding products and or services. South African SMMEs said that email was significant in staying in touch with customers.

4.6 Conclusion

Chapter Four described the processes of data analysis and the interpretation of the survey. The analysis categorisation was based on the sections stated in the questionnaire. The sections included company demographics, electronic computer devices, Internet connectivity and e-commerce importance, benefits and time. Various statistical analyses were performed using *t*-tests and stepwise regression to identify e-commerce effects, benefits, and effect-benefit relationships from the primary data. Comparisons were made between similar researches conducted in Australia.

Chapter Five is the conclusion of this research based on statistical responses from South African SMMEs. The significant findings and the limitations are discussed together with recommendations for further research.

Chapter 5

CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

Chapter Four described the processes of data analysis and the interpretation of the survey. The analysis categorisation was based on the sections stated in the questionnaire. The sections included company demographics, electronic computer devices, Internet connectivity and e-commerce importance, benefits and time. Various statistical analyses were performed using *t*-tests and stepwise regression to identify e-commerce effects, benefits, and effect-benefit relationships from the primary data. Comparisons were made between similar research conducted in Australia.

Chapter Five is the conclusion of this research based on statistical responses from South African SMMEs. The significant findings, conclusions and limitations are discussed together with recommendations for further research.

5.2 Conclusion

This Chapter concludes the work by summarising what was achieved in two ways: firstly the objectives of the research as identified in section 1.3; and secondly the research questions and hypotheses identified in section 3.4 and 3.5 (including appendix F) respectively.

5.2.1 Research objectives

The four objectives of this research were:

- to investigate the realm of small business operating in the Western Cape;
- to examine the emergence and adoption of e-commerce in that business sector;
- to undertake a quantitative study of e-commerce application utilisation; and
- to understand the strategies that will lead to success in this context;

The realm of small business operating in the Western Cape

The first objective, the realm of small businesses in the Western Cape was achieved by using a random sample providing an adequate response. Some engagement with SMMEs took place either via email (requesting a questionnaire) or by telephone (motivation for the completion of an incomplete questionnaire and to verify information). The results were provided by a high percentage of SMMEs suggesting the sampling worked, and the receipt of good reliable data.

The emergence and adoption of e-commerce

Are SMMEs playing a wait-and-see game in e-commerce adoption as suggested by Carr (2004:20)? In 1998 the OECD found in Australia that 34% of small sized businesses make use of the internet compared to 65% of medium sized businesses. Mustaffa and Beaumont (2004:5) citing Yellow Pages¹ (1999) stated 48% of small sized businesses make use of the internet compared to 82% of medium sized businesses. In this South African research the statistics show 100% of small businesses make use of the Internet compared to 83.3% of medium businesses.

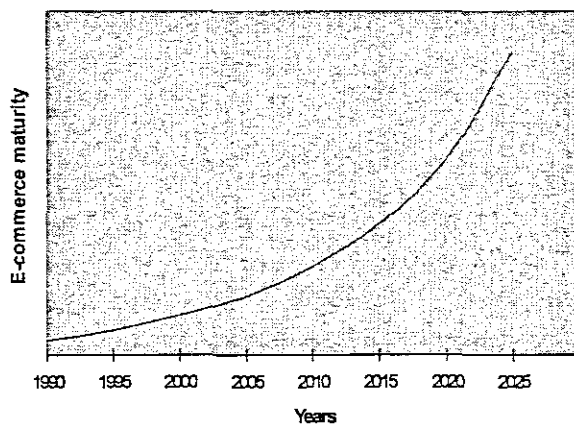


Figure 5.1: Exponential growth of e-commerce maturity (future)

¹ Yellow Pages. 1999. *Small business index: a survey of computer technology and e-commerce in Australian small and medium business*. Telstra Corp.

The statistics are understandably different as seven years have elapsed since the OECD study, clearly indicating the upswing of e-commerce adoption by small and medium businesses and an upward trend in the use of e-commerce. This refers back to a previous lack of e-commerce maturity. But the levels are still evolving especially between these two and other classifications of SMMEs. Five of the 38 SMMEs surveyed did not use email while small businesses showed 100% usage of email and medium businesses 83.3%. The statistics from research and previous Australian research, echo the suggestions by Carr (2003:6; 2004:17-20) indicating e-commerce is still in its infancy and e-commerce maturity grows exponentially as illustrated in Figure 5.1.

But how can SMMEs mature in e-commerce? Referring back to the comment made by OECD (1998:1), they state:

“There may thus be a particularly strong rationale for governments to address the problems that impede SMEs from adopting and using electronic commerce” (OECD, 1998:1).

They have noted various governments are encouraging the spread of e-commerce to improve business competitiveness and encourage the access to new markets. Raising public and business awareness using Web sites and training assistance are examples of current government initiatives to promote e-commerce maturity.

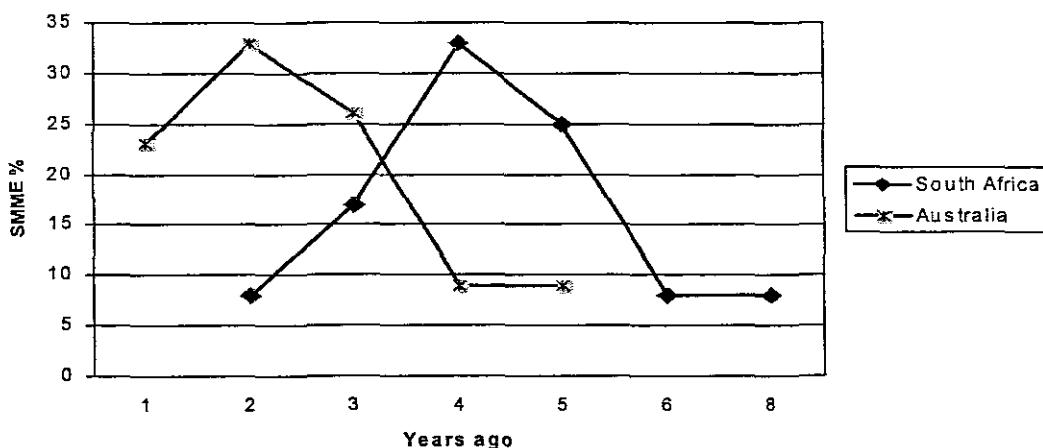


Figure 5.2: Percentage of SMMEs using e-commerce, years ago

E-commerce application utilisation by South African SMMEs

A decline in e-commerce marketing was attempted to be measured in the survey, but none of the SMMEs surveyed indicated they had stopped using e-commerce. However the statistics relating time and e-commerce usage was interesting. The curves of the graphs illustrated in Figure 5.2 between South Africa and Australia are similar. The peaks are shown at two years ago for Australia and four years ago for South Africa. Could this indicate that South African SMMEs have a higher confidence factor than Australian SMMEs by investing in e-commerce earlier? This question warrants further exploratory research.

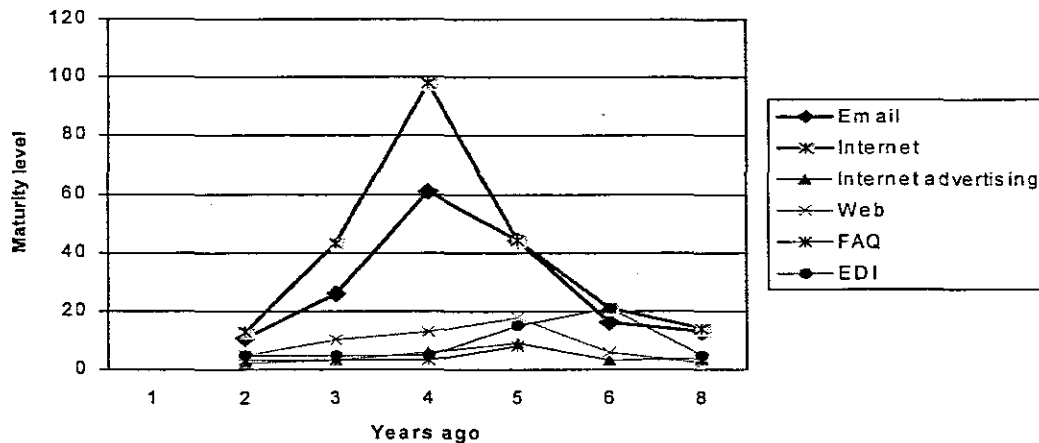


Figure 5.3: SMME application maturity levels, years ago

Table 5.3 illustrates the maturity level of application utilisation of South African SMMEs for the last eight years. SMMEs using email and the Internet for four years show the greatest usage and the Web to a lesser degree and at five years. But why then was there such a large increase and dramatic decrease? SMMEs experiencing e-commerce in 2001 will refer back to the unexpected depreciation of South African Rand (R). The Rand dropped nearly 50% in value from R6.70 per US\$1.00 to R13.21/US\$1.00 in nine months. This was the worst recorded depreciation of the Rand in South African history. Thereafter, the Rand strengthened and has now not only surpassed the pre 2001 level but is hovering around the 1998 exchange rate level. This graph illustrates the urgent need to globally market and distribute goods and services at a low exchange rate therefore boosting business income in Rand terms. Now that the Rand has stabilised this need has vanished as SMMEs have become aware that selling products and services internally within the country is more profitable.

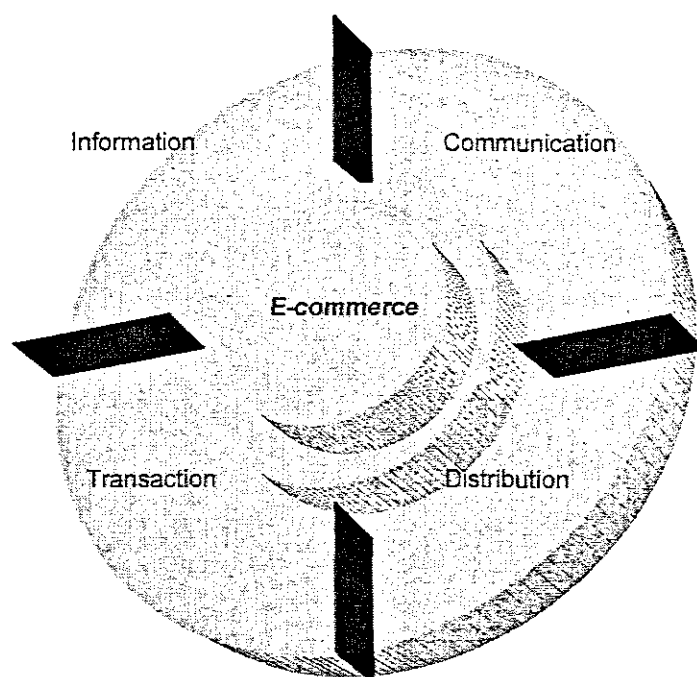


Figure 5.4: The ICDT model (Angehrn, 1997:2)

This example of the fluctuating exchange rate shows how quickly SMMEs can change their business strategy and adapt to changing markets. Angehrn (1997:2) reflects this in his ICDT model illustrated in Figure 5.4 where: communication can be rapidly made through email at low cost and high speed; information through the visibility of Web pages; transactions through B2B and B2C orders and invoices; and distribution through products and services (digitised through computer networks). These allow alternate global markets to operate when unexpected changes take place in an existing local market place.

A quantitative study of e-commerce application utilisation

The research was conducted using quantitative methodology using statistical tests to test: six e-commerce importance hypotheses; twenty one 'effect' hypotheses; and six 'benefit' hypotheses. These hypotheses were successfully accepted or rejected according to their one-tailed *t*-tests and their significance at the 1%, 5% and 10% significance levels. Stepwise regression was used to successfully extract the seven application-effect-benefit relationships supporting the proposed application-effect-benefit relationship model as illustrated in Figure 5.5.

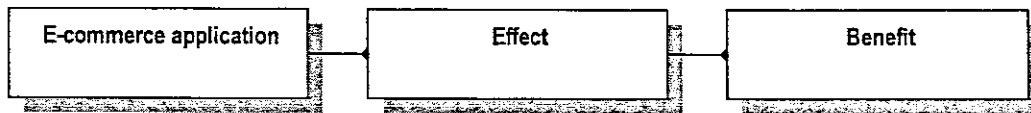


Figure 5.5: The e-commerce application-effect-benefit relationship model

Understand the strategies leading to success of e-commerce utilisation

The application layer research model shown in Figure 5.6 illustrates the strategy by which SMMEs must adopt to successfully fully utilise global e-commerce. Firstly an investment in electronic computer devices (PCs, laptops, cellphones, PDAs and even VoIP) is needed followed by the all important connection to the global e-commerce market through Internet connectivity (Dial-up modem, leased line, ADSL or ISDN). Once connected to the Internet email can then be used and Web sites can be developed. Internet advertising through Web pages or even email is cheap and inexpensive and FAQs help to support customer relations with useful information. Finally EDI can reduce data input and create automated data transfers between computers reducing costs and time.

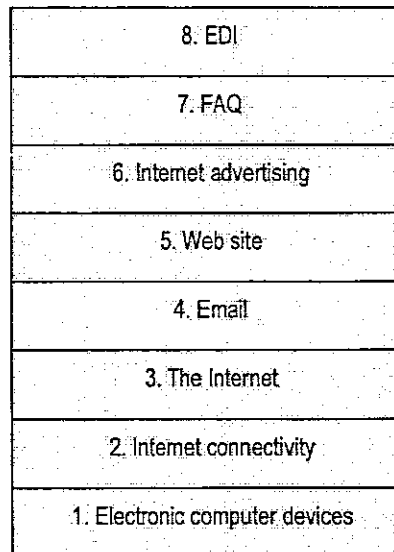


Figure 5.6: The application layer research model

5.2.2 Research questions

The seven research questions in this research were:

- Which electronic computer devices do SMMEs most use?
- Which Internet connections do SMMEs most use?
- What elements of e-commerce do SMMEs deem important?
- What are the positive effects of SMME e-commerce application utilisation?
- What are the positive benefits of SMME e-commerce application utilisation?
- What significant relationships exist between effects and benefits?
- How do South Africa and Australia compare in e-commerce utilisation?

Electronic computer devices and Internet connectivity

The top three most used electronic computer devices and Internet connections were the PC, dial-up modem and software email with 97%, 77% and 71% respectively. Other significant usages revealed were Web browser email, the cellphone, laptop and ADSL with 53%, 53%, 46% and 38% respectively. 'Other' online Internet connectivity and PDA based email were found as insignificant but PDAs, VoIP, leased line and cellphone email showed some significance but with low usage levels. According to the research in South Korea and US by Lee and Chan-Olmsted (2004:2), 10% of global Internet subscribers use broadband with DSL and cable-modem dominating the market with 59% and 39% respectively. The statistics from this research reveal much higher usage of broadband by SMMEs with 39% but ADSL and leased-line were similar at 54% and 38% respectively. The statistics support the view of Yeng *et al* (2001:4) when they state the acceptance of DSL is superior to ISDN. The results show that SMMEs use ADSL nearly twice as much than ISDN. This author himself recently switched from dial-up ISDN incurring call charges to always-on call charge free ADSL.

Throughout the analysis of the data of this research there has been a tendency for SMMEs to move towards the technology acceptance of mobile electronic computer devices and broadband Internet connectivity.

To support this finding the top three electronic computer devices found were: the PC (computing, communication and messaging), the cellphone (mobile communication and mobile messaging) and the laptop (mobile computing, mobile communication and mobile messaging). Nokia (2005b:2005c) recently launched a mobile smartphone with computing capabilities which enables a cellphone to now have mobile computing, mobile communication and mobile messaging services, as illustrated in Figure 5.7.

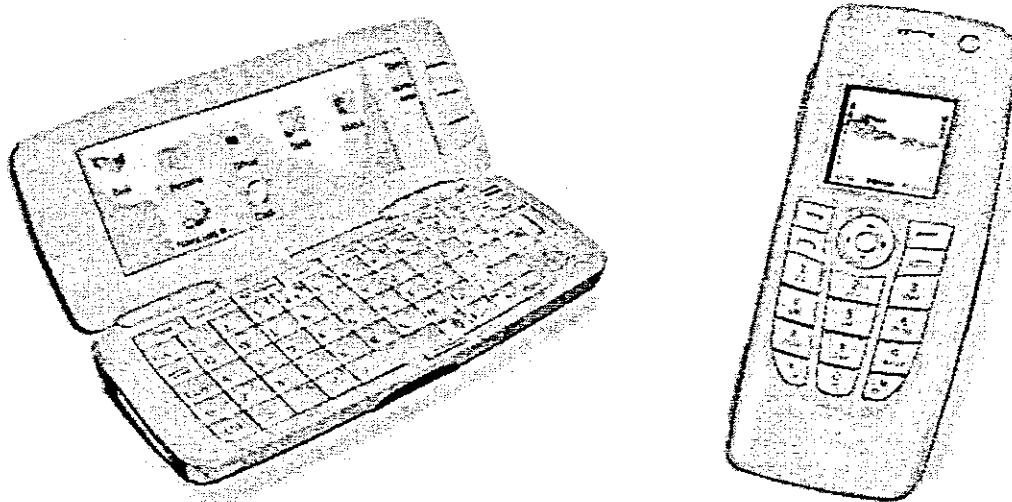


Figure 5.7: The smartphone (Nokia, 2005b)

The top three most popular Internet connections found were dial-up modem, always-on ADSL (broadband) and always-on leased line (broadband). SMMEs are accepting technology based on speed and cost. While leased line is known for its high cost it is mainly used by larger SMMEs. Although dial-up modem is currently the connection of choice by SMMEs, rising support for broadband technology will demand higher transmission rates enabling further usage of ADSL by South African SMMEs. Perhaps all that new business start-ups will ever need in the future is a smartphone which can almost do as much as other electronic computer devices explored in this work can do.

E-commerce importance

All six elements of e-commerce importance showed significant importance to SMMEs. Four of these: sales, information distribution, customer service and advertising were rated significantly important.

In South Africa the importance of on-line sales is paramount for businesses and by looking at the success of Kalahari.net (De La Harpe, 2005), Kalula (Scholtz, 2005) and in the US Amazon.com (Ghosh, 1998:9) one can see why. These are example businesses attempting to maximise the benefit of e-commerce utilisation.

Mustaffa and Beaumont (2004:5) and Grandon and Pearson (2004:4) support the importance of information distribution in an e-commerce environment. E-commerce enhances the distribution of information by improving information accessibility and improving communication using high speed electronic processes.

Customer service is rated important and benefits from e-commerce through interactive Web based applications facilitating customer feedback and enquiries. Online businesses can offer an online help desk (FAQ) to answer customer enquiries with less direct human involvement (Quaddus & Achjari, 2005:9).

Advertising was the fourth most important element of e-commerce. This echoes the thoughts of Abell and Black (1996) that the number of businesses using the Internet for marketing and advertising has doubled in recent years.

Effects of e-commerce utilisation

The research has shown that SMMEs utilising email creates positive effects (or intermediate effects) for their businesses. These effects are summarised by stating that email helps the SMME to stay in touch with: customers; suppliers; business partners; and employees. Business effects from utilising the Internet were also revealed from this research. These effects are:

- expanding the market reach of products and or services;
- assisting in finding alternative suppliers;
- helping the SMME enter overseas markets;
- allowing overseas competitors to enter South African markets;
- helping the SMME to bypass traditional suppliers; and
- helping the SMME sell directly to customers

Internet advertising was found to have the single effect of reducing advertising costs. The literature has shown that this is owing to the low set-up costs in advertising over the Internet.

The two Web effects found were:

- a Web page helps in attracting new customers; and
- a Web page increases local market share

Although EDI showed unreliable statistics one respondent showed a strong belief in the investment of EDI for a particular business venture.

Benefits of e-commerce utilisation

This study was based on statistical responses from SMMEs that utilised various forms of e-commerce. With reference to the research model there is overwhelming statistical evidence that e-commerce application utilising SMMEs benefit from business effects. The research found strong statistical relationships between business effects (increased local market share, sell directly to customers, reduced advertising cost and staying in touch with customers) and perceived business benefits (increased revenue, reduced cost and competitive advantage) both in the short- and long-term.

Benefits	<ul style="list-style-type: none"> • Increased new revenue • Reduced costs • Increased competitive advantage 	<ul style="list-style-type: none"> • Increased new revenue • Reduced costs • Increased competitive advantage
	Effects	<ul style="list-style-type: none"> • Increased local market share • Reduced advertising cost
	Short term	Long term

Figure 5.8: SMME perceived benefits versus time frame

These relationships are illustrated in Figure 5.4. Figure 5.4 reveals what people are seeking does not change, but clearly what they are able to achieve is different between the short and long term. This results in:

“What people want to get does not change over time” (Bytheway, 2005b).

All six intended benefits became achieved benefits. The achieved effects were less than intended. This is a consequence of how long SMMEs have been utilising e-commerce and the behavioural aspect of resistance to change. For example, if a business gave 60 salespeople PDA's instead of cellphones for information and communication purposes, nothing will change as they will use them as cellphones. The use of a cellphone to send email does not allow any record keeping compared to the use of software email installed on a PC.

Significant effect-benefit relationships

In this study the statistics have revealed the e-commerce application-effect-benefit relationships in South Africa. Most of these relationships have persuasive causal explanations. These are illustrated by the relationship model in Figure 5.5. In summary the relationships that exist between e-commerce applications, the effects produced and the positive benefits created for the South African SMME, are:

- SMMEs utilising Web pages effectively increase local market share thereby benefiting from increased short-term: new revenue and competitive advantage.
- SMMEs utilising Internet advertising lower advertising cost benefiting from reduced short-term cost and increased short-term competitive advantage.
- Email utilisation effectively helps the SMME to stay in touch with customers thus benefiting from long-term: reduced cost and increased competitive advantage.
- The Internet assists the SMME to sell directly to customers thereby creating the benefit of higher long-term new revenue.

From this survey seven significant effect-benefit relationships were revealed while the Australian survey revealed twelve. The maturity figures show South Africa has been using e-commerce for longer, so why are there so few relationships? Does this mean South Africans are very slow learners or has it taken a long time for South Africans to get confused? A possible explanation can be that Australia is known as a highly regulated society, while South Africa is nominal and full of indiscipline (Bytheway, 2005b).

A South African and Australian comparison in e-commerce utilisation

Short-term cost reduction in South Africa was found to be associated with Internet advertising reducing advertising costs while in Australia associations were not pursued as short-term cost reduction was omitted from the study showing no significance at the one percent significance level.

The Australian survey revealed associations with both email and the Internet. Email was associated with staying in touch with customers while the Internet was associated with both: helping overseas competitors enter Australian markets and the Internet helps to identify alternative suppliers. South African SMMEs confirmed the association that email does help to stay in touch with customers.

Short-term competitive advantage is associated with Web page and Internet advertising. Web pages helped increase market share while Internet advertising has helped to reduce advertising cost. The Australian survey revealed the former association and showed that the Internet had helped overseas competitors enter Australian markets.

In Australia long-term competitive advantage was associated with the Internet and Web page utilisation. The Web pages helped in expanding local markets and the Internet had helped in expanding products and or services. South African SMMEs said that email was significant in staying in touch with customers.

5.3 Limitations of study

The research sample of SMMEs in the Western Cape produced a model which should be applicable to the rest of South Africa.

It became apparent that the crucial design feature in this research was the design of the questionnaire. Although the questionnaire was pilot tested the sample of five was insufficient to identify one flaw in the design. It was designed not according to the flow of the text but in view of the respondents answering the questionnaire. One requirement of this type of research is to include the questionnaire in this work so it is therefore crucial to match the flow of the text with the design of the questionnaire. This did not affect the results of this study but could have made the reading of the text a little awkward.

The Australian sample that laid the foundation of this research was based on active e-commerce users. The sample of 75 was reduced to 70 for analysis rejecting 5 non e-commerce using SMMEs (Mustaffa & Beaumont, 2004:6). This research surveyed both active and non active e-commerce SMMEs. These differences could have limited the comparative study between the two countries.

A quantitative approach was used for this survey based on statistical analysis using hard and reliable data. Many results were highly informative but the true reasoning behind certain questions and answers were not divulged owing to quantitative methodology. Perhaps a richer and deeper data approach, as used in qualitative methodology, would have seen a greater understanding (interpretivism) of the views of the participants, especially in the use of electronic computer devices, Internet connectivity and e-commerce importance (Klein & Myers, 1999:1). With a quantitative analysis a reasonably balanced view is generated while the qualitative interpretive work is less generalised and creates a better contextual understanding (Uys, 2005).

5.4 Recommendations

How long does it take to start up a business in South Africa? From empirical experience three weeks to register a company name (the applicant is required to nominate three possible names) and approximately two weeks to then register the business. Thereafter a further week is estimated to register for Value Added Tax (VAT), South African Revenue Services (SARS) and many other legal requirements taking the total to about six weeks. In Sweden the process takes three hours (Bytheway, 2005b). It is clear from the research that Government should encourage the potential and existing entrepreneurs to participate in business through greater awareness of e-commerce benefits. On the other side of the business spectrum monopolistic businesses must be transformed allowing free competition and reduced costs. This will encourage further investment in IT and e-commerce applications by SMMEs allowing them to maximise e-commerce benefits. Support structures to educate business owners in IT and e-commerce strategies must be established, together with the provision of tax breaks, to enable the vast potential that SMMEs have in contributing to the gross domestic product (GDP) of South Africa to be realised (Tommeay, 2005).

Cellphone and Internet connectivity costs must be reduced and be comparable with other countries to evident confidence and increased competition between businesses in South Africa and across its geographic borders. Internet connectivity and cellphone costs must be reduced in line with the Europe, South Africa's major trading partner. The South African currency, the Rand (R), is linked to the performance of the European Euro (€). So from an exchange rate point of view they are relatively stable. So why are South Africa's Internet connectivity and cellphone costs so much higher? These costs must be reduced to provide the springboard for potential and for current SMMEs to take advantage of cheaper communications that support the functionality of their businesses. The introduction of a second national operator (SNO) will hopefully assist in cost reduction through competition and in the longer term, broadband over power line (BoPL) could become a reality, reducing costs further by using South Africa's existing electricity distribution networks.

The Internet2 will change the speed and effectiveness of e-commerce known today and will support the information space provided by the Web, with vigour. Email has already diversified from desktops to Web browsers and cellphones. The Web itself is expanding rapidly creating vast opportunities for SMMEs that have taken advantage of it, and supporting the establishment of Web sites and FAQ pages. FAQs are a cheap and effective way of tailoring products and services to customers' needs and help to stay in touch with customers. But why don't South African and Australian SMMEs deem these as benefits? One possible reason is that many are still not on-line reducing all potential benefit considerably. EDI has been around since the 1970s but Internet EDI has diversified using Internet based protocols and technologies. There are numerous research programs actively trying to set data communication standards thereby supporting better established and less complicated EDI applications.

5.5 Further research

This research was based on Western Cape SMMEs. A national study of SMMEs operating in the larger cities and in rural areas would assist in supporting the research questions in this study. Thereafter a proposed comparative study could be made between three large geographical countries namely: Brazil, South Africa and Australia to establish southern hemisphere e-commerce maturity (OECD, 1998:2).

The graph illustrated in Figure 5.2, indicating the percentage of SMMEs using e-commerce years ago, suggests similarities between South Africa and Australia SMMEs utilising the Internet and should be further explored.

From an electrical engineering perspective BoPL supporting grid and distributed computing requires further research. This will allow easy-to-use and convenient broadband Internet access for communities using a common electrical plug point in the home or office.

A minimum of demographic data was solicited from the respondents for example: geographic area of operation. This was limited to the four answers in this survey, namely: local, provincial, national and international. In depth operational enquiries could have stretched into the 'where, what and why' businesses were operating in these four areas. As this research was based on the Australian survey and comparative results and simplicity were required, this approach was not used. The 'where, what, why' of SMME operations, makes an interesting topic for further exploratory research.

How interesting it was, despite the quantitative nature of this research that some respondents were driven to make an adaptation of the questionnaire which suggests there is a more relaxed approach to completing questionnaires than in the past. Further work based upon selected interviews of participating SMMEs would contribute greatly to research into e-commerce application utilisation.

Web usage is much lower than Internet usage for micro-, very small- and small-enterprises. This prompts the question: do SMMEs confuse the Internet with the Web? This possible confusion warrants further research.

From the literature there seems to be no apparent 'link' between the development of the second generation Internet (Internet2 or Abilene network) and the future expansion of the Web including Web standard recommendations. The inventor of the Web, who is currently the head of the World Wide Web Consortium, has no personal involvement with the Internet2 and therefore cannot state when Internet2 will become globally available (Berners-Lee, 2005). This 'link' warrants further exploratory research.

This study is concluded with the words of Berners-Lee and Fischetti (2000:162):

"When I proposed the Web in 1989, the driving force I had in mind was *communication through shared knowledge*, and the driving 'market' for it was *collaboration among people at work and at home*"
Berners-Lee and Fischetti (2000:162).

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Appendix A: Covering letter



**CAPE PENINSULA
UNIVERSITY OF TECHNOLOGY**



01 June 2005

The Managing Director
ABC Management
188 Van Riebeeck Road
Kuils River 7580

Dear Sir/Madam

Survey of small business usage of e-commerce applications

This letter serves to inform you of the ongoing academic research project (effective implementation of e-commerce in SMMEs) at the Cape Peninsula University of Technology. Kyle Fitzgerald is leading this project as part of a Masters Degree programme in Business Information Systems (BIS).

This research is generously funded by the National Research Foundation (NRF) in partnership with the CPUT and the benefits to participating small businesses are enormous. Your company has been carefully selected to participate in this survey and your input will be relevant to the successful completion of the project. All participating small businesses will have access to the final report as part of their involvement and could learn about good practice that delivers e-commerce benefits.

Please find the attached copy of questionnaire to be completed and returned by post in the pre-stamped self addressed envelope. The information provided in the questionnaire will be used for the purpose of academic research only and will be kept in strict professional confidence.

Thanking you in anticipation.

KYLE FITZGERALD

Appendix B: Sample questionnaire

Section A: Business demographics

In order to determine whether your business is classified as a SMME (small-, medium- and micro-enterprise), please answer each of the following questions by placing a tick in the appropriate block.

Num	Question	Yes	No
Q1	Is the annual turnover of your business less than R40 million?		
Q2	Is the value of business assets, excluding fixed property, less than R15 million?		

Please enter a number in the appropriate block for the following question.

Num	Question	No of Employees
Q3	How many people do you employ?	

Please answer the following question by placing a tick in the appropriate block.

Num	Question	Local	Provincial	National	International
Q4	What is the geographic area of your business operation?				

Section B: Electronic computer devices

There are five electronic computer devices covered in this section, as depicted in Figure 1 below.



Personal computer (PC)



Laptop computer



Cellphone



Personal digital assistant (PDA) hand held computer



Voice over Internet Protocol (VoIP) Internet telephony

Figure 1: Five electronic computer devices

Please answer the following questions by placing a tick in the appropriate block.

Num	Question	Not at all	To a small extent	To some extent	To a large extent	To a very large extent
Q5	Does your business use personal computers (PCs)?					
Q6	Does your business use laptop computers?					
Q7	Does your business use cellphones?					
Q8	Does your business use PDAs?					
Q9	Does your business use VoIP?					

Section C: E-commerce applications

Please answer each of the following seven questions by placing a tick in the appropriate block. If you answer 'Yes' or 'No longer use' to any please complete the section stated.

Num	Question	Yes	No	No longer use	If you answered 'Yes' or 'No longer use', please complete the section(s) as stated below.
Q10	Do you use electronic commerce (e-commerce)?				Section D
Q11	Do you use electronic mail (email)?				Sections E and F
Q12	Do you use the Internet?				Sections E and G
Q13	Do you advertise on the Internet?				Section H
Q14	Do you use a Web page?				Section I
Q15	Do you use a frequently asked question (FAQ) Web page?				Section J
Q16	Do you use electronic data interchange (EDI)?				Section K

If you have ticked 'No longer use' at least once, please state why.

Section D: Using e-commerce

If you use e-commerce please tick the appropriate block according to the following statements.

Num	Statement	Not at all	Some importance	Important	Very important	Most important
S1	Sales are an important use of e-commerce.					
S2	The distribution of Information is an important use of e-commerce.					
S3	Customer service is an important use of e-commerce.					
S4	Subscription (a payment to subscribe to something) is an important use of e-commerce.					
S5	Advertising is an important use of e-commerce.					
S6	Other important uses of e-commerce.					

Num	Statement	Don't know	0-10%	11-20%	21-30%	31-40%	More than 40%
S7	E-commerce will help to attract new revenue in the short term.						
S8	E-commerce will help us to attract new revenue in the long term.						
S9	E-commerce will help to reduce costs in the short term.						
S10	E-commerce will help to reduce costs in the long term.						
S11	E-commerce will provide competitive advantage in the short term.						
S12	E-commerce will provide competitive advantage in the long term.						

Please enter the number of years for the following question.

Num	Question	No of Years
Q17	How long have you used e-commerce for?	

Section E: Connecting to the Internet

Access to the Internet is provided by an Internet service provider (ISP). This section deals with how your business connects to the Internet via your ISP. Please tick the appropriate block according to the following questions.

Num	Question	Not at all	To a small extent	To some extent	To a large extent	To a very large extent
Q18	Does your business use a dial-up facility using a modem to connect to the Internet?					
Q19	Does your business use a leased line to connect to the Internet?					
Q20	Does your business use an ISDN line to connect to the Internet?					
Q21	Does your business use an ADSL line to connect to the Internet?					
Q22	Does your business make use of any other type of Internet connection?					

Section F: Using electronic mail (email)

If you use email please tick the appropriate block according to the following statements and questions.

Num	Statement	Not at all	To a small extent	To some extent	To a large extent	To a very large extent
S13	Using email helps us to stay in touch with customers.					
S14	Using email helps us to stay in touch with suppliers.					
S15	Using email helps us to stay in touch with business partners.					
S16	Using email helps us to stay in touch with employees.					

Num	Question	Not at all	To a small extent	To some extent	To a large extent	To a very large extent
Q23	Do you make use of software based email?					
Q24	Do you make use of Web browser based email?					
Q25	Do you make use of cellphone based email?					
Q26	Do you make use of PDA based email?					

Section G: Using the Internet

Please tick the appropriate block according to the following statements.

Num	Statement	Not at all	To a small extent	To some extent	To a large extent	To a very large extent
S17	Using the Internet expands the reach of our products and services.					
S18	Using the Internet assists us to find alternative sources of supplies.					
S19	Using the Internet helps us to enter overseas markets.					
S20	The Internet has allowed overseas competitors to enter South African markets.					
S21	Using the Internet helps us to bypass traditional suppliers.					
S22	Using the Internet helps us to sell directly to customers.					

Section H: Advertising on the Internet

Please tick the appropriate block according to the following statements.

Num	Statement	Not at all	To a small extent	To some extent	To a large extent	To a very large extent
S23	Advertising on the Internet reduces advertising cost for our business.					

Section I: Using a Web page

Please tick the appropriate block according to the following statements.

Num	Statement	Not at all	To a small extent	To some extent	To a large extent	To a very large extent
S24	Having a Web page has helped us to attract new customers.					
S25	Having a Web page assists us to increase local market share.					

Section J: Using a frequently asked question (FAQ) page

Please tick the appropriate block according to the following statements.

Num	Question	Not at all	To a small extent	To some extent	To a large extent	To a very large extent
Q27	Using FAQ pages help us to tailor products and services to customers' needs?					
Q28	Using FAQ pages help us stay in touch with customers?					
Q29	Using FAQ pages assist in receiving timely feedback?					

Section K: Using Electronic Data Interchange (EDI)

Please tick the appropriate block according to the following statements.

Num	Statement	Not at all	To a small extent	To some extent	To a large extent	To a very large extent
S26	Using Internet based EDI helps us cut order and delivery time.					
S27	Using Internet based EDI reduces data entry cost.					
S28	Using Internet based EDI increases data transfer speed.					
S29	Using Internet based EDI reduces data entry errors.					
S30	Using Internet based EDI assists us in holding less inventory.					

Section L: Conclusion

Please tick the box if you require a copy of the results of this survey.

Please return the completed questionnaire in the stamped and addressed envelope provided. Thank you for your kind assistance with this questionnaire.

Appendix C – Definitions and concepts

Application

An application is the use of a technology for the benefit of a small business. For example electronic mail (email) is an application (Poon & Swatman, 1997a:9).

Business benefit

A business benefit is a tangible or intangible element that contributes to business success. Statistically it is the dependent variable in the analysis of association.

E-business

Electronic business is any information system or digital application that empowers business processes.

E-commerce

Electronic commerce is the buying, selling, marketing, and servicing of products or services over computer networks including the Internet.

Effect

Effect is the positive or negative result of a specific application use. Statistically it is the independent variable in the analysis of association.

Information system (IS)

An information system is the totality of technological and human components that work together to produce the information systems and services that a business needs, and that processes information for some organisational purpose.

Information technology (IT)

Information technology refers to specific technical components, normally organised as hardware, software and communications used to make up an information system.

Appendices

Positivism

Emphasis on the ability to measure and prove concepts.

Regression

In statistics regression is the analysis of the associations between the dependant variable and one or more dependant variables.

Strategy

The short-term and/or long-term plan for a business.

Technology

Technology refers to technical components and inventions using recently-discovered scientific principles and processes.

Appendix D – Abbreviations

Abbreviation	Description
2G	Second-generation wireless telephone technology
3G	Third-generation wireless telephone technology
ADSL	Asymmetrical digital subscriber line
AdTrailer	Advertising trailer or mobile billboard
ATM	Asynchronous transfer mode
B2B	Business-to-business
B2C	Business-to-consumer
BIS	Business information systems
BoPL	Broadband over power lines
Bps	Bits per second
CC	Close corporation
CERN	European Organization for Nuclear Research
CICA	Context Inspired Component Architecture
CPU	Central processing unit
CRM	Customer relationship management
CSSA	Computer society of South Africa
CPUT	Cape Peninsula University of Technology
CUASA	Communications Users Association of South Africa
DMT	Discrete multi-tone
DNS	Domain name system
DOM	Document object model
DSL	Digital subscriber line
E-banking	Electronic banking
E-business	Electronic business
ebXML	Electronic business using extensible markup language
E-commerce	Electronic commerce
ECSA	Engineering Council of South Africa
EDI	Electronic data interchange
Email	Electronic mail
E-marketing	Electronic marketing
EMS	Enhanced messaging service
E-payment	Electronic payment
EU	European Union
FAQ	Frequently asked question
FTP	File transfer protocol
Gbps	Giga bits per second
GDP	Gross domestic product
GHz	Gigahertz
GPS	Global positioning system
GSM	Global system for mobile communications
HTML	Hypertext markup language
HTTP	Hypertext transfer protocol
ICASA	Independent Communications Authority of South Africa
ICDT	Information, communication, distribution and transaction
ICT	Information and communication technology

Appendices

Abbreviation	Description
IP	Internet protocol
IPv4	Internet protocol version four
IPv6	Internet protocol version six
IS	Information systems
ISDN	Integrated services digital network
ISP	Internet service provider
IT	Information technology
JSE	Johannesburg stock exchange
LAN	Local area network
MB	Megabyte
Mbps	Megabits per second
M-commerce	Mobile commerce
MMS	Multimedia messaging service
MTN	Mobile Telephone Networks South Africa
NAT	Network address translation
NRF	National Research Foundation
O/S	Operating system
OSI	Open systems interconnection reference model
P2P	Person-to-person
PBX	Private business exchange
PC	Personal computer
PDA	Personal digital assistant
PLC	Power-line carrier
POS	Point-of-sale
PPP	Point-to-point protocol
PSTN	Public switched telephone network
RAM	Random access memory
SAIEE	South African Institute of Electrical Engineers
SARS	South African Revenue Service
SBIC	Small business Internet commerce
SCM	Supply chain management
SDA	Secondary data analysis
SIC	Standard industry classification
SIM	Subscriber identity module
SME	Small-, and medium-sized enterprise
SMME	Small-, medium- and micro-enterprise
SMS	Short messaging service
SNO	Second national operator
TAM	Technology acceptance model
TCP	Transmission control protocol
TCP/IP	Transmission control protocol/Internet protocol
U-commerce	Ubiquitous commerce
UDI	Universal document identifier
UK	United Kingdom
URL	Uniform resource locator
US	United States

Appendices

Abbreviation	Description
USB	Universal serial bus
VAT	value added tax
VBA	Visual basic access
VoIP	Voice over Internet protocol
WAN	Wide area network
WAP	Wireless application protocol
WC	Western Cape
Web	World Wide Web
WiFi	Wireless fidelity
WIG	Wireless Internet gateway
WiMAX	Worldwide interoperability for microwave access
WLL	Wireless local loop
WMN	Wireless mesh network
xDSL	Designation for digital subscriber line technology
XML	Extensible markup language

Appendix E – Program code

Option Compare Database

Public Sub CreateStatistics()

***Variable definitions ***

Dim DB1 As DAO.Database

Dim RS1 As DAO.Recordset

Dim TD1 As DAO.TableDef

Dim xSQL As String

Dim QId(70, 3) As Variant

Dim a As Integer

Dim MaxQ As Integer

**** Set database ****

Set DB1 = CurrentDb()

***Read the Question Identity codes in sequential order and place into an array ***

xSQL = "SELECT * FROM Questions ORDER BY NO ASC "

Set RS1 = DB1.OpenRecordset(xSQL)

q = 1

While Not RS1.EOF

 QId(RS1("No"), 1) = RS1("QId")

 QId(RS1("No"), 2) = RS1("DataType")

 QId(RS1("No"), 3) = RS1("No")

 RS1.MoveNext

 q = q + 1

Wend

MaxQ = q - 1

xSQL = "DELETE FROM MailingListStats "

Call DeletelnsertQ(DB1, xSQL)

xSQL = "SELECT * FROM MailingList WHERE SeqReceived IS NOT NULL "

Set RS1 = DB1.OpenRecordset(xSQL)

xSQL = "SELECT * FROM MailingListStats "

Set RS2 = DB1.OpenRecordset(xSQL)

q = 1

While Not RS1.EOF

 For q = 1 To MaxQ

 If QId(q, 2) = "Boolean" Then

 If convBoolean(RS1(QId(q, 1))) >= 0 Then

 RS2.AddNew

 RS2("Companyld") = RS1("Companyld")

Appendices

```

        RS2("QId") = QId(q, 1)
        RS2("No") = QId(q, 3)
        RS2("Answer") = convBoolean(RS1(QId(q, 1)))
        RS2.Update
    End If
End If
If QId(q, 2) = "Integer" Then
    If convinteger(RS1(QId(q, 1))) >= 0 Then
        RS2.AddNew
        RS2("CompanyId") = RS1("CompanyId")
        RS2("QId") = QId(q, 1)
        RS2("No") = QId(q, 3)
        RS2("Answer") = convInteger(RS1(QId(q, 1)))
        RS2.Update
    End If
End If
If QId(q, 2) = "Text" Then
    If convText(RS1(QId(q, 1))) <> "" Then
        RS2.AddNew
        RS2("CompanyId") = RS1("CompanyId")
        RS2("QId") = QId(q, 1)
        RS2("No") = QId(q, 3)
        RS2("AnswerText") = convText(RS1(QId(q, 1)))
        RS2.Update
    End If
End If
If QId(q, 2) = "YesNo" Then
    If convYesNo(RS1(QId(q, 1))) >= 0 Then
        RS2.AddNew
        RS2("CompanyId") = RS1("CompanyId")
        RS2("QId") = QId(q, 1)
        RS2("No") = QId(q, 3)
        RS2("Answer") = convYesNo(RS1(QId(q, 1)))
        RS2.Update
    End If
End If
Next q
RS1.MoveNext
Wend
End Sub

```

Sub DeleteInsertQ(xDB As Database, xSQL As String)

*** This routine deletes or inserts records depending on the SQL passed *

```

    Dim QD As QueryDef
    Set QD = xDB.CreateQueryDef("")
    QD.SQL = xSQL
    QD.Execute
End Sub

```


Appendices

Function convBoolean(yAns As Variant) As Integer

*** This function converts boolean types to 0 (False) or 1 (True) *

convBoolean = 0

If yAns = True Then convBoolean = 1

End Function

Function convInteger(yAns As Variant) As Integer

*** This function converts NULL to -1 for integer *

convInteger = 0

If IsNull(yAns) Then

convInteger = -1

Else

If yAns >= 1 Then convInteger = yAns

End If

End Function

Function convText(yAns As Variant) As String

*** This function converts NULL to "" for text *

convText = ""

If IsNull(yAns) Then

convText = ""

Else

If Len(yAns) > 0 Then convText = yAns

End If

End Function

Function convYesNo(yAns As Variant) As Integer

*** This function converts NULL to -1 for Y/N *

convYesNo = 0

If IsNull(yAns) Then

convYesNo = -1

Else

If yAns = 1 Then convYesNo = yAns

End If

End Function

Appendix F – Hypotheses

Elements	
Hypothesis	Hypothesis description
H101 ₀	Sales are not an important use of e-commerce
H101 ₁	Sales are an important use of e-commerce
H102 ₀	Information distribution is not an important use of e-commerce
H102 ₁	Information distribution is an important use of e-commerce
H103 ₀	Customer service is not an important use of e-commerce
H103 ₁	Customer service is an important use of e-commerce
H104 ₀	Advertising is not an important use of e-commerce
H104 ₁	Advertising is an important use of e-commerce
H105 ₀	Subscription is not an important use of e-commerce
H105 ₁	Subscription is an important use of e-commerce
H106 ₀	The are no other important uses of e-commerce
H106 ₁	The are other important uses of e-commerce

Effects	
Hypothesis	Hypothesis description
H201 ₀	Email has no effect in helping to stay in touch with customers
H201 ₁	Email has a positive effect in staying in touch with customers
H202 ₀	Email has no effect in helping to stay in touch with suppliers
H202 ₁	Email has a positive effect in staying in touch with suppliers
H203 ₀	Email has no effect in helping to stay in touch with business partners
H203 ₁	Email has a positive effect in staying in touch with business partners
H204 ₀	Email has no effect in helping to stay in touch with employees
H204 ₁	Email has a positive effect in staying in touch with employees
H205 ₀	The Internet has no effect in expanding products and or services
H205 ₁	The Internet has a positive effect in expanding products and or services
H206 ₀	The Internet has no effect in finding alternate source of supplies
H206 ₁	The Internet has a positive effect in finding alternate source of supplies
H207 ₀	The Internet has no effect in helping to enter overseas markets
H207 ₁	The Internet has a positive effect in helping to enter overseas markets
H208 ₀	The Internet has no effect in allowing overseas competitors to enter South African markets
H208 ₁	The Internet has a positive effect in allowing overseas competitors to enter South African markets
H209 ₀	The Internet has no effect in bypassing traditional suppliers
H209 ₁	The Internet has a positive effect in bypassing traditional suppliers
H210 ₀	The Internet has no effect in helping to sell directly to customers
H210 ₁	The Internet has a positive effect in helping to sell directly to customers
H211 ₀	The Internet has no effect in reducing advertising cost
H211 ₁	The Internet has a positive effect in reducing advertising cost
H212 ₀	A Web page has no effect in attracting new customers
H212 ₁	A Web page has a positive effect in attracting new customers
H213 ₀	A Web page has no effect in increasing local market share
H213 ₁	A Web page has a positive effect in increasing local market share

Effects	
Hypothesis	Hypothesis description
H214 ₀	A FAQ page has no effect in helping to tailor products and services to customers' needs
H214 ₁	A FAQ page has a positive effect in helping to tailor products and services to customers' needs
H215 ₀	A FAQ page has no effect in helping to stay in touch with customers
H215 ₁	A FAQ page has a positive effect in helping to stay in touch with customers
H216 ₀	A FAQ page has no effect assisting in receiving timely feedback
H216 ₁	A FAQ page has a positive effect assisting in receiving timely feedback
H217 ₀	Internet EDI has no effect in cutting order and delivery time
H217 ₁	Internet EDI has a positive effect in cutting order and delivery time
H218 ₀	Internet EDI has no effect in reducing data entry cost
H218 ₁	Internet EDI has a positive effect in reducing data entry cost
H219 ₀	Internet EDI has no effect in increasing data entry speed
H219 ₁	Internet EDI has a positive effect in increasing data entry speed
H220 ₀	Internet EDI has no effect in reducing data entry errors
H220 ₁	Internet EDI has a positive effect in reducing data entry errors
H221 ₀	Internet EDI has no effect in assisting to hold less inventory
H221 ₁	Internet EDI has a positive effect in assisting to hold less inventory

Benefits	
Hypothesis	Hypothesis description
H301 ₀	E-commerce has no benefit in increasing short-term new revenue
H301 ₁	E-commerce has a positive benefit in increasing short-term new revenue
H302 ₀	E-commerce has no benefit in increasing long-term new revenue
H302 ₁	E-commerce has a positive benefit in increasing long-term new revenue
H303 ₀	E-commerce has no benefit in reducing costs in the short-term
H303 ₁	E-commerce has a positive benefit in reducing costs in the short-term
H304 ₀	E-commerce has no benefit in reducing costs in the long-term
H304 ₁	E-commerce has a positive benefit in reducing costs in the long-term
H305 ₀	E-commerce has no benefit in increasing short-term competitive advantage
H305 ₁	E-commerce has a positive benefit in increasing short-term competitive advantage
H306 ₀	E-commerce has no benefit in increasing long-term competitive advantage
H306 ₁	E-commerce has a positive benefit in increasing long-term competitive advantage

Appendix G – Emails

Kyle Fitzgerald

From: Andre Watkins [prof.watkins@absamail.co.za]
Sent: 24 August 2005 13:11
To: Kyle Fitzgerald
Subject: Re: Masters survey question

Kyle,
That would be acceptable.

Prof. Dr. J. André Watkins, D.Phil., D.Com., Ph.D.
Tel: 021- 8561913 Cell: 083-6472572
E-Mail: prof.watkins@absamail.co.za
P.O. Box 1+29, Gordon's Bay, 7151.

----- Original Message -----
From: Kyle Fitzgerald
To: prof.watkins@absamail.co.za
Sent: Wednesday, August 24, 2005 12:31 PM
Subject: Masters survey question

Hi Prof Watkins

How are you?

Can you let me know, in your opinion, what is an acceptable percentage of returned questionnaires for a Masters?







I sent out 300 and have received 36 back so far. Is this sufficient?

Regards
Kyle Fitzgerald
MTECH BIS
CPUT

05/11/2005

Kyle Fitzgerald

From: Nicholas Beaumont [Nicholas.Beaumont@BusEcon.monash.edu.au]
Sent: 08 July 2005 01:18
To: Kyle Fitzgerald
Subject: Re: Request for research data

 Qdata.sav (13 KB)  Descriptives1.doc (73 KB)  Descriptives2.doc (41 KB)  Descriptives3.doc (93 KB)  Descriptives.doc (41 KB)  Factor Analysis.doc (39 KB)

Kyle,

attached.

I would be pleased to have copies of any papers you produce. If you would acknowledge Shameen's help.

Best of luck with your research.

Nick

Kyle Fitzgerald wrote:

- > Hello Dr Beaumont
- >
- > I am a 45 year old currently preparing a thesis for my M.Tech degree
- > in Business Information Systems at the Cape Peninsula University of
- > Technology in Cape Town.
- >
- > I have read your excellent article "The effect of electronic commerce
- > on small Australian enterprises" in the Technovation journal of
- > February 2004.
- >
- > My research proposal is to conduct similar research that, Ms Kistoffe
- > and yourself, have performed in Australia, but for South African
- > small, medium and micro enterprises.
- >
- > I note that the data from your research is available for further
- > research.
- >
- > Could you email me a copy of your data / documentation?
- >
- > Thank you
- >
- > Kind regards
- >
- > Kyle Fitzgerald
- >
- > M.Tech BIS
- >
- > Student No: 265118671
- >
- > Cape Peninsula University of Technology
- >

--
Dr Nicholas Beaumont
Department of Management, Faculty of Business and Economics,
Monash University,
PO Box 197 Caulfield East, Vic 3145, Australia.
Phone 61 3 9593 2371, Fax 61 3 9903 2718, Mob 0418 579 145
Room B5.17 Caulfield Campus

Appendix H – Statistical tables

Critical values for the correlation coefficient (r) one-tailed tests

N	5%	1%
4	0.900	0.980
5	0.805	0.934
6	0.729	0.882
7	0.669	0.833
8	0.621	0.789
9	0.582	0.750
10	0.549	0.715
11	0.521	0.685
12	0.497	0.658
13	0.476	0.634
14	0.458	0.612
15	0.441	0.592
16	0.426	0.574
17	0.412	0.558
18	0.400	0.543
19	0.389	0.529
20	0.378	0.516
21	0.369	0.503
22	0.360	0.492
23	0.352	0.482
24	0.344	0.472
25	0.337	0.462
26	0.330	0.453
27	0.323	0.445
28	0.317	0.437
29	0.312	0.430
30	0.306	0.423
40	0.264	0.367
50	0.235	0.328
60	0.214	0.300
70	0.198	0.278
80	0.185	0.260
90	0.174	0.245
100	0.165	0.232
110	0.158	0.222
120	0.151	0.212